NICOLLS ROAD
ALTERNATIVES ANALYSIS

Final Report | June 2016

SUFFOLK COUNTY, NEW YORK

NYMTC
NEW YORK METROPOLITAN TRANSPORTATION COUNCIL

PARSONS BRINCKERHOFF

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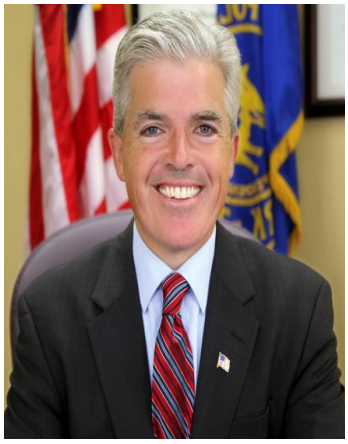

June 2016

I am pleased to present to you the Final Report for the Nicolls Road Alternatives Analysis. With the completion of this study, we are one step closer to the establishment of a premium transit system along the Nicolls Road corridor. Through this process, we have been able to structure a plan that will result in long-term economic stability and growth for the region. This report documents how Bus Rapid Transit (BRT) can provide the foundation for a sustainable transportation strategy to connect our commercial, residential, educational, and research institutions with transit-oriented developments and vibrant downtowns.

A BRT system along Nicolls Road will create the first direct north-south public transportation link between the Port Jefferson, Ronkonkoma, and Montauk LIRR lines. Combined with a parallel hiking/biking trail, this project will transform the road into a multi-modal corridor. Furthermore, it will provide necessary connections between regional assets along the route, including Stony Brook University, Stony Brook University Hospital, Suffolk County Community College - Ammerman Campus, St. Joseph's College, Ronkonkoma Hub, and Long Island MacArthur Airport. The Nicolls Road BRT system will allow for the creation of new jobs, retention of existing jobs, and a wider range of housing options within the corridor, all while improving access to employment, housing, and leisure throughout the entire region.

This process was guided by the goals and objectives of the Suffolk County BRT Feasibility Study, Connect Long Island plan, and the Long Island Innovation Zone plan. Through these complementary efforts, we have laid the groundwork for the development necessary to transform Suffolk County into an even more desirable place to visit, work, and live.

I would like to express my thanks to the New York Metropolitan Transportation Council for serving as the primary sponsor and our partner in this effort. I would also like to give my thanks to all the community members who have been involved in this process—your input and collaboration has been invaluable in shaping this plan. With your continued support, we can move this vision into a reality.

Sincerely,

Steven Bellone
Suffolk County Executive

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EXECUTIVE SUMMARY

STUDY OVERVIEW

Nicolls Road (the "Corridor") (County Route (CR) 97) runs north-south in the Towns of Brookhaven and Islip, and is one of the key economic engines on Long Island. A connection to Ronkonkoma and Patchogue, the Corridor is home to a wide range of activity centers, including innovation assets (educational institutions and research facilities), employment and shopping centers, local downtowns, and recreational resources. There are opportunities to improve conditions along the Corridor by addressing severe traffic congestion, sprawling automobile-oriented development patterns, and the lack of travel alternatives.

The introduction of a premium transit service and hiking/biking trail to the Nicolls Road Corridor will:

- Provide an attractive transit option to employers, residents, students, and visitors
- Assist in mitigating future increases in traffic congestion
- Improve environmental conditions and quality of life
- Catalyze smart growth and sustainable economic development
- Support Complete Streets within the Corridor

The Nicolls Alternatives Analysis (AA) provided the process (**Figure ES 1**) for advancing and evaluating a range of route and modal alternatives for a new, high-quality transit service. The vision for Nicolls Road features a multi-modal, pedestrian- and bicycle-friendly Corridor with a hiking/biking trail to complement the premium transit service.

STUDY PROCESS AND OVERVIEW OF LOCALLY PREFERRED ALTERNATIVE (LPA)

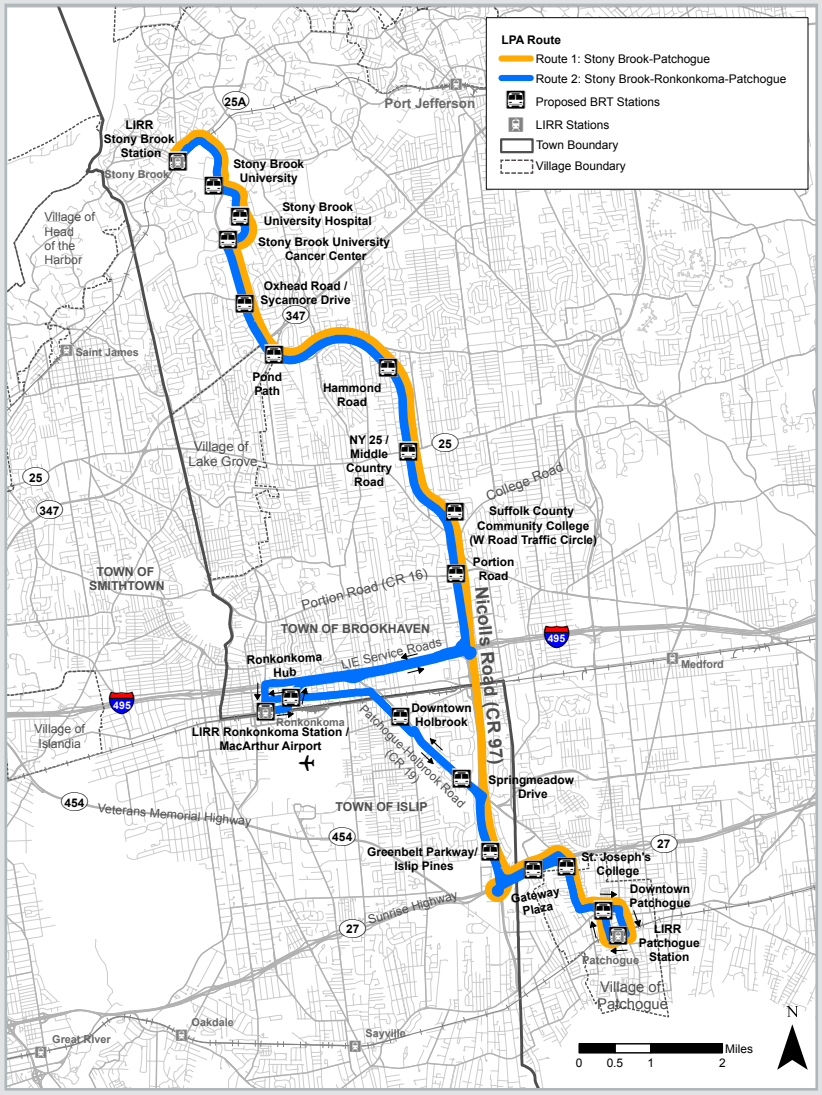
ANALYZE EXISTING CONDITIONS
Fall 2014 - Winter 2015

IDENTIFY ISSUES AND OPPORTUNITIES
Winter 2015

DEVELOP PURPOSE AND NEED, DEFINE GOALS AND OBJECTIVES
Winter 2015 - Spring 2015

CONDUCT ALTERNATIVES DEVELOPMENT AND SCREENING
Spring 2015 - Fall 2015

SELECT LOCALLY PREFERRED ALTERNATIVE (LPA)
Fall 2015 - Winter 2016



The outcome of the AA was the selection of a Locally Preferred Alternative (LPA), comprising a bus rapid transit (BRT) system with two routes: (1) Stony Brook-Patchogue; and (2) Stony Brook-Ronkonkoma-Patchogue. The LPA will be advanced to Project Development and National Environmental Policy Act (NEPA) review with the Federal Transit Administration (FTA), and will be refined as appropriate during Preliminary Engineering.

FIGURE ES 1
Source: Parsons Brinckerhoff, NYS GIS Program Office, GPI

STUDY AREA AND EXISTING CONDITIONS

Key Study Area Findings

- People between 20 and 34 years of age account for a relatively large percentage of total population (compared to Suffolk County overall), a reflection of the large undergraduate and graduate student population
- The relative concentration of multi-family housing supports the notion that Nicolls Road is well-suited for transit improvements to bolster economic development
- More than 80% of workers who live in the study area drive alone to work; only 5% use public transportation
- Half of the work and non-work trips that end in the study area, begin in the study area
- The percentage of Suffolk County's employment in the study area is greater than the percentage of Suffolk County's population in the area, indicating its importance as an employment destination

NO-BUILD ALTERNATIVE

The Nicolls Road AA study area (**Figure ES 2**) encompassed all census tracts with 50 percent or more of their area within one mile of the Stony Brook-Patchogue corridor as identified in the 2014 *Suffolk County BRT Feasibility Study*. The primary focus of the AA was the approximately 12-mile segment of the Nicolls Road Corridor between Health Sciences Drive/Shirley Kenny Drive in the north and NY 27/Sunrise Highway in the south.

The Nicolls Road AA included an assessment of existing conditions in the study area:

- Socioeconomic and demographic indicators
- Population and employment trends
- Travel trends
- Land use patterns and major activity centers
- Transit service
- Roadway characteristics
- Traffic conditions
- Pedestrian and bicycle accommodations

The existing conditions assessment supported the premise that the introduction of a premium transit service along Nicolls Road will result in a wide range of economic activity and beneficial outcomes for Suffolk County and the surrounding region.

A No-Build Alternative was defined to include the existing and committed transportation facilities and services expected to exist in the future horizon year (2040), including LIRR Double Track, Third Track, and East Side Access. It also was defined to reflect population and employment growth forecasts in the study area to 2040:

- The population in the study area is projected to increase by approximately 30,000 people (18%) for a total population of approximately 196,000. Growth is expected in established residential areas as well as new residential and mixed-use developments.
- Employment in the study area is projected to increase by approximately 33,000 jobs (38%) for a total of approximately 119,000 jobs, which demonstrates that the study area will steadily grow as an important trip attractor in the regional travel market.

The No-Build Alternative served as a baseline for comparing the anticipated environmental, transportation, social, and economic benefits and impacts of the project alternatives. The No-Build Alternative will get carried through to the environmental analysis phase after the AA.

STUDY AREA AND MAJOR ACTIVITY CENTERS

FIGURE ES 2
Source: NYS GIS Program Office; Suffolk County; Parsons Brinckerhoff; Tritec; Serota Properties

The study area contains many of Suffolk County's assets and includes three LIRR stations (Stony Brook, Ronkonkoma, and Patchogue) on three different branches.

CHALLENGES AND OPPORTUNITIES, PURPOSE AND NEED, GOALS AND OBJECTIVES

The identification of existing and future challenges and opportunities facing the study area served as the basis for establishing the Purpose and Need.

Transportation challenges within the study area include:

» Constrained travel choices

» Inadequate multi-modal connectivity

» Existing and projected future traffic congestion

» Long travel times by bus (disincentive for transit use)

» Auto-centric land use patterns

» Limited walkability and bicycle accommodations

Key transportation opportunities include:

» Major activity centers (including Stony Brook University Research & Development Park) and development projects (including Ronkonkoma Hub and Islip Pines) as economic generators and sources of transit ridership

» Opportunities to integrate with multiple bus service providers, including Suffolk County Transit and Stony Brook University Transit

» Multiple branches of the LIRR serving the study area

» Proximity to Long Island MacArthur Airport

» Multiple travel markets to be served

» Ability to leverage funded capital improvements in the study area

» LIRR East Side Access, Double Track, and Third Track projects

A well-crafted Purpose and Need was critical to achieving a successful AA, as it served as a roadmap to clearly define why the project was necessary and what the project intended to accomplish.

PURPOSE AND NEED

The purpose of the Nicolls Road AA was to plan a premium transit service that:

» Enhances multi-modal connectivity with three lines of the LIRR and existing bus service

» Improves north-south mobility

» Increases transit access to and from major activity centers

» Promotes increased transit use

» Supports transit-integrated development in the study area

» Connects major assets to Long Island MacArthur Airport

The Purpose and Need provided a foundation for the development of project goals and objectives as well as the subsequent identification of evaluation criteria and measures that were used to screen alternatives.

Project Goals

GOAL 1 IMPROVE MOBILITY AND CONNECTIVITY

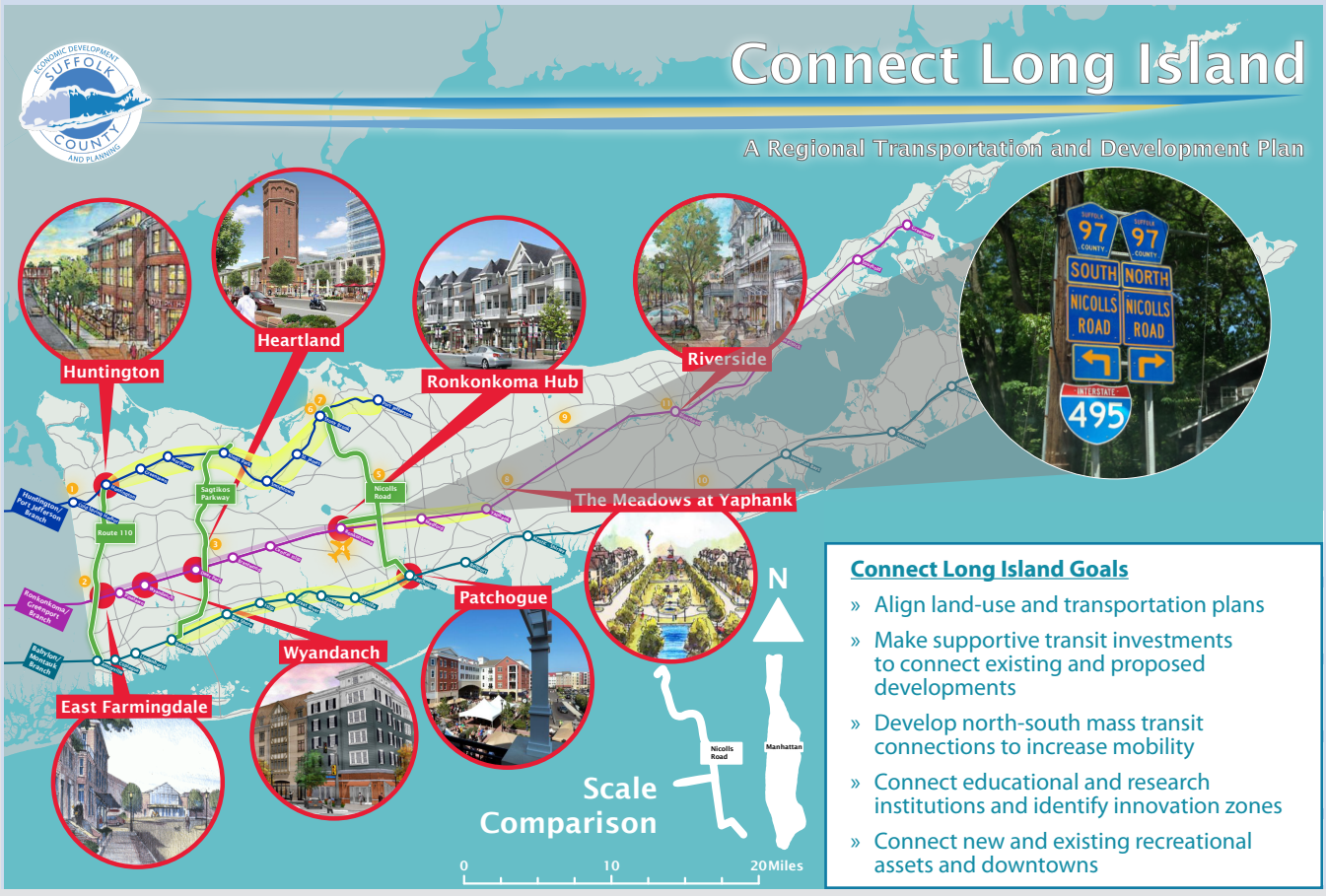
GOAL 2 ENHANCE ECONOMIC COMPETITIVENESS AND PROMOTE ECONOMIC GROWTH

GOAL 3 MAXIMIZE COST AND OPERATIONAL EFFECTIVENESS

GOAL 4 MINIMIZE ADVERSE ENVIRONMENTAL IMPACTS

The Nicolls Road AA provided the framework for planning a robust multi-modal transit network that will enhance connectivity with existing local bus and commuter rail service (**Figure ES 3**)

Source: Parsons Brinckerhoff



An integrated approach to land use policy and transportation improvements can ensure sustainable economic growth
FIGURE ES 3

Source: Suffolk County

LONG-TERM VISION: THE INNOVATION ZONE (I-ZONE)

The I-Zone is a plan to build out a major innovation and transportation hub by transforming Nicolls Road into a multi-modal Corridor that will connect the County's key assets. The plan was formed in 2015 at a meeting of the Long Island Regional Planning Council, where leaders of Suffolk County, Town of Brookhaven, Town of Islip, Patchogue Village, Stony Brook University, Brookhaven National Laboratory, MTA/LIRR, Cold Spring Harbor Laboratory, and the Suburban Millennial Institute came together to develop and support a comprehensive, regionally transformative plan to make Suffolk County a more attractive place for young people and high-tech businesses.

The I-Zone vision is anchored by the following components (**Figure ES 4**):

- A multi-modal Nicolls Road Corridor with BRT and a hiking/biking trail, reflecting the LPA that emerged in this AA
- A "train to plane" connection with a new state-of-the-art airport terminal on the north side of MacArthur Airport, linked to the LIRR Ronkonkoma Station and providing convenient BRT access to/from Nicolls Road
- The full build out of the Ronkonkoma Hub, including sewer connections and structured parking
- Relocation of the LIRR Yaphank Station to Brookhaven National Lab
- Additional long-term electrification of the LIRR along the Main Line, Port Jefferson Branch, and Montauk Branch
- Stronger transit links to Cold Spring Harbor Laboratory

In conjunction with other complementary initiatives to improve regional connectivity, the I-Zone vision is emblematic of the promising opportunities in Suffolk County's future.

COMPONENTS OF THE I-ZONE

The I-Zone will connect existing and planned transit-oriented downtowns, such as New Village in Patchogue, the Meadows at Yaphank, and the Ronkonkoma Hub, to the region's world-class research institutions – Stony Brook University, Brookhaven National Laboratory, and Cold Spring Harbor Laboratory – in order to create a quality of life ecosystem that is attractive to employers and millennials who have been leaving Long Island in record numbers.

A multi-modal Nicolls Road Corridor would provide connectivity between the activity centers in the I-Zone. The addition of a hiking/biking trail to complement the proposed BRT system would offer another modal option that could potentially reduce automobile usage.

With a new state-of-the-art terminal on the north side of MacArthur Airport, the LIRR Ronkonkoma Station would feature a multi-modal plane-train-BRT station, essentially bringing the airport to the BRT, instead of bringing the BRT to the airport. Additionally, the new terminal would enable a one-seat ride from the airport either east to Montauk or west to New York City.

FIGURE ES 4
Source: Suffolk County, Parsons Brinckerhoff

ALTERNATIVES DEVELOPMENT & SCREENING - PROCESS OVERVIEW AND SELECTION OF PREFERRED MODE

The alternatives development process started with the definition of a number of alignment concepts that were subsequently paired with transit modes. The alternatives under consideration were narrowed down in multiple tiers of screening (**Figure ES 5**) to identify the most feasible and promising alternatives that best achieved the project goals and objectives. Based on the results of the Long List Screening, BRT emerged as the preferred mode for a new premium transit service along Nicolls Road.

Compared to other transit modes that were considered (streetcar, light rail, automated guideway transit, commuter rail, and subway), BRT offers the needed flexibility to easily accommodate route and service modifications over time, and also is conducive to phased implementation as demand warrants and as funding becomes available.

BRT is a term applied to public transportation systems using a series of systematic, integrated improvements to provide faster, more efficient service than an ordinary bus line. A number of BRT elements distinguish the premium service from ordinary bus service. The elements of BRT that are proposed for Nicolls Road are summarized on **Figure ES 6**.

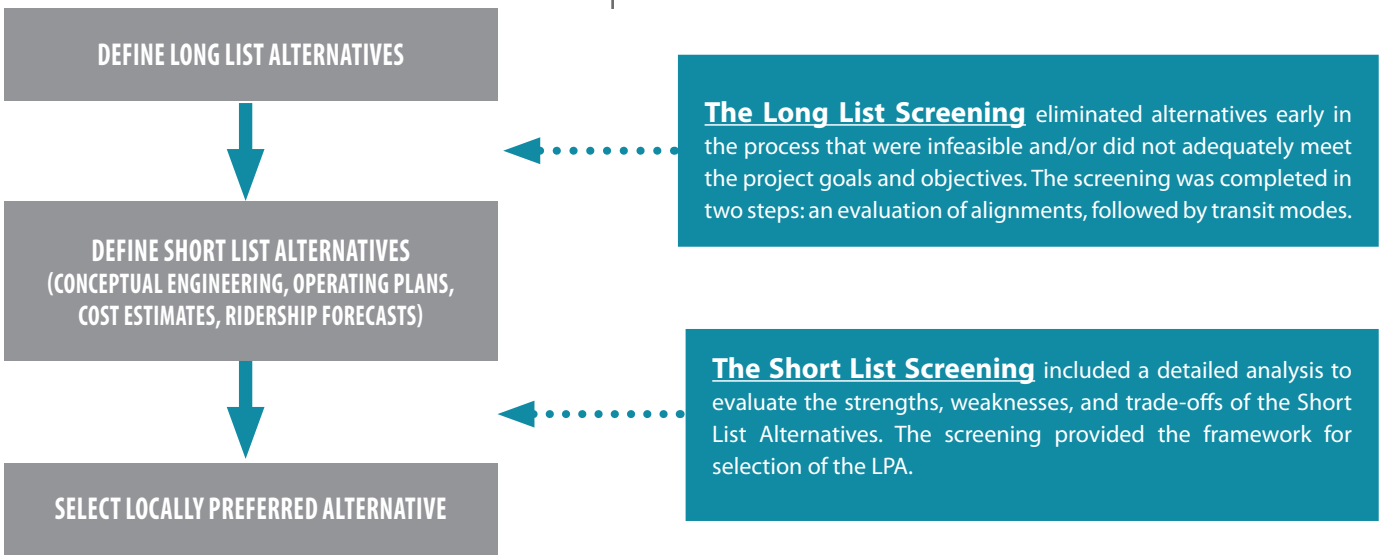


FIGURE ES 5

Source: Parsons Brinckerhoff (2015)

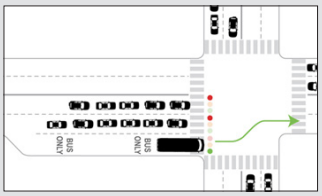
BRT ELEMENTS PROPOSED FOR NICOLLS ROAD

Faster Service

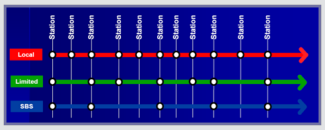
Dedicated Lanes

State-of-the-Art Fare Collection Methods

Traffic Signal Priority/Queue Jumps



More Frequent Service with Fewer Stops



User-Friendly

Enhanced Vehicles

New Stations

Strong Brand Identity

Real-Time Information

Options for Enhanced Bus Interiors for Customer Comfort and Convenience

FIGURE ES 6

Source: Grand Rapids Silver Line BRT; transportation.gov; York BRT; Viva; Swift BRT; Urbanindy; Flickr; Trans4M; Select Bus Service; MTA NYC Transit; NYCDOT; NICE Bus; Transdevna; USDOT Intelligent Transportation Systems Joint Program Office; Nova/Volvo; Parsons Brinckerhoff

ALTERNATIVES DEVELOPMENT & SCREENING - ALIGNMENT OPTIONS

The Short List Alternatives comprised three different BRT alignment options along Nicolls Road, shown on **Figure ES 7** and summarized as follows:

- **Alternative E1**: Construction of a new dedicated runningway for BRT within the median of Nicolls Road
- **Alternative E2**: Construction of a new dedicated runningway for BRT on Nicolls Road as one additional travel lane in each direction, taking from the median
- **Alternative E3**: Repurposing (i.e., reconstructing and widening) the existing shoulder on Nicolls Road to be a dedicated BRT lane in each direction

There were also minor differences among the Short List Alternatives with respect to routing options and specific station locations appropriate to each alignment option. All of the Short List Alternatives included accommodation of a hiking/biking trail to complement the BRT system along Nicolls Road.

Results of the Short List Screening demonstrated that Alternatives E1, E2, and E3 would achieve the project goals and objectives, and no one alternative emerged as the best option. While there are considerable similarities among the Short List Alternatives, the Screening also exposed key differences, which include—but are not limited to—the extent to which the respective alternatives would:

- Provide last-mile and multi-modal connectivity
- Reduce travel time for transit users
- Increase transportation system capacity
- Improve safe pedestrian access and accommodate a hiking/biking trail along Nicolls Road
- Minimize estimated order-of-magnitude capital and annual operating and maintenance (O&M) costs
- Minimize operational (traffic) constraints for implementation

The refinement and evaluation of the Short List Alternatives through the Short List Screening provided the foundation for the selection of the LPA, which includes a hybrid of the Short List Alternatives that best achieves the project goals and objectives.

SHORT LIST ALTERNATIVE ALIGNMENTS

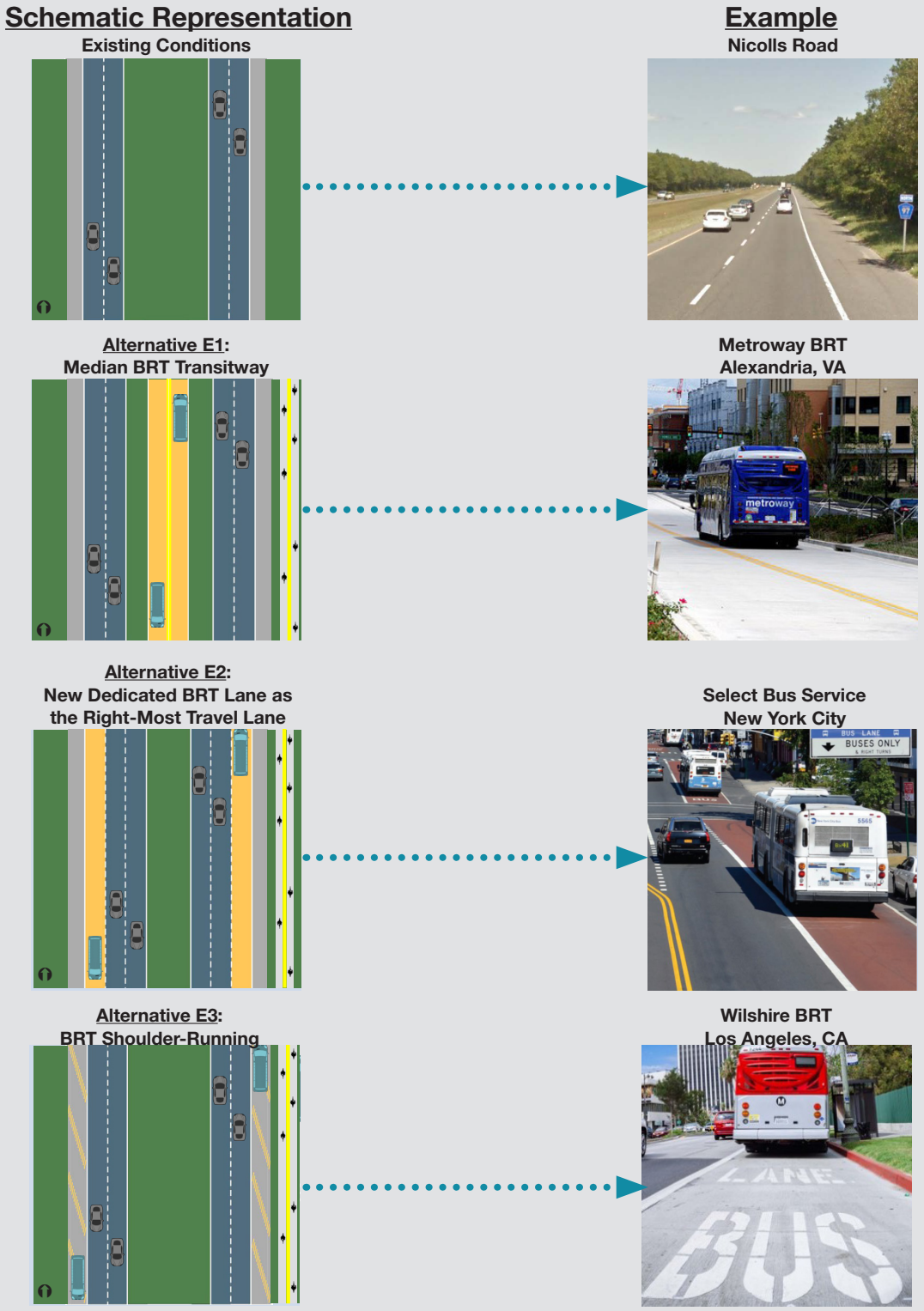


FIGURE ES 7

Source: Suffolk County, Parsons Brinckerhoff, Greater Greater Washington, NYCDOT, MTA NYC Transit, The Source

SUMMARY OF THE LOCALLY PREFERRED ALTERNATIVE (LPA)

23.5 MILE BRT SYSTEM WITH TWO ROUTES:
(1) STONY BROOK-PATCHOGUE
(2) STONY BROOK-RONKONKOMA-PATCHOGUE

19 STATIONS SERVING EXISTING AND FUTURE ACTIVITY CENTERS IN THE STUDY AREA

$200.4 MILLION CAPITAL COST (2015 $, **TABLE ES 2**):
$185.4 MILLION BRT SYSTEM AND
$15.0 MILLION HIKING/BIKING TRAIL

$8.5 MILLION CAPITAL COST PER MILE (2015 $)

$12.4 MILLION ANNUAL O&M COST (2015 $)
FOR BRT SYSTEM

2,240 WEEKDAY BRT BOARDINGS IN 2040
(1,790 NEW TRANSIT BOARDINGS,
COMPARED TO NO-BUILD CONDITION)

» Hybrid of Short List Alternatives, including all three alignment options (**Figures ES 9 and 10**)

» Hiking/biking trail with amenities to complement the BRT system (**Figure ES 8**)

» Fast, frequent service with long hours of operation (**Table ES 1**)

» Multi-modal connectivity: LIRR, Suffolk County Transit, Stony Brook University Transit

» Further refinements are anticipated in Preliminary Engineering

PROPOSED BRT OPERATIONS

SPAN OF SERVICE	Monday-Thursday	5:00am - 10:00pm
	Friday-Saturday	5:00am - 12:00am
	Sunday	6:00am - 10:00pm
SERVICE FREQUENCY (REDUCED HEADWAY ALONG OVERLAPPING PORTIONS OF THE TWO ROUTES)	Weekday Peak	Every 10 minutes
	Weekday Off-Peak	Every 15 minutes
	Weekends	Every 20 minutes
FLEET REQUIREMENT	Peak Period, Including 20% Spare	30 BRT vehicles
TRAVEL TIME & AVERAGE SPEED (STONY BROOK-PATCHOGUE, PEAK PERIOD)	Northbound	42 minutes (23 mph)
	Southbound	46 minutes (22 mph)

TABLE ES 1
Source: Parsons Brinckerhoff, GPI

ITEMIZED ORDER-OF-MAGNITUDE CAPITAL COST ESTIMATE FOR THE LPA

FTA STANDARD COST CATEGORIES (SCC) ITEM	TOTAL COST (2015$)
GUIDEWAY	$17,350,000
STATIONS	$9,200,000
SUPPORT FACILITIES	$0
SITEWORK AND SPECIAL CONDITIONS	$54,530,000
SYSTEMS	$430,000
CONSTRUCTION SUBTOTAL	$81,510,000
RIGHT-OF-WAY (ROW)	$1,630,000
VEHICLES	$22,500,000
SUBTOTAL (CONSTRUCTION + ROW + VEHICLES)	$105,650,000
SOFT COSTS/PROFESSIONAL SERVICES (40%)	$33,260,000
CONTINGENCY (40%)	$46,560,000
SUBTOTAL, BRT (2015$)	$185,460,000
SUBTOTAL, HIKING/BIKING TRAIL (2015$)	$14,960,000
TOTAL (2015$)	$200,430,000

TABLE ES 2
Source: Toscano Clements Taylor, Parsons Brinckerhoff, GPI

Order-of-magnitude capital cost for the LPA was calculated as the sum of the capital cost for the proposed BRT system and the capital cost for the proposed hiking/biking trail, including a contingency (40%) to reflect the fact that the cost estimates were prepared based on conceptual engineering. The cost estimate includes a noise wall with an estimated order-of-magnitude capital cost of $25 million that could be required for the addition of any new travel lane along Nicolls Road. The estimated capital cost will be refined as necessary during Preliminary Engineering and Final Design.

MULTI-MODAL NICOLLS ROAD CORRIDOR WITH HIKING/BIKING TRAIL

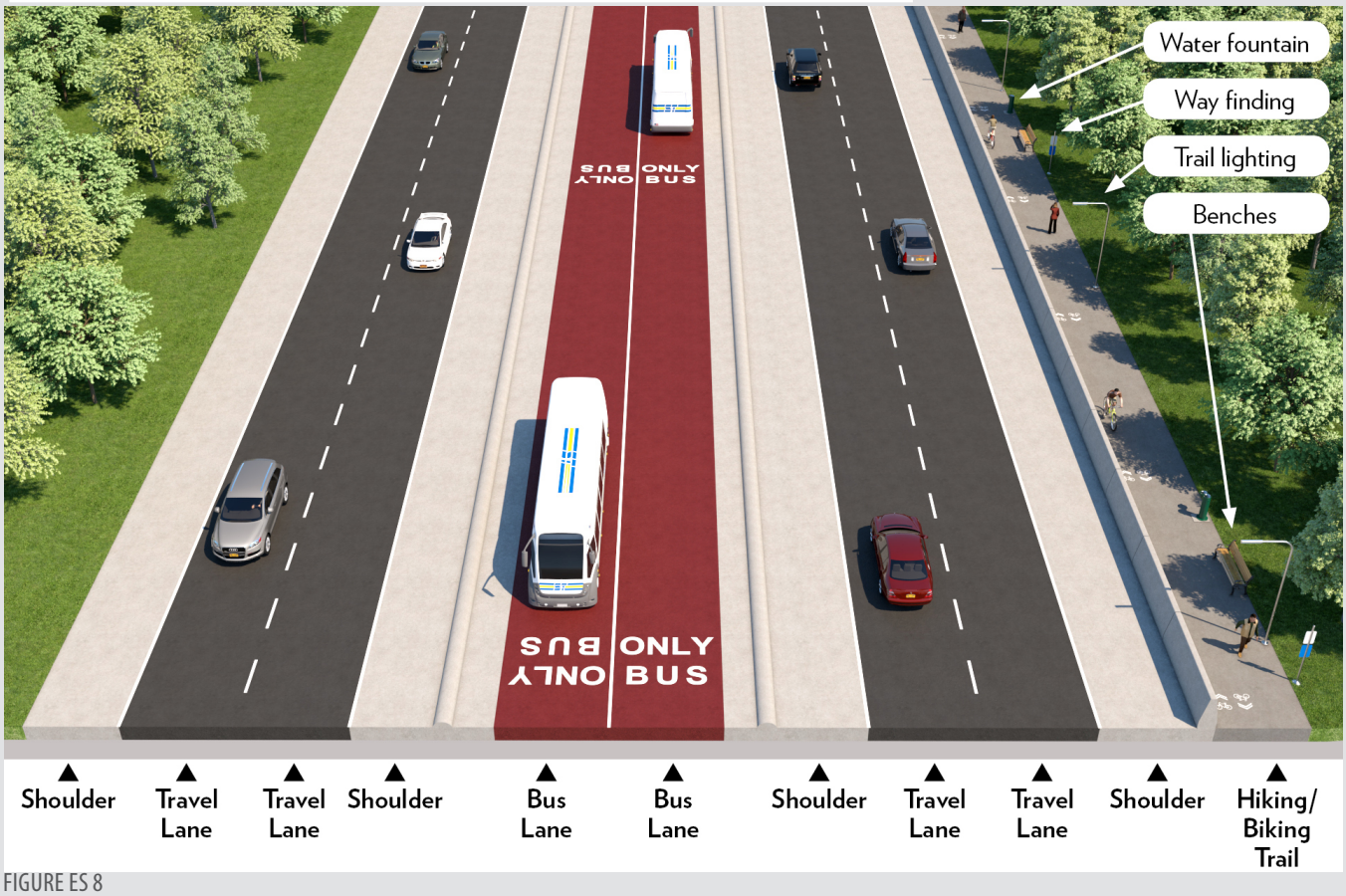
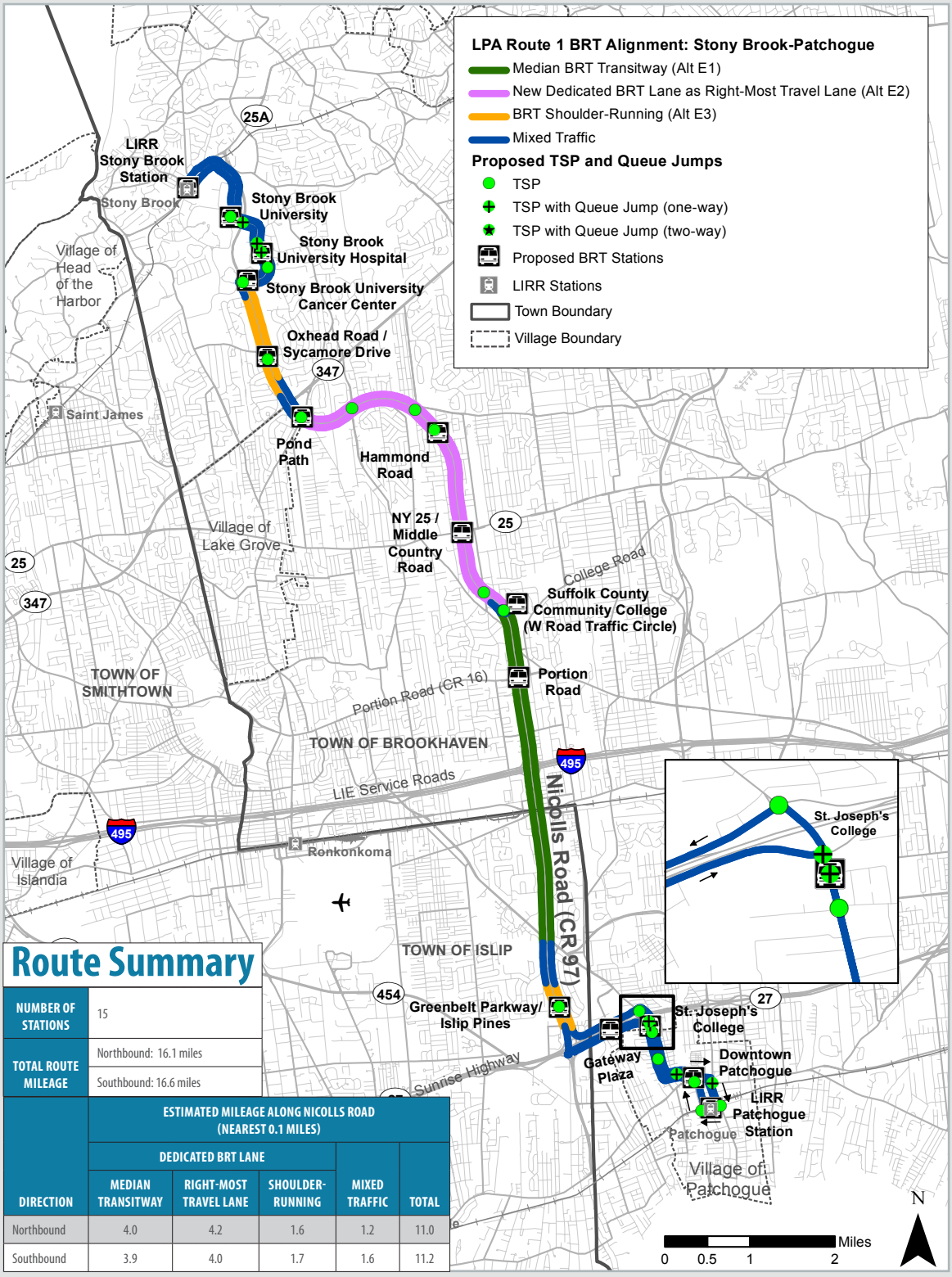


FIGURE ES 8
Source: NYS GIS Program Office, Parsons Brinckerhoff, GPI

PROPOSED BRT ALIGNMENT - LPA ROUTE 1



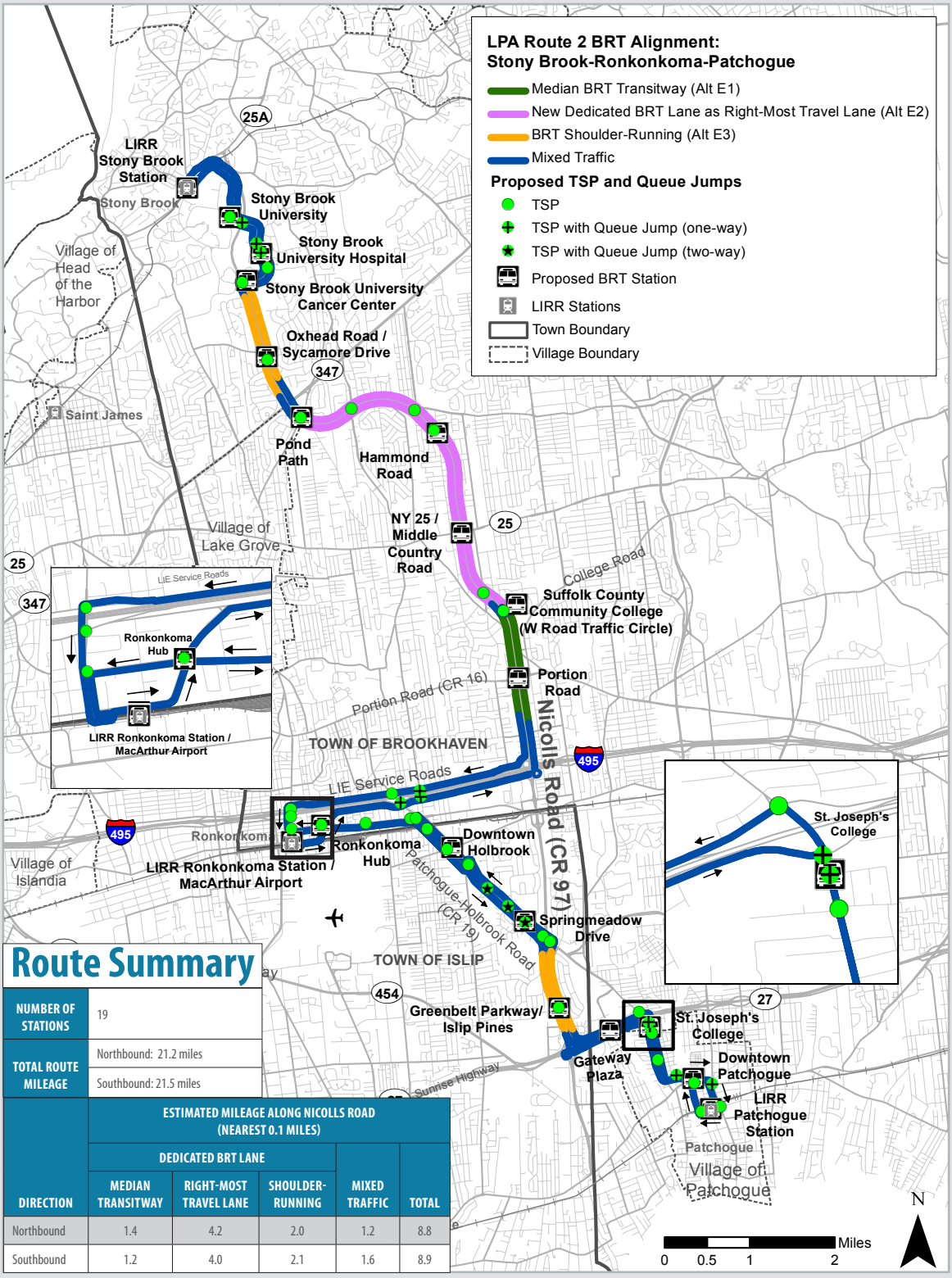
Route Summary

NUMBER OF STATIONS	15
TOTAL ROUTE MILEAGE	Northbound: 16.1 miles
	Southbound: 16.6 miles

DIRECTION	ESTIMATED MILEAGE ALONG NICOLLS ROAD (NEAREST 0.1 MILES)				
	DEDICATED BRT LANE				
	MEDIAN TRANSITWAY	RIGHT-MOST TRAVEL LANE	SHOULDER-RUNNING	MIXED TRAFFIC	TOTAL
Northbound	4.0	4.2	1.6	1.2	11.0
Southbound	3.9	4.0	1.7	1.6	11.2

FIGURE ES 9
Source: NYS GIS Program Office, Parsons Brinckerhoff, GPI

PROPOSED BRT ALIGNMENT - LPA ROUTE 2



Route Summary

NUMBER OF STATIONS	19
TOTAL ROUTE MILEAGE	Northbound: 21.2 miles
	Southbound: 21.5 miles

DIRECTION	ESTIMATED MILEAGE ALONG NICOLLS ROAD (NEAREST 0.1 MILES)				
	DEDICATED BRT LANE			MIXED TRAFFIC	TOTAL
	MEDIAN TRANSITWAY	RIGHT-MOST TRAVEL LANE	SHOULDER-RUNNING		
Northbound	1.4	4.2	2.0	1.2	8.8
Southbound	1.2	4.0	2.1	1.6	8.9

FIGURE ES 10
Source: NYS GIS Program Office, Parsons Brinckerhoff, GPI

ADDITIONAL DETAILS OF THE LPA

The AA Final Report documents the methodologies and results of the operations analysis, order-of-magnitude cost estimates, and ridership forecast for the LPA. Each of these efforts revealed important details about the proposed BRT system.

The operations analysis demonstrated that travel by BRT would result in time savings compared to travel by local bus and even travel by automobile. The reduced travel time would be due to the combination of a dedicated BRT lane with traffic signal priority along Nicolls Road, in conjunction with queue jumps where feasible off Nicolls Road. The operational benefits of the proposed Nicolls Road BRT system are further underscored through a comparison with other BRT systems around the country (**Table ES 3**).

The ridership forecast for the LPA projected that implementation of BRT would result in an approximately 45% increase in weekday transit boardings compared to the No-Build condition in 2040.

The projected increase in weekday transit ridership associated with the proposed Nicolls Road BRT system corresponds to a reduction of approximately 1,190 auto vehicle trips and 16,550 daily vehicle miles traveled. Overall, approximately 53% of projected BRT trips are attributed to diverted auto vehicle trips.

It is important to note that BRT ridership will likely be higher than currently projected due to a number of additional factors:

» Implementation of other elements of the I-Zone

» Integration of the Stony Brook University Transit system with the proposed BRT system

» The likelihood of larger-than-projected travel time savings associated with BRT along Nicolls Road

» Consideration for capacity and pricing of parking at LIRR stations

The order-of-magnitude cost estimates demonstrated that implementation of the proposed BRT system and hiking/biking trail would require a capital investment (**Table ES 4**). However, similar to other locations around the country, Suffolk County and the region could derive a return on the investment, as the new transportation options could catalyze long-term economic development and sustained growth as envisioned for the I-Zone.

TRAVEL SPEED COMPARISON TO SAMPLE BRT SYSTEMS IN THE UNITED STATES

BRT SYSTEM	LOCATION	ESTIMATED NET PEAK TRAVEL SPEED (MPH)*
LANE TRANSIT DISTRICT EMERALD EXPRESS (EMX)	Eugene/Springfield, OR	15
HILLSBOROUGH AREA REGIONAL TRANSIT (HART) METRORAPID	Tampa, FL	16
CDTA BUS PLUS	Albany, Schenectady, NY	17
KCATA MAX	Kansas City, MO	19
CT*FASTRAK*	Hartford/New Britain, CT	19
NICOLLS ROAD BRT (ROUTE 1, NORTHBOUND)	Suffolk County, NY	23

TABLE ES 3
Source: Lane Transit District; HART; CDTA; KCATA; CTfastrak; Parsons Brinckerhoff; GPI
* Based on approximate route distance and peak travel time, per schedule

As shown in **Table ES 3,** the projected Nicolls Road BRT travel speeds are comparable to, and in fact higher than, several BRT systems that currently operate in the United States. This includes the CT*fastrak* BRT system, which launched service in 2015 and surpassed its first year ridership goal.

Detailed estimates of time savings associated with the proposed Nicolls Road BRT system will be determined in Preliminary Engineering. The operations analysis completed for the AA demonstrated that travel by BRT would offer a one-seat ride and result in estimated time savings ranging from 50 minutes to nearly two hours compared to travel by local bus, including the transfer time between local bus routes.

The BRT system—unconstrained by traffic congestion in its dedicated lane—would also be traveling at a higher speed than general traffic, which would result in reduced trip times. When the time to get from a parking lot to the traveler's destination is factored in, the time savings for BRT as compared to automobile trips would be even greater. As traffic congestion is projected to increase in the future, the travel time benefits of BRT service along Nicolls Road would be even greater. Additionally, many BRT customers could experience an improved quality of travel, no longer needing to spend their travel time driving a car.

CAPITAL COST COMPARISON TO SAMPLE BRT SYSTEMS IN THE UNITED STATES

BRT SYSTEM	LOCATION	APPROXIMATE ROUTE DISTANCE (MILES)	APPROXIMATE CAPITAL COST	APPROXIMATE CAPITAL COST PER MILE
MONTGOMERY COUNTY RAPID TRANSIT SYSTEM (FOUR CORRIDORS)*	Montgomery County, MD	39.0	$1.603 billion	$41.1 million
CT*FASTRAK*	Hartford / New Britain, CT	9.4	$573 million	$61.0 million
PORT AUTHORITY OF ALLEGHENY COUNTY WEST BUSWAY	Pittsburgh, PA	8.1	$327 million	$40.4 million
GREATER CLEVELAND REGIONAL TRANSIT AUTHORITY (RTA) HEALTHLINE	Cleveland, OH	9.4	$200 million	$21.3 million
NICOLLS ROAD BRT	Suffolk County, NY	23.5**	$200 million	$8.5 million
KING COUNTY METRO TRANSIT B LINE	Seattle, WA	10.0	$190 million	$19.0 million
KING COUNTY METRO TRANSIT A LINE	Seattle, WA	11.0	$190 million	$17.3 million
PORT AUTHORITY OF ALLEGHENY COUNTY MARTIN LUTHER KING, JR. EAST BUSWAY	Pittsburgh, PA	9.1	$115 million	$12.6 million
MBTA SILVER LINE PHASE I	Boston, MA	2.4	$26 million	$10.8 million
LYNX LYMMO	Orlando, FL	3.0	$21 million	$7.0 million

TABLE ES 4
Source: Toscano Clements Taylor, Parsons Brinckerhoff, GPI, National BRT Institute, Montgomery County Transit Authority
* Planned BRT system; not yet operational
** Includes non-duplicating mileage of both routes

As shown in **Table ES 4**, the LPA would have total and per mile capital costs that are comparable to, and in fact lower than, several BRT systems in the United States. This includes the Cleveland HealthLine, which has generated approximately $5 billion in economic value and is regularly cited as a model for how BRT can promote economic development.

NEXT STEPS AND CONCLUSION

Project Development is a required step in the federal process to be eligible for the FTA Small Starts discretionary grant program (**Figure ES 11**), which will likely be one of the key funding options to be pursued to help pay for implementation. Key next steps to advance the proposed project include the following:

» Preliminary Engineering and Final Design, including close coordination with both the Federal Highway Administration (FHWA) and FTA

» Environmental review and associated studies

» Financial planning, including documentation of local financial commitment

» Agency coordination and stakeholder/public engagement

Another potential concept for consideration in Project Development is to recommend an initial operating segment or an initial operating phase of implementation to align with available funding and as warranted by demand. This could potentially include one of the two proposed BRT routes.

The AA has set the stage for implementation of a fast, frequent, and high-quality BRT service along Nicolls Road to connect all three lines of the LIRR and improve north-south mobility and multi-modal connectivity along this traditionally auto-oriented Corridor. The LPA provided the framework for a transit-oriented future along Nicolls Road and in the broader study area.

The guiding principle of this AA was that sustainable economic development requires close coordination and integration of transportation improvements with land use policy, consistent with the fundamental tenet of the *Connect Long Island* plan. This AA complemented other ongoing local and regional initiatives to transform the land use character and transportation network of the study area, which could collectively enhance the long-term potential of Nicolls Road and the I-Zone.

SMALL STARTS PROCESS

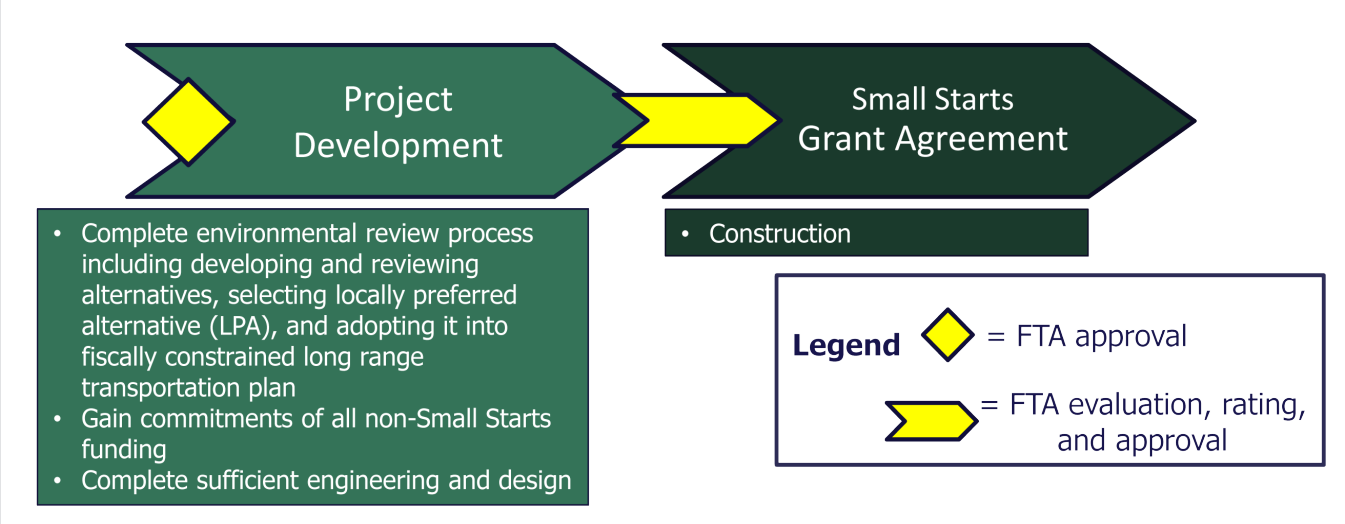


FIGURE ES 11
Source: FTA

It is anticipated that the proposed project will be advanced in the Project Development process, leading to evaluation, rating, and consideration by the FTA for approval of a Small Starts Grant Agreement. The combination of federal funding with state, local, and/or project-specific funding can provide the necessary resources to move from plan to implementation for this transformative project that has the potential to result in far-reaching benefits for the Nicolls Road Corridor, Suffolk County, and the surrounding region.

1 INTRODUCTION

Nicolls Road (the "Corridor") (County Route (CR) 97) runs north-south in the Towns of Brookhaven and Islip, and is one of the key economic engines on Long Island. A connection to Ronkonkoma and Patchogue, the Corridor is home to a wide range of activity centers, including innovation assets (educational institutions and research facilities), employment and shopping centers, local downtowns, and recreational resources. There are opportunities to improve conditions along the Corridor by addressing severe traffic congestion, sprawling automobile-oriented development patterns, and the lack of travel alternatives.

The introduction of a premium transit service on Nicolls Road would provide an attractive transportation option to help address future increases in traffic congestion and improve environmental conditions and quality of life. It would also effectively support and stimulate smart growth, sustainable economic development, and Complete Streets within the Corridor, which would be further bolstered by the addition of a hiking/biking trail.

Good planning practice dictates the importance of looking at a range of alternatives to select a solution to address identified problems in a transportation corridor. The Alternatives Analysis (AA) process provides the framework to evaluate differing transportation alternatives. The Nicolls Road AA process (**Figure 1**) enabled a quick but substantiated selection of mode and route for the transportation improvements along the Corridor, resulting in selection of an LPA to advance to Project Development and National Environmental Policy Act (NEPA) review with the Federal Transit Administration (FTA). The LPA will be refined as appropriate during Preliminary Engineering.

ANALYZE EXISTING CONDITIONS
Fall 2014 - Winter 2015

↓

IDENTIFY ISSUES AND OPPORTUNITIES
Winter 2015

↓

DEVELOP PURPOSE AND NEED, DEFINE GOALS AND OBJECTIVES
Winter 2015 - Spring 2015

↓

CONDUCT ALTERNATIVES DEVELOPMENT AND SCREENING
Spring 2015 - Fall 2015

↓

SELECT LOCALLY PREFERRED ALTERNATIVE (LPA)
Fall 2015 - Winter 2016

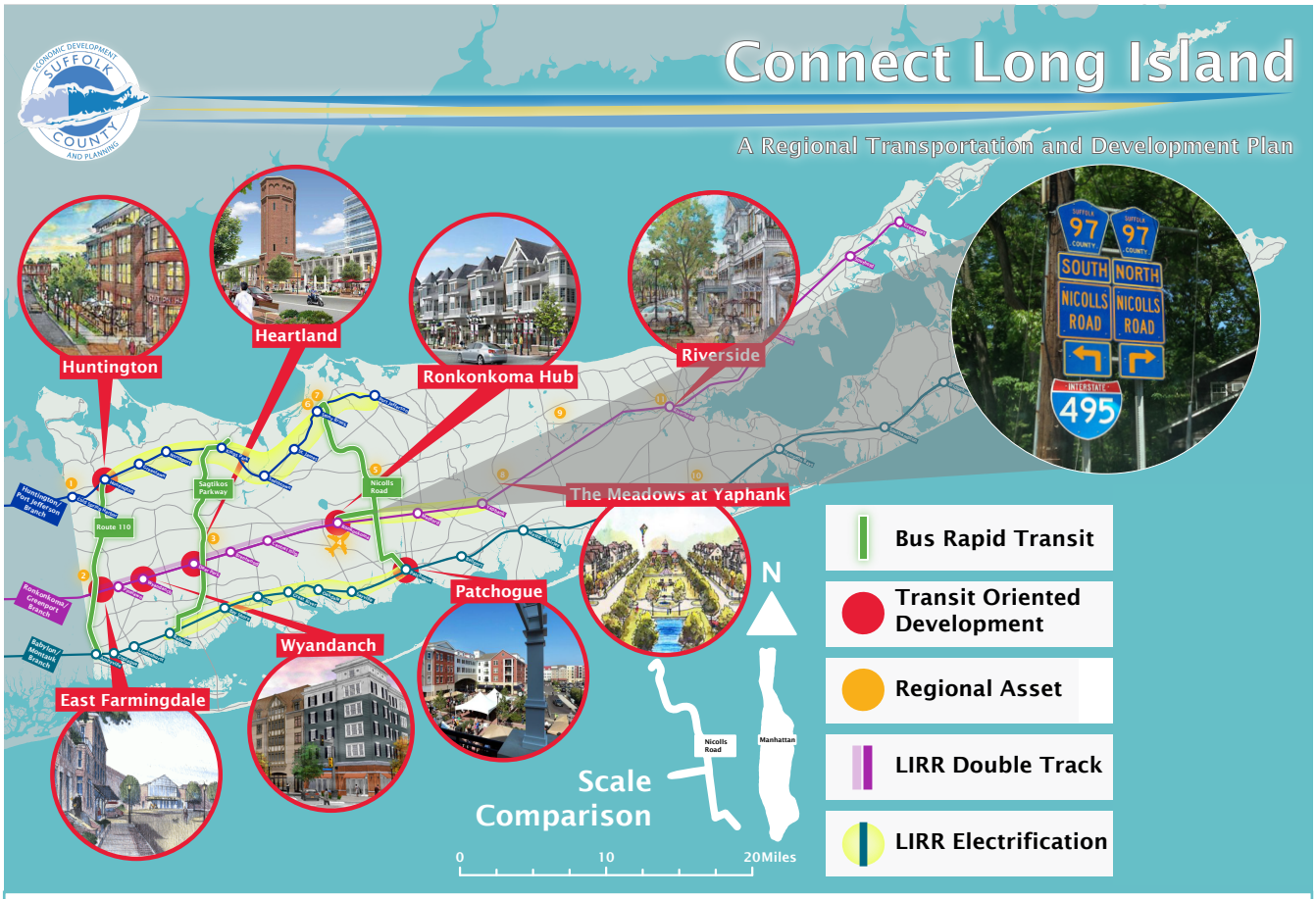
FIGURE 1: Nicolls Road AA Study Process
Source: Parsons Brinckerhoff

The introduction of a new premium transit service on Nicolls Road could improve multi-modal connectivity and assist in mitigating future increases in traffic congestion
Source: Parsons Brinckerhoff

2 BACKGROUND AND RELATED INITIATIVES

The August 2015 adoption of *Framework for the Future–Suffolk County Comprehensive Master Plan 2035* highlights the *Connect Long Island* plan as the County's guide for addressing longstanding transportation, land use, and economic development challenges (**Figure 2**). One of the principal goals of the *Connect Long Island* plan is to expand north-south transit options to provide enhanced connections between the robust east-west network of the Long Island Rail Road (LIRR) and development hubs, regional job centers, and educational and research assets.

A theme of the plan is the need to integrate land use policy and transportation improvements to drive economic sustainability and growth, which is also a cornerstone of the Long Island Innovation Zone (I-Zone) (refer to sidebar on page 5). The Nicolls Road AA provided the framework to advance this transformative plan by identifying transportation improvements that would improve north-south mobility and transit connectivity between existing and emerging activity centers in the Towns of Brookhaven and Islip.



Connect Long Island Goals

- Align land-use and transportation plans
- Make supportive transit investments to connect existing and proposed developments
- Develop north-south mass transit connections to increase mobility
- Connect educational and research institutions and identify innovation zones
- Connect new and existing recreational assets and downtowns

FIGURE 2: Connect Long Island
Source: Suffolk County, Parsons Brinckerhoff

The Nicolls Road AA built upon the 2014 *Suffolk County Bus Rapid Transit (BRT) Feasibility Study*, which identified Nicolls Road (in addition to Route 110 and the Sagtikos Parkway) as a critical north-south corridor that should be prioritized for implementation of BRT. The Feasibility Study concluded that implementation of BRT, in conjunction with the appropriate land use and zoning policies, could transform travel along the priority corridors, and reap enormous economic benefits similar to other BRT systems throughout the United States.

Additionally, a number of other previous and ongoing initiatives set the stage for the Nicolls Road AA by providing background data to inform the development and evaluation of alternatives in this planning process. These local and regional efforts include—but are not limited to—the following:

» Ongoing *Ronkonkoma Hub – Nicolls Road Corridor Parking Analysis*

» Ongoing Ronkonkoma Hub and Islip Pines mixed-use development projects

» Ongoing and recently completed capital improvements as outlined in the Suffolk County Capital Program, New York Metropolitan Transportation Council (NYMTC) Transportation Improvement Program (TIP), and Metropolitan Transportation Authority (MTA) Capital Program

» 2013 NYMTC *Plan 2040* Regional Transportation Plan (RTP)

» 2011 Long Island Regional Economic Development Council (LIREDC) *Strategic Economic Development Plan for Nassau and Suffolk Counties*

» 2010 Long Island Regional Planning Council (LIRPC) *Sustainable Strategies for Long Island 2035*

Appendix A includes detailed summaries and a comprehensive inventory of the previous and ongoing planning efforts that complement the Nicolls Road AA.

The Nicolls Road AA was informed by the *Suffolk County Comprehensive Master Plan 2035* and the *Suffolk County BRT Feasibility Study*
Source: *Suffolk County Comprehensive Master Plan 2035*, *Suffolk County BRT Feasibility Study*

THE I-ZONE AND A 21ST CENTURY MULTI-MODAL TRANSPORTATION SYSTEM FOR SUFFOLK COUNTY

The I-Zone is a plan to build out a major innovation and transportation hub by transforming Nicolls Road into a multi-modal Corridor that will connect the County's key assets. The plan was formed in 2015 at a meeting of the Long Island Regional Planning Council, where leaders of Suffolk County, Town of Brookhaven, Town of Islip, Patchogue Village, Stony Brook University, Brookhaven National Laboratory, MTA/LIRR, Cold Spring Harbor Laboratory, and the Suburban Millennial Institute came together to develop and support a comprehensive, regionally transformative plan to make Suffolk County a more attractive place for young people and high-tech businesses.

The I-Zone vision is anchored by the following components (**Figure 3**):

» A multi-modal Nicolls Road Corridor with BRT and a hiking/biking trail, reflecting the LPA that emerged in this AA

» A "train to plane" connection with a new state-of-the-art airport terminal on the north side of MacArthur Airport, linked to the LIRR Ronkonkoma Station and providing convenient BRT access to/from Nicolls Road

» The full build out of the Ronkonkoma Hub, including sewer connections and structured parking

» Relocation of the LIRR Yaphank Station to Brookhaven National Lab

» Additional long-term electrification of the LIRR along the Main Line, Port Jefferson Branch, and Montauk Branch

» Stronger transit links to Cold Spring Harbor Laboratory

In conjunction with other complementary initiatives to improve regional connectivity, the I-Zone vision is emblematic of the promising opportunities in Suffolk County's future. Additional details about the I-Zone are included in Appendix B.

FIGURE 3: Nicolls Road and the I-Zone
Source: Suffolk County

3 STUDY AREA

The Nicolls Road AA study area (**Figure 4**) encompasses all census tracts with 50 percent or more of their area within one mile of the Stony Brook-Patchogue corridor as identified in the *Suffolk County BRT Feasibility Study*. The primary focus of this AA is the approximately 12-mile segment of the Nicolls Road Corridor between Health Sciences Drive/Shirley Kenny Drive in the north and NY 27/Sunrise Highway in the south, which runs primarily north-south through the Towns of Brookhaven and Islip. As discussed in the following sections, the study area contains many of Suffolk County's assets and includes three LIRR stations (Stony Brook, Ronkonkoma, and Patchogue) on three different branches.

Several innovation assets are located within the study area, including a number of educational and research institutions

Source: Parsons Brinckerhoff, SBU, Newsday

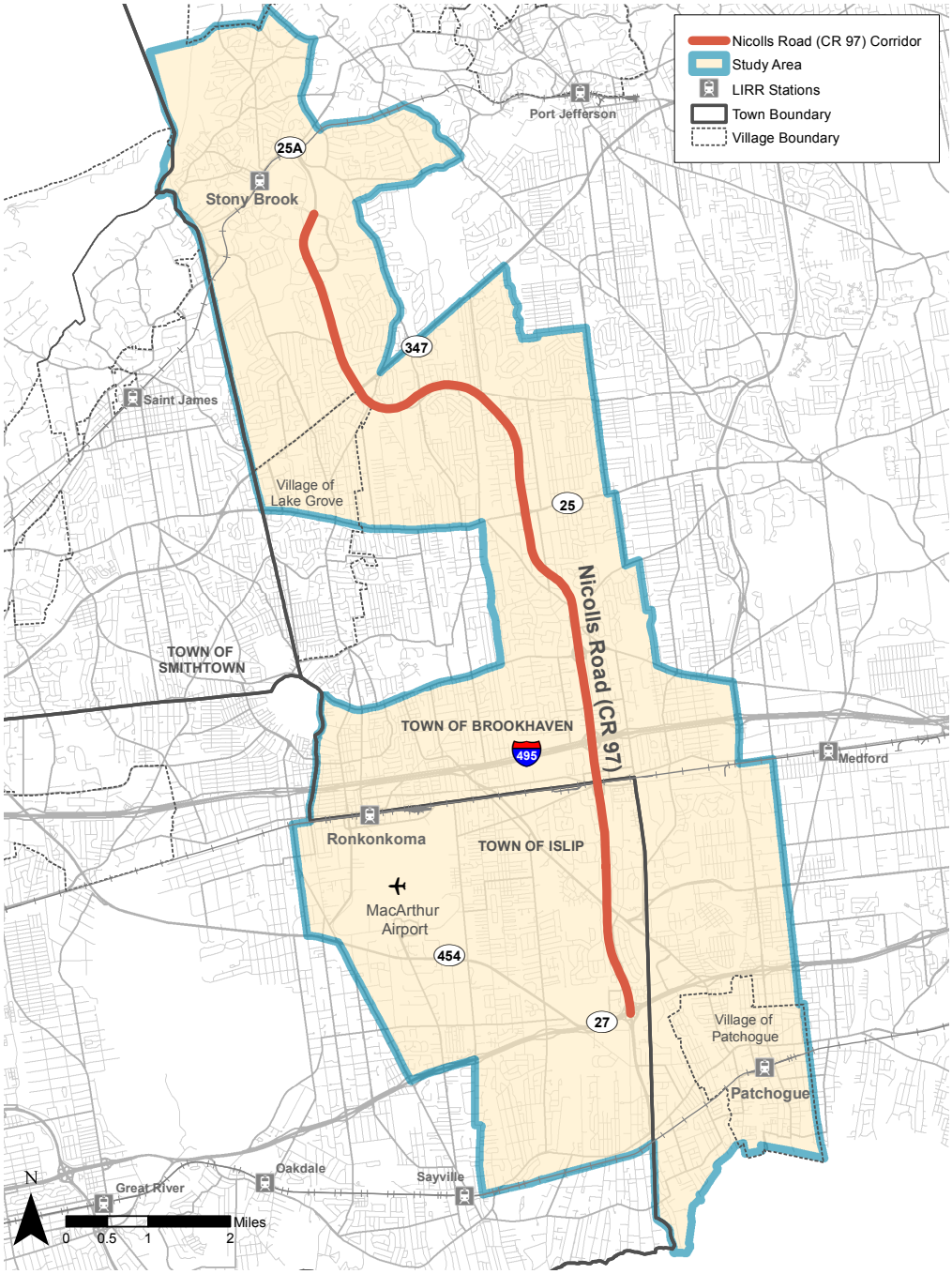


FIGURE 4: Study Area and Corridor Boundaries

Source: Parsons Brinckerhoff, NYS GIS Program Office, Suffolk County

4 EXISTING AND FUTURE CONDITIONS

The following discussion presents an overview of existing and future conditions within the study area, which sets the framework for the project Purpose and Need and alternatives development process. Additional details are included in Appendices A and C.

The following section features an evaluation of:

» Socioeconomic and demographic indicators
» Population and employment trends
» Travel trends
» Land use patterns and activity centers
» Existing transit service
» Roadway characteristics
» Traffic conditions
» Pedestrian and bicycle infrastructure

The data included in this section were summarized at different geographic scales to guide the subsequent definition, screening, and evaluation of transit alternatives in the planning process.

4.1 SOCIOECONOMIC AND DEMOGRAPHIC PROFILE

A socioeconomic and demographic profile of the study area was prepared by compiling data from the 2010 Census, the 2006-2010 Census Transportation Planning Package (CTPP), and the 2009-2013 American Community Survey (ACS) 5-Year Estimates provided by the United States Census Bureau. The 2009-2013 ACS 5-Year Estimates reflect the most up-to-date data at the time the socioeconomic and demographic profile was prepared for this AA.

The study area encompasses a total of 35 census tracts, all located in Suffolk County. The data were aggregated from the census tract level to create a profile for the study area, which was compared to Suffolk County as a whole to illustrate the regional context.

Key socioeconomic and demographic indicators for the study area are summarized below.

» The percentage of Suffolk County's employment in the study area (14%, or approximately 85,000 jobs) is greater than the percentage of Suffolk County's population in the study area (11%, or approximately 166,000 residents), which indicates that the study area is an important employment destination in the region. As shown on **Figure 6**, the following four industries account for more than half of the total employment in the study area: educational, health and social services (27%); retail trade (14%); professional, scientific, management, administrative, and waste management services (10%); and manufacturing (10%). These industries similarly constitute the largest percentage of jobs in Suffolk County overall.

» People between 20 and 34 years of age account for a slightly larger percent of the study area's total population (20%) than the respective percentage for this age group in the County overall (17%). This is perhaps a reflection of the large undergraduate and graduate student population in the study area, but may also indicate that this area is potentially less affected by the "brain drain"—

THE BRAIN DRAIN ON LONG ISLAND

The concept of the brain drain refers to the decline of the age cohort that generally comprises college students and emerging professionals. The brain drain on Long Island was first identified by the Long Island Index in 2004 in its report, Setting Goals, Measuring Progress for the Long Island Region, which noted that the decline in this key age cohort on Long Island between 1990 and 2000 was five times the national average. The brain drain remains a pressing issue, highlighted again in the 2015 Long Island Index report, *Long Island's Future: Economic Implications of Today's Choices* (**Figure 5**).

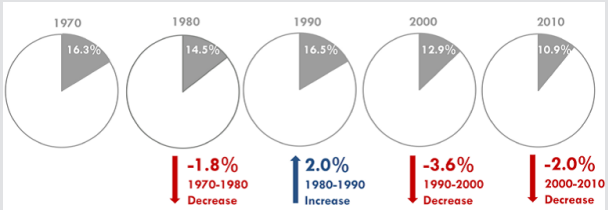


FIGURE 5: Ages 25-34 Cohort as Percent of Total Long Island Population (1970-2010)
Source: Long Island Index (2015)

caused by young people moving off Long Island to work and live in other areas—than other parts of the County (refer to sidebar on page 9).

» One-unit detached housing is the predominant housing type in the study area, accounting for nearly 80% of the total housing stock, which is similar to figures for Suffolk County as a whole. This is indicative of the low-density residential development pattern that defines much of Long Island, although there are several multi-family housing developments in the study area. The second-most-common housing type in the study area is 20+ unit housing (5%), possibly due to the student population. The relative concentration of multi-family housing in the study area supports the notion that the Nicolls Road Corridor is well-suited for transit improvements to bolster economic development.

» More than four of every five workers (82%) who live in the study area drive alone to their place of work, and only about one in every 20 workers (5%) uses public transportation as their means of transportation to work (**Figure 7**). These statistics parallel the respective percentages County-wide, and reflect both the dominant auto-oriented development pattern on Long Island, as well as the need for enhanced transit access to and from origins and destinations.

» More than four of every five workers (86%) who live in the study area have more than one vehicle available. In addition to possibly reflecting personal preference regarding automobile ownership, this statistic could support the premise that the sprawling development pattern in the study area (and in Suffolk County in general) encourages reliance on the automobile. There is also a small but important transit-dependent population—defined as persons who do not own a car (comprising approximately 2% of workers who live in the study area)—whose travel needs should be equitably met by the existing and future transportation system.

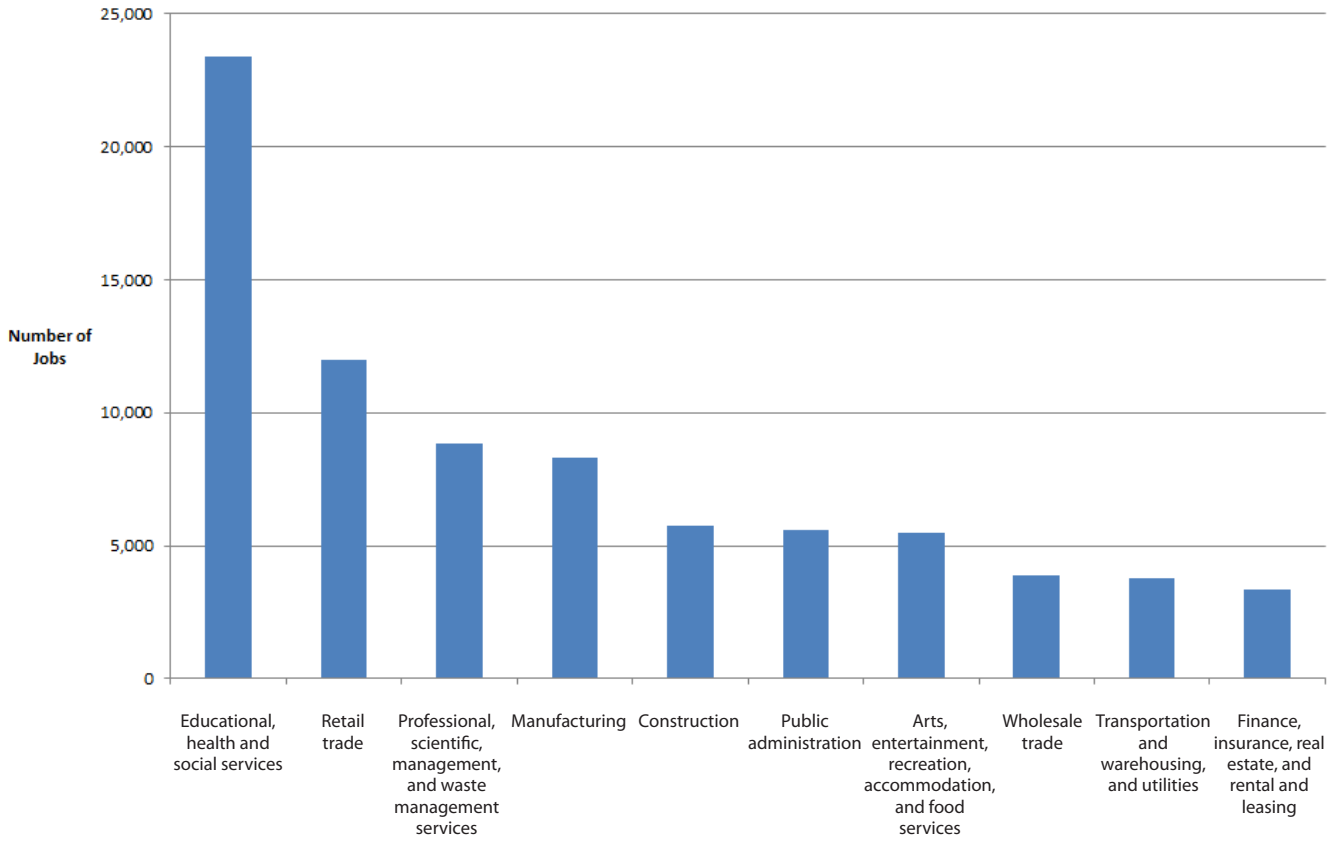


FIGURE 6: Employment by Industry in the Study Area
Source: 2006-2010 CTPP ACS 5-Year Estimates, A202104

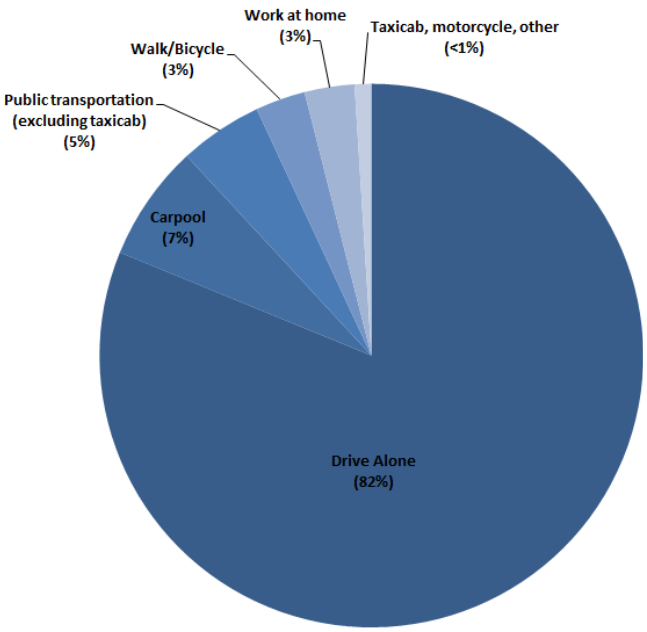


FIGURE 7: Means of Transportation to Work for Workers Who Live in the Study Area

Source: 2009-2013 American Community Survey 5-Year Estimates, S0801

» There is great variation in commuting time among workers who live in the study area, ranging from less than 30 minutes to more than one hour. This is likely due in part to the geographic distribution of workplaces throughout the metropolitan area. Travel trends for work and non-work trips destined for the study area are discussed in Section 4.3.

Overall, the socioeconomic and demographic profile of the study area underscored some of the principal challenges to improving transit access, promoting transit use, and providing the transportation framework to enable transit-supportive development.

4.2 POPULATION AND EMPLOYMENT TRENDS

An assessment of recent and projected future population and employment trends offered insight into the potential travel markets for the transportation improvements proposed in this AA. Historical data were compiled from the United States Census and ACS, and future forecasts were prepared using a working set of 2010–2040 socioeconomic and demographic data for the New York Best Practice Model (BPM) 2010 Update project. The BPM is the travel demand forecasting model for the New York metropolitan area, developed by NYMTC for 28 counties in New York, New Jersey, and Connecticut.

As shown on **Figure 8**, the population within the study area increased by approximately 9,600 (6%) between 2000 and 2010, to a total of approximately 166,000 people. The population is projected to continue to increase at the same rate between 2010 and 2040, adding another approximately 30,000 people (18%) for a total of approximately 196,000. This projected population growth is a reflection of both the expected growth in established residential areas as well as new residential and mixed-use developments.

Despite the recession in the latter half of the past decade, the study area experienced an increase of more than 8,700 jobs (11%) between 2000 and 2010, to a total of nearly 86,000 jobs (**Figure 8**). Employment within the study area is projected to increase by a slightly faster rate between 2010 and 2040, adding approximately 33,000 jobs (38%) for a total of approximately 119,000 jobs. This considerable growth in projected employment demonstrates that the study area will steadily grow as an important trip attractor in the regional travel market.

4.3 TRAVEL TRENDS

To summarize the existing travel market, tabulations of trips were compiled from NYMTC's Regional Household Travel Survey (RHTS), a study conducted from Fall 2010 through Fall 2011 that collected daily travel data from households across 28 counties in New York, New Jersey and Connecticut. According to NYMTC, the RHTS "provides key travel statistics for the region to help in the planning of future transportation investments."

Data were aggregated for the census tracts within the study area, consistent with the socioeconomic and demographic profile. Using a complex weighting/expansion procedure, the travel market analysis that was completed during this AA summarized daily work and non-work trips within, to, and from the study area. Work trips include journey-to-work trips made by workers, as well as trips to schools/universities made by students. Non-work trips include all other trips, such as shopping and other discretionary travel. The travel market analysis methodology, findings, and data are presented in Appendix D.

The travel market analysis demonstrated that nearly all work and non-work trips destined for the study area have local origins on Long Island (approximately 96% and 99%, respectively) (**Figure 9** and **Figure 10**), which highlights the importance of intra-Island travel in the regional travel market. Additionally, approximately half of the daily work and non-work trips that end in the study area, begin in the study area, which is another indication of the importance of north-south mobility on Long Island. The fact that there are more daily non-work trips destined for the study area (approximately 372,080 trips) than daily work trips destined for the study area (approximately 276,270 trips) underscores the role of the Corridor and the surrounding area as not just a place of employment, but as a place of shopping and leisure as well.

In sum, the travel market analysis demonstrated that the study area is an important destination in the tri-state metropolitan area. Moreover, travel is projected to increase within, to, and from the study area in the future, reflecting expected growth in the area and based on socioeconomic and demographic forecasts.

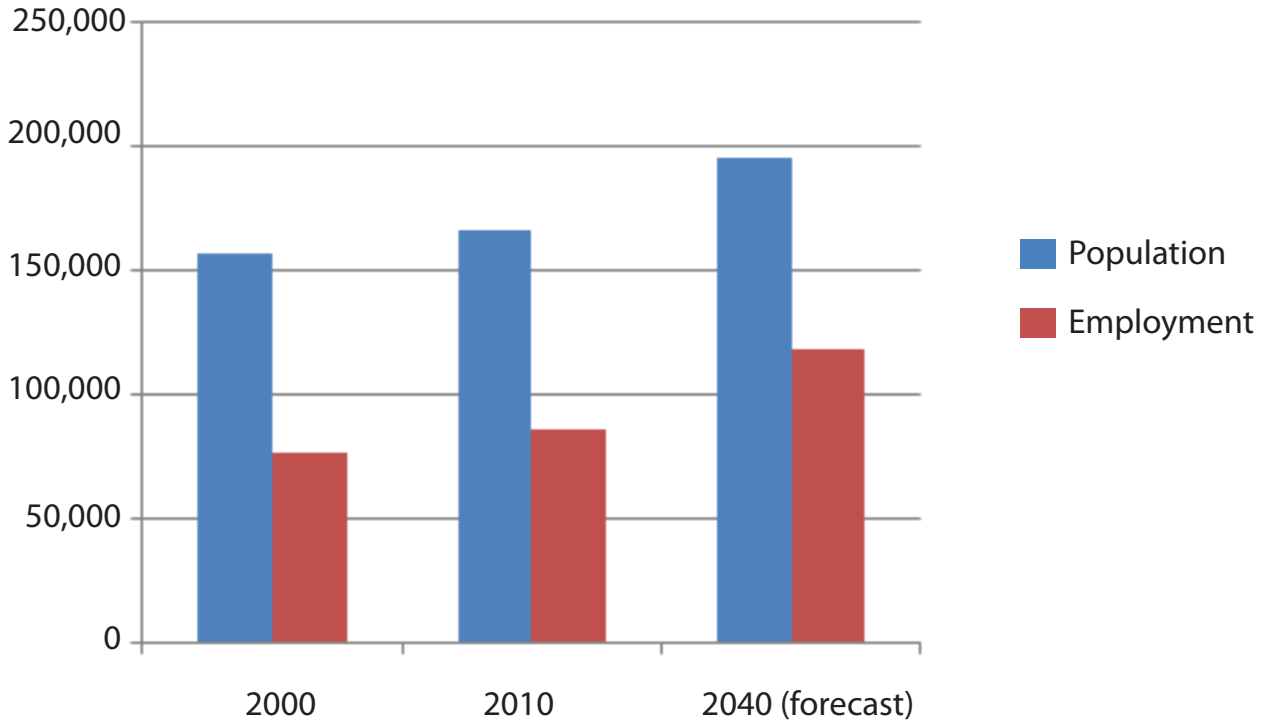


FIGURE 8: Population and Employment in the Study Area (2000, 2010, and 2040 Forecast)

Source: 2006-2010 Census Transportation Planning Package (CTPP) ACS 5-Year Estimates Table A202100, 2000 CTPP P2-004, 2010 and 2000 US Census Summary File 1 DP-1, working set of 2010 – 2040 socioeconomic and demographic (SED) data for the New York BPM 2010 Update project, Parsons Brinckerhoff

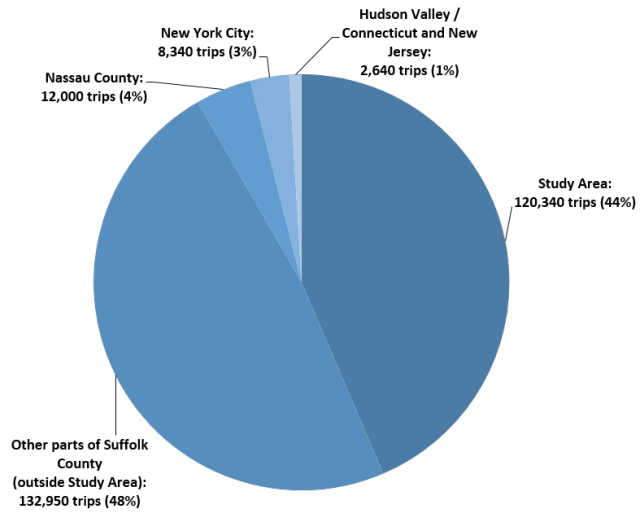


FIGURE 9: Daily Work Trips Destined for the Study Area, by Origin (Total ≈ 276,270 Daily Trips)
Source: 2010 NYMTC RHTS, GPS Weighted and Factored

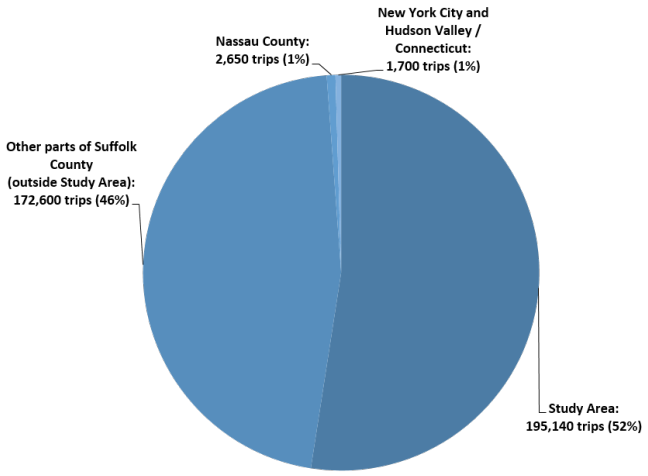


FIGURE 10: Daily Non-Work Trips Destined for the Study Area, by Origin (Total ≈ 372,080 Daily Trips)
Source: 2010 NYMTC RHTS, GPS Weighted and Factored
Note: No daily non-work trips destined for the study area originated in New Jersey; sum of trips may not add to total due to rounding.

4.4 LAND USE PATTERNS AND ACTIVITY CENTERS

Travel within, to, and from the study area is informed by the area's land use composition and the presence of activity centers. As shown on **Figure 11**, development patterns vary in different portions of the study area, and land use is regulated by the Towns of Brookhaven and Islip, and the Villages of Patchogue and Lake Grove, within their respective municipal boundaries. Nicolls Road itself is largely absent of uses with frontage on the Corridor, and instead is surrounded by single-family residential subdivisions with frontage on side streets. However, a number of trip generators and attractors are located within the study area in the vicinity of Nicolls Road.

Near the northern terminus of the Corridor, the main campus of Stony Brook University (SBU) is located just west of Nicolls Road and south of NY 25A/North Country Road. The campus is situated on approximately 1,040 acres and includes a wide range of academic buildings, an 8,300-seat stadium and sports complex, and 28 residence halls plus 23 apartment-style buildings that collectively provide housing for more than 9,400 students. As of Fall 2015, total enrollment at SBU is approximately 25,300, including both undergraduate and graduate students as well as full- and part-time students. The University also includes an approximately 250-acre Research and Development Park. Across Nicolls Road, the SBU Hospital is located on Health Sciences Drive and offers an approximately 600-bed facility and a number of medical centers and institutes to complement inpatient services.

In addition to SBU, two other noteworthy educational institutions are located within the study area. The Suffolk County Community College (SCCC)-Ammerman Campus, which is the oldest of the three SCCC campuses, is located on 156 acres just east of Nicolls Road and north of Portion Road. The Ammerman Campus offers a range of academic and career training programs, and has an enrollment of over 14,000 students. Farther south, the Patchogue campus of St. Joseph's College—with an enrollment of approximately 4,400 students—is located near the northern border of Patchogue Village, just south of NY 27/ Sunrise Highway.

The southern portion of the study area is anchored by downtown Patchogue, which is experiencing an ongoing revitalization in the vicinity of the LIRR station. The pedestrian-friendly downtown along Main Street in Patchogue is lined with retail establishments and entertainment destinations, including the Patchogue

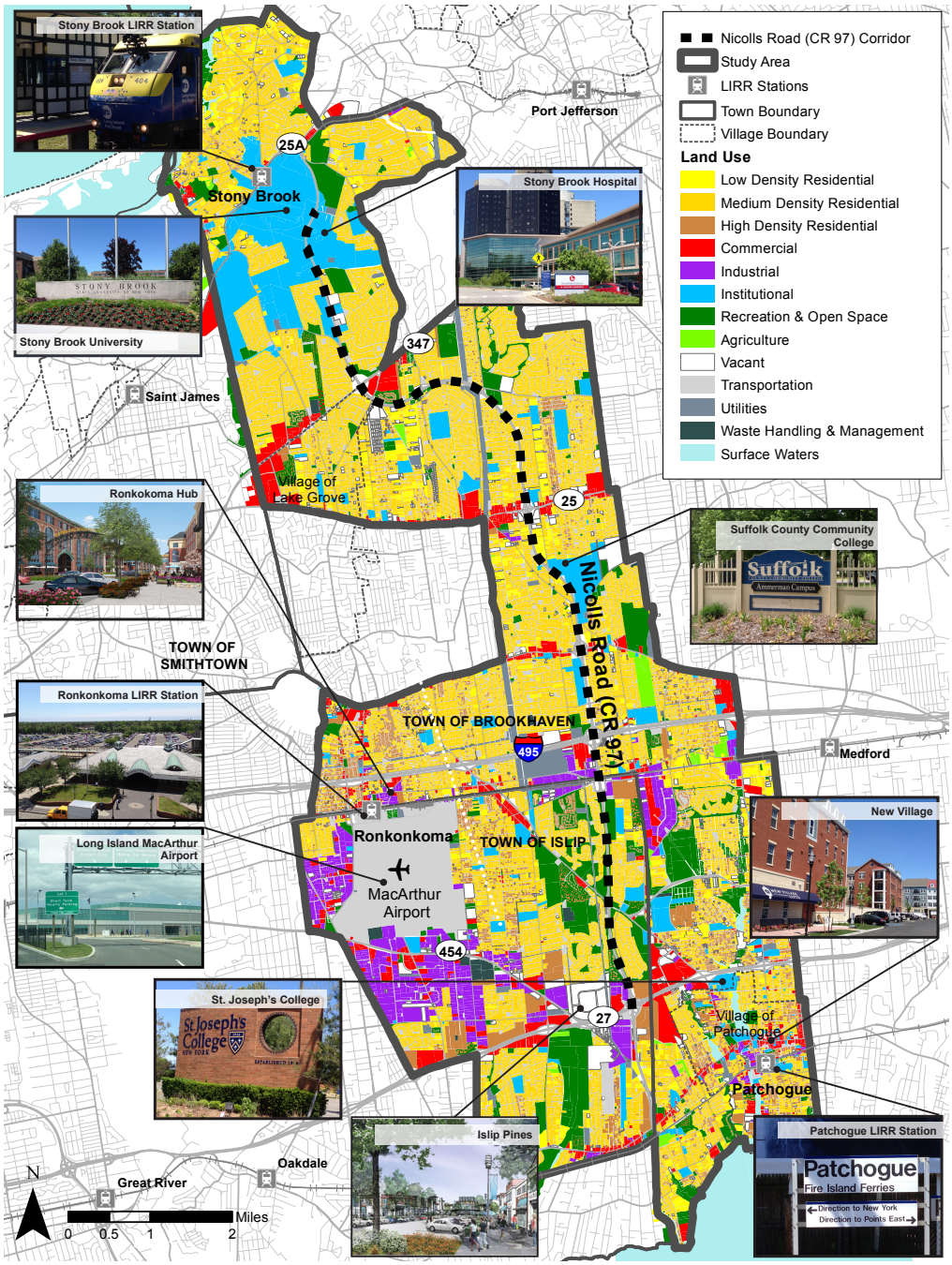


FIGURE 11: Study Area Land Use

Source: NYS GIS Program Office; Suffolk County; Parsons Brinckerhoff; Tritec; Serota Properties

Theater for the Performing Arts. The transformation of downtown Patchogue is most evident at the New Village mixed-use development, which includes approximately 290 rental apartments and 15,000 square feet of ground-floor retail space.

A number of retail centers are located in the vicinity, but off the main spine, of Nicolls Road. These retail centers include—but are not limited to—Nicolls Plaza and Nicolls Plaza II on Pond Path, east of Nicolls Road; the Centereach Mall and Smith Haven Mall on NY 25/Middle Country Road, west of Nicolls Road; Independence Plaza, College Plaza, and Selden Plaza on NY 25/Middle Country Road, east of Nicolls Road; and Gateway Plaza on NY 27/Sunrise Highway, east of Nicolls Road.

One of the principal activity centers in the study area is MacArthur Airport, which also serves as a critical node in the regional transportation system, complementing the LIRR (refer to Section 4.5.1). Owned and operated by the Town of Islip, MacArthur Airport is located on approximately 1,310 acres and serves more than 5,000 air travelers each day. A number of office complexes and hotels are located near the airport, as is the Islip Foreign Trade Zone, which offers economic opportunities for companies conducting international trade.

In addition to the existing activity centers within the study area, two mixed-use developments are expected to be completed within the next decade. Adjacent to the LIRR Ronkonkoma Station is the site of the Ronkonkoma Hub, which may include as many as 1,450 apartments and 545,000 square feet of retail and office space on approximately 50 acres in the Town of Brookhaven. At the corner of NY 27/Sunrise Highway and NY 454/ Veterans Memorial Highway is the site of the Islip Pines development, which is proposed to include a combination of 350 apartments, 1.1 million square feet of industrial and office space, 38,000 square feet of commercial space, community spaces, and athletic fields on approximately 136 acres in the Town of Islip.

Overall, Nicolls Road and the surrounding study area include a wide range of types and intensities of land use, as well as a number of activity centers that contribute to travel demand within, to, and from this regionally significant corridor.

4.5 EXISTING TRANSIT SERVICE

As part of the broader study area, Nicolls Road is a strategic north-south corridor on Long Island in part because it crosses multiple branches of the LIRR. Additionally, although the Corridor is not served in its entirety by a single existing transit route, a number of local bus routes provide service along a portion of and/or cross Nicolls Road. The following sections present an overview of these different transit services.

4.5.1 LONG ISLAND RAIL ROAD (LIRR)

The LIRR provides commuter rail service to and from the study area between points east and west on Long Island and New York City. Including connections to Ronkonkoma via the Long Island Expressway (LIE) Service Roads and to Patchogue via CR 19, Nicolls Road provides a link between three different branches of the LIRR:

» The Montauk Branch at the Patchogue Station;
» The Main Line at the Ronkonkoma Station; and
» The Port Jefferson Branch at the Stony Brook Station.

The 2013 LIRR Origin and Destination Survey includes ridership statistics for these three LIRR stations within the study area. For all three stations, the greatest number of weekday boardings occurs in the morning peak period in the westbound direction (i.e., 5,510 at Ronkonkoma, approximately 410 at Stony Brook, and 290 at Patchogue), reflecting the commuter travel market from Long Island to Manhattan. Similarly, the greatest number of weekday alightings at the LIRR Ronkonkoma Station (approximately 3,940) occurs in the evening peak period in the eastbound direction, when New York City commuters are returning home. The LIRR Stony Brook Station experiences the greatest number of alightings (approximately 340) in the midday off-peak period (presumably corresponding to SBU students), and the LIRR Patchogue Station experiences the greatest number of alightings (approximately 200) after the evening peak period, followed closely by the evening peak period (approximately 190). In terms of both boardings and alightings, the LIRR Ronkonkoma Station is by far the busiest of the three LIRR stations, likely due to the fact that electrification allows for frequent, direct, and faster service to and from New York City than is offered at other stations and because Ronkonkoma serves as a regional transportation hub.

The study area includes three LIRR stations (Stony Brook, Ronkonkoma, and Patchogue) on three different branches
Source: Parsons Brinckerhoff

Several Suffolk County Transit routes serve portions of the study area
Source: Suffolk County Transit

4.5.2 SUFFOLK COUNTY TRANSIT

As shown on **Figure 12**, several existing Suffolk County Transit routes serve portions of the Corridor and broader study area. The S71 route serves much of the northern portion of the Corridor along Nicolls Road north of Portion Road. While the southern portion of the Corridor lacks existing bus service, the S63 route connects Nicolls Road to downtown Patchogue via CR 19. Additionally, many Suffolk County Transit routes serve small portions of the Corridor and offer connections to other bus routes, as well as the LIRR. A number of Suffolk County Transit routes converge at the LIRR stations in the study area:

» The S71 and 3D routes both terminate at the LIRR Stony Brook Station, providing service between Stony Brook and Yaphank/Mastic and Brentwood, respectively.

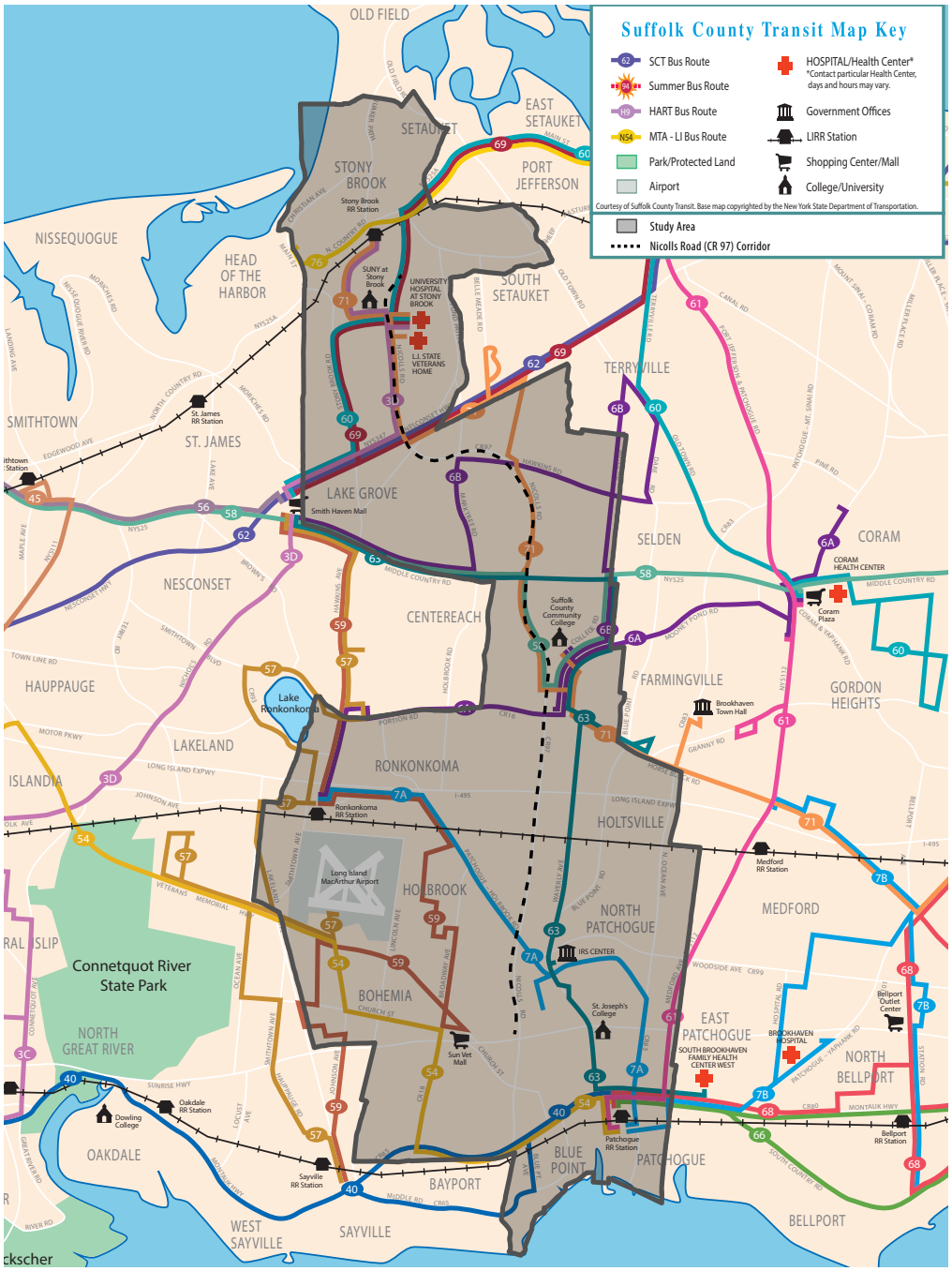
» The S57, S59, 6A, and 7A routes serve the LIRR Ronkonkoma Station and provide connections between Ronkonkoma and Sayville/Lake Grove via Bohemia, and Sayville/Lake Grove via Holbrook, Coram, and Patchogue, respectively.

» The S40, S54, S61, S63, S66, S68, 7A, and 7B routes all terminate at the LIRR Patchogue Station, providing service between Patchogue and Babylon, Melville, Port Jefferson, Lake Grove/Smith Haven Mall, Mastic Beach/Moriches, Bellport, Ronkonkoma, and Medford/Bellport, respectively.

The SCCC-Ammerman Campus also offers transfer opportunities among multiple Suffolk County Transit routes, including the S58, S63, S71, 6A, and 6B. Collectively,

FIGURE 12: Suffolk County Transit Services within the Study Area

Source: Suffolk County Transit, Parsons Brinckerhoff



these routes connect Nicolls Road with locations from East Northport to Riverhead; Patchogue to Lake Grove; Shirley to Stony Brook; Ronkonkoma to Coram; and Lake Grove to Farmingville, thereby linking the Corridor with a number of origins and destinations throughout Suffolk County.

Some routes that serve the Corridor only operate weekdays, while others also operate on Saturday or the entire weekend. The routes also vary with respect to hours of operation and frequency of service. The majority of the routes operate every 60 minutes or more for most hours during the day, with some routes offering more frequent service during the morning and/or evening peak period.

Based on data collected in 2013, the routes with the highest weekday ridership—S54 (1,430), S40 (1,175), and S66 (1,070)—do not operate along the Corridor, but rather provide connections to the Corridor at its southern terminus in Patchogue. Overall, weekday ridership among these routes varies considerably, from approximately 50 (S69) to 1,430 (S54). The routes with the highest Saturday ridership (S66 with approximately 730 riders and S60 with 650 riders) similarly do not operate along the Corridor, but provide connections to the Corridor at the southern and northern termini of the Corridor, respectively.

4.5.3 OTHER LOCAL AND REGIONAL BUS SERVICES

In addition to Suffolk County Transit, the SBU Transit system also provides local fixed-route bus service within a portion of the study area. As shown on **Figure 13**, there are seven SBU Transit routes that operate within and in the vicinity of the main SBU campus, including routes that also serve the SBU Hospital, Research and Development Park, and Southampton Campus. Several SBU Transit stops are shared with Suffolk County Transit, offering connections between the two services. Similar to Suffolk County Transit, some of the SBU Transit routes only operate during weekdays, while others also operate on weekends. Service frequency ranges among the routes from every 12 minutes to every 30 minutes.

Furthermore, 7 Bus is a private, for-profit bus operator that provides commuter bus service from Ronkonkoma and SBU to Rego Park in Queens and three locations on the east side of Manhattan between 40th Street and 59th Street. 7 Bus provides service for the New York City-bound commuter, as well as those commuting on Long Island, including to the study area.

All of these complementary bus services provide the framework for a robust intra-Island transit network, bolstered by the east-west LIRR. One of the crucial underpinnings of this AA was that improved multi-modal connectivity with the LIRR and existing bus service could promote equitable and sustainable economic growth while reducing the number of cars on the road.

4.6 ROADWAY CHARACTERISTICS

Nicolls Road changes in character and width at different locations. As shown on **Figure 14**, there are three typical roadway segments along the 12-mile stretch of Nicolls Road between NY 27/Sunrise Highway and Shirley Kenny Drive:

» Segment 1: Nicolls Road from NY 27/Sunrise Highway to Pond Path – This segment consists of two travel lanes in each direction with approximately 10-foot-wide shoulders and separated by a 46-foot-wide grass median. At signalized intersections, single left turn lanes (with double left turn lanes at a few intersections) are provided in the median. A recent Suffolk County capital project added a third travel lane in each direction between Mark Tree Road and Pond Path by reconstructing the right shoulder.

» Segment 2: Nicolls Road from Pond Path to NY 347 – This segment has three travel lanes in each direction, approximately 7-to-10-foot-wide shoulders, dual left turn lanes, and exclusive right turn lanes on almost all approaches. There is also a paved median that varies in width from about 8 to 16 feet with guide rail separating northbound and southbound traffic.

» Segment 3: Nicolls Road from NY 347 to Shirley Kenny Drive – This segment contains two travel lanes in each direction with approximately 8-foot-wide shoulders divided by a 22-foot grass median (with cable guide rail) that is narrowed where left turn lanes are provided.

FIGURE 13: SBU Transit Services
Source: SBU Transit

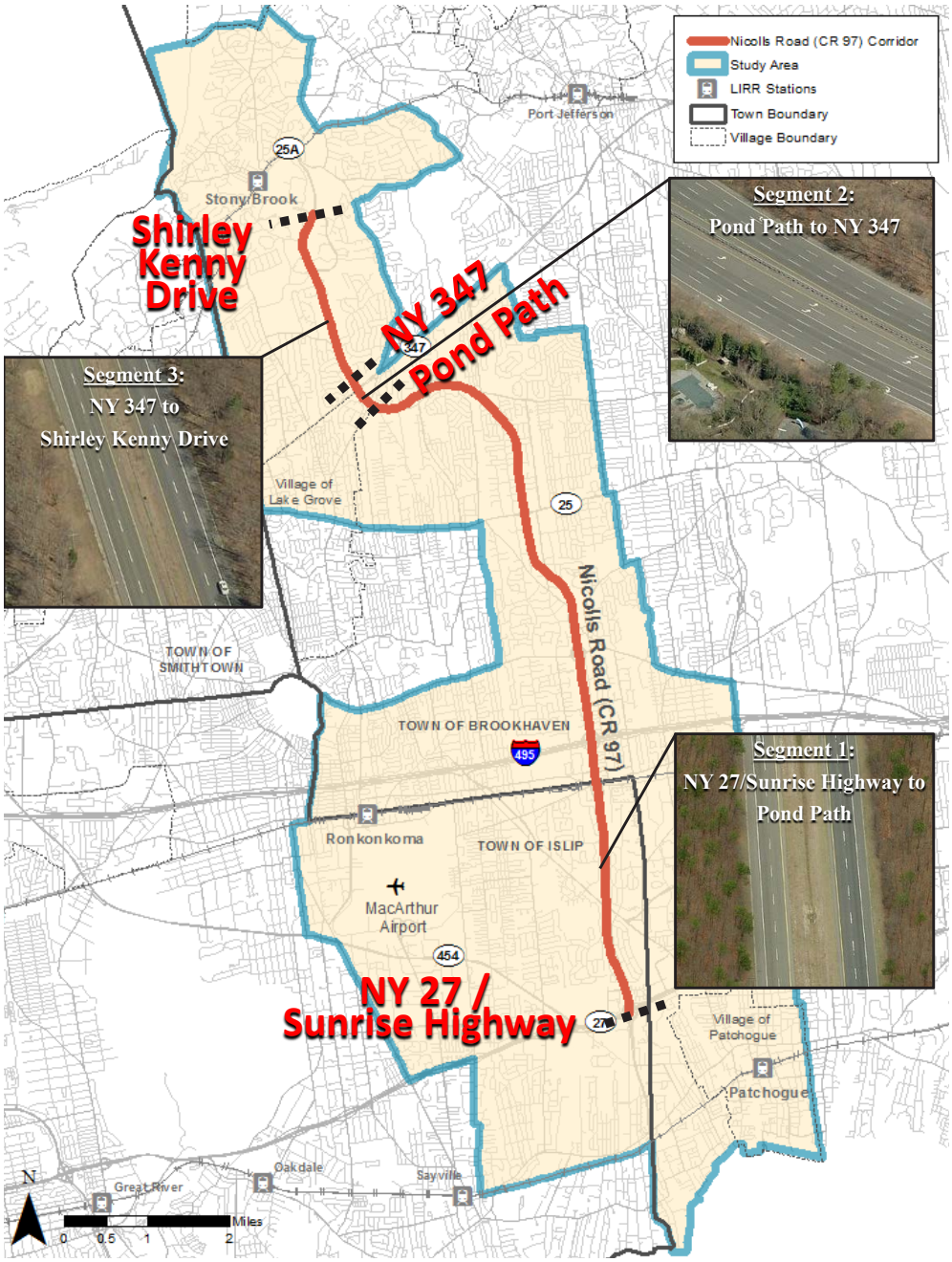


FIGURE 14: Typical Roadway Segments along the Study Corridor

Source: NYS GIS Program Office; Suffolk County; Bing Maps; Parsons Brinckerhoff; GPI

4.7 TRAFFIC CONDITIONS

During the AA, traffic data was collected at a targeted number of locations to supplement and verify the traffic conditions analyzed under previous studies. The data collected included several metrics used to evaluate traffic operations, such as turning movement counts, queue lengths, and travel time runs. The details of the data collection and analysis efforts are presented in Appendix C.

The results of the data analysis were consistent with previous studies, further demonstrating that traffic operating conditions are poor along Nicolls Road, and especially between the LIE and NY 347 during the evening peak period. Nicolls Road is one of the primary north-south corridors within Suffolk County and demand on this roadway is high, resulting in recurring congestion characterized by large queues (often 16 to 20 cars per lane) and traffic flow with frequent stops. Additionally, based on the travel time runs, several segments along the Corridor operate at speeds much lower than the speed limit due to the number of vehicles exceeding the roadway capacity.

As discussed in Section 4.4, there are many large activity centers in the vicinity of Nicolls Road, and these trip generators and attractors add traffic as drivers traverse the Corridor. In addition, development projects that are being advanced near the Corridor (most notably the Ronkonkoma Hub and Islip Pines developments) will continue to stress the existing roadway network in the study area.

Although recent and forthcoming traffic changes along Nicolls Road as part of Suffolk County Capital Project (CP) 5512 have/will provide some isolated relief to congestion in the Corridor, poor operating conditions still generally remain and are expected to continue. As such, auto-centric transportation improvements alone cannot address the existing and future needs within the Corridor. Therefore, one of the intended outcomes of this AA was to identify transit alternatives that could promote sustainable economic growth without exacerbating traffic congestion along the Corridor.

Nicolls Road experiences recurring traffic congestion during peak periods
Source: Parsons Brinckerhoff

4.8 PEDESTRIAN AND BICYCLE INFRASTRUCTURE

Nicolls Road lacks sidewalks along the full extent of the Corridor between NY 27/Sunrise Highway and Shirley Kenny Drive. There is an approximately 0.1-mile segment of Nicolls Road that includes sidewalks on the east side of the road, specifically at its northern terminus between Sheep Pasture Road (at the north entrance of SBU) and NY 25A. Moreover, Suffolk County CP 5512 includes the installation of sidewalks on the west side of the road at this location, complementing the existing sidewalk on the east side. In addition, the County received an award of approximately $1.5 million from New York State to improve pedestrian/bicycle access to future transit stations along Nicolls Road.

Overall, while there is a wide shoulder on both sides of the street for large stretches of the Corridor, there is no pedestrian infrastructure along the vast majority of Nicolls Road, thereby limiting walkability and appeal for cyclists. However, sidewalks are generally consistent on both sides of the street in the immediate vicinity of the three LIRR stations in the study area.

There are no designated bicycle lanes along Nicolls Road, and bicycles are prohibited between the LIE and NY 347 due to the roadway type. However, a number of other

Nicolls Road lacks accommodation for pedestrians and bicyclists
Source: Parsons Brinckerhoff

roadways in the study area are included in the regional network of bikeways and trailways, including—but not limited to—an off-road, shared-use path within the SBU campus. Furthermore, SBU operates a bike share system (SBU Wolf Ride) for students, faculty, staff, and visitors. Since the program launched in April 2013, there has been a total utilization of more than 16,000 rides, with an average of nearly 30 rides per day. Other roadways within the study area are included in the regional network of bikeways and trailways, such as the on-road bicycle route along portions of CR 19.

Despite the presence of some pedestrian and bicycle infrastructure, the Corridor is primarily auto-oriented, which is a reflection of the sprawling development pattern. However, the I-Zone calls for the creation of a hiking/biking trail along Nicolls Road, which could vastly improve conditions for pedestrians and bicyclists along the Corridor. Pedestrian and bicycle safety is a key element of the vision for a multi-modal Nicolls Road Corridor, including accessibility to and from future transit stations.

5 CHALLENGES AND OPPORTUNITIES, PURPOSE AND NEED, GOALS AND OBJECTIVES

The identification of existing and future challenges and opportunities facing the study area served as the basis for establishing the Purpose and Need. (Refer to Appendices D and E.) A well-crafted Purpose and Need was critical to achieving a successful AA, as it served as a roadmap to clearly define the rationale and intended outcome of the project. The Purpose and Need provided a foundation for the development of project goals and objectives as well as the subsequent identification of evaluation criteria and measures that were used to screen alternatives.

5.1 EXISTING AND FUTURE CHALLENGES

The commercial success and quality of life of the study area is at risk due to a number of problems:

- **Travel choices are constrained** due to sprawling development patterns that encourage automobile use and limit the utility of the existing transit system. Additionally, there is a lack of intra- and inter-County mobility choices.
- **Multi-modal connectivity is lacking** because Nicolls Road is not served entirely by a single existing Suffolk County Transit route, and the existing bus routes offer infrequent and primarily uncoordinated service between the LIRR and destinations in the study area. Additionally, bus-rail transfer locations only provide basic passenger amenities, such as partially enclosed small shelters and minimal passenger information.
- **Existing bus travel times are not competitive** with—and are often less reliable than—automobile travel times for those trips that can be served by existing transit, which serves as a disincentive to use transit.
- **Existing traffic congestion** along the Corridor contributes to travel delays and travel time unreliability, which limits mobility along the Corridor.
- **Future traffic congestion** will likely be exacerbated by projected increases in population and employment, in addition to planned and proposed developments in the study area, thereby putting a strain on the transportation network.
- **Transit-oriented development (TOD) opportunities are lacking** in the study area due to the inadequacy of the existing north-south transit system to complement the east-west LIRR network and the lack of available and suitable (i.e., transit-integrated) development sites.
- **Walkability and pedestrian accessibility are impeded** due to the absence of sidewalks along the vast majority of Nicolls Road and the prevalence of auto-centric development patterns.

Existing traffic congestion is a key challenge facing the Nicolls Road Corridor, and it is projected to get worse in the future
Source: Parsons Brinckerhoff

The I-Zone vision reflects a unique partnership of multiple levels of government and several of the region's top research institutions
Source: Suffolk County

5.2 EXISTING AND FUTURE OPPORTUNITIES

Despite these challenges, there are a number of factors that are supportive of improved transit service in the study area, including:

» Multiple regional plans point to **the need for and potential benefits of improved north-south transit connectivity on Long Island,** including—but not limited to—the *Connect Long Island* plan (and I-Zone), the *Suffolk County BRT Feasibility Study*, NYMTC's *Plan 2040* RTP, the LIRPC's *Sustainable Strategies for Long Island 2035*, and the LIREDC's *Strategic Economic Development Plan*, in addition to reports issued by the Long Island Index.

» Through the **I-Zone,** Suffolk County can build upon its strong and burgeoning partnership with the Towns of Brookhaven and Islip as well as the Village of Patchogue, which each have jurisdiction over regulating land use and development policy within their respective boundaries. In addition to promoting a unified vision for a regionally transformative multi-modal transportation network, this collaboration can help to provide the regulatory framework for encouraging transit-supportive development.

» There are a number of **funded corridor-specific as well as countywide capital improvements** that will benefit the study area in the near- and mid-term future. These capital improvements are defined in the Suffolk County Capital Program 2016-2018, and Suffolk County was also the recipient of financial awards from federal and state sources for pedestrian/bicycle and transit improvements along the Corridor.

» The study area includes a large number of **activity centers that serve as origins and destinations in the regional travel market**, including the SBU Research & Development Park and other economic generators. Residents, employees, and visitors to the study area are a source of potential future transit ridership, and both population and employment are projected to increase in the future.

» The study area has a **comparatively large share of multi-family housing** compared to Suffolk County overall, which supports the premise that Nicolls Road is well-suited for transit improvements to bolster economic development potential.

» The study area is crossed by **three branches of the LIRR** and served by **multiple bus transit systems**, which offer opportunities to create multi-modal connectivity. Additionally, the proximity of the LIRR Ronkonkoma Station to **MacArthur Airport** further bolsters the multi-modal opportunities in the study area, especially due to the I-Zone vision for a new terminal on the north side of the airport.

» There are **multiple travel markets** that can be served in the study area, including work trips during the morning and evening peak periods, non-work trips by employees during the lunch hour, and non-work trips made by shoppers, visitors, university students, and other non-workers during both peak and off-peak periods. Additionally, there are projected increases in daily work and non-work trips within, to, and from the study area.

» The **LIRR East Side Access project**, with a scheduled completion date of 2022, will connect the LIRR to Grand Central Terminal. This will increase capacity and provide faster access for many LIRR passengers to their destinations, thereby promoting economic development across the region and supporting existing population and employment centers, including within the study area.

» The **LIRR Double Track project**, with a scheduled completion date of 2018, will allow the LIRR to increase off-peak train frequency from hourly to half-hourly, and the improved service and reliability along the Main Line will support enhanced connectivity and intra-Island travel, which can benefit the study area as a reverse

commuting destination. Specifically, the Double Track project will enable more reverse peak trains to operate east to the LIRR Ronkonkoma Station during the morning peak, which cannot be supported by the existing single track.

» The **LIRR Third Track project** (LIRR Expansion project) would add an additional track to an approximately 9.8-mile segment of the Main Line between Floral Park and Hicksville. In addition to improving reliability system-wide along the LIRR, the project would achieve the full benefits of East Side Access by increasing capacity for reverse peak and intra-Island service.

» **Planned, proposed, and ongoing development projects** in the vicinity of Nicolls Road can provide sources for additional transit ridership and the ability to evolve the Corridor through transit-supportive design principles. The Ronkonkoma Hub and Islip Pines developments are examples of two projects with transformative potential for the study area. There are also other development opportunities in the study area, including at the County-owned parcel on College Road in Selden, located adjacent to the SCCC-Ammerman Campus.

» The **START-UP NY** program, which creates tax-free areas sponsored by colleges and universities across New York State, can further enhance the economic competitiveness of the study area and serve as a draw for new businesses to locate in the vicinity of the Corridor.

» There could be **opportunities to partner with developers, property owners, and employers** to provide enhanced and more direct transit service between, to, and from the regional assets in the study area, including the SBU campus and hospital, Patchogue Village, SCCC-Ammerman Campus, and the Ronkonkoma Hub.

Overall, these existing and future opportunities demonstrate that the Corridor warrants transit improvements integrated with land use policy to improve mobility and connectivity and promote economic development.

5.3 PURPOSE AND NEED

The purpose of the Nicolls Road AA is to advance the *Connect Long Island* plan and establish the framework to create a new north-south rapid transit corridor in order to increase mobility, reduce congestion, and create sustainable economic growth (Appendix E).

Specifically, the purpose of the AA is to:

» **Implement a premium transit service** in the Nicolls Road Corridor to connect trip generators and attractors. The features of a premium transit service include enhanced frequency, reliability, and passenger amenities.

» **Enhance multi-modal connectivity** because direct connections are currently limited in coverage, span, and frequency, and the Corridor is not served entirely by a single transit route.

» **Improve north-south mobility** because travel time on Nicolls Road suffers due to existing traffic congestion, which is projected to increase in the future.

» **Promote intra- and inter-County mobility** because Nicolls Road is an important north-south arterial that links east-west corridors.

» **Increase transit access to and from activity centers**--including connecting major assets to MacArthur Airport--because the existing bus and rail network offers infrequent service between trip generators and attractors.

» **Promote increased transit use** by attracting "choice/discretionary riders" (i.e., those who own an automobile) because automobile dependence contributes to traffic congestion, harms the local and global environment, and reinforces unsustainable land use patterns. Given the distance from parking to destinations at SBU, Stony Brook Hospital, SCCC and other locations, a well-designed transit service can offer travel times that are very competitive with automobile travel.

PURPOSE AND NEED, CONTINUED

» **Support TOD along the Corridor** because existing auto-centric development patterns consume increasingly scarce land, are very expensive to provide with municipal services, and are not easily served by public transit.

» **Create sustainable economic growth** to encourage job retention and attraction as well as lay the groundwork for an innovation economy.

The Nicolls Road AA addresses the following needs:

» **Create a new north-south transit service** to enhance transit connectivity. The study area includes three LIRR stations (Stony Brook, Ronkonkoma, and Patchogue) and a regional airport (MacArthur Airport), and is served by multiple bus transit systems (Suffolk County Transit, SBU Transit, and 7 Bus). However, travel without an automobile is inhibited by inadequate north-south multi-modal connectivity. Therefore, improved north-south transit service is needed to complement the east-west network of the LIRR.

» **Provide direct, convenient transit access**. The study area includes a large number of activity centers that serve as origins and destinations in the regional travel market, including universities, multi-family housing complexes, office complexes, and retail centers. However, many of these trip generators are located beyond a reasonable walking distance from the main spine of the Corridor. Therefore, improved transit service is needed to effectively provide the connection for potential transit customers to destinations located off the Corridor, in addition to enhancing transit access along the Corridor.

» **Reduce travel time for transit customers**. Mobility for transit customers within the study area is limited by existing traffic congestion, which also affects existing bus service. Traffic congestion within the study area contributes to travel delays, especially during peak periods. Mobility is also constrained by short service spans and suboptimal frequencies. Enhanced transit service in the study area, possibly including priority treatment and limited-stop service, can improve mobility, reduce overall travel time, and increase travel time reliability for transit customers.

» **Increase transportation system capacity.** Additional transportation system capacity is needed to address existing and projected future congestion that will likely result from regional population and employment growth as well as future development along and near the Corridor. Noteworthy future developments that would benefit from transit improvements include the two regionally significant projects, Ronkonkoma Hub and Islip Pines.

» **Improve the image of transit.** To attract choice riders, transit improvements must be branded in such a way to raise the profile of transit service and make it more appealing. An effective branding strategy is needed to make transit more visible in the study area and to highlight the benefits of new, high-quality service to existing and potential customers. The transit service must also deliver as promised, ensuring improved travel time reliability.

» **Serve the transit-dependent population.** By definition, transit-dependent persons do not own, or have access to, a car. Transit improvements within the study area are needed to equitably address the existing and future travel needs of this population.

PURPOSE AND NEED, CONTINUED

» **Improve pedestrian and bicycle accessibility by employing a Complete Streets mindset.** There is a need to address the challenge of pedestrian accessibility due to the absence of sidewalks along the vast majority of Nicolls Road and the prevalence of auto-centric development patterns. There is also limited infrastructure for bicyclists within the study area. According to the Suffolk County Complete Streets Policy, the Suffolk County Department of Public Works is required to consider all modes of travel within its design projects, and also evaluate the feasibility of implementing Complete Streets design features in the planning stage of each project. Transit improvements proposed in this AA must be paired with efforts to improve the ease and safety of walking and bicycling along the Corridor. A safe, lit, accessible pedestrian and bicycle network will ensure that transit improvements are successful in the Corridor.

» **Provide the transportation framework to enable TOD**. Travel choices are constrained due to sprawling development patterns that encourage automobile use and limit the utility of the existing transit system. Improved transit service in the Corridor, when coordinated with effective land use planning and zoning, can provide a transportation spine to anchor development around a series of transit nodes, consistent with the *Connect Long Island* plan and other local and regional planning efforts. Additionally, site-sensitive design can help to reduce surface run-off and the amount of land devoted to surface parking at large trip generators.

» **Promote economic growth and vitality.** There is a need to enhance the long-term economic competitiveness of the Corridor to retain and attract employers and employees as well as support future development projects. Transit improvements in the study area can contribute to job creation and retention and also create opportunities for transit-integrated development (as opposed to simply transit-adjacent development).

» **Maximize cost effectiveness and efficiency** of transit investments and operations. The need for transit improvements must be balanced with a careful consideration of costs for implementation, including both capital and operating costs. It will be important to demonstrate an ability to adequately fund construction, operation, and maintenance of potential transit improvements in addition to the existing transit service.

» **Expand travel options to attract discretionary riders and improve quality of life and environmental conditions**. There is a need to create additional travel choices to supplement local bus service and provide a transportation alternative to the automobile. Transit improvements along the Corridor can serve as an incentive for automobile owners to use transit for their travel needs, which can result in increased overall transit ridership and reduced automobile usage. In conjunction with a shift in development patterns to encourage TOD, transit improvements are necessary to improve quality of life and reduce harm to the local and global environment, thereby promoting sustainability and smart growth while reducing the cost to government to provide services to new development.

5.4 GOALS AND OBJECTIVES

The following four goals and objectives for the project are tied directly to the Purpose and Need Statement. The goals and objectives collectively informed the development of the evaluation criteria and performance measures that were subsequently used in the screening process. (Refer to Section 6.1.)

GOAL 1: IMPROVE MOBILITY AND CONNECTIVITY

OBJECTIVES:

- Provide frequent, direct, high-quality transit service to activity centers along the Corridor
- Establish last-mile connectivity to destinations located off the main spine of the Corridor
- Connect educational and research assets to existing and emerging development hubs
- Increase transit ridership
- Provide seamless multi-modal connections with the LIRR to attract longer-distance trips, including work and non-work trips
- Improve travel time for transit customers within the study area
- Increase transportation system capacity to accommodate future growth and assist in mitigating future increases in traffic congestion
- Enhance the customer experience and improve the image of transit to attract choice riders
- Provide enhanced transit service for workers, students, residents, visitors, and shoppers who do not own an automobile (i.e., transit-dependent persons)
- Establish convenient pedestrian and bicycle access to activity centers and points of transit access

GOAL 2: ENHANCE ECONOMIC COMPETITIVENESS AND PROMOTE ECONOMIC GROWTH

OBJECTIVES:

- Encourage a shift in land use patterns to promote transit-integrated development, sustainability, and smart growth
- Support ongoing and planned transportation and development projects
- Support the continued viability of SBU and Hospital as primary research and medical institutions on Long Island by offering enhanced multi-modal transportation access
- Support MacArthur Airport as a regional economic driver
- Support the creation and growth of innovation zones for emerging high-tech companies by offering transportation choices to high-value employees
- Advance the goals of local and regional plans, including *Connect Long Island*

GOAL 3: MAXIMIZE COST AND OPERATIONAL EFFECTIVENESS

OBJECTIVES:

- Implement cost-effective transit improvements with capital costs and operating and maintenance (O&M) costs that are consistent with realistically anticipated available funding
- Improve transit efficiency
- Make use of existing and planned transportation system services, capacity, and maintenance facilities
- Be compatible and avoid conflicts with existing and planned transit operations and infrastructure in the study area
- Implement transit improvements within a reasonable construction timeframe
- Enable opportunities to pursue phased implementation to align with available funding
- Enable the use of innovative sources of project financing and alternative project delivery approaches

GOAL 4: MINIMIZE ADVERSE ENVIRONMENTAL IMPACTS

OBJECTIVES:

- Reduce automobile usage and air emissions
- Implement transit improvements that are constructible and operable without adversely affecting the natural and built environment
- Operate transit service in a manner to reduce fuel consumption and limit emissions
- Reduce the impact on the built environment by encouraging efficient land use, reducing stormwater runoff, and other environmentally sustainable approaches

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6 ALTERNATIVES DEVELOPMENT AND SCREENING

While Suffolk County previously studied the feasibility and potential benefits of a specific mode (i.e., BRT) in the 2014 *Suffolk County BRT Feasibility Study*, it was important to take a step back and assess a broad range of alternative transportation solutions to address the identified problems in the study area. As such, the alternatives development process started with the definition of a number of alignment concepts that were subsequently paired with transit modes. This process is documented in detail in Appendix F.

The alternatives under consideration were narrowed down in multiple tiers of screening to identify the most feasible and promising alternatives that best achieved the project goals and objectives, leading to selection of an LPA for further refinement in the Project Development process.

6.1 SCREENING METHODOLOGY AND EVALUATION CRITERIA

As shown on **Figure 15**, the Nicolls Road AA consisted of a multi-tiered screening process to evaluate a wide range of route and modal alternatives that address the project Purpose and Need.

The Long List Screening eliminated alternatives early in the process that were infeasible and/or did not adequately meet the project goals and objectives. The screening of the Long List Alternatives was completed in two steps: an evaluation of alignments, followed by transit modes. The first step of the Long List Screening resulted in identification of a preferred alignment concept, and the second step resulted in selection of a preferred transit mode.

The Short List Screening provided a detailed analysis to evaluate the strengths, weaknesses, and trade-offs of the remaining Short List Alternatives, which were developed through the preparation of operating plans in conjunction with conceptual engineering along Nicolls Road. This screening provided the framework for recommending an LPA to advance to Project Development.

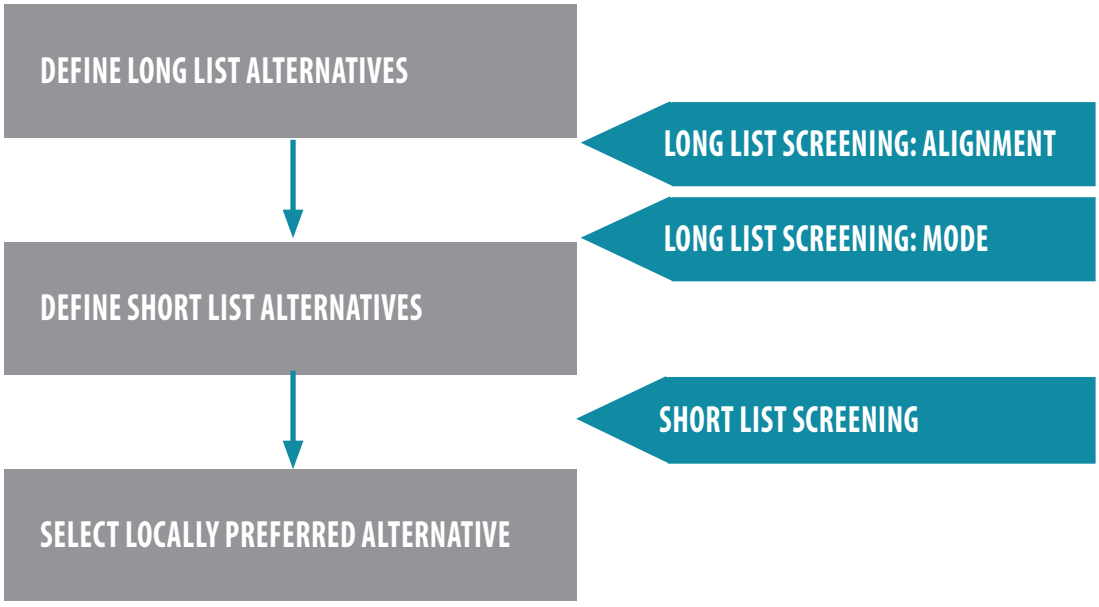


FIGURE 15: Alternative Evaluation Process
Source: Parsons Brinckerhoff

The project goals and objectives provided the foundation for the evaluation process. As shown in **Table 1**, the evaluation criteria that were used in the multi-tiered screening process were directly linked to the project goals and objectives.

EVALUATION AND SCORING

In each tier of the screening process, evaluation measures were developed for the respective criteria. Several criteria were carried over and applied in multiple tiers of the screening process, and the evaluation measures were defined at a greater level of detail in each tier, as necessary. Whereas the Long List Screening was primarily a qualitative evaluation based on the basic attributes of the Long List Alternatives, the Short List Screening combined qualitative and quantitative evaluation measures to enable a more detailed comparison of the Short List Alternatives.

In each tier of the screening process, the results were tabulated to enable a comparison of the extent to which the alternatives achieved the project goals and objectives. Alternatives with the lowest overall evaluation scores were eliminated from further advancement in the screening process.

The screening methodology and results for each tier of the screening process are described in the following sections.

6.2 LONG LIST ALTERNATIVES AND SCREENING

The Long List Alternatives encompassed a range of potentially feasible conceptual transit alternatives (alignments and modes) that addressed the Purpose and Need, and goals and objectives, of this AA. The Long List Screening evaluated the Long List Alternatives based on qualitative evaluation criteria that best utilized the data available at an early stage of the AA. Rather than limit the Long List Screening to identification of fatal flaws, each Long List Alternative was evaluated against all of the pertinent evaluation criteria at that stage of analysis to enable a comprehensive comparison of the relative strengths and weaknesses of the respective alternatives.

The Long List Screening reduced the number of alternatives under consideration using a two-step process. The screening first assessed at a high level the ability of each Long List Alternative alignment to meet the project goals and objectives, and subsequently evaluated the reasonableness of different transit modes, with operational and fiscal viability as a primary consideration. Any Long List Alternative alignments that either failed to adequately meet or only partially met the project goals and objectives, based on an evaluation using the applicable screening criteria in **Table 1**, were eliminated from consideration. The remaining alternative alignments were paired with each of the transit modes under consideration—BRT, streetcar, light rail transit (LRT), automated guideway transit (AGT), commuter rail, and subway—and a second Long List Screening was conducted to evaluate these mode-specific alternatives.

Appendix G presents the Long List Alternatives and the detailed results of the two-step Long List Screening, which are summarized in the following sections.

6.2.1 LONG LIST ALTERNATIVE ALIGNMENTS

DEFINITION OF ALTERNATIVES

The initial definition of the Long List Alternatives included a No-Build Alternative, an Enhanced Bus Alternative, and several alignment alternatives, which were subsequently paired with modes following the first step of the Long List Screening (**Table 2**).

No-Build Alternative

A No-Build Alternative was defined to include the existing and committed transportation facilities and services expected to exist in the future Build year (2040), including LIRR Double Track, Third Track, and East Side Access. It was anticipated that the LPA would be operational well before 2040—and the specific timeframe for implementation would depend on the specific mode and alignment—but 2040 was used as the Build year in this study as it corresponded to the horizon year for the NYMTC Plan 2040 RTP. The No-Build Alternative served as a baseline for comparing the anticipated environmental, transportation, social, and economic benefits and impacts of the project alternatives. This alternative will get carried through to the environmental analysis phase after the AA.

Enhanced Bus Alternative (Alternative A)

An Enhanced Bus Alternative was defined to comprise a lower-cost alternative that would be more limited in scope than the other Build alternatives. Whereas the other Build alternatives would add a new premium transit service with priority treatments to supplement existing bus service, the

TABLE 1: Goals, Objectives, and Evaluation Criteria

Source: Parsons Brinckerhoff

OBJECTIVES	EVALUATION CRITERIA
GOAL 1: IMPROVE MOBILITY AND CONNECTIVITY	
Provide frequent, direct, high-quality transit service to activity centers along the Corridor	• Improves transit service frequency (reduces headways) along the Corridor
Establish last-mile connectivity to destinations located off the main spine of the Corridor	• Provides last-mile transit service to activity centers located beyond a reasonable walking distance from the Corridor
Connect educational and research assets to existing and emerging development hubs	• Increases connectivity between universities and other activity centers along the Corridor
Increase transit ridership	• Optimizes station spacing to maximize ridership potential
	• Maximizes number of automobile trips diverted to transit
	• Increases overall transit ridership in the study area
Provide seamless multi-modal connections with the LIRR to attract longer-distance trips, including work and non-work trips	• Increases connectivity between the LIRR, Suffolk County Transit, and SBU Transit
Improve travel time for transit customers within the study area	• Improves travel time by transit between activity centers in the study area
Increase transportation system capacity to accommodate future growth and assist in mitigating future increases in traffic congestion	• Increases transportation system capacity
Enhance the customer experience and improve the image of transit to attract choice riders	• Provides passenger amenities such as modern station stops, customer information, and enhanced, comfortable vehicles
Provide enhanced transit service for workers, students, residents, visitors, and shoppers who do not own an automobile (i.e., transit-dependent persons)	• Increases transit service to the transit-dependent population
Establish convenient pedestrian and bicycle access to activity centers and points of transit access	• Provides sidewalks, walkways, and/or other pedestrian infrastructure to safely connect stations with nearby destinations
	• Maximizes the length and continuity of the hiking/biking trail along Nicolls Road
GOAL 2: ENHANCE ECONOMIC COMPETITIVENESS AND PROMOTE ECONOMIC GROWTH	
Encourage a shift in land use patterns to promote transit-integrated development, sustainability, and smart growth	• Supports mixed-use and transit-supportive development
Support ongoing and planned transportation and development projects	• Maximizes compatibility with ongoing and planned transportation projects
	• Delivers enhanced transit service to the sites of ongoing and planned development projects
Support the continued viability of SBU and Hospital as primary research and medical institutions on Long Island by offering enhanced multi-modal transportation access	• Provides new transit service to SBU and Hospital with convenient connections to existing transit service
Support MacArthur Airport as a regional economic driver	• Provides enhanced transit service to MacArthur Airport and surrounding employment areas for air travelers and employees
Support the creation and growth of innovation zones for emerging high-tech companies by offering transportation choices to high-value employees	• Provides a transit framework around which to bolster the I-Zone
Advance the goals of local and regional plans, including *Connect Long Island*	• Maximizes compatibility with local and regional plans

[Continued on next page]

OBJECTIVES	EVALUATION CRITERIA
GOAL 3: MAXIMIZE COST AND OPERATIONAL EFFECTIVENESS	
Implement cost-effective transit improvements with capital and O&M costs that are consistent with realistically anticipated available funding	• Effectively serves projected demand
	• Minimizes level of construction complexity
	• Minimizes estimated capital cost
	• Minimizes estimated net annual O&M costs
Improve transit efficiency	• Offers physical and service attributes that are appropriate for study area land use and density
Make use of existing and planned transportation system services, capacity, and maintenance facilities	• Minimizes physical (right-of-way) and/or operational (traffic) constraints for implementation in the study area
Be compatible and avoid conflicts with existing and planned transit operations and infrastructure in the study area	• Maximizes compatibility and minimizes conflicts with existing and planned transit operations and infrastructure in the study area
Implement transit improvements within a reasonable construction timeframe	• Minimizes timeframe for implementation (including design, environmental review, and construction)
Enable opportunities to pursue phased implementation to align with available funding	• Allows for phased implementation
Enable the use of innovative sources of project financing and alternative project delivery approaches	• Allows for the use of innovative project financing sources and project delivery approaches
GOAL 4: MINIMIZE ADVERSE ENVIRONMENTAL IMPACTS	
Reduce automobile usage and air emissions	• Reduces vehicle miles traveled (VMT)
Implement transit improvements that are constructible and operable without adversely affecting the natural and built environment	• Minimizes potential adverse impacts to the natural and built environment • Minimizes potential for displacement of residents and businesses
Operate transit service in a manner to reduce fuel consumption and limit emissions	• Utilizes a transit technology that minimizes fuel consumption and air emissions
Reduce the impact on the built environment by encouraging efficient land use, reducing stormwater runoff, and other environmentally sustainable approaches	• Supports a shift to environmentally-sensitive development patterns

TABLE 1, Continued: Goals, Objectives, and Evaluation Criteria
Source: Parsons Brinckerhoff

TABLE 2: Long List Alternatives

Source: Parsons Brinckerhoff

ALTERNATIVE LETTER	ALTERNATIVE NAME	DESCRIPTION
	No-Build Alternative	• The existing and committed transportation facilities and services expected to exist in the future Build year (2040)
A	Enhanced bus service along the Corridor	• Existing bus service, with an additional bus route between the LIRR Stony Brook and Patchogue Stations
B	Trunk route between Stony Brook and Patchogue only	• Trunk route between the LIRR Stony Brook and Patchogue Stations • Connects two of the three LIRR branches in the study area (Port Jefferson and Montauk Branches)
C	Trunk route between Stony Brook and Ronkonkoma only	• Trunk route between the LIRR Stony Brook and Ronkonkoma Stations • Connects two of the three LIRR branches in the study area (Port Jefferson Branch and Main Line)
D	Trunk route between Stony Brook and Patchogue, and between Stony Brook and Ronkonkoma	• Trunk route between the LIRR Stony Brook and Patchogue Stations, with an additional trunk route between the LIRR Stony Brook and Ronkonkoma Stations • Each trunk route connects two of the three LIRR branches in the study area (Port Jefferson and Montauk Branches, and Port Jefferson Branch and Main Line)
E	Trunk route between Stony Brook and Patchogue, and between Stony Brook, Ronkonkoma, and Patchogue	• Trunk route between the LIRR Stony Brook and Patchogue Stations, with an additional trunk route between the LIRR Stony Brook, Ronkonkoma, and Patchogue Stations • One trunk route connects two of the three LIRR branches in the study area (Port Jefferson and Montauk Branches), and one trunk route connects all three LIRR branches in the study area (Port Jefferson Branch, Main Line, and Montauk Branch)

Enhanced Bus alternative would be limited to a new local bus route from Stony Brook to Patchogue.

Alignment Alternatives (Long List Alternatives B – E)

The initial definition of the Long List Alternatives identified potential alignment concepts, independent of mode, which are shown schematically on **Figure 16** through **Figure 19** and generally correspond to those identified in the *Suffolk County BRT Feasibility Study*. The alignment concepts covered a range of alternatives in the study area, including between Stony Brook and Patchogue (primarily along the Nicolls Road Corridor) as well as to the LIRR Ronkonkoma Station.

The specific routing and service characteristics of the alignment concepts were defined following the Long List Screening for the alternatives that remained under consideration.

Screening Results

The first step of the Long List Screening included a rating assigned to each Long List Alternative alignment for its relative performance against each criterion. An overall evaluation score was computed for each alternative.

Based on the tabulated results, only Long List Alternative E (trunk route between Stony Brook and Patchogue, and between Stony Brook, Ronkonkoma, and Patchogue) was advanced to the second step of the Long List Screening, in which the alignment concept was paired with transit modes for another round of evaluation. Additionally, the No-Build Alternative was automatically advanced in the evaluation process. The Short List Screening subsequently included consideration of the No-Build Alternative as the baseline against which the benefits and impacts of the Build alternatives were evaluated.

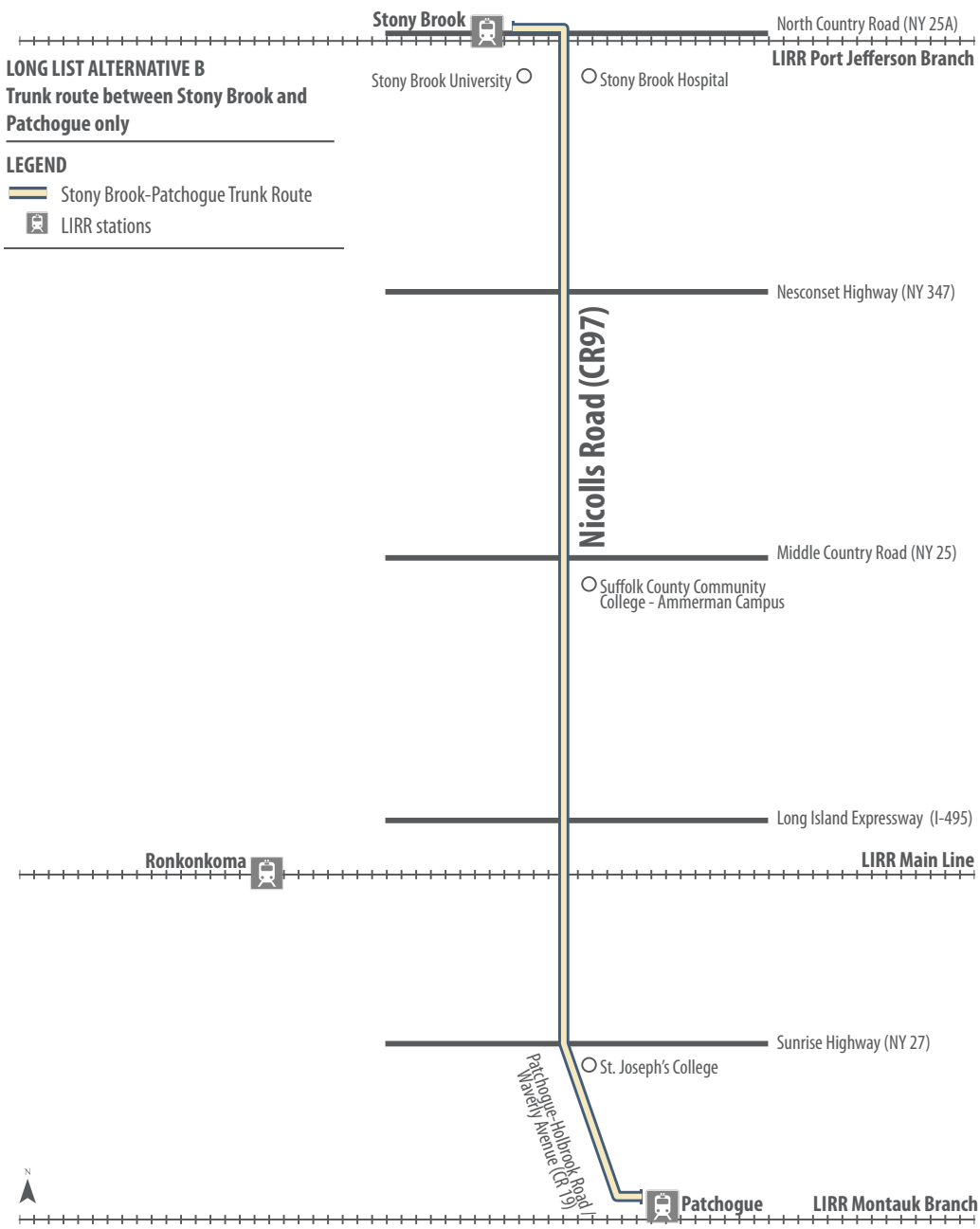
The other Long List Alternative alignments were eliminated from consideration because these concepts would not adequately meet the project goals and objectives. Each of these alternatives fall short to differing extents in their ability to improve mobility and connectivity, enhance economic competitiveness, and maximize operational effectiveness along the Corridor and in the broader study area.

Long List Alternative A (Enhanced Bus Alternative) was eliminated from consideration because the introduction of another local bus route along the Corridor would fail to achieve two of the fundamental objectives of this AA: to improve the image of transit to attract choice riders; and to improve pedestrian safety along Nicolls Road. Additionally, although the Enhanced Bus Alternative would provide a one-seat ride between Stony Brook and Patchogue, it would not allow transit customers to bypass traffic congestion on Nicolls Road because, unlike the other Build alternatives, this alternative would not include priority treatments. Accordingly, the Enhanced Bus Alternative would not improve travel time for transit customers to the same extent as the other Build alternatives. Furthermore, the Enhanced Bus Alternative would only connect Stony Brook and Patchogue; it would not offer a connection to Ronkonkoma.

Only Long List Alternative E would fully meet the project goals and objectives by including a new premium transit service along the full Corridor and also linking all three branches of the LIRR within the study area. Long List Alternative E would provide the greatest increases in connectivity between activity centers in the study area, thereby creating the strongest framework around which to advance the I-Zone. Accordingly, Long List Alternative E was advanced in the screening process for further development and evaluation.

FIGURE 16: Long List Alternative B

Source: Parsons Brinckerhoff
Note: schematic representation; not drawn to scale



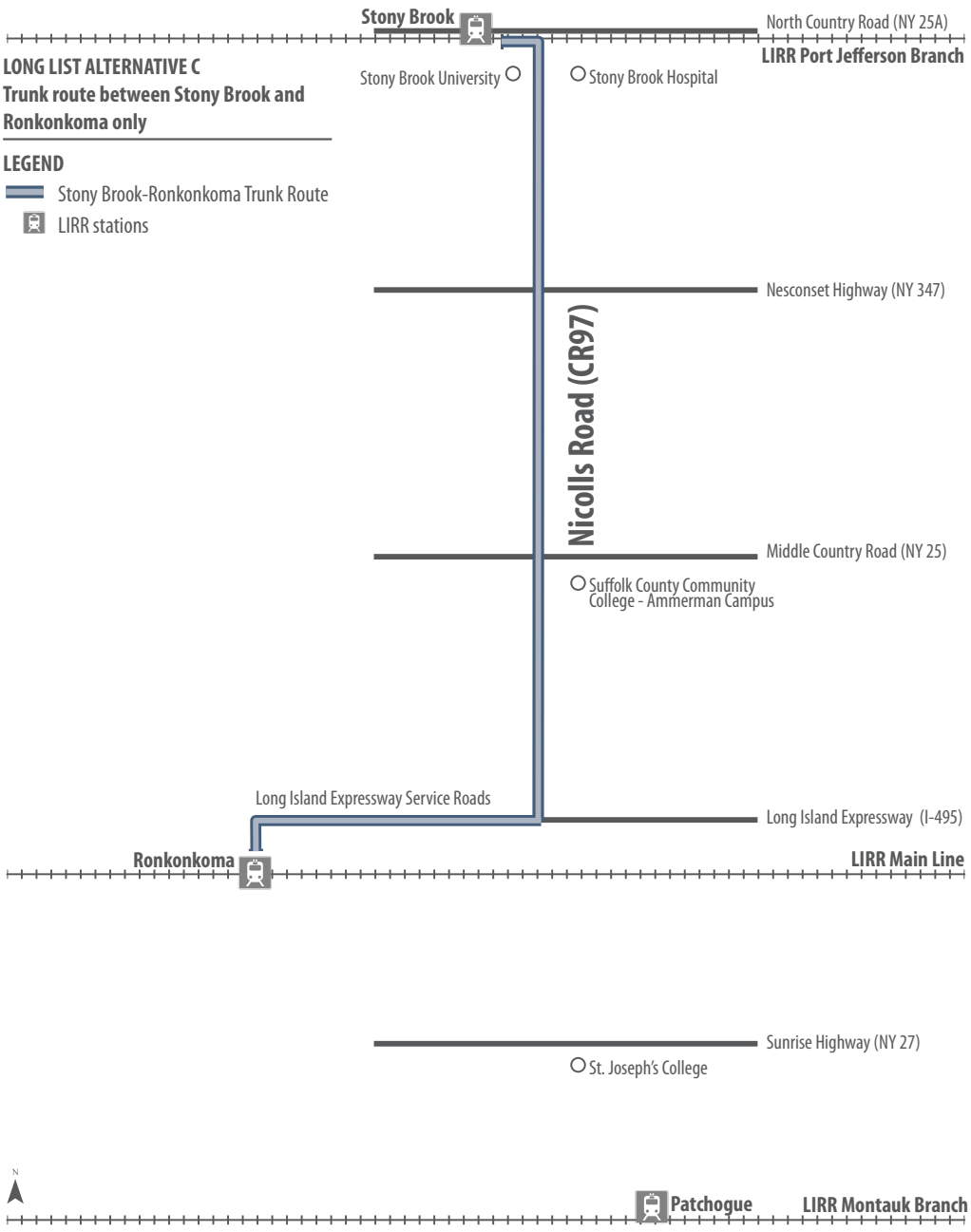
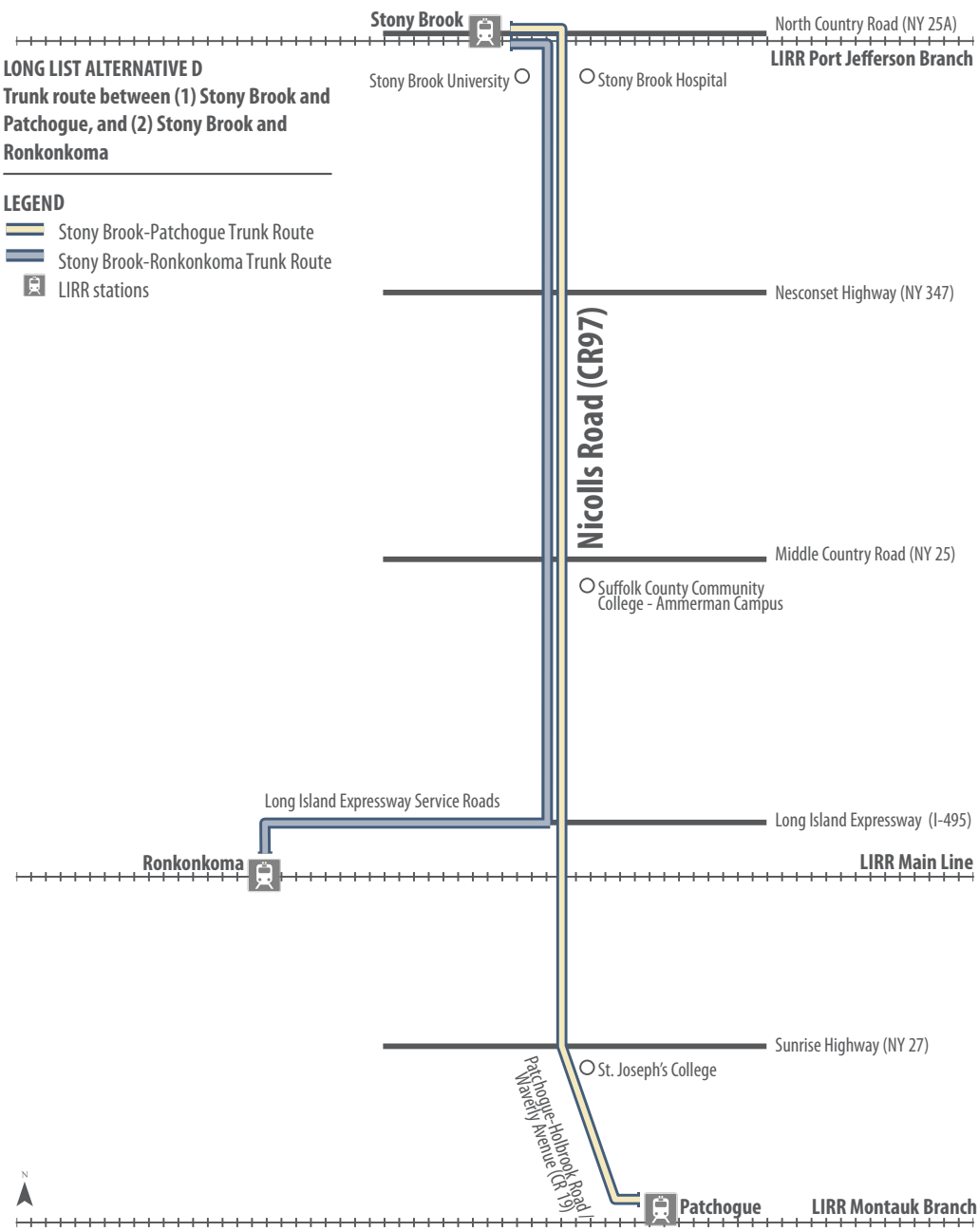


FIGURE 17: Long List Alternative C
Source: Parsons Brinckerhoff
Note: schematic representation; not drawn to scale

FIGURE 18: Long List Alternative D

Source: Parsons Brinckerhoff
Note: schematic representation; not drawn to scale



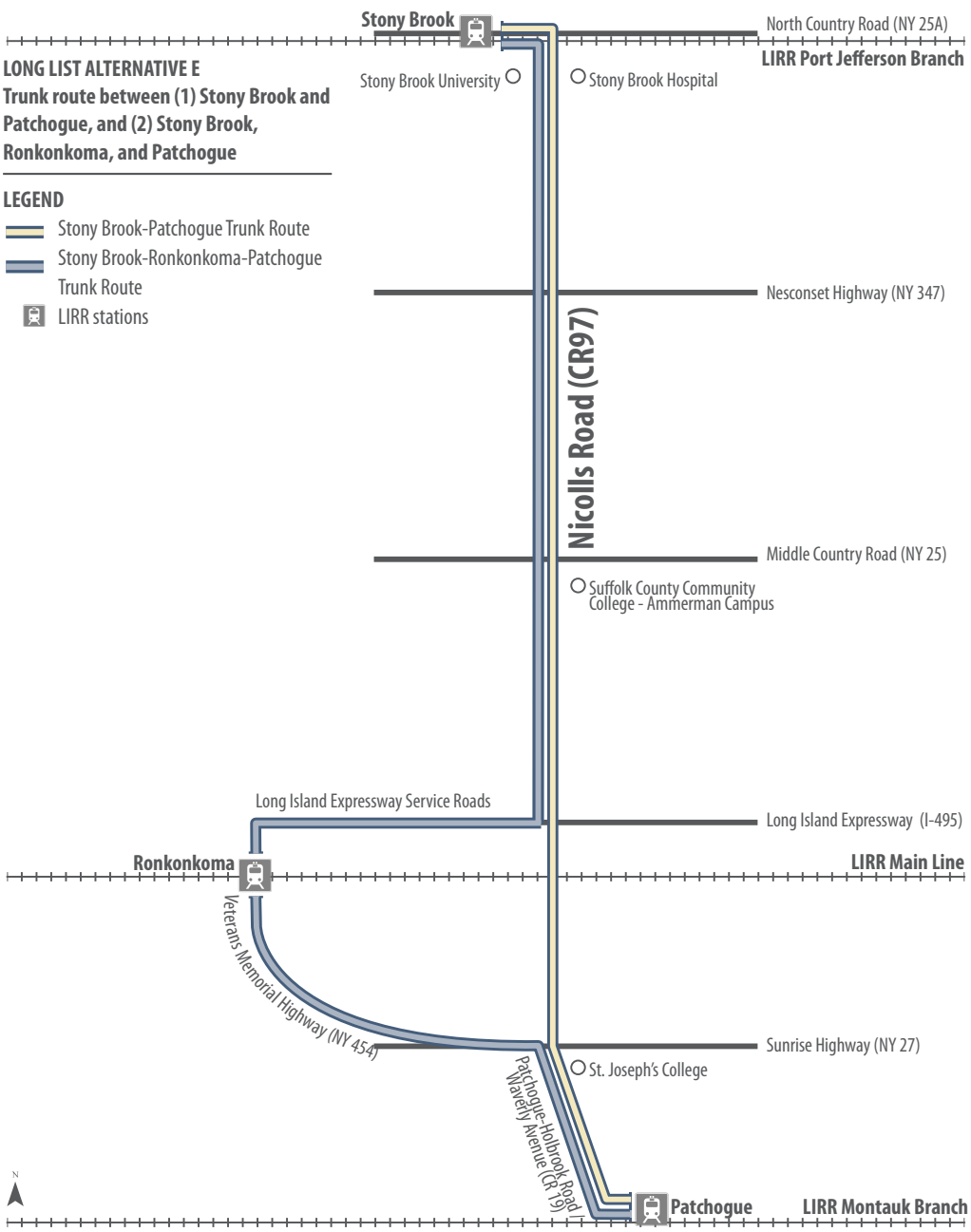


FIGURE 19: Long List Alternative E
Source: Parsons Brinckerhoff
Note: schematic representation; not drawn to scale

6.2.2 LONG LIST ALTERNATIVE TRANSIT MODES

DEFINITION OF ALTERNATIVES

Following the initial Long List Screening of the alignment alternatives, the remaining alternatives were paired with each of the following transit modes, and a second Long List Screening was conducted to evaluate the mode-specific alternatives.

BRT

As discussed in the *Suffolk County BRT Feasibility Study*, BRT is a term applied to public transportation systems that use "a combination of technology and roadway and traffic signalization improvements to achieve faster, more reliable service than traditional bus service." Elements of BRT that distinguish the premium service from ordinary bus service can include—but are not limited to—specialized vehicles and stations, limited-stop service, traffic priority (e.g., exclusive bus lanes, queue jumps, and/or traffic signal priority), enhanced customer information, branding, and alternative methods for fare collection. Different BRT systems offer different combinations of these elements. Two examples in New York include Select Bus Service in New York City and BusPlus in Albany.

BRT can operate either entirely or partially along a dedicated running way, meaning that a BRT system offers the flexibility for transit vehicles to operate on the existing roadway in mixed traffic. Similar to the conventional bus, BRT vehicles do not operate on tracks and typically do not require electrical infrastructure to be powered, thereby offering flexibility from a routing perspective as well.

It was assumed that the BRT alternatives for Nicolls Road would provide limited-stop service as an overlay to the existing bus network. It was not anticipated that existing Suffolk County Transit routes would be replaced or service reduced. Whereas existing Suffolk County Transit routes would continue to provide local service, BRT would provide more frequent, faster service with fewer stops.

BRT

New York City: Select Bus Service

City of Albany, New York: BusPlus

Source: NYCDOT, MTA, New York City Transit, Metro-Magazine, CDTA

STREETCAR

City of Portland, Oregon: Portland Streetcar

City of Seattle, Washington: Seattle Streetcar

Source: Travel Portland, DGuide

Streetcar

Streetcars are transit vehicles that operate on tracks (i.e., a fixed-guideway), often along existing streets, at-grade. Streetcars can operate in either a dedicated running way or in mixed traffic, but the routing is fixed because the vehicles must remain on the tracks and within reach of the electrical infrastructure—typically an overhead catenary system—that powers the vehicles. Examples of streetcar systems in the United States include those in Portland, Oregon and Seattle, Washington.

LRT

New Jersey: Hudson-Bergen Light Rail

Maryland: BWI Marshall Airport Light Rail

Source: Maryland Transit Administration, Flickr, NJ Transit

Light Rail Transit (LRT)

Similar to the streetcar, LRT comprises a fixed-guideway transit system that operates on tracks. LRT vehicles are typically designed to enable travel in existing standard roadway lanes, and therefore can operate either in a dedicated running way or in mixed traffic, at-grade. The streetcar and LRT modes are comparable, although LRT vehicles generally have larger capacity, operate at higher speeds, and make fewer stops at greater distances. Most LRT systems—including the Newark and Hudson-Bergen Light Rail in New Jersey and the Hunt Valley and BWI Marshall Airport Light Rail in Maryland—include overhead catenary lines to provide power to the vehicles, although some systems (e.g., the River Line in New Jersey) use self-propelled diesel-powered rail vehicles.

AGT

London, England: Ultra Global PRT

New York City: AirTrain JFK

Source: Ultra Global PRT, Londonist, NY Times, Airtrain JFK

Automated Guideway Transit (AGT)

AGT comprises a fixed-guideway transit system that operates with automated (driverless) vehicles. One form of AGT is personal rapid transit (PRT), which features small multi-passenger electric vehicles, often referred to as people movers or pods. Trips on PRT can be individually programmed by passengers between defined origins and destinations. Examples of PRT systems include the Ultra PRT in London's Heathrow Airport, which connects passengers between the short-term parking lots and terminal, and the Morgantown PRT system, which serves multiple campuses of West Virginia University. Other forms of AGT include larger vehicles that operate on rail, such as the AirTrain JFK that provides service to, from, and around Kennedy International Airport.

HEAVY RAIL - COMMUTER RAIL

Long Island, New York: LIRR

Long Island, New York: LIRR

Source: Newsday, LIRR, NYCSubway.org

Heavy Rail: Commuter Rail

Commuter rail comprises a fixed-guideway transit system that operates on tracks with either an at-grade or grade-separated alignment, using high-capacity trains of multiple cars. A unique aspect of the commuter rail alternatives would be the possibility of a physical connection to the existing and planned LIRR network, powered by either an electric third rail or diesel locomotive. Specifically, the commuter rail alternatives would make a physical rail connection to the LIRR network at the Stony Brook, Ronkonkoma, and Patchogue Stations, thereby enabling passengers to continue traveling along the Port Jefferson Branch, Main Line, or Montauk Branch of the LIRR, respectively, without transferring between modes.

HEAVY RAIL - SUBWAY

New York City: Subway

New York City: Subway

Source: Scientific American, MTA New York City Transit, NYCSubway.org

Heavy Rail: Subway

Similar to commuter rail, the subway comprises a fixed-guideway transit system that operates on tracks with a grade-separated alignment, using high-capacity trains of multiple cars. Whereas commuter rail would operate above-grade and would provide a physical connection to the LIRR, the subway alternatives would be located below ground level, under the existing roadway. Additionally, the subway mode is generally characterized by a higher frequency of service, with shorter distances between stations, than commuter rail. A local example of this mode is the subway in New York City, although large stretches of the transit system outside Manhattan are elevated.

SCREENING RESULTS

Long List Alternative E (two trunk routes operating between Stony Brook and Patchogue, one of which diverts to Ronkonkoma) was paired with the transit modes under consideration—BRT, streetcar, LRT, AGT, commuter rail, and subway—for this second round of evaluation. As such, the Long List Alternatives for this second step of the Long List Screening were as follows:

» E1: BRT trunk route between Stony Brook and Patchogue, and between Stony Brook, Ronkonkoma, and Patchogue

» E2: Streetcar trunk route between Stony Brook and Patchogue, and between Stony Brook, Ronkonkoma, and Patchogue

» E3: LRT trunk route between Stony Brook and Patchogue, and between Stony Brook, Ronkonkoma, and Patchogue

» E4: AGT trunk route between Stony Brook and Patchogue, and between Stony Brook, Ronkonkoma, and Patchogue

» E5: LIRR trunk route between Stony Brook and Patchogue, and between Stony Brook, Ronkonkoma, and Patchogue

» E6: Subway trunk route between Stony Brook and Patchogue, and between Stony Brook, Ronkonkoma, and Patchogue

A rating was assigned to each mode-specific alternative for its relative performance against each criterion, and an overall evaluation score was computed for each alternative.

Based on the tabulated results, only the BRT alternative (Long List Alternative E1) was advanced in the screening process. The streetcar, LRT, AGT, commuter rail, and subway alternatives (Long List Alternatives E2, E3, E4, E5, and E6, respectively) were eliminated from consideration because these alternatives failed to achieve the goal of maximizing cost and operational effectiveness. With the exception of the BRT alternative, all of the other modal alternatives would fail to offer physical and service attributes that are appropriate for the study area land use and density. The non-BRT alternatives would be appropriate in a more urban environment where there is less need for flexibility

FIGURE 20: Representation of Potential Nicolls Road BRT System from the *Suffolk County BRT Feasibility Study*
Source: *Suffolk County BRT Feasibility Study*

to operate off the primary Nicolls Road Corridor and to modify service based on future changes in the Corridor.

The operational needs of BRT could largely be met using existing right-of-way (ROW), thereby minimizing potential property takings. Furthermore, BRT would be compatible with the existing bus transit network in the study area, which would facilitate integration with existing transit operations.

Additionally, several local and regional plans, in addition to identifying the need for transit improvements, explicitly call for BRT as a feasible and/or desirable modal option on Nicolls Road. The list of documents that cite the potential introduction of BRT on Nicolls Road includes: the *Connect Long Island* plan; the *Suffolk County BRT Feasibility Study* (**Figure 20**); the Suffolk County Capital Program 2016-2018; and the NYMTC *Plan 2040* RTP.

In sum, the second step of the Long List Screening resulted in the BRT alternative (Long List Alternative E1, hereafter Alternative E) scoring the highest and being advanced in the screening process for further development and evaluation, while the other modal alternatives were eliminated from consideration.

6.2.3 LONG LIST SCREENING RESULTS: IDENTIFICATION OF MODE-SPECIFIC ALIGNMENT CONCEPT

Based on the two-tiered Long List Screening, one mode-specific alignment concept—specifically, BRT between Stony Brook and Patchogue, and between Stony Brook, Ronkonkoma, and Patchogue—was advanced to the next phase of the AA.

From a mobility and connectivity standpoint, the alignment concept that would include a new premium transit service along the full Corridor and also connect all three branches of the LIRR within the study area emerged as the preferred option in the first step of the Long List Screening. From a cost and operational standpoint, BRT emerged as the preferred mode for a new premium transit service in the second step of the Long List Screening. BRT offers the needed flexibility to easily accommodate route and service modifications over time, and also is conducive to phased implementation as demand warrants and as funding becomes available.

6.3 SHORT LIST ALTERNATIVES AND SCREENING

After selecting the preferred mode-specific alignment concept through the Long List Screening, the next step in the alternatives development process was to refine the Short List Alternatives. As discussed in the following sections, three Short List Alternatives consistent with Alternative E were developed in greater detail, which included engineering, operations, cost, and ridership analyses. The Short List Screening was then conducted to evaluate the strengths, weaknesses, and trade-offs of the Short List Alternatives, which provided the framework for selecting the LPA. Appendices H and I provide details of the Short List Alternatives and the Short List Screening, respectively, which are summarized in the following sections.

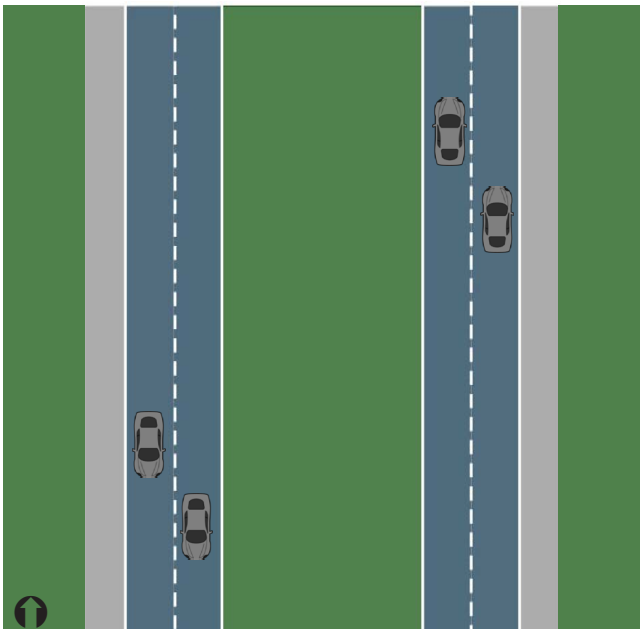
6.3.1 SUMMARY OF SHORT LIST ALTERNATIVES

The Short List Alternatives are summarized in **Table 3** and primarily differ with respect to (1) alignment options along Nicolls Road, and (2) routing options (and specific station locations) appropriate to each alignment option to best serve activity centers in close proximity to the Corridor (i.e., the SBU Hospital and SCCC). The graphics on **Figure 21** depict at a high level the alignment concepts that comprise the Short List Alternatives, and the following sections elaborate upon the similarities and differences among the alternatives.

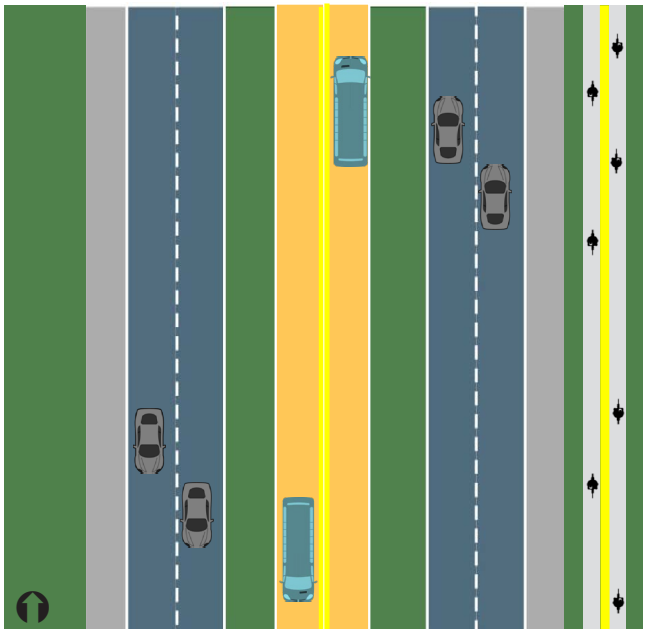
ALTERNATIVE	DESCRIPTION	ALIGNMENT	ROUTING AND STATION LOCATIONS
ALTERNATIVE E1	Construction of a new dedicated runningway for BRT within the median of Nicolls Road	Two-lane center median BRT transitway (i.e., one lane in each direction)	• Does not divert off Nicolls Road to serve activity centers • In-line stations at all locations
ALTERNATIVE E2	Construction of a new dedicated runningway for BRT on Nicolls Road as one additional travel lane in each direction, taking from the median	Dedicated BRT lane as the right-most travel lane, located between the general purpose lanes and the shoulder in each direction	• Diverts off Nicolls Road at select locations to serve activity centers • Primarily in-line stations, with off-line stations at select locations
ALTERNATIVE E3	Repurposing (i.e., reconstructing and widening) the existing shoulder on Nicolls Road to be a dedicated BRT lane in each direction	Dedicated BRT shoulder-running in each direction	• Diverts off Nicolls Road at select locations to serve activity centers • Primarily in-line stations, with off-line stations at select locations

TABLE 3: Short List Alternatives

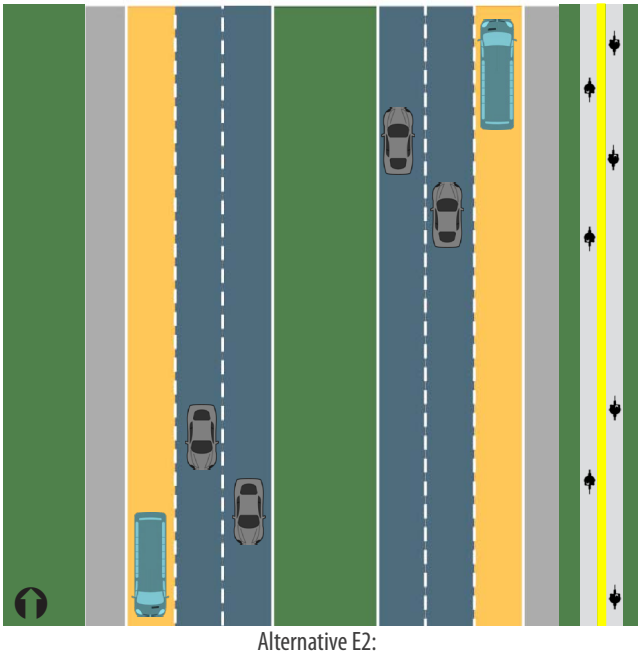
Source: Parsons Brinckerhoff



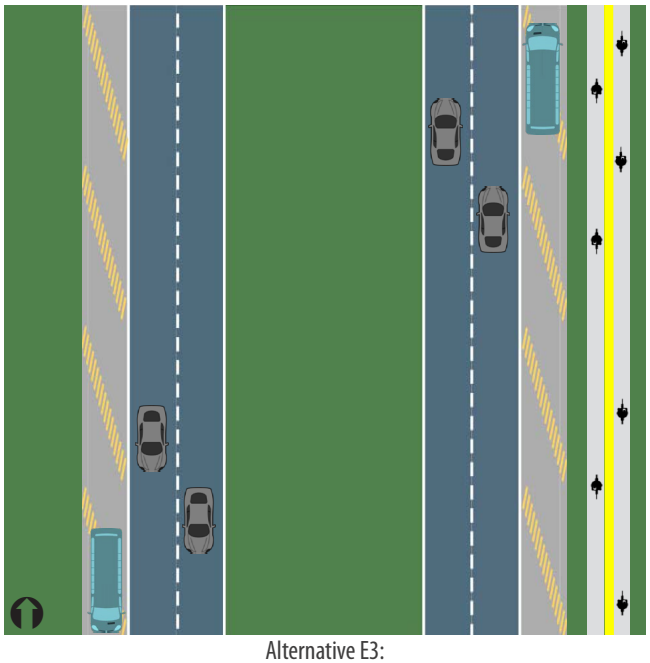
Existing Conditions



Alternative E1:
Median BRT Transitway



Alternative E2:
Dedicated BRT Lane at the Right-Most Travel Lane



Alternative E3:
BRT Shoulder-Running

FIGURE 21: Schematic Representation of Short List Alternative Alignments

Source: Suffolk County; Parsons Brinckerhoff
Note: Not drawn to scale

6.3.2 PROPOSED BRT ROUTING AND STATIONS FOR THE SHORT LIST ALTERNATIVES

The first step in the refinement of the Short List Alternatives was to identify the proposed BRT routing and station locations. All of the Short List Alternatives would include two proposed BRT routes: (1) Stony Brook-Patchogue; and (2) Stony Brook-Ronkonkoma-Patchogue. Alternatives E2 and E3 would share the same routing and station locations; as discussed in Section 6.3.3, the two alternatives would differ only with respect to the alignment (i.e., right-most travel lane and shoulder-running, respectively).

Figure 22 shows the two routes—(1) Stony Brook-Patchogue, and (2) Stony Brook-Ronkonkoma-Patchogue—and the station locations for the Short List Alternatives, highlighting the key differences between Alternative E1 and Alternatives E2/E3 in the vicinity of the SBU Hospital/Cancer Center and SCCC. Whereas Route 1 under Alternative E1 would stay on Nicolls Road between Shirley Kenny Drive and NY 27/Sunrise Highway, Route 1 under Alternatives E2 and E3 would divert off Nicolls Road on Health Sciences Drive and College Road to more directly serve the SBU Hospital/Cancer Center and SCCC, respectively.

Under each alternative, the routes would be identical between the LIRR Stony Brook Station and Nicolls Road at the LIE, as well as between Nicolls Road at NY 27/Sunrise Highway and the LIRR Patchogue Station. The routes would diverge between Nicolls Road at the LIE and Nicolls Road at NY 27/Sunrise Highway, with Route 1 continuing south on Nicolls Road, and Route 2 diverting off Nicolls Road to serve the Ronkonkoma Hub, the LIRR Ronkonkoma Station, and Islip Pines.

Several factors informed the selection of proposed BRT stations, including the objectives to:

» Optimize distance between stations

» Serve existing and future activity centers to maximize ridership potential

» Promote economic development by serving as anchors for transit-supportive development

» Maximize transfer opportunities

» Ensure safe pedestrian access and vehicular movements

» Provide parking accommodations, with consideration for new park-/kiss-and-ride lots and facilities as warranted to supplement the existing parking supply (refer to sidebar on page 51)

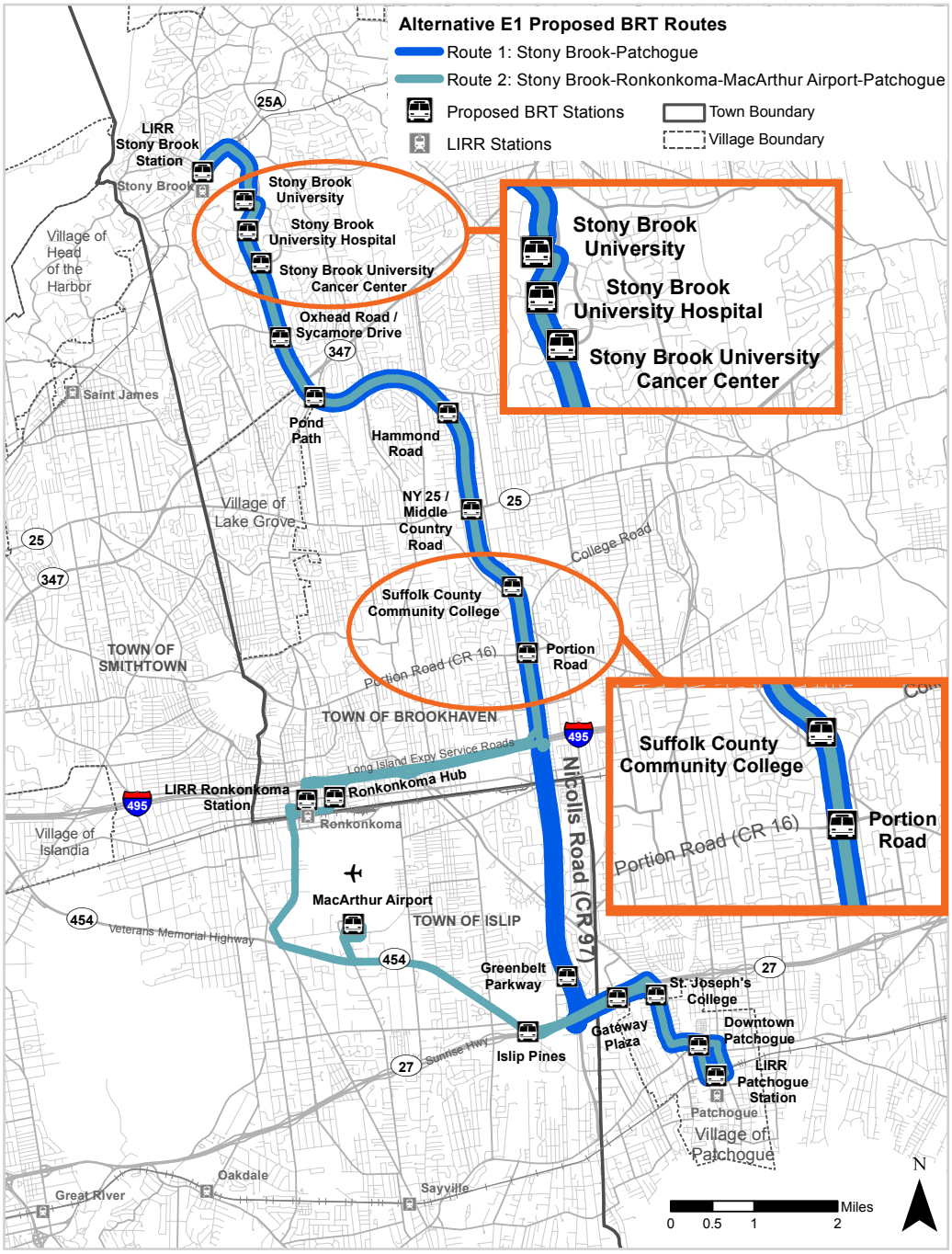
Based on these factors, the BRT stations identified in **Table 4** were proposed for the Short List Alternatives. Most stations would be shared among the two routes in each alternative, while certain stations south of the LIE would only be served by either Route 1 or Route 2.

In most instances, the proposed stations locations would each have separate northbound and southbound BRT stations. Exceptions would include the northern and southern termini (i.e., LIRR Stony Brook Station and LIRR Patchogue Station, respectively), as well as the LIRR Ronkonkoma Station and MacArthur Airport, which would each have one combined BRT station for northbound and southbound travel. The proposed BRT station at SCCC for Alternatives E2 and E3 (located off Nicolls Road on the college campus at College Road) would also have one combined BRT station for northbound and southbound travel. At these locations, separate berths would be provided for transit users to distinguish between northbound and southbound travel.

Within the SBU campus and south of NY 27/Sunrise Highway, as well as west of Nicolls Road along Route 2 to Ronkonkoma, the BRT stations for all three alternatives would be located along the side of the road at the curb. However, along Nicolls Road, the specific locations of the stations under Alternatives E2 and E3 would differ from Alternative E1. Specifically, between Shirley Kenny Drive and NY 27/Sunrise Highway, the BRT stations under Alternatives E2 and E3 would be located along the side of the road, but most BRT stations under Alternative E1 would be located within the median with side platforms (consistent with the median transitway alignment concept).

FIGURE 22: Routing and Station Locations for the Short List Alternatives

Source: NYS GIS Program Office; Suffolk County; Parsons Brinckerhoff; GPI



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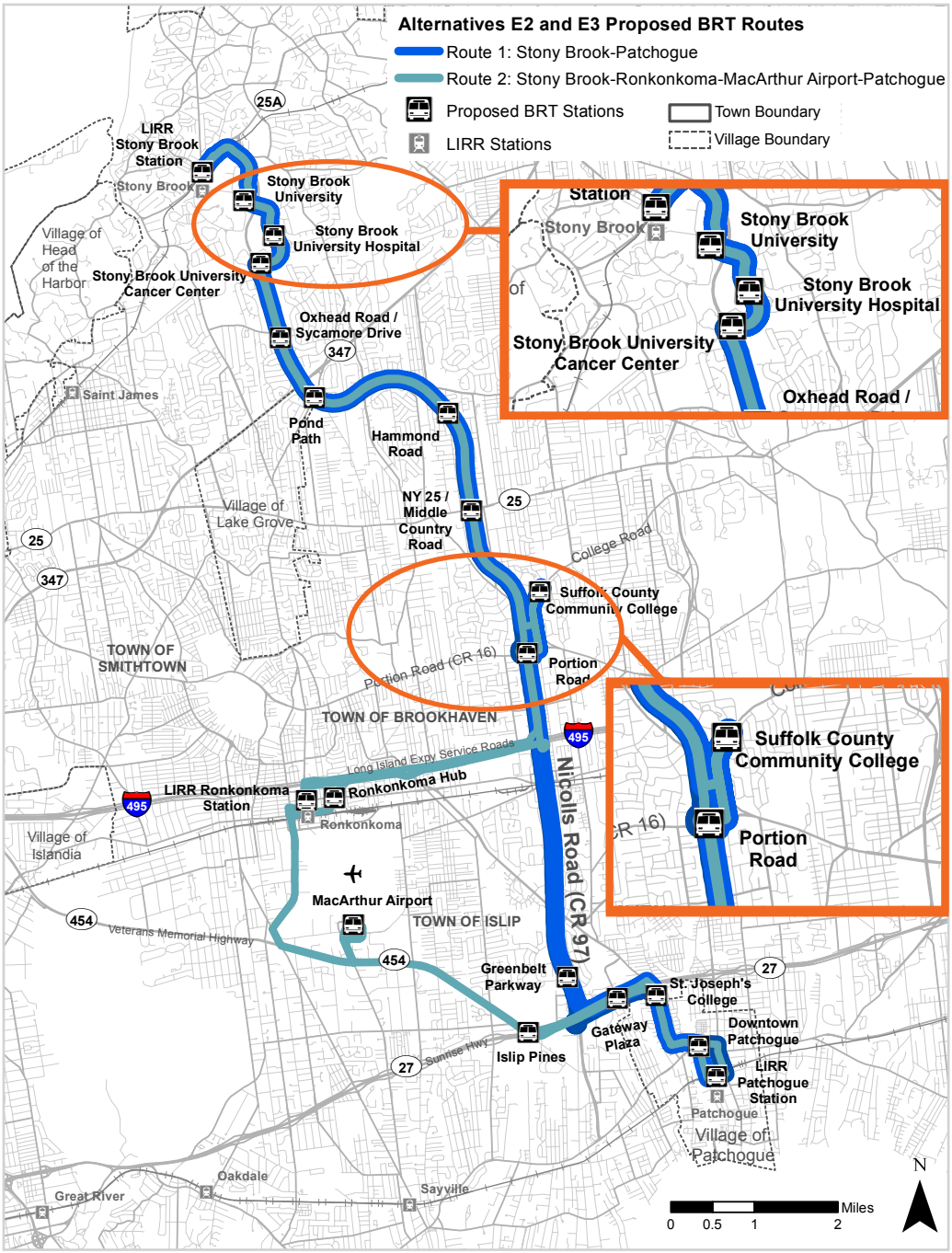


FIGURE 22, Continued: Routing and Station Locations for the Short List Alternatives

Source: NYS GIS Program Office; Suffolk County; Parsons Brinckerhoff; GPI

THE RONKONKOMA HUB – NICOLLS ROAD CORRIDOR PARKING ANALYSIS

In 2015, Suffolk County initiated the *Ronkonkoma Hub – Nicolls Road Corridor Parking Analysis* to complement the Nicolls Road AA. The purpose of the ongoing Parking Analysis is two-fold:

» (1) To determine how the proposed Nicolls Road BRT system could mitigate increased parking needs at existing transportation hubs, especially the LIRR Ronkonkoma and Patchogue Stations

» (2) To assess opportunities to introduce park-/kiss-and-ride lots and facilities at proposed BRT stations

The outcome of the Parking Analysis will provide insight into the projected parking demand and supply along the proposed BRT routes. By exploring opportunities for automobile users to seamlessly transfer to the BRT service, the Parking Analysis will help to advance one of the main objectives of this AA, namely to promote increased transit use by attracting choice riders.

The Nicolls Road AA study area includes a park-and-ride lot off the LIE and a parking garage at the LIRR Ronkonkoma Station
Source: Bing Maps; Parsons Brinckerhoff

STATION NAME (NORTH TO SOUTH)	ROUTE 1: STONY BROOK-PATCHOGUE	ROUTE 2: STONY BROOK-RONKONKOMA-PATCHOGUE	NUMBER OF STATIONS (EITHER 1 COMBINED STATION OR 2 SEPARATE STATIONS FOR NORTHBOUND / SOUTHBOUND TRAVEL)	STATION LOCATION
LIRR Stony Brook Station	✓	✓	1 (northern terminus)	LIRR parking lot within SBU campus, west of Circle Road
Stony Brook University	✓	✓	2	Circle Road at Shirley Kenny Drive
Stony Brook University Hospital	✓	✓	2	• Alternative E1: Nicolls Road at SBU Hospital underpass • Alternatives E2 and E3: Health Sciences Drive at SBU Hospital Main Entrance
Stony Brook University Cancer Center	✓	✓	2	• Alternative E1: Nicolls Road at South Drive/Health Sciences Drive • Alternatives E2 and E3: Health Sciences Drive, east of Nicolls Road
Oxhead Road/ Sycamore Drive	✓	✓	2	Nicolls Road at Oxhead Road/Sycamore Drive
Pond Path	✓	✓	2	Nicolls Road at Pond Path
Hammond Road	✓	✓	2	Nicolls Road at Hammond Road
*NY 25/Middle County Road	✓	✓	2	To be determined in Preliminary Engineering
Suffolk County Community College-Ammerman Campus	✓	✓	• Alternative E1: 2 • Alternatives E2 and E3: 1 (with separate berths for northbound / southbound)	• Alternative E1: Nicolls Road at W Road • Alternatives E2 and E3: college campus at College Road
*Portion Road	✓	✓	2	To be determined in Preliminary Engineering
Ronkonkoma Hub		✓	2	Union Avenue at Mill Road
LIRR Ronkonkoma Station		✓	1 (with separate berths for northbound/southbound)	• Short-term: Loop road between Hawkins Avenue and The Plaza, south of Railroad Avenue • Long-term: Easton Street, south of the LIRR tracks
MacArthur Airport		✓	1 (with separate berths for northbound/southbound)	Arrival Avenue at the terminal building
Islip Pines		✓	2	NY 454/Veterans Memorial Highway at Church Street
Greenbelt Parkway	✓		2	Nicolls Road at Greenbelt Parkway
*Gateway Plaza	✓	✓	2	To be determined in Preliminary Engineering
St. Joseph's College	✓	✓	2	Waverly Avenue at Savannah Boulevard
Downtown Patchogue	✓	✓	2	Holbrook Road at Lake Street
LIRR Patchogue Station	✓	✓	1 (southern terminus)	Division Street at Cedar Avenue

TABLE 4: Proposed BRT Station Locations for the Short List Alternatives

Source: Parsons Brinckerhoff; GPI

* Stations proposed for long-term implementation due to grade-separated interchanges and/or the need for a pedestrian overpass.

As identified in **Table 4**, some elements of the Short List Alternatives would be more conducive to long-term implementation, and the Short List Alternatives were defined to create opportunities for phased implementation as demand warrants and as funding becomes available. The elements that were envisioned for long-term implementation include:

» BRT stations at grade-separated interchanges (Nicolls Road at NY 25/Middle Country Road and Portion Road) and at locations that would require a pedestrian overpass (Gateway Plaza on Sunrise Highway). Specific considerations include:

  « Nicolls Road at NY 25/Middle Country Road and Portion Road: At both of these grade-separated interchanges, Nicolls Road is carried over the cross streets. The roadway width of Nicolls Road is reduced on the structures and there does not appear to be sufficient space to provide a station without widening or reconstructing the interchanges. Furthermore, these locations are challenging to access by pedestrians due to the high speed ramps that exist and grade difference with cross streets.

  « Gateway Plaza: This site would require extensive review to ensure connectivity between the northbound and southbound BRT stations. The two stations would be over 250 feet apart and a pedestrian bridge would be needed to cross NY 27/Sunrise Highway to connect customers with the stations.

» Relocation of the BRT station at the LIRR Ronkonkoma Station from the north side of the LIRR tracks to the south side of the LIRR tracks to promote multi-modal connectivity with a new state-of-the-art passenger terminal that is envisioned on the north side of MacArthur Airport.

Proposed BRT station elements, including a range of customer amenities and station-area pedestrian improvements, are presented in 7.1.1 in the discussion of the LPA.

6.3.3 CONCEPTUAL ENGINEERING FOR THE SHORT LIST ALTERNATIVES

The conceptual engineering effort included the preparation of alignment plans and typical sections for each of the Short List Alternatives. The plans were prepared at a conceptual level of engineering, which provided enough detail to estimate order-of-magnitude capital costs, identify potential geometric design constraints for implementation, and determine the lengths of dedicated BRT and mixed traffic alignment segments for use in travel time forecasting and ridership modeling. The following discussion presents an overview of the conceptual engineering effort, and Appendix H includes the full sets of plans and additional details.

GUIDELINES FOR CONCEPTUAL ENGINEERING

For all the Short List Alternatives, several key guidelines were applied for the conceptual engineering effort:

» To enable BRT vehicles to bypass traffic congestion, a dedicated BRT lane with traffic signal priority (TSP) would be proposed wherever feasible along Nicolls Road between Shirley Kenny Drive and NY 27/Sunrise Highway for all alternatives. Due to ROW or other geometric/operational constraints, BRT would be proposed to operate in mixed traffic along those portions of the two routes that use roadways other than Nicolls Road. To improve travel time for BRT off of Nicolls Road, TSP and queue jumps would be proposed wherever feasible (refer to sidebar on page 54).

» The mileage of dedicated BRT lane along Nicolls Road would be maximized to the extent possible in each travel direction under each alternative. Bridges would not be reconstructed to widen the road to permit a BRT lane.

» The following minimum geometric dimensions (widths) would be applied:

  « BRT and mixed traffic lanes: 11 feet
  « Turn lanes: 10 feet
  « Shoulders where provided: 10 feet
  « Median transitway minimum separation from mixed traffic lanes (Alternative E1 only): 2 feet

» Property takings would be minimized. The existing ROW width along Nicolls Road is a minimum of 150 feet wide. Additional ROW does exist at grade-separated interchanges, most signalized intersections,

TRAFFIC SIGNAL PRIORITY (TSP) AND QUEUE JUMPS: TIME-SAVINGS MEASURES FOR BRT

TSP, which limits time spent waiting at red lights, is typically achieved at signalized intersections through an extension of green time to allow the BRT vehicles to pass the intersection before the signal turns red (**Figure 23**). TSP can also be achieved through an earlier start of green time to allow the BRT vehicles to avoid the red light, although TSP typically does not turn red lights to green.

Queue jumps are intersection modifications that provide preferential treatment at busy intersections for BRT vehicles to move before the other vehicles on the same approach (**Figure 24**).

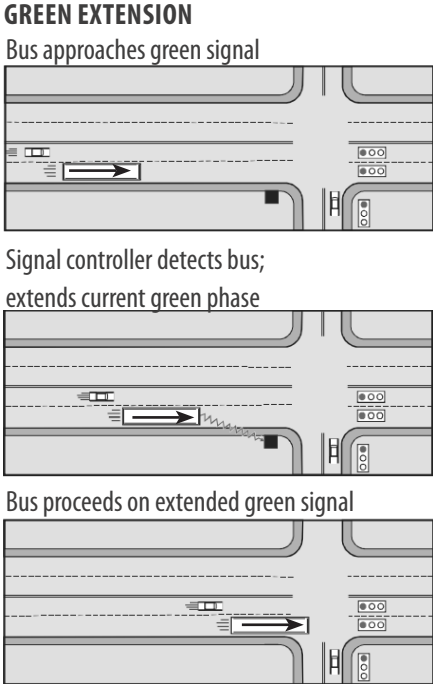


FIGURE 23: Schematic Representation of TSP
Source: TCRP Report 118

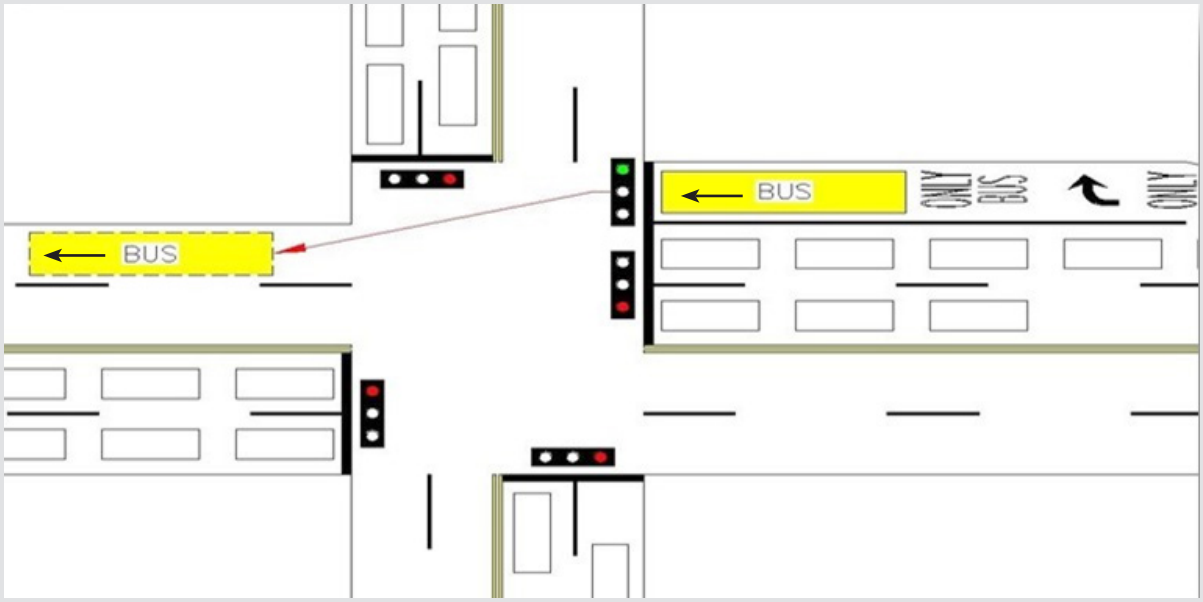


FIGURE 24: Schematic Representation of a Queue Jump
Source: GPI

and locations where additional ROW was purchased for drainage needs or for future improvements such as at the Route 347 intersection. Until detailed design is conducted and stations are sited, it is important to acknowledge that some minor property acquisition could be necessary to adequately design the station areas for pedestrian access and BRT ingress and egress. Station design during Preliminary Engineering will also need to consider potential ROW constraints associated with the provision of park-/kiss-and-ride lots and facilities, as informed by the ongoing *Ronkonkoma Hub – Nicolls Road Corridor Parking Analysis*.

» BRT stations would generally be located on the far side of signalized intersections to maximize the benefits of TSP.

» To advance the I-Zone, the construction of an off-road hiking/biking trail within existing ROW would be considered at a high level to complement the parallel BRT lanes on a multi-modal Nicolls Road Corridor. Although design of the trail was outside the scope of this analysis, the preliminary assessment completed in this AA demonstrated that the alternatives would differ in their ability to accommodate a trail within the ROW of Nicolls Road.

The conceptual engineering effort was also informed by guidance provided by the American Public Transportation Association (APTA) ("Designing Bus Rapid Transit Runningways") and Transit Cooperative Research Program (TCRP) (Report 90 "Bus Rapid Transit" and Report 118 "Bus Rapid Transit Practitioner's Guide").

This effort included a level of detail appropriate for an AA planning process. Items that will require more detailed engineering during subsequent design stages include—but are not limited to—horizontal and vertical roadway alignment; ROW/property boundaries; specific station and parking locations; pedestrian accommodations; signage (including the location of overhead mast arm signs); utility impacts; need for sound barriers; need for physical separation between the road and the hiking/biking trail; and location and alignment of the hiking/biking trail.

SUMMARY OF BRT ALIGNMENTS FOR THE SHORT LIST ALTERNATIVES

Figure 25 through **Figure 27** present a typical section and plan of the BRT alignments for each of the three Short List Alternatives, as follows:

» Alternative E1 (**Figure 25**): Construction of a new dedicated runningway for BRT within the median of Nicolls Road. This would include a two-lane center median BRT transitway, with one new BRT travel lane in each direction.

» Alternative E2 (**Figure 26**): Construction of one travel lane in each direction in the median. This new travel lane would become a general purpose lane, and the right-most travel lane would become a dedicated BRT lane, located between the general purpose lanes and the shoulder in each direction.

» Alternative E3 (**Figure 27**): Repurposing (i.e., reconstructing and widening) the existing shoulder on Nicolls Road to be a dedicated BRT lane in each direction. This would include dedicated BRT shoulder-running in each direction.

Additionally, **Figure 28** shows examples of the BRT alignments for each of the Short List Alternatives.

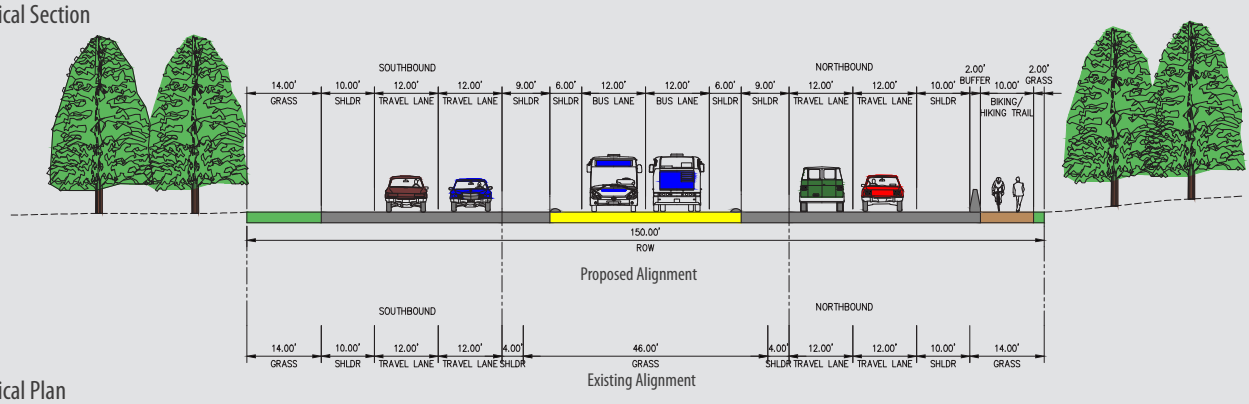
The lengths of proposed dedicated BRT lane and mixed traffic alignment segments along Nicolls Road are summarized in **Table 5** for each of the Short List Alternatives, and additional details are included in Appendix H. The total estimated mileages along Nicolls

TABLE 5: Summary of Proposed Dedicated BRT Lane and Mixed Traffic Alignment Segments along Nicolls Road for the Short List Alternatives

Source: GPI; Parsons Brinckerhoff

ALTERNATIVE	ESTIMATED MILEAGE ALONG NICOLLS ROAD BETWEEN SHIRLEY KENNY DRIVE AND NY 27/SUNRISE HIGHWAY (ROUNDED TO NEAREST 0.1 MILES)					
	NORTHBOUND			SOUTHBOUND		
	DEDICATED BRT LANE	MIXED TRAFFIC	TOTAL	DEDICATED BRT LANE	MIXED TRAFFIC	TOTAL
Alternative E1	10.7 miles	0.9 miles	11.6 miles	10.7 miles	1.2 miles	11.9 miles
Alternative E2	9.7 miles	0.9 miles	10.6 miles	9.8 miles	1.2 miles	11.0 miles
Alternative E3	6.0 miles	4.6 miles	10.6 miles	6.2 miles	4.8 miles	11.0 miles

Typical Section

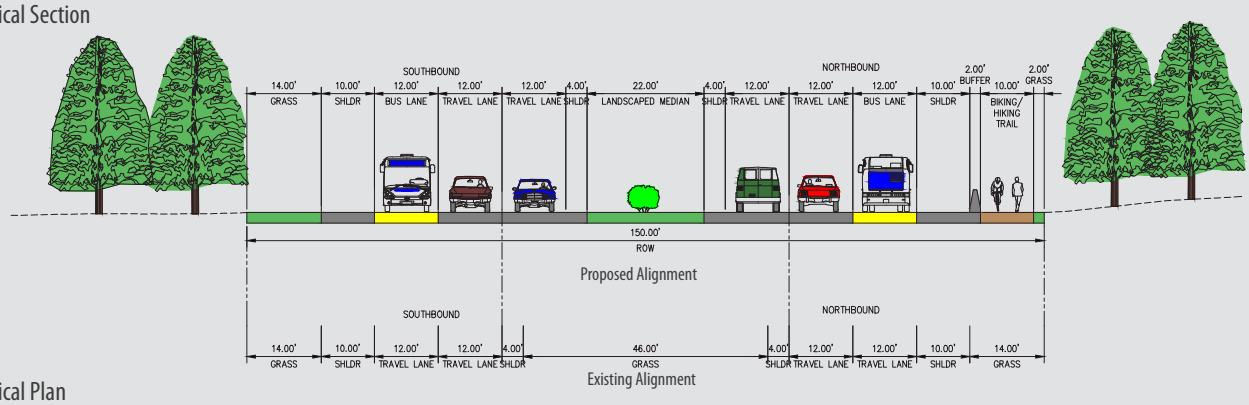


Typical Plan

FIGURE 25: Typical Section and Plan of Alternative E1 Alignment

Source: GPI

Typical Section



Typical Plan

FIGURE 26: Typical Section and Plan of Alternative E2 Alignment

Source: GPI

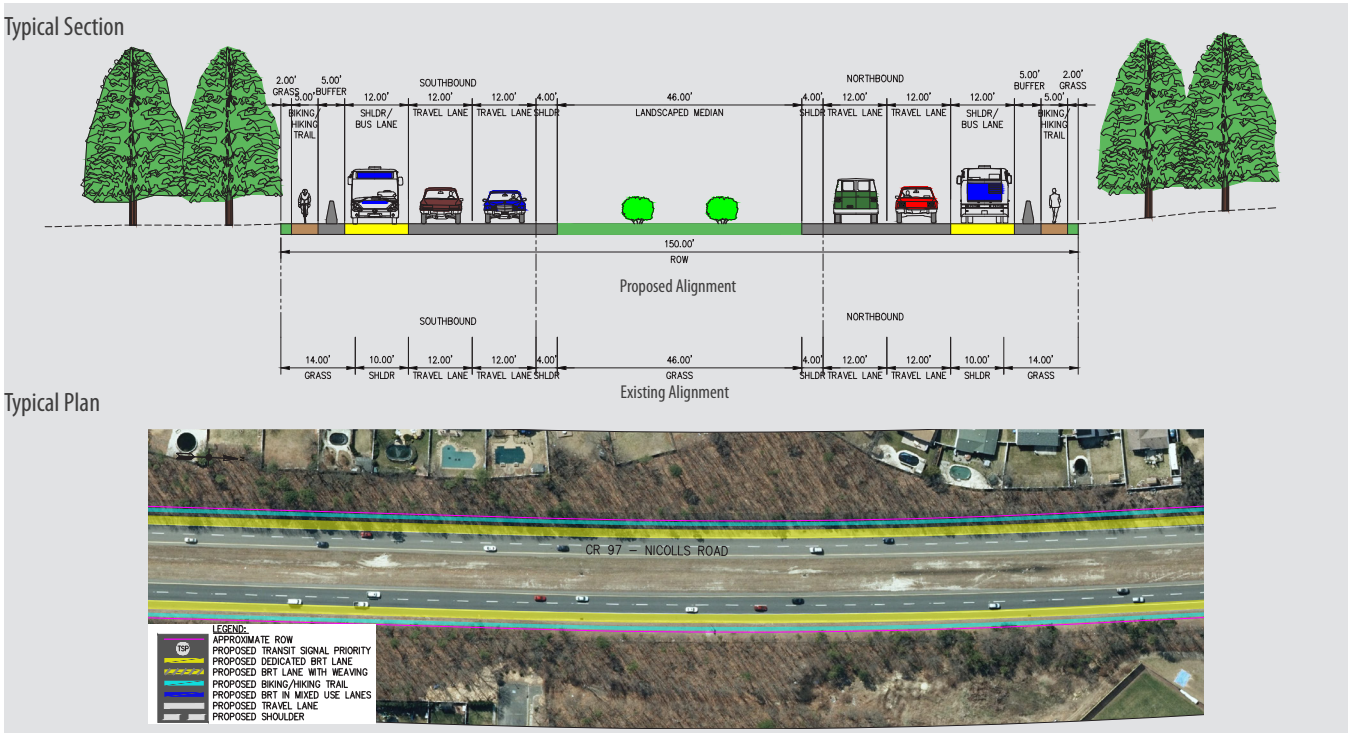


FIGURE 27: Typical Section and Plan of Alternative E3 Alignment
Source: GPI

Road in each direction are the same for Alternatives E2 and E3, but are different for Alternative E1 because of the routing to serve the SBU Hospital/Cancer Center and SCCC.

While Alternative E1 would include the longest distance of dedicated BRT lane (approximately 10.7 miles in both the northbound and southbound directions), all three alternatives could accommodate dedicated BRT lanes along large stretches of Nicolls Road, which would enable BRT to bypass traffic congestion.

Figure 29 shows the full alignments and proposed locations for TSP and queue jumps for both routes under each alternative. In total, there are 47 signalized intersections along the proposed BRT routes for the Short List Alternatives, including 12 signalized intersections along Nicolls Road. At this preliminary stage of analysis, TSP was proposed for each alternative at all signalized intersections with the exception of two:

» Nicolls Road at NY 347: This intersection operates at a poor level of service on all approaches, and thus TSP most likely cannot be considered without further degrading traffic operations.

» Nicolls Road at the Setauket Fire District driveway: This traffic signal is always green except when the fire department preempts the signal, so TSP is not appropriate.

Traffic analysis and jurisdictional coordination with the entities that own, operate, and maintain the traffic signals along the BRT routes would be required to confirm the feasibility of TSP from an operational efficiency perspective. Additionally, the consideration for queue jumps was based strictly on existing roadway geometry, so traffic analysis will be necessary to demonstrate both the viability and effectiveness of queue jumps at the proposed locations.

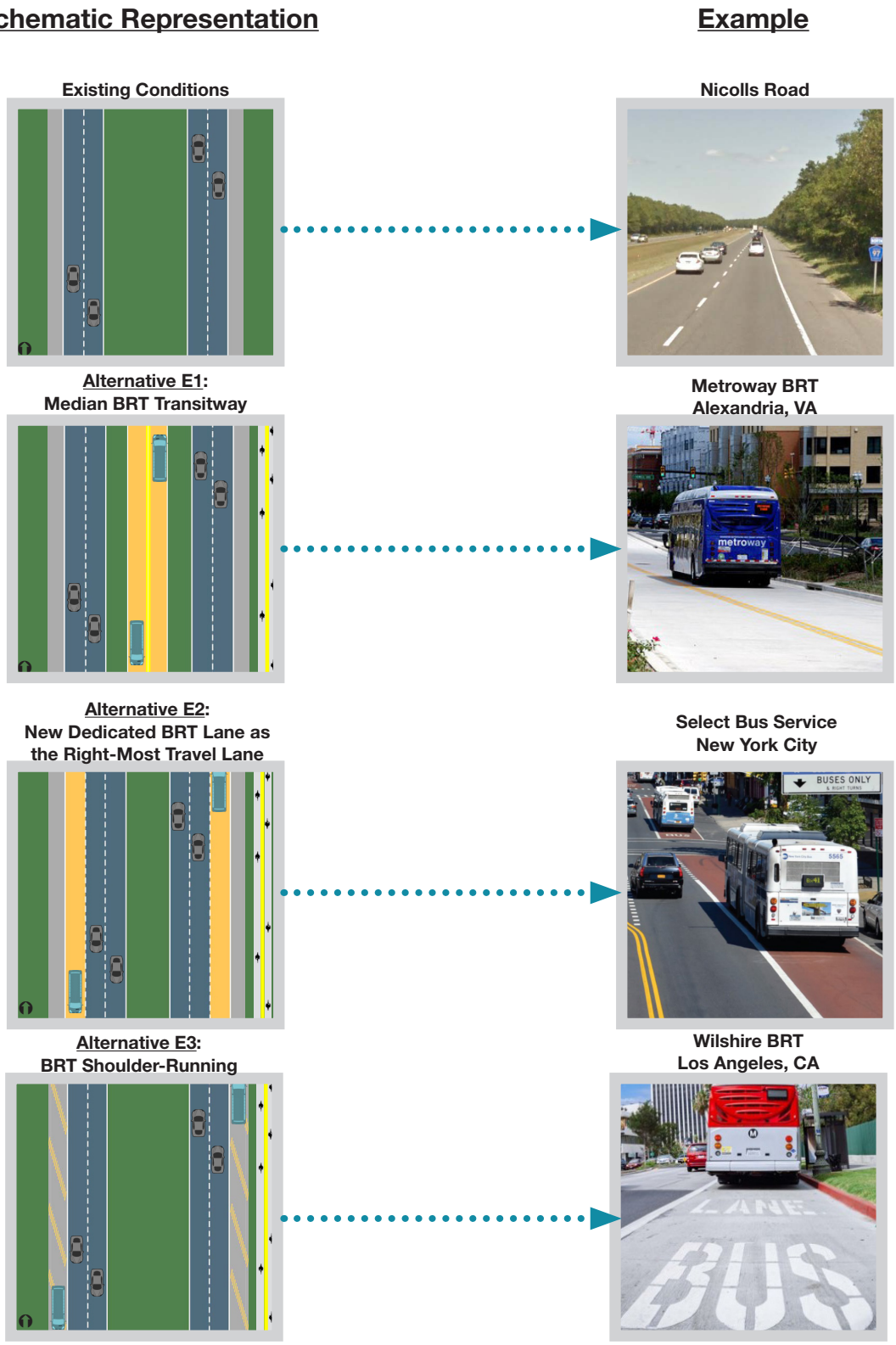
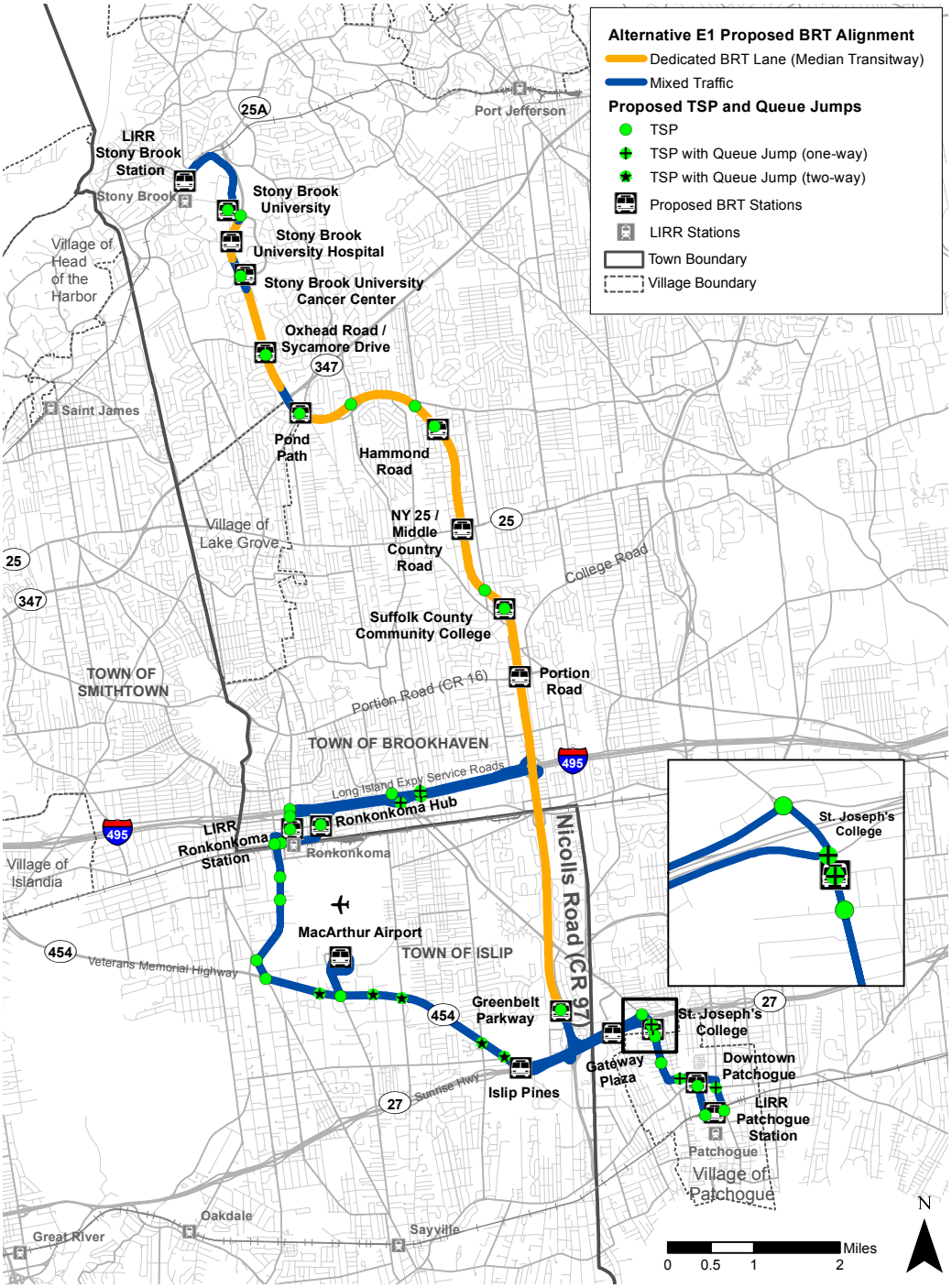


FIGURE 28: Examples of Short List Alternative Alignments

Source: Suffolk County, Parsons Brinckerhoff, Greater Greater Washington, NYCDOT, MTA NYC Transit, The Source

FIGURE 29: Alignments and Priority Treatments for the Short List Alternatives

Source: NYS GIS Program Office; Suffolk County; Parsons Brinckerhoff; GPI



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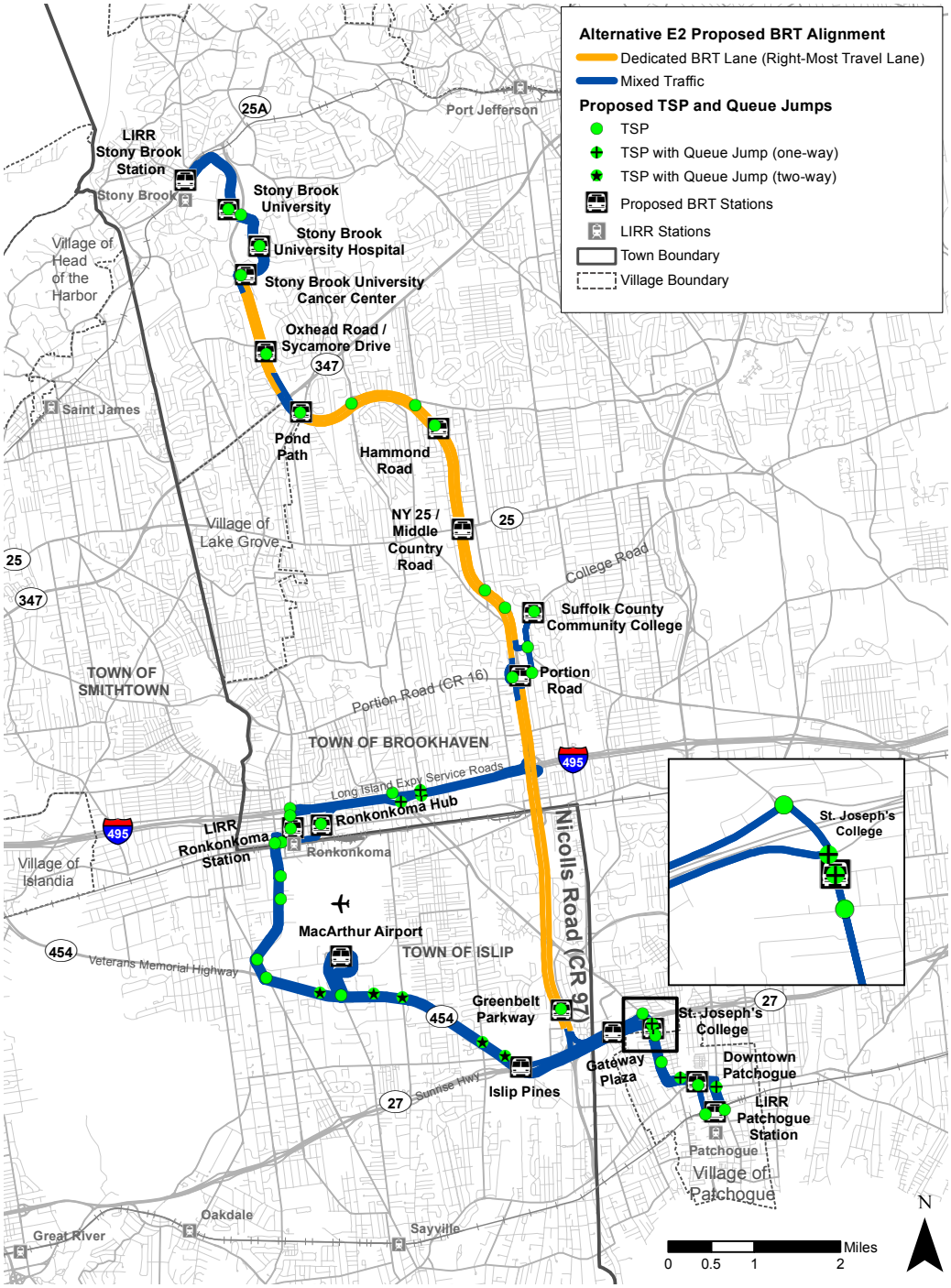

FIGURE 29, Continued: Alignments and Priority Treatments for the Short List Alternatives
Source: NYS GIS Program Office; Suffolk County; Parsons Brinckerhoff; GPI

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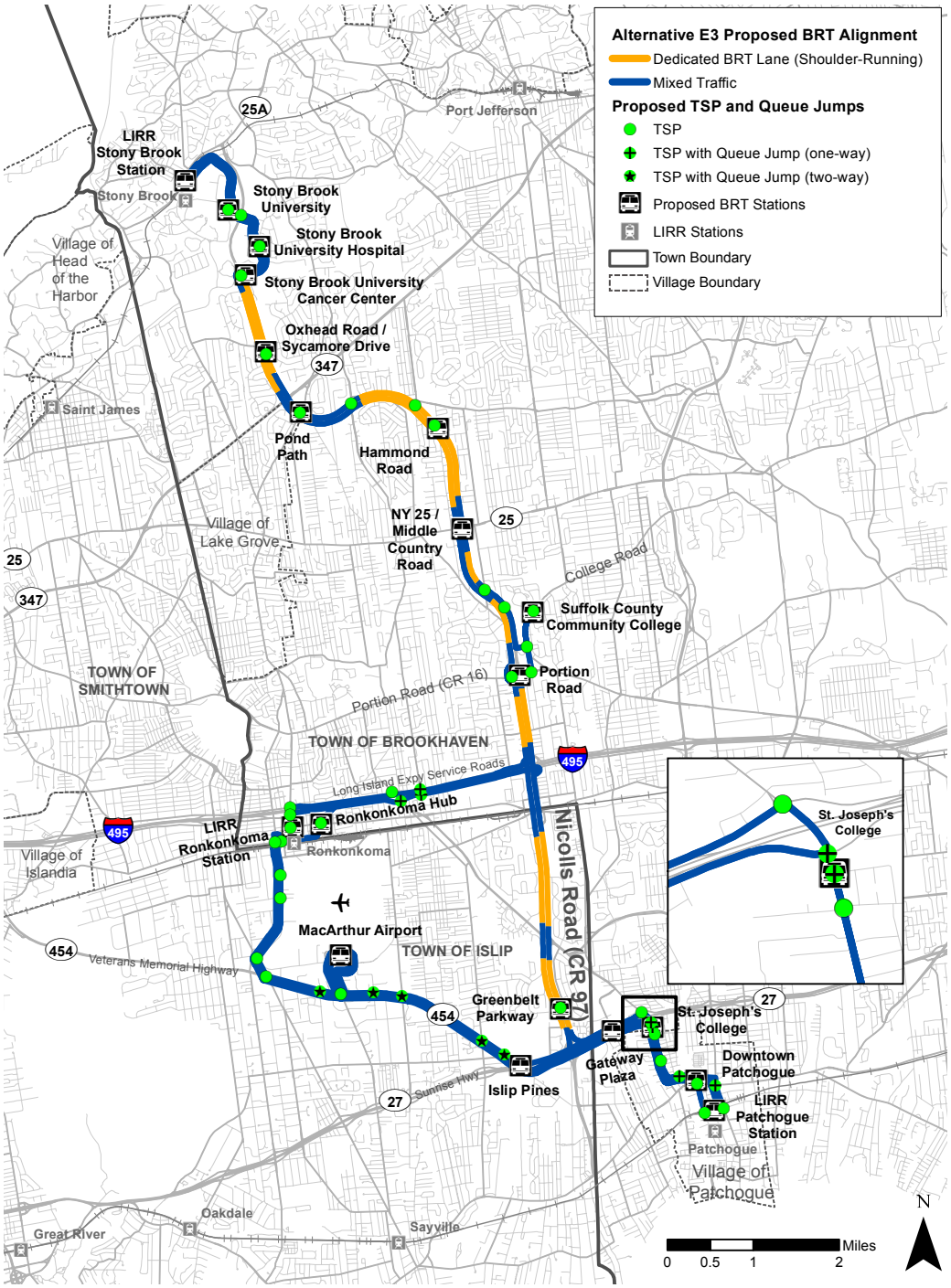
FIGURE 29, Continued: Alignments and Priority Treatments for the Short List Alternatives
Source: NYS GIS Program Office; Suffolk County; Parsons Brinckerhoff; GPI



6.3.4 OPERATIONS ANALYSIS FOR THE SHORT LIST ALTERNATIVES

After selecting the BRT station locations and determining the dedicated and mixed traffic alignment segments along the routes for each alternative, the next step in refining the Short List Alternatives was to conduct an operations analysis for the BRT service.

SERVICE POLICY ASSUMPTIONS

For all of the Short List Alternatives, the operating plan was guided by the following service policy assumptions:

- **Span of service**
  - Monday – Thursday: 5:00am – 10:00pm
  - Friday & Saturday: 5:00am – 12:00am
  - Sunday & Holiday: 6:00am – 10:00pm
- **Service frequency**
  - Weekdays: every 10 minutes during peak periods, and every 15 minutes during off-peak periods
    - Morning peak: 6:00am – 9:00am
    - Evening peak: 3:00pm – 7:00pm
  - Weekends & Holidays: every 20 minutes

The combination of a long span of service and a high frequency of service would help to brand BRT as a distinct, premium transit option compared to existing local bus service.

TRAVEL TIME ESTIMATES

For each of the Short List Alternatives, the following process was applied to generate travel time estimates between each station for each direction (northbound and southbound) and each route (Route 1 and Route 2):

- Estimate the base travel time in the dedicated alignment segments along Nicolls Road by applying base travel speeds specific to each alternative (listed below). It was assumed that BRT would safely operate with the highest travel speed under Alternative E1 because the runningway would be the most separated from mixed traffic. BRT would safely operate with a somewhat slower travel speed under Alternatives E2. For Alternative E3, the proposed travel speed accounts for the use of a repurposed shoulder (that would continue to function as an emergency access and breakdown lane for other traffic) in proximity to the proposed hiking/biking trail. Nevertheless, all three alternatives would operate with faster travel speeds in the dedicated alignment segments than in mixed traffic. For each alternative, the following base travel speeds (which do account for stopped delays at traffic signals) were applied in the dedicated alignment segments along Nicolls Road:
  - Alternative E1: 50 miles per hour (mph) south of South Drive and 40 mph north of South Drive (i.e., 5 mph less than the speed limit along Nicolls Road)
  - Alternative E2: 45 mph (i.e., 10 mph less than the speed limit along the applicable portions of Nicolls Road, all located south of South Drive)
  - Alternative E3: 40 mph (i.e., 15 mph less than the speed limit along the applicable portions of Nicolls Road, all located south of South Drive)
- Estimate the base travel time in the mixed traffic segments for both the peak and off-peak periods by applying travel time estimates from Google Maps cross-checked against travel time runs conducted during the AA planning process.
- Add a dwell time of 45 seconds per station, which also conservatively accounts for acceleration and deceleration between stations.
- Subtract 5 seconds per signalized intersection that is proposed to be equipped with TSP, based on guidance from TCRP Report 118.
- Subtract 6 seconds per signalized intersection that is proposed to have a queue jump, based on guidance from TCRP Report 118. This time savings would be applied instead of (not in addition to) the time savings for TSP. Therefore, the estimated time savings are not cumulative.

Estimated travel times and average speeds for each route, in each direction, and for the peak and off-peak periods are summarized in **Table 6** for Alternative E1 and **Table 7** for Alternatives E2 and E3. The tables show a comparison between travel by automobile and travel by BRT for each of the alternatives; the estimated travel times and average speeds by automobile for Alternative E1 are different than for Alternatives E2 and E3 because of the different routing of the respective alternatives.

Under all of the alternatives, projected net BRT travel speeds would be comparable to—and in some instances faster than—automobile travel speeds, even after accounting

for dwell time at stations. Overall, BRT would benefit from travel time savings and fast operating speeds for each alternative along Nicolls Road due to the combination of a dedicated BRT lane with TSP, complemented by queue jumps wherever feasible in the portions of the routes off Nicolls Road that cannot readily accommodate a dedicated lane. Additional details and comparisons of BRT time savings are presented in Section 7 for the LPA.

6.3.5 RIDERSHIP FORECAST FOR THE SHORT LIST ALTERNATIVES

OVERVIEW AND METHODOLOGY

Ridership forecasting was a critical component of the AA process, as it enabled a quantitative evaluation of the mobility and connectivity benefits of the Short List Alternatives (and subsequently the LPA) for a potential Nicolls Road BRT system. The ridership forecasting effort was conducted using the FTA's Simplified Trips-on-Project Software (STOPS) model (Versions 1.51 and 1.52, limited release July 2015 and December 2015, respectively), which is explicitly referenced in the FTA New and Small Starts Evaluation and Rating Process Final Policy Guidance as a tool that can streamline generation of ridership estimates and vehicle-miles traveled (VMT) data for use in the evaluation of alternatives. Once calibrated, STOPS utilized demographic forecasts from NYMTC to represent expected changes in population and employment and generate ridership estimates for transit use in the future with, and without, the proposed BRT service.

Given the similarities of the Short List Alternatives from a routing, alignment, and station location perspective, and the absence of a single existing bus route along the full length of the Corridor to calibrate the ridership model, it was determined that ridership would not prove to be a differentiator among the alternatives. Therefore, one ridership forecast was prepared to represent the order-of-magnitude ridership potential for all of the Short List Alternatives. To be conservative, the alternative with the longest travel time (Alternative E3) was coded in the model.

TABLE 6: Comparison of Estimated Travel Times and Net Average Speeds – BRT (Alternative E1) and Automobile

Source: Google Maps; Traffic Databank; GPI; Parsons Brinckerhoff

	ESTIMATED TRAVEL TIME (AVERAGE SPEED) (ROUNDED TO THE NEAREST 1 MINUTE AND 1 MPH)							
	ROUTE 1: STONY BROOK-PATCHOGUE				ROUTE 2: STONY BROOK-RONKONKOMA-PATCHOGUE			
	SOUTHBOUND		NORTHBOUND		SOUTHBOUND		NORTHBOUND	
	PEAK	OFF-PEAK	PEAK	OFF-PEAK	PEAK	OFF-PEAK	PEAK	OFF-PEAK
Automobile	43 min (23 mph)	37 min (26 mph)	37 min (26 mph)	35 min (27 mph)	70 min (21 mph)	61 min (24 mph)	61 min (22 mph)	59 min (23 mph)
BRT (Alternative E1)	40 min (24 mph)	40 min (24 mph)	38 min (25 mph)	38 min (25 mph)	70 min (21 mph)	66 min (22 mph)	64 min (21 mph)	63 min (22 mph)

TABLE 7: Comparison of Estimated Travel Times and Net Average Speeds – BRT (Alternatives E2 and E3) and Automobile

Source: Google Maps; Traffic Databank; GPI; Parsons Brinckerhoff

	ESTIMATED TRAVEL TIME (AVERAGE SPEED) (ROUNDED TO THE NEAREST 1 MINUTE AND 1 MPH)							
	ROUTE 1: STONY BROOK-PATCHOGUE				ROUTE 2: STONY BROOK-RONKONKOMA-PATCHOGUE			
	SOUTHBOUND		NORTHBOUND		SOUTHBOUND		NORTHBOUND	
	PEAK	OFF-PEAK	PEAK	OFF-PEAK	PEAK	OFF-PEAK	PEAK	OFF-PEAK
Automobile	52 min (22 mph)	46 min (25 mph)	43 min (24 mph)	40 min (26 mph)	79 min (20 mph)	70 min (23 mph)	67 min (22 mph)	64 min (23 mph)
BRT (Alternative E2)	50 min (23 mph)	50 min (23 mph)	46 min (23 mph)	45 min (23 mph)	79 min (20 mph)	75 min (21 mph)	71 min (20 mph)	70 min (21 mph)
BRT (Alternative E3)	55 min (21 mph)	52 min (22 mph)	49 min (21 mph)	47 min (22 mph)	83 min (19 mph)	77 min (21 mph)	74 min (20 mph)	72 min (20 mph)

The ridership forecasting effort incorporated the following assumptions regarding future transit service in 2040:

» All existing bus services will continue to operate without any service modifications, with the following exceptions (based on discussions with Suffolk County): the Suffolk County Transit S40, S66, and S68 routes have been re-routed to terminate at the LIRR Patchogue Station on Division Street instead of the courthouse on South Street.

» The planned LIRR Republic Station will be operational.

» LIRR East Side Access, Double Track, and Third Track projects will be complete.

Assumptions regarding LIRR service in 2040 were based on discussions with the LIRR. The assumptions can be revisited and revised as necessary during Project Development that will follow the AA. Additional inputs to the STOPS model are discussed in Appendix I.

The STOPS model was used to estimate transit ridership for the following scenarios:

» **2014 Existing** – 2014 estimates of population and employment, as well as current transit schedules for the LIRR and Suffolk County Transit.

» **2040 No-Build** – 2040 estimates of population and employment, as well as transit schedules reflecting the assumptions listed above. This scenario served as a baseline for comparing the anticipated ridership of the Short List Alternatives.

» **2040 Build** – 2040 estimates of population and employment, the 2040 No-Build transit schedules reflecting the assumptions listed above, and additional service representing the two BRT routes. Additionally, this scenario included new BRT park-and-ride facilities, although it was anticipated that the locations, availability, and cost for such facilities will be refined by the ongoing *Ronkonkoma Hub – Nicolls Road Corridor Parking Analysis*.

The current year for this analysis was 2014, based on the commencement of the AA project in 2014 and the availability of data obtained from Suffolk County Transit and NYMTC. In addition to estimating ridership for the Short List Alternatives in the horizon year (2040), the STOPS model also generated ridership forecasts for the current year (Appendix I).

RIDERSHIP FORECASTING RESULTS

The results of the ridership forecast are presented as number of weekday boardings in **Table 8**. The number of weekday boardings can be interpreted as the number of people who board any given route or service, often referred to as "unlinked trips" when summed over the

ROUTE	2014 EXISTING (STOPS CALIBRATED ESTIMATE)	2040 NO-BUILD	2040 BUILD
Proposed BRT Route 1	-	-	550
Proposed BRT Route 2	-	-	920
Subtotal, Proposed BRT Routes	-	-	1,470
Suffolk County Transit Corridor Routes	2,990	3,930	3,480
Total, All Routes	2,990	3,930	4,950
Change in total (vs. No-Build)			1,020

TABLE 8: Summarized Ridership Forecast for the Short List Alternatives (Weekday Boardings, by Scenario)

Source: RSG; Parsons Brinckerhoff
Note: All numbers rounded to the nearest 10 boardings

entire transit network. Since unlinked trips represent the total number of boardings, a trip that includes one transfer would be counted as two boardings or two unlinked trips (i.e., one for the first vehicle that was boarded and another for the transfer).

Table 8 presents an overview of the ridership forecast results for each of the scenarios, including a summary of the number of weekday boardings for the proposed BRT service and existing Suffolk County Transit routes that serve specific markets that would also be served by the proposed BRT service (denoted "Corridor Routes"). The existing Suffolk County Transit Corridor Routes reflected in the table include the 3D, 6A, 6B, 7A, S60, S63, S69, and S71; other Suffolk County Transit routes are omitted from the Corridor Routes to avoid diluting the results. The 2014 Existing and 2040 No-Build scenarios only include existing Suffolk County Transit Corridor Routes, and the 2040 Build scenario adds the two proposed BRT routes.

Key ridership statistics include the following:

» The 2040 No-Build scenario attracts 3,930 weekday boardings on the Suffolk County Transit Corridor Routes, an approximately 30% increase over the 2014 Existing scenario. This growth is a result of increases of population and employment and transit ridership increases associated with improvements to LIRR service and increases in highway travel times between the Corridor and New York City.

» The Build scenario attracts a total of approximately 1,470 weekday boardings on the two proposed BRT routes combined, in addition to approximately 3,480 weekday boardings on the existing Suffolk County Transit Corridor Routes. The total ridership of all routes combined (i.e., both BRT routes and the existing Suffolk County Transit Corridor Routes) is approximately 4,950 weekday boardings, an increase of approximately 1,020 (approximately 25%) compared to total ridership in the No-Build scenario. The source of BRT ridership is a combination of approximately 450 existing Suffolk Country Transit riders shifting to the new service, as well as approximately 1,020 new transit users who previously used another mode of transportation.

Furthermore, the ridership forecast demonstrated that implementation of the two proposed BRT routes would result in approximately 445 vehicle trips diverted to BRT in the horizon year (2040) with an average of 15.9 miles per diverted trip, which corresponds to a reduction of approximately 7,065 daily VMT compared to the No-Build condition.

Additional ridership data, including the number of projected weekday BRT boardings by mode of access for each proposed station, are presented in Section 7 for the LPA. The discussion in Section 7 also outlines the reasons why BRT ridership could be higher than currently projected.

6.3.6 ORDER-OF-MAGNITUDE COST ESTIMATES FOR THE SHORT LIST ALTERNATIVES

Based on the conceptual engineering and operations planning efforts, order-of-magnitude capital and O&M cost estimates were prepared for the three Short List Alternatives. The preliminary cost estimates will be refined as appropriate as the project advances through NEPA and Project Development, reflecting the continuous nature of the cost estimating process.

As shown in **Table 9**, the total order-of-magnitude capital costs for Alternatives E1, E2, and E3 are approximately $216.5 million (including $204.3 million for BRT and $12.2 million for the hiking/biking trail), $191.1 million (including $179.8 million for BRT and $11.3 million for the hiking/biking trail), and $165.7 million (including $150.8 million for BRT and $14.9 million for the hiking/biking trail), respectively. The annual O&M costs are approximately $12.9 million for Alternative E1 and $14.2 million for Alternatives E2 and E3. Appendix I includes a detailed discussion of the methodology and inputs used in estimating the costs during the AA, and the following summary presents a high-level overview of the methodology and results.

CAPITAL COST

Order-of-magnitude capital cost estimates were prepared for the three Short List Alternatives using current available unit prices (in 2015 dollars) that are typical for the Suffolk County/Long Island area. The capital costs were estimated according to the FTA's Standard Cost Categories (SCC), which offer a consistent format for the reporting of capital costs. As presented in **Table 10**, the SCCs include several items related to construction (i.e., guideways, stations, support facilities, sitework and special conditions, and systems), as well as ROW costs, BRT vehicle costs, soft costs/professional services (calculated as 40% of the subtotal of construction and ROW costs), and a 40% contingency.

All of the alternatives would have order-of-magnitude capital costs in the range of $165 million to $220 million, including the proposed hiking/biking trail. The variation in capital cost among the alternatives is due primarily to differences in the BRT alignments along Nicolls Road. Specifically, construction of pavement and drainage would vary considerably by alternative, with Alternative E1 requiring the largest capital investment. Implementation of Alternative E1 would require paving most of the existing grass median to accommodate BRT and a raised island to separate BRT from the mixed traffic lanes. This would also require extensive drainage work to address the increase in impervious surface area associated with this alternative. Furthermore, Alternative E1 would entail more intersection work than the other alternatives due to the need to shift the alignment of left turn lanes and mixed traffic lanes where BRT lanes would encroach upon existing turn lanes.

Alternative E2 would have a lower capital cost than Alternative E1 for several reasons: a smaller amount of grass median would be paved, which also dictates less drainage work; intersection alterations would be limited to reconstructing left turns; and realignment of mixed travel lanes would not be needed. Alternative E3 would be the least expensive option due to the addition of less new pavement, the lack of disturbance to the existing grass median thereby resulting in the least impact on drainage, and because it would not require alignment changes to turn lanes or travel lanes.

Under any of the alternatives, the addition of new travel lanes along Nicolls Road would require that noise levels be assessed, and noise abatement would have to be considered where ambient noise levels exceed a certain threshold. To be conservative, the capital cost for each alternative included a noise wall with an estimated order-of-magnitude cost of $25 million, which was based on an estimate of the needed mileage and height of the noise wall.

All of the alternatives would include the purchase of BRT vehicles. (A discussion of BRT vehicle assumptions is included in Section 7 for the LPA.) For each route under each alternative, the fleet requirement was calculated as the cycle time (amount of time required for a BRT vehicle to make a round trip) divided by the headway (number of BRT trips scheduled per hour) during the peak period, rounded up. The total fleet requirement was calculated by applying a 20% spare factor to the fleet requirement. Based on this calculation, the fleet requirement for Alternatives E1, E2, and E3 would be 29, 34, and 36 BRT vehicles, respectively. The difference in the number of vehicles is due to the differences in travel times among the alternatives. The breakdown of the fleet requirement by route for each alternative is summarized in **Table 11**. It was assumed that the cost of any storage/maintenance facilities would be borne by the vendor.

ALTERNATIVE	CAPITAL COST ESTIMATE (MILLIONS, IN 2015$)			ANNUAL O&M COST ESTIMATE (MILLIONS, IN 2015$)
	BRT	HIKING/BIKING TRAIL	TOTAL	
Alternative E1	$204.34	$12.16	$216.50	$12.90
Alternative E2	$179.80	$11.29	$191.09	$14.20
Alternative E3	$150.79	$14.94	$165.73	$14.20

TABLE 9: Summary of Order-of-Magnitude Capital and O&M Cost Estimates for the Short List Alternatives

Source: Parsons Brinckerhoff; GPI; Toscano Clements Taylor; Suffolk County

TABLE 10: Order-of-Magnitude Capital Cost Estimates for the Short List Alternatives

Source: Parsons Brinckerhoff; GPI; Toscano Clements Taylor; Suffolk County

FTA SCC ITEM	TOTAL COST (2015$)		
	ALTERNATIVE E1	ALTERNATIVE E2	ALTERNATIVE E3
Guideway	$22,220,000	$18,010,000	$7,850,000
Stations	$10,280,000	$8,080,000	$8,080,000
Support Facilities	$0	$0	$0
Sitework and Special Conditions	$58,470,000	$52,070,000	$46,630,000
Systems	$570,000	$380,000	$380,000
Construction Subtotal	$91,530,000	$78,530,000	$62,940,000
Right-of-Way (ROW)	$1,630,000	$200,000	$220,000
Vehicles	$21,750,000	$25,500,000	$27,000,000
Subtotal (Construction + ROW + Vehicles)	$114,910,000	$104,230,000	$90,160,000
Soft Costs/Professional Services (40%)	$37,260,000	$31,490,000	$25,260,000
Contingency (40%)	$52,170,000	$44,090,000	$35,370,000
Subtotal, BRT (2015$)	$204,340,000	$179,800,000	$150,790,000
Subtotal, Hiking/Biking Trail (2015$)	$12,160,000	$11,290,000	$14,940,000
Total (2015$)	$216,500,000	$191,090,000	$165,730,000

The capital cost estimate informed the evaluation of the Short List Alternatives in the Short List Screening, as discussed in Section 6.3.7. Additional details about capital cost, including comparisons to other BRT systems, are included in Section 7 for the LPA.

OPERATING AND MAINTENANCE (O&M) COST

Consistent with existing Suffolk County Transit operating contracts, the O&M cost estimates for the Short List Alternatives were prepared based upon annual vehicle revenue miles. The annual O&M cost for each alternative was calculated as the number of annual vehicle revenue miles multiplied by $5.97363 per revenue mile, as advised by Suffolk County Transit and corresponding to the rate for the Suffolk County Transit fixed-route bus operation. The estimated O&M costs accounted for the BRT service only, excluding costs associated with increased highway maintenance, off-board fare collection, the proposed hiking/biking trail, and any potential park/kiss-and-ride lots.

The annual vehicle revenue miles and associated order-of-magnitude annual O&M cost estimates for the Short List Alternatives are presented in **Table 12**. All of the alternatives would have order-of-magnitude BRT O&M costs in the range of $13 million to $14 million per year. While the frequencies and spans of service would be the same for the different alternatives, the different routings would result in different annual vehicle revenue miles and thus different O&M costs under each alternative. Specifically, Alternative E1 would have the fewest annual vehicle revenue miles and the lowest annual O&M cost because—unlike Alternatives E2 and E3—the BRT routes would not divert off Nicolls Road to serve SCCC and the SBU Hospital/Cancer Center. Alternatives E2 and E3 would have the same O&M cost because the BRT routes are identical for the two alternatives, differing only with respect to alignment on Nicolls Road. For each alternative, Route 2 would have a higher annual O&M cost than Route 1 because of the greater distance and thus the greater number of annual vehicle revenue miles associated with this route.

As discussed in the following section, the O&M cost estimate was one of the factors that informed the evaluation of the Short List Alternatives in the Short List Screening.

ALTERNATIVE	FLEET REQUIRED (NUMBER OF BRT VEHICLES)			TOTAL (ROUTES 1 AND 2)
	ROUTE 1: STONY BROOK-PATCHOGUE	ROUTE 2: STONY BROOK-RONKONKOMA-PATCHOGUE	SPARES (20%)	
Alternative E1	9	15	5	29
Alternative E2	11	17	6	34
Alternative E3	12	18	6	36

TABLE 11: Fleet Requirement for the Short List Alternatives

Source: Parsons Brinckerhoff;

ROUTE	ANNUAL VEHICLE REVENUE MILES		TOTAL ANNUAL O&M COST (2015$)	
	ALTERNATIVE E1	ALTERNATIVES E2 & E3	ALTERNATIVE E1	ALTERNATIVES E2 & E3
Route 1: Stony Brook-Patchogue	877,470	990,250	$5,242,000	$5,915,000
Route 2: Stony Brook-Ronkonkoma-Patchogue	1,281,830	1,386,350	$7,657,000	$8,282,000
Total, All Routes	2,159,300	2,376,600	$12,899,000	$14,197,000

TABLE 12: Order-of-Magnitude Annual O&M Cost Estimates for the Short List Alternatives

Source: Parsons Brinckerhoff; Suffolk County

6.3.7 SHORT LIST SCREENING RESULTS: IDENTIFICATION OF LOCALLY PREFERRED ALTERNATIVE

The Short List Screening included an evaluation of the Short List Alternatives for their relative performance against each criterion. Based on the tabulated results, each of the Short List Alternatives would achieve the project goals and objectives, and no one alternative emerged as the best option. While there are considerable similarities among the Short List Alternatives, the Screening also exposed key differences, which guided the selection of the LPA. As discussed in detail in Appendix I, these differences include—but are not limited to—the extent to which the respective alternatives would:

» Provide last-mile and multi-modal connectivity

All of the Short List Alternatives would improve connectivity to activity centers located off the main spine of the Corridor, and would also improve connectivity between existing transit services, but Alternatives E2 and E3 would perform better than Alternative E1 with respect to these criteria. This would be due to the different routing of the alternatives in the vicinity of SCCC and the SBU Hospital/Cancer Center. Specifically, whereas Alternatives E2 and E3 would divert off Nicolls Road to serve these activity centers and also provide additional opportunities for customers to transfer between modes, Alternative E1 would remain on Nicolls Road, offering less direct service and transfer opportunities at these locations.

» Reduce travel time for transit users

All of the Short List Alternatives would reduce travel time for transit users within the study area, but Alternative E1 would outperform Alternatives E2 and E3 with respect to this criterion. Estimated travel time between Stony Brook and Patchogue ranged from approximately 40 minutes under Alternative E1 to approximately 50-55 minutes under Alternatives E2 and E3. There were also comparable differences in estimated travel time among the alternatives for the proposed BRT route that would serve Ronkonkoma. While the alignment was one determinant of travel time, the routing was another important reason for the stark difference among the alternatives. Specifically, Alternative E1 would minimize travel time for BRT customers by remaining on Nicolls Road between NY 27/Sunrise Highway and Shirley Kenny Drive, whereas additional travel time would be required under Alternatives E2 and E3 to divert off Nicolls Road, particularly in the southbound direction to serve SCCC.

» Increase transportation system capacity

Although all of the Short List Alternatives would increase transportation system capacity by adding dedicated BRT lanes to Nicolls Road, the alternatives would offer different mileages of dedicated BRT lane. This would be due to different geometric and operational constraints associated with the alignments of the alternatives. Alternative E1 would include the greatest distance of dedicated BRT lane (approximately 10.7 miles in both the northbound and southbound directions), and thus would contribute the most to increasing transportation system capacity. Alternative E2 would offer approximately 9.7 miles and 9.8 miles of dedicated BRT lane in the northbound and southbound directions, respectively, while Alternative E3 would accommodate approximately 6.0 and 6.2 miles, respectively.

» Improve safe pedestrian access and accommodate a hiking/biking trail along Nicolls Road

All of the Short List Alternatives would improve pedestrian access and safety by providing a range of station-area and corridor-wide pedestrian improvements, but there were differences among the alternatives with respect to the hiking/biking trail. Specifically, while Alternative E1 would offer an improved pedestrian connection between the BRT stations in the median and the proposed hiking/biking trail along the side of Nicolls Road, Alternatives E2 and E3 would create opportunities to integrate the stations (on one side of the road) with the hiking/biking trail. However, the preliminary feasibility assessment conducted as part of the AA demonstrated that Alternative E1 could accommodate approximately 6.6 miles of hiking/biking trail within the ROW of Nicolls Road, compared to 5.2 miles under Alternative E2 and 4.6 miles under Alternative E3.

» Minimize estimated order-of-magnitude capital costs

All of the Short List Alternatives would have considerable capital costs for implementing the BRT system and hiking/biking trail, but Alternative E3 would be the least expensive option (approximately $165.7 million). The capital cost of Alternative E2 is approximately $191.1 million, and the capital cost of Alternative E1 is

approximately $216.5 million, which would be the most expensive option. This corresponds to a 15% differential in the capital costs between Alternatives E3 and E2, and an approximately 30% differential in the capital costs between Alternatives E3 and E1. As previously noted, the variation among the alternatives is due primarily to differences in the magnitude of construction required for the alignments along Nicolls Road.

» Minimize estimated order-of-magnitude annual O&M costs

All of the Short List Alternatives would have considerable annual O&M costs for the two-route BRT system, but Alternative E1 would outperform the other alternatives with respect to this criterion. The annual O&M cost of Alternative E1 (approximately $12.9 million) would be approximately $1.3 million less than the annual O&M cost of Alternatives E2 and E3 (approximately $14.2 million). This corresponds to a 10% differential in the O&M costs between Alternatives E1 and E2/E3. As previously noted, the variation among the alternatives would be primarily to differences in the annual vehicle revenue miles associated with the respective BRT routes.

» Minimize operational (traffic) constraints for implementation in the study area

From a traffic operational standpoint, Alternative E1 would generally have fewer constraints for implementation than Alternatives E2 and E3 because the BRT runningway would be physically separated from the other travel lanes. Under Alternatives E2 and E3, mixed traffic would have to weave across the dedicated BRT lane to enter and exit Nicolls Road, which could create potential vehicular conflicts (particularly at high-traffic-volume intersections and interchanges, such as Nicolls Road at the LIE). This concern would be minimized under Alternative E1 due to the median transitway alignment that would be separated from mixed traffic lanes. Additionally, the alignment under Alternative E1 would require the BRT to make the fewest transitions between a dedicated lane and mixed traffic, thereby further minimizing potential vehicular conflicts.

Overall, the refinement and evaluation of the Short List Alternatives through the Short List Screening provided the foundation for the identification of the LPA. Alternatives E2 and E3 performed better than Alternative E1 with respect to some criteria, such as capital costs, while Alternative E1 outperformed Alternatives E2 and E3 with respect to other criteria, such as reducing travel time. This evaluation effectively set the stage for the selection of the LPA, which includes a hybrid of the Short List Alternatives that best achieves the project goals and objectives.

7 LOCALLY PREFERRED ALTERNATIVE

The selection of the LPA was the third and final step in the multi-tiered screening process completed in the Nicolls Road AA, following the Long List Screening and Short List Screening. Whereas the Long List Screening led to the identification of a preferred mode-specific alignment concept, the refinement and evaluation of the Short List Alternatives through the Short List Screening provided the foundation for selection of the LPA.

The LPA for the proposed Nicolls Road BRT system comprises a combination of components from each of the three Short List Alternatives. The LPA was defined by selecting the most suitable elements from each of the Short List Alternatives to design a BRT system that best meets the project's Purpose and Need. The LPA includes segments of all three dedicated BRT lane alignments from the Short List Alternatives (i.e., median transitway, right-most travel lane, and shoulder-running) along different portions of the Nicolls Road Corridor. As a hybrid of the Short List Alternatives, the LPA addresses several shortcomings of the individual alternatives as demonstrated in the Short List Screening. Commonalities among the Short List Alternatives are also incorporated into the LPA, including service frequency/span and proposed implementation of TSP at signalized intersections and queue jumps off of Nicolls Road where feasible.

The following sections present the details of the LPA as currently defined; it is likely that further refinements to the LPA will be made during Preliminary Engineering and Project Development following completion of this AA. As discussed in greater detail in Section 8, these refinements will include, but will not be limited to, addressing existing traffic operational issues, identifying precise station locations and designs, and conducting detailed planning and design of the proposed Nicolls Road hiking/biking trail (refer to sidebar).

7.1 PROPOSED BRT ROUTING AND STATIONS

As shown on **Figure 31**, the LPA includes two proposed BRT routes—(1) Stony Brook-Patchogue; and (2) Stony Brook-Ronkonkoma-Patchogue—that are based upon and comparable to the two routes as proposed for each of the Short List Alternatives. The two proposed routes are identical between the LIRR Stony Brook Station and

PRELIMINARY ASSESSMENT OF PROPOSED NICOLLS ROAD HIKING/BIKING TRAIL

Consistent with the Short List Alternatives, an off-road hiking/biking trail is proposed along Nicolls Road to complement the proposed BRT routes as part of the LPA (**Figure 30**). The benefits of constructing a hiking/biking trail include providing safe access for customers to reach the BRT system, promoting healthier lifestyles, providing another modal option that could potentially reduce automobile usage, reducing carbon footprint, and enhancing the attractiveness and potentially the property values for the nearby communities.

The investigation conducted for this AA was a preliminary assessment that provides a framework for further study. Some of the considerations that informed the location of the hiking/biking trail in this AA included the availability of safe pedestrian/bicycle crossings, grade and elevation changes, noise wall locations, and the estimated width of the existing ROW. Detailed planning and design, including addressing the need to provide space for signing and utilities, will be studied during Preliminary Engineering.

The hiking/biking trail along Nicolls Road is proposed to be physically separated from motorized vehicular traffic with either a 10-foot-wide buffer or a concrete barrier or guide rail along those portions of the Corridor with limited ROW. It is recommended that crosswalk, ramp, and pedestrian signal improvements be considered wherever the hiking/biking trail would meet side streets. Portions of the hiking/biking trail that are proposed for two-way travel

PRELIMINARY ASSESSMENT OF PROPOSED NICOLLS ROAD HIKING/BIKING TRAIL, CONTINUED

would have a minimum width of 10 feet, and portions of the hiking/biking trail that are proposed for one-way travel would have a minimum width of 5 feet.

As currently envisioned, the hiking/biking trail would run along Nicolls Road from Greenbelt Parkway in the south to Health Sciences Drive/South Drive in the north, with diversions off Nicolls Road as necessary to account for ROW limitations and to ensure pedestrian and bicycle safety. Although this AA identified the potential for approximately five miles of trail within the Nicolls Road ROW (in conjunction with the BRT LPA), it is clear that the trail—when designed and built—will be continuous, incorporating low-volume side streets and parklands as needed.

During Preliminary Engineering, potential extensions of the hiking/biking trail can be considered, for instance to promote integration with the bicycle/pedestrian network within SBU and the Village of Patchogue, as well as connections to the Patchogue-Watch Hill Ferry Terminal. A detailed analysis will be needed to develop logical termini at both ends of the trail.

As discussed in Appendix J, potential routes for the segments off Nicolls Road were determined based on recommended directions for bicyclists according to Google Maps, but detailed planning and design will be necessary to confirm the routes during Preliminary Engineering. The order-of-magnitude capital cost estimate for the hiking/biking trail (Section 7.5) includes only the five miles of trail along Nicolls Road for which conceptual engineering was conducted during this AA. For the segments of the proposed trail that would be routed on local streets and/or parks, the capital cost per mile is expected to be lower.

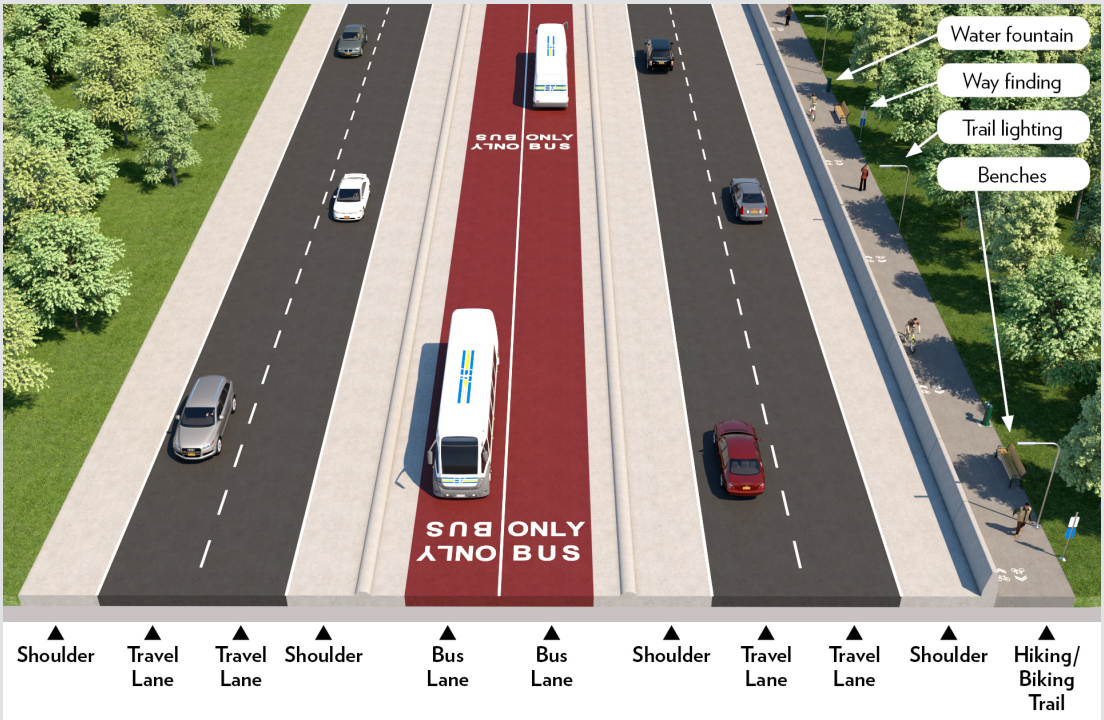
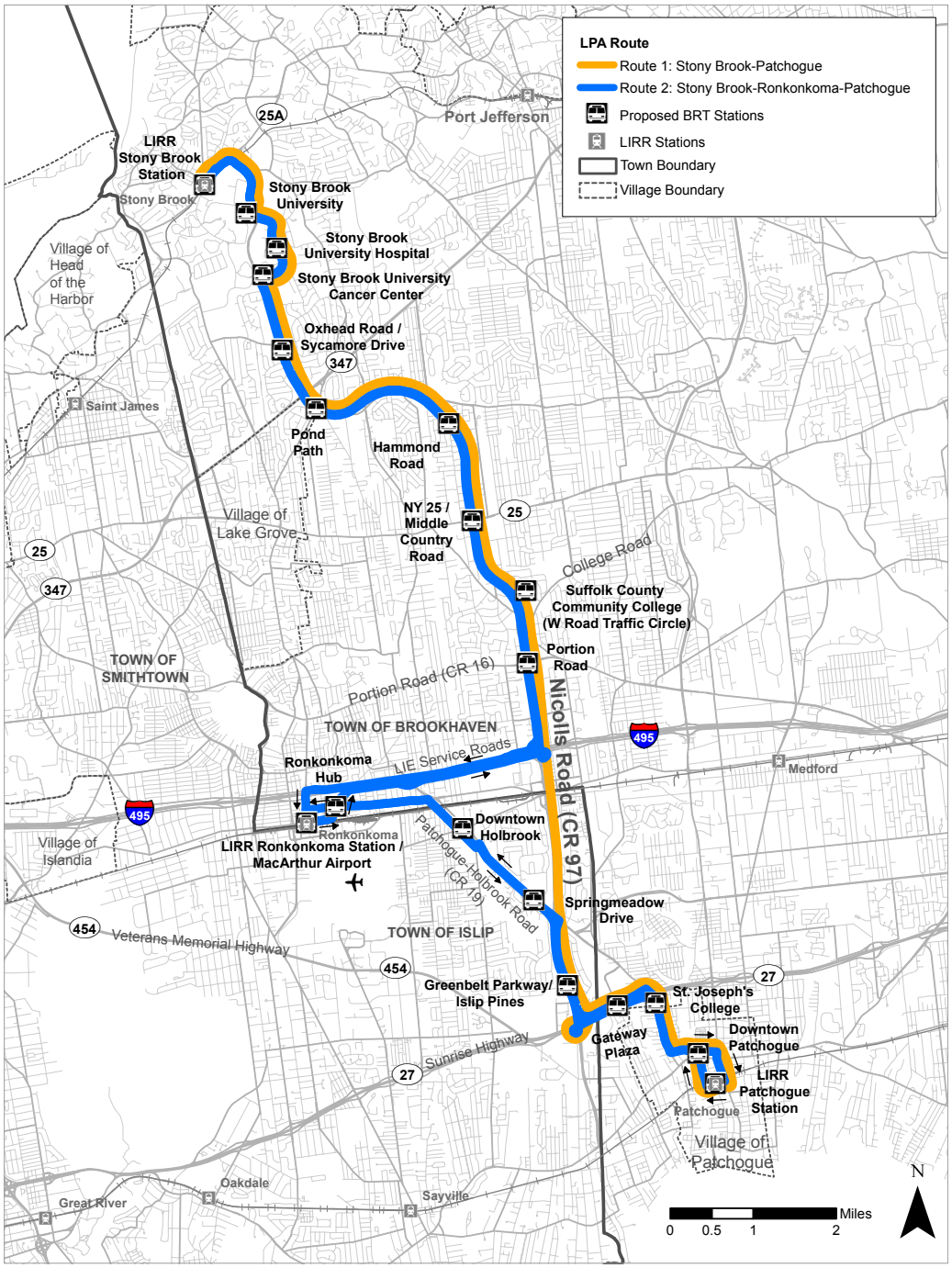


FIGURE 30: Rendering of Multi-Modal Nicolls Road Corridor with Hiking/Biking Trail
Source: Parsons Brinckerhoff

FIGURE 31: Proposed BRT Routing and Station Locations for the LPA

Source: NYS GIS Program Office, Suffolk County; Parsons Brinckerhoff ; GPI



Nicolls Road at the LIE, as well as between Nicolls Road at Patchogue-Holbrook Road and the LIRR Patchogue Station. The southbound routes would diverge at Nicolls Road at the LIE with Route 1 continuing south on Nicolls Road, and Route 2 diverting off Nicolls Road to serve other activity centers that are located within the study area; the two routes would then converge at Nicolls Road at Patchogue-Holbrook Road. The proposed routing of both routes in the vicinity of the SBU Hospital is consistent with that of Alternatives E2 and E3. Specifically, both Route 1 and Route 2 would divert off Nicolls Road at Health Sciences Drive/South Drive to provide enhanced last-mile and multi-modal connectivity.

Compared to the Short List Alternatives, the LPA includes minor routing modifications (within the study area) to best achieve the project goals and objectives, as follows:

» The proposed routing at SCCC (for both routes in both directions) includes a diversion off Nicolls Road at W Road to serve a BRT station within the W Road traffic circle. Additionally, a new direct pedestrian connection between the traffic circle and the center of the campus would enhance pedestrian accessibility to and from Nicolls Road, complementing the existing pedestrian walkway next to the Brookhaven Gymnasium. With this routing, the LPA would more effectively serve the Community College than would an in-line station along Nicolls Road (as proposed under Alternative E1), while avoiding the additional off-corridor travel time required to serve the existing on-campus bus stop on College Road (as proposed under Alternatives E2 and E3). The work in Preliminary Engineering can also consider opportunities to bring the BRT as close to the center of campus as possible.

  « In the short term, customers could transfer between BRT and other Suffolk County Transit local buses at College Road by means of a short (approximately ¼-mile) walk through campus, which is comparable to the walking distance to certain parts of campus from some of the existing parking fields.

  « In the long term, it could be possible to re-route certain existing Suffolk County Transit bus routes to promote enhanced connectivity with BRT at this location.

» The proposed routing for Route 2 includes service along Main Street/Patchogue-Holbrook Road instead of NY 454/Veterans Memorial Highway. The principal reason for this modification is that the proposed routing reduces travel time, mileage, and O&M costs, while also providing service to growing activity centers in the study area. For instance, between the proposed BRT stations at Portion Road and Gateway Plaza during the peak period, the routing for Route 2 under the LPA would save approximately 6 minutes in the southbound direction and 30 seconds in the northbound direction, compared to the Short List Alternatives routing for Route 2. The routing modification would also reduce mileage by approximately 2.9 miles in the southbound direction and 1.8 miles in the northbound direction, which results in a reduction in O&M costs. Furthermore, the use of Main Street/Patchogue-Holbrook Road would enable the BRT system to expand ridership potential by serving downtown Holbrook and the residential communities and retail centers near Springmeadow Drive. Additionally, Route 2 under the LPA would use Nicolls Road between the Sunrise Highway Service Roads and Patchogue-Holbrook Road, thereby maximizing use of the proposed dedicated BRT lanes along Nicolls Road (discussed in Section 7.2).

  « Route 2 would serve MacArthur Airport at a combined LIRR Ronkonkoma Station/MacArthur Airport BRT station.

    « In the short term, BRT operations would be coordinated with the private carriers who currently operate shuttle van service between the LIRR Ronkonkoma Station and MacArthur Airport to ensure a quick and seamless connection. As part of its "Long Island Getaways" program, the LIRR offers a discount package that includes a one-way LIRR trip to/from the LIRR Ronkonkoma Station and a taxi voucher for shuttle van service to/from MacArthur Airport. The shuttle van service operates every 30 minutes and is scheduled to meet all trains at the LIRR Ronkonkoma Station. Suffolk County, the LIRR, and MacArthur Airport should increase education and marketing of the existing shuttle van service and ticket package as part of its ongoing BRT branding and strategic marketing campaign. The BRT fare policy should also be coordinated with the ticket package to encourage multi-modal connections.

    « In the long term, and as part of the I-Zone (**Figure 32**), Suffolk County intends to collaborate with local and regional partners to build a new state-of-the-art terminal on the north side of MacArthur Airport. The LIRR Ronkonkoma Station

FIGURE 32: Long-Term I-Zone Vision: Multi-Modal Plane-Train-BRT Station at Ronkonkoma
Source: Parsons Brinckerhoff

would feature a direct "train to plane" connection with MacArthur Airport, essentially bringing the airport to the BRT, instead of bringing the BRT to the airport. The I-Zone vision is anchored by a multi-modal plane, train and BRT station at Ronkonkoma. Additionally, the new terminal would enable a one-seat ride from the airport either east to Montauk or west to New York City.

« Both Routes 1 and 2 would serve Islip Pines at a combined Greenbelt Parkway/Islip Pines BRT station. The proposed BRT station would be within a reasonable walking distance (approximately ¼- to ½-mile) of the planned 136-acre, mixed-use development.

The proposed BRT station locations for the two routes are identified in **Table 13**.

7.1.1 PROPOSED BRT STATION ELEMENTS

Stations would function as the gateway for customers and would play a critical role in branding BRT as a premium transit option that could attract choice customers in addition to serving the needs of customers without access to an automobile. As such, the BRT stations would include a number of customer amenities to distinguish the Nicolls Road BRT system from local bus service.

As proposed for the LPA, each BRT station would include a shelter with seating, bicycle racks to facilitate and encourage multi-modal trips, trash receptacles, and landscaping. Variable message signage (VMS) would offer real-time information at each BRT station to alert customers of arriving BRT vehicles and potential delays. Each station also would include wayfinding signage with lighting to orient customers to the surrounding area and would display BRT route maps, schedules, and fare information.

The station areas would include pedestrian improvements to enhance the image of BRT and help transform Nicolls Road into a pedestrian-friendly corridor consistent with the principles of Complete Streets. These improvements would include enhanced crosswalks, pedestrian signals and push buttons, and the addition of station-area sidewalks with ramps that adhere to Americans with Disabilities Act of 1990 (ADA) guidelines. Additionally, the combination of a raised curb at BRT stations and the use of low-floor vehicles would enable level boarding by decreasing the vertical gap between the station-area sidewalk and the vehicle floor. This would result in faster boarding and alighting for

STATION NAME (NORTH TO SOUTH)	ROUTE 1	ROUTE 2	NUMBER OF STATIONS (EITHER 1 COMBINED STATION OR 2 SEPARATE STATIONS FOR NORTHBOUND/SOUTHBOUND TRAVEL)	STATION LOCATION
LIRR Stony Brook Station	✓	✓	1 (northern terminus)	LIRR parking lot within SBU campus, west of Circle Road
Stony Brook University	✓	✓	2	Circle Road at Shirley Kenny Drive
Stony Brook University Hospital	✓	✓	2	Health Sciences Drive at SBU Hospital Main Entrance
Stony Brook University Cancer Center	✓	✓	2	Health Sciences Drive, east of Nicolls Road
Oxhead Road/Sycamore Drive	✓	✓	2	Nicolls Road at Oxhead Road / Sycamore Drive
Pond Path	✓	✓	2	Nicolls Road at Pond Path
Hammond Road	✓	✓	2	Nicolls Road at Hammond Road
*NY 25/Middle County Road	✓	✓	2	To be determined in Preliminary Engineering
Suffolk County Community College-Ammerman Campus	✓	✓	1 (with separate berths for northbound/southbound)	Within W Road traffic circle
*Portion Road	✓	✓	2	To be determined in Preliminary Engineering
LIRR Ronkonkoma Station / MacArthur Airport		✓	1 (with separate berths for northbound/southbound)	• Short-term: Loop road between Hawkins Avenue and The Plaza, south of Railroad Avenue • Long-term: Easton Street, south of the LIRR tracks
Ronkonkoma Hub		✓	2	Union Avenue at Mill Road
Downtown Holbrook		✓	2	Main Street at Furrows Road
Springmeadow Drive		✓	2	Patchogue-Holbrook Road at Springmeadow Drive
Greenbelt Parkway / Islip Pines	✓	✓	2	Nicolls Road at Greenbelt Parkway
*Gateway Plaza	✓	✓	2	To be determined in Preliminary Engineering
St. Joseph's College	✓	✓	2	Waverly Avenue at Savannah Boulevard
Downtown Patchogue	✓	✓	2	Holbrook Road at Lake Street
LIRR Patchogue Station	✓	✓	1 (southern terminus)	Division Street at Cedar Avenue

TABLE 13: Proposed BRT Station Locations for the LPA

Source: Parsons Brinckerhoff; GPI
* Stations proposed for long-term implementation due to grade-separated interchanges and/or the need for a pedestrian overpass.

all customers, including the disabled and elderly, thereby creating travel time savings by reducing the dwell time at stations.

Another element of the proposed BRT system is an alternative method of fare collection. The proposed fare collection strategy would include on-board fare collection with a pre-payment option reflecting the County's effort that is underway to develop a smart phone application. The mobile ticketing technology would enable customers to pay the fare ahead of their trips, thereby allowing customers to quickly board the BRT vehicles. This would result in a reduction of the dwell time at each BRT station and an associated improvement in overall travel time. This approach to fare pre-payment would achieve some of the benefits of off-board fare collection. Additional details about fare collection are discussed in Section 7.3.1. It is assumed that the BRT fare would be equivalent to the Suffolk County Transit fares.

All of the individual elements would contribute to a strong brand identity of BRT as a premium service. To further brand the BRT system, the station areas could potentially include tinted concrete, tactile strips at the curb, and/or concrete pads in the runningway tinted red. The proposed branding of the BRT system will be informed by the forthcoming Suffolk County BRT Design Standards Study.

BRT station examples from other locations in North America are included on **Figure 33**, and **Figure 34** shows a rendering of a typical proposed Nicolls Road BRT station. **Figure 35** depicts the regional context of the proposed Nicolls Road BRT system, showing the proposed hiking/biking trail and several key regional assets that are components of the I-Zone.

The proposed BRT system would include three different shelter types:

1. Simple shelter measuring 5 feet by 12 feet, which would match the size of existing Suffolk County Transit shelters;
2. Enhanced shelter measuring 10 feet by 24 feet; and
3. Enclosed station of comparable size to the enhanced shelter but with additional security and climate controlling features to convey permanence and reinforce the BRT system image.

The proposed shelter typology at each station location would be guided by the County's system-wide BRT branding and strategic marketing campaign, and would also be informed by projected ridership demand.

Greater Cleveland Regional Transit Authority (RTA) HealthLine
Cleveland, OH

Kansas City Area Transportation Authority (KCATA) Metro Area Express (MAX)
Kansas City, MO

Capital District Transportation Authority (CDTA) BusPlus
Albany, NY

OC Transpo Transitway
Ottawa, Canada

FIGURE 33: BRT Station Examples
Sources: TRANS4M; Bslotterback Wordpress; Metro-Magazine; Wikimedia

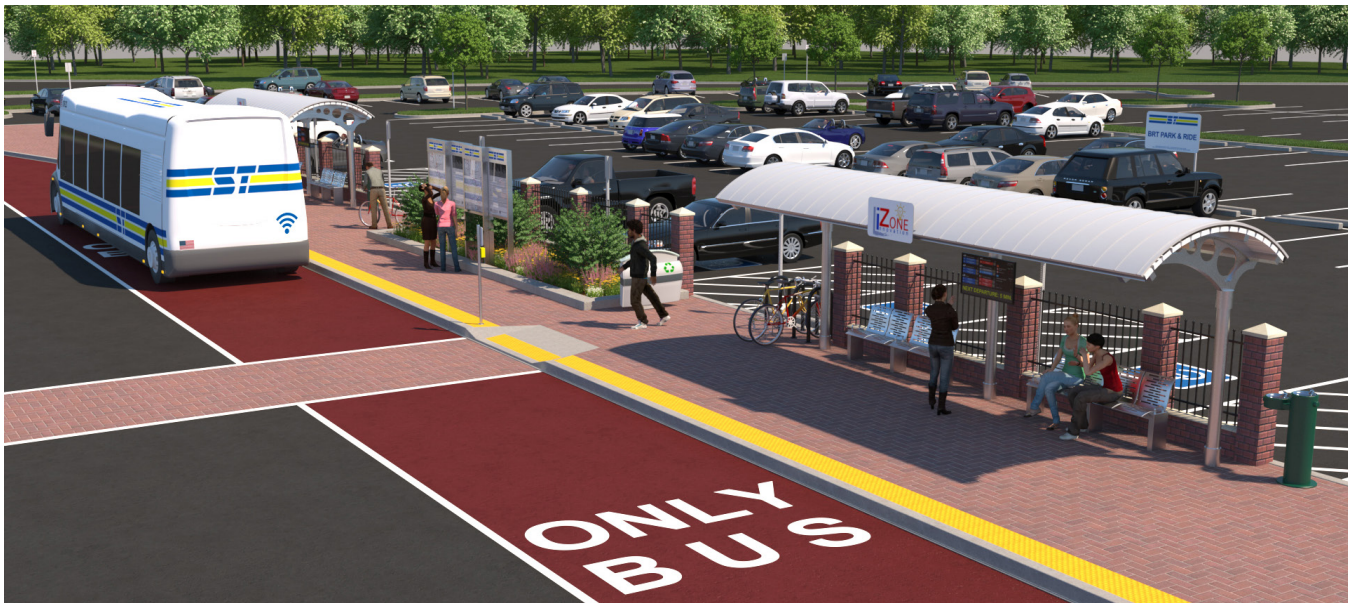


FIGURE 34: Rendering of Typical Nicolls Road BRT Station Area
Source: Parsons Brinckerhoff

FIGURE 35: Rendering of Multi-Modal Nicolls Road Corridor
Source: Parsons Brinckerhoff

7.2 PROPOSED BRT ALIGNMENT

The alignment of the proposed BRT system is a hybrid of the three Short List Alternatives. Along different segments of Nicolls Road, the proposed BRT alignment would include either a:

» Median BRT transitway (based upon the Alternative E1 alignment);
» New dedicated BRT lane as the right-most travel lane (based upon the Alternative E2 alignment); or
» Repurposed shoulder as a dedicated BRT lane (based upon the Alternative E3 alignment), with minimal segments of mixed traffic.

The selected alignment best meets the projects goals and objectives, and it achieves the best balance of faster running times, access to trip generators, and capital cost.

The lengths of the proposed dedicated BRT lane and mixed traffic alignment segments along Nicolls Road are summarized in **Table 14** for the LPA (Route 1), and additional details are included in Appendix J. The difference in total mileage in the northbound and southbound directions for Route 1 is attributable to the locations of the NY 27/Sunrise Highway on- and off-ramps. Route 2 includes less total mileage along Nicolls Road because of the diversion off Nicolls Road between the LIE Service Roads and Patchogue-Holbrook Road.

As shown in **Table 14**, the vast majority of the route mileage along Nicolls Road would include a dedicated BRT lane, thereby enabling BRT to bypass traffic congestion. The addition of a dedicated BRT lane to Nicolls Road would also increase transportation system capacity, which is needed to address existing and projected future congestion that will likely result from regional population and employment growth as well as future development in the study area.

DIRECTION	ESTIMATED MILEAGE ALONG NICOLLS ROAD BETWEEN HEALTH SCIENCES DRIVE/SOUTH DRIVE AND NY 27/ SUNRISE HIGHWAY (ROUNDED TO THE NEAREST 0.1 MILES)				
	DEDICATED BRT LANE (SHORT LIST ALTERNATIVE)			MIXED TRAFFIC	TOTAL
	MEDIAN TRANSITWAY (ALTERNATIVE E1)	RIGHT-MOST TRAVEL LANE (ALTERNATIVE E2)	SHOULDER-RUNNING (ALTERNATIVE E3)		
Northbound	4.0	4.2	1.6	1.2	11.0
Southbound	3.9	4.0	1.7	1.6	11.2

TABLE 14: Summary of Proposed Dedicated BRT Lane and Mixed Traffic Alignment Segments along Nicolls Road for the LPA (Route 1)

Source: Parsons Brinckerhoff; GPI

Figure 36 and **Figure 37** show the full alignment for the two proposed BRT routes, as well as proposed locations for TSP and queue jumps at signalized intersections. In total, there are 45 signalized intersections along both proposed BRT routes, including 12 signalized intersections along Nicolls Road. At this preliminary stage of analysis, and consistent with the approach used for the Short List Alternatives as previously discussed, TSP is proposed at all signalized intersections along the two BRT routes for the LPA with the exception of two: Nicolls Road at NY 347, and Nicolls Road at the Setauket Fire District driveway.

For both routes, queue jumps are proposed at the following intersections as feasible given existing roadway geometry:

» Health Sciences Drive/Shirley Kenny Drive at Nicolls Road (westbound/northbound only)

» Health Sciences Drive at Stony Brook University Hospital north entrance (southbound only)

» Health Sciences Drive at Stony Brook University Hospital main entrance (southbound only)

» LIE North Service Road at Holbrook Road (one-way heading westbound/southbound)

» LIE South Service Road at Holbrook Road (one-way heading eastbound/northbound)

» LIE South Service Road at CR 19 (one-way heading eastbound/northbound)

» CR 19 at Somerset Drive (both northbound and southbound)

» CR 19 at Singingwood Drive (both northbound and southbound)

» CR 19 at Springmeadow Drive (both northbound and southbound)

» CR 19 at Sunrise Highway South Service Road (northbound only)

» CR 19 at Savannah Boulevard (southbound only)

» CR 19 at Briarcliffe College driveway (southbound only)

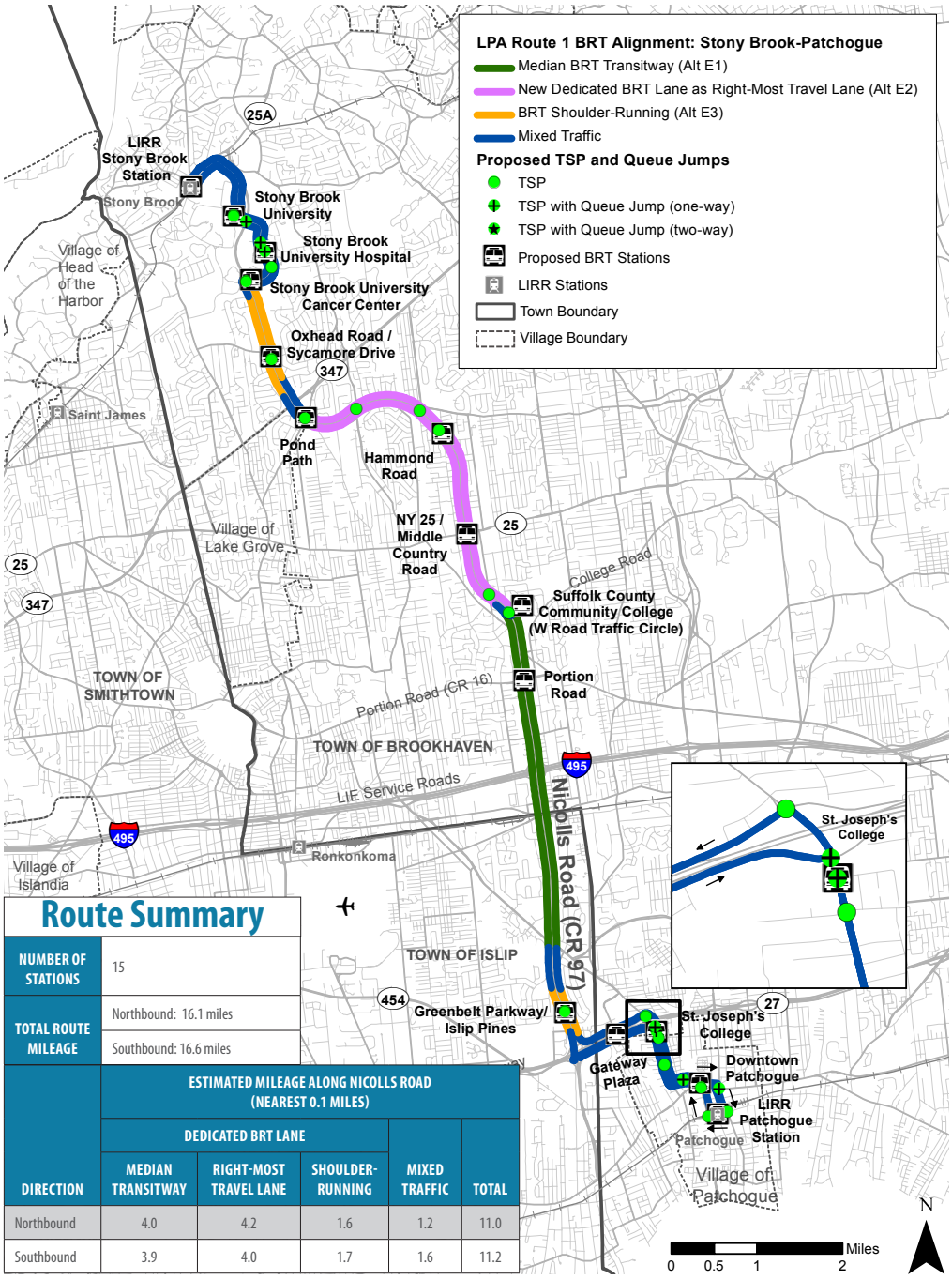
» Montauk Highway at North Ocean Avenue (southbound only)

Traffic analysis and jurisdictional coordination with the entities that own, operate, and maintain the traffic signals along the BRT routes would be required to confirm the feasibility and effectiveness of TSP and queue jumps at the proposed locations.

Details of the alignment for the LPA along Nicolls Road are discussed from south to north in the following section, and additional considerations for Preliminary Engineering are discussed in Section 8. Conceptual engineering plans are included in Appendix J and show the proposed alignment, station locations, pedestrian access, and any necessary modifications to the existing roadway, both on and off Nicolls Road.

FIGURE 36: Proposed Route 1 BRT Alignment for the LPA

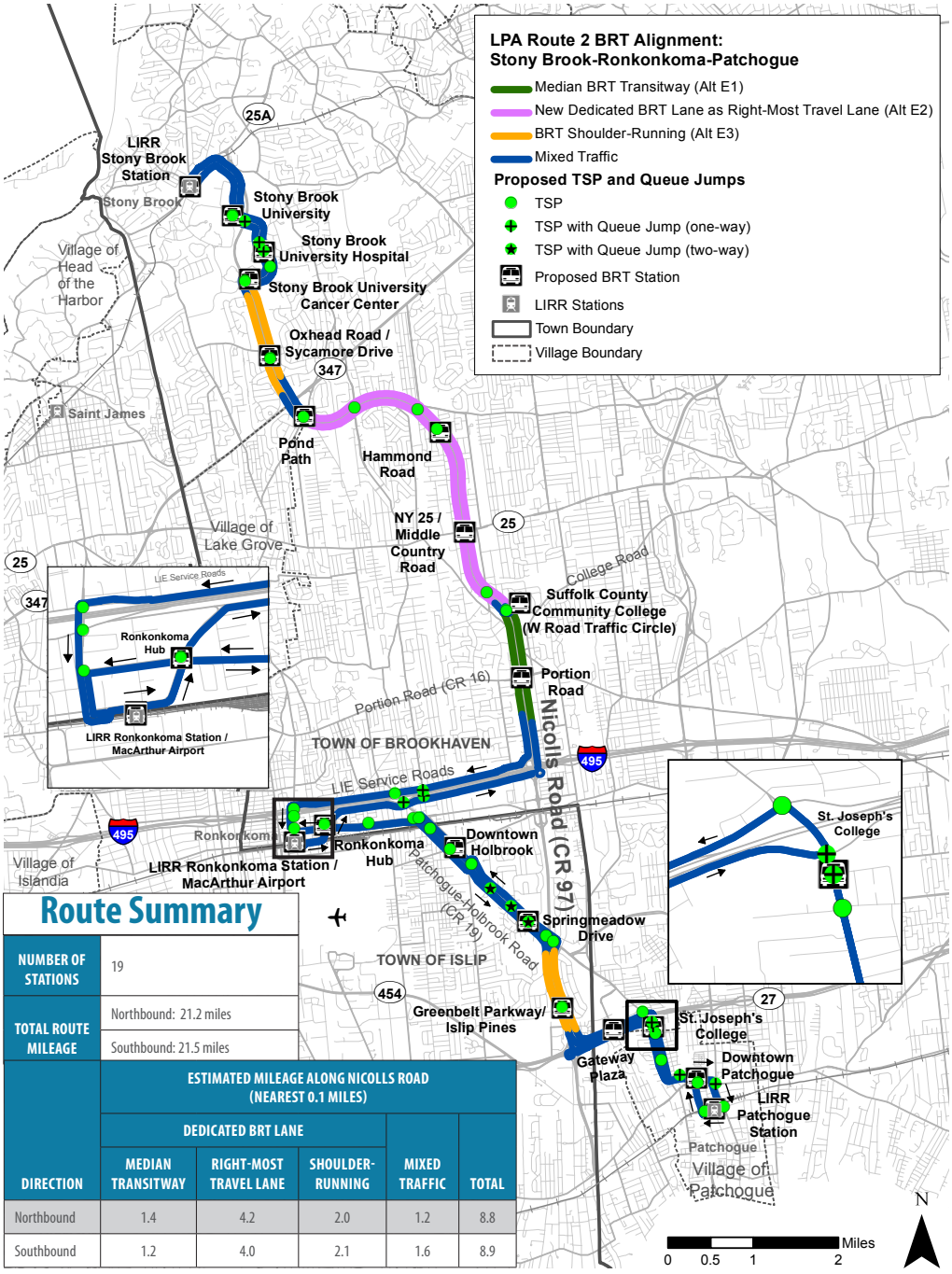
Source: NYS GIS Program Office, Suffolk County, Parsons Brinckerhoff, GPI



Route Summary

NUMBER OF STATIONS	15
TOTAL ROUTE MILEAGE	Northbound: 16.1 miles
	Southbound: 16.6 miles

DIRECTION	ESTIMATED MILEAGE ALONG NICOLLS ROAD (NEAREST 0.1 MILES)				
	DEDICATED BRT LANE			MIXED TRAFFIC	TOTAL
	MEDIAN TRANSITWAY	RIGHT-MOST TRAVEL LANE	SHOULDER-RUNNING		
Northbound	4.0	4.2	1.6	1.2	11.0
Southbound	3.9	4.0	1.7	1.6	11.2



Route Summary

NUMBER OF STATIONS	19
TOTAL ROUTE MILEAGE	Northbound: 21.2 miles
	Southbound: 21.5 miles

DIRECTION	ESTIMATED MILEAGE ALONG NICOLLS ROAD (NEAREST 0.1 MILES)				
	DEDICATED BRT LANE			MIXED TRAFFIC	TOTAL
	MEDIAN TRANSITWAY	RIGHT-MOST TRAVEL LANE	SHOULDER-RUNNING		
Northbound	1.4	4.2	2.0	1.2	8.8
Southbound	1.2	4.0	2.1	1.6	8.9

FIGURE 37: Proposed Route 2 BRT Alignment for the LPA

Source: NYS GIS Program Office, Suffolk County, Parsons Brinckerhoff, GPI

7.2.1 BRT ALIGNMENT ALONG NICOLLS ROAD BETWEEN NY 27/SUNRISE HIGHWAY AND HEALTH SCIENCES DRIVE/SOUTH DRIVE

The dedicated BRT lane would begin immediately north of NY 27/Sunrise Highway by reconstructing and widening the existing right shoulder (Alternative E3 alignment). At the signalized intersection of Nicolls Road and Greenbelt Parkway, the shoulder would be used as a right turn lane, and mixed traffic would have to weave across the dedicated BRT lane to enter and exit Nicolls Road. During Preliminary Engineering, the proposed southbound BRT alignment and station location in the vicinity of Greenbelt Parkway may be modified to help address existing queue spillback and related safety problems.

The shoulder-running alignment would continue until a location south of Patchogue-Holbrook Road, where the BRT alignment would transition to a median transitway (Alternative E1 alignment), which would continue uninterrupted as far as W Road. This transition to the median would occur approximately ½-mile south of Patchogue-Holbrook Road to provide sufficient distance for the weaving movement from the shoulder to the median. The proposed shoulder-running alignment segment south of Patchogue-Holbrook Road would enable a smooth transition for Route 2 to turn off Nicolls Road in the northbound direction and turn on to Nicolls Road in the southbound direction.

Along the median transitway portion of the proposed alignment, the grass median width of approximately 46 feet would provide sufficient space to provide a two-way dedicated transitway and a buffer between the dedicated BRT lanes and the general use lanes. An exception is where bridges are encountered over Patchogue-Holbrook Road, Furrows Road/Long Island Avenue, and Portion Road. These structures were built with a sufficiently wide left shoulder that would allow the BRT to continue in a dedicated lane adjacent to the left travel lane. Similarly, Nicolls Road goes under bridges at the LIE and at Division Street that have center piers protected by guide rail, which would require the BRT lane to shift closer to the left travel lane in both directions, but it would still be possible to maintain a continuous dedicated BRT lane.

The median transitway alignment would avoid operational constraints at the high-traffic-volume interchange of Nicolls Road at the LIE. Specifically, since the median transitway would be separated from the general purpose lanes, mixed traffic would be able to enter and exit Nicolls Road without having to weave across the dedicated BRT lane, thereby minimizing potential vehicular conflicts at this location.

North of the LIE, BRT vehicles operating on Route 2 would enter and exit the median transitway by weaving across the mixed traffic lanes. The precise location and design for this transition will be determined during Preliminary Engineering. This transition would occur approximately ½-mile north of the LIE to provide sufficient distance for the weaving movement. Along a portion of the median, the raised island would be removed to allow BRT vehicles to exit southbound and enter northbound.

At W Road, after the alignment diverts off Nicolls Road for the BRT to serve the proposed SCCC BRT station within the traffic circle, the alignment would transition to a new dedicated BRT lane as the right-most travel lane, located between the general purpose lanes and the shoulder in each direction (Alternative E2 alignment). All BRT turning movements at the W Road intersection would be signal-controlled. This alignment, which would continue north until Pond Path, would be created by converting the existing right travel lane into a BRT lane and constructing an additional general purpose travel lane in both directions from the existing grass median. Along this portion of the alignment, the existing median width is typically 46 feet wide and could accommodate the additional travel lanes without changing the alignment of the current travel lanes of Nicolls Road in most locations. Where signalized intersections are encountered, the existing left turn lane in both directions would be used as through travel lanes and new left turn lanes would be constructed adjacent to these lanes.

Along this portion of the alignment, the use of the right lane for dedicated BRT would introduce weaving for mixed traffic that is entering or exiting Nicolls Road at intersections and interchanges. This would be comparable to the shoulder-running portion of the alignment farther south at Greenbelt Parkway. In the northbound direction along Nicolls Road, non-BRT vehicles that wish to exit at NY 25/Middle Country Road would need to use the BRT lane for a short distance to access the exit ramp. Similarly, non-BRT vehicles that are destined for southbound Nicolls Road from NY 25/Middle Country Road would have to enter the BRT lane from the on-ramp for a short distance to access the mixed traffic lanes. The appropriate signing and pavement markings will be developed during future design phases to ensure smooth traffic operations.

Between Pond Path and NY 347, BRT would operate in mixed traffic by merging out of the dedicated BRT lane and into the adjacent general purpose lane. A dedicated BRT lane is not proposed along this segment because the existing median is narrow, reconstruction of the roadway would be required, and ROW acquisition would likely be needed to realign and reconstruct the roadway. This is a relatively short segment (about ½-mile) of the Corridor.

North of NY 347, BRT would operate in a dedicated lane along those portions of the Corridor that could accommodate a reconstructed and widened shoulder (Alternative E3 alignment) until Health Sciences Drive/South Drive.

Along the full Nicolls Road alignment between NY 27/Sunrise Highway and Health Sciences Drive/South Drive, it would be necessary to clearly delineate and sign the proposed BRT lanes. Where lanes would be dedicated for BRT-only operation, a different color pavement, lettering on the pavement, and overhead mast-arm signage at regular intervals and other techniques would be recommended to ensure that motorists understand that the lanes are for the exclusive use of BRT. Similarly, when BRT is proposed to operate in general purpose lanes, signing and markings that define the beginning and end of sections where mixed traffic would be permitted would be important to maintain an orderly traffic flow.

7.2.2 BRT ALIGNMENT OFF OF NICOLLS ROAD

Due to ROW constraints off Nicolls Road, BRT service is proposed to operate in mixed traffic along those portions of the two routes that use roadways other than Nicolls Road. To improve travel time for BRT off Nicolls Road, TSP is proposed at all signalized intersections, and queue jumps are proposed wherever feasible.

The proposed BRT alignment off of Nicolls Road includes the following:

» Routes 1 and 2: between the LIRR Patchogue Station and NY 27/Sunrise Highway at Nicolls Road via primarily CR 19 and NY 27/Sunrise Highway

» Route 2: between CR19 at Nicolls Road and the LIE at Nicolls Road via primarily CR 19, Main Street, Union Avenue, and the LIE Service Roads

» Routes 1 and 2: within the W Road traffic circle at the Suffolk County Community College campus

» Routes 1 and 2: between Nicolls Road at Health Sciences Drive/South Drive and the LIRR Stony Brook Station via Health Sciences Drive, Shirley Kenny Drive, and Circle Road

7.3 OPERATIONS ANALYSIS OF THE LPA

The operating plans for the two BRT routes were guided by the same service policy assumptions as the Short List Alternatives (refer to Section 6.3.4), including 10-minute headways during the weekday peak period and 15-minute headways during the weekday off-peak period, which may be refined during subsequent stages of Project Development. The combination of a long span of service and a high frequency of service—as well as enhanced vehicles and travel time savings—would help to brand BRT as a distinct, premium transit option compared to existing local bus service.

7.3.1 VEHICLE ASSUMPTIONS

The recommended BRT vehicles are 40-foot-long hybrid diesel-electric transit coaches that are consistent with the Suffolk County Transit fixed-route bus fleet. During the AA process, there was some discussion about using smaller buses, but the cost of 35-foot-long buses is not materially less than 40-foot-long buses. Additionally, there are far more choices of appealing BRT vehicles at the 40-foot-long size.

Fare collection technology is evolving very rapidly, allowing for more convenience for the customer and easier processing for the bus operator. Whatever technology is adopted, it would need to integrate with existing Suffolk County Transit operations, while also allowing for the adoption of mobile fare pre-payment technology that is currently under development by Suffolk County Transit. Another option is the MTA's New Fare Payment System, which is several years away from implementation. This system will allow customers to use a credit card or phone to pay transit fares. Once the system is operational, the County should explore whether to adopt the system for BRT fare collection. If the New Fare Payment System incorporates LIRR ticketing, then an even stronger case can be made for adoption by Suffolk County.

Aesthetic enhancements to the vehicles, including eye-catching paint schemes, styling options, and interior amenities (**Figure 38**), would help to brand and differentiate BRT as a premium service. Wi-Fi

FIGURE 38: Sample Interior Images of BRT Vehicles and Mobile Fare Pre-Payment Technology Example
Source: Nova/Volva, NICE Bus

technology would be included as an added customer amenity. As previously noted, the use of low-floor vehicles would enable level boarding by decreasing the vertical gap between the station-area sidewalk and the vehicle floor, thereby enabling faster boarding and alighting for all customers, including the disabled and elderly. The vehicles would also be equipped with technology to communicate with a central traffic control system or with individual traffic signal controllers to activate TSP at signalized intersections.

The fleet requirement for the LPA, which informed the order-of-magnitude capital cost for implementation, is discussed in Section 7.5.

7.3.2 TRAVEL TIME ESTIMATES

Travel time estimates were generated for the LPA by applying the methodology used for the Short List Alternatives (refer to Section 6.3.4). The operations analysis demonstrated that travel by BRT would result in time savings compared to travel by local bus and even travel by automobile.

According to current Suffolk County Transit schedules, it would take approximately 65 minutes to travel from the LIRR Stony Brook Station to the LIRR Patchogue Station (plus a transfer between the S71 and S63 at SCCC), compared to an estimated 45-minute one-seat-ride on BRT. Travel time by local bus does not account for waiting time to make the transfer at SCCC, which can range from 30 minutes to 90 minutes depending on the time of day.

Including the transfer between local bus routes, travel by BRT would result in **time savings ranging from 50 minutes to nearly two hours compared to travel by local bus** between Stony Brook and Patchogue.

At certain times of day, BRT is projected to also be faster than automobile trips. The greatest time savings would be achieved along the main spine of the Nicolls Road Corridor where existing traffic congestion is most pronounced. Between Oxhead Road/Sycamore Drive and Greenbelt Parkway, **travel by BRT is projected to result in time savings of nearly 10 minutes compared to driving** in the southbound direction during the peak period. When the time to get from a parking lot to the traveler's destination is factored in at locations such as the colleges and the hospital, the time savings for BRT as compared to automobile trips would be even greater. Furthermore, as traffic congestion is projected to increase in the future, the

travel time benefits of a dedicated lane BRT service along Nicolls Road would be even greater, which will likely result in some shifts from driving in single-occupant vehicles to BRT.

Estimated travel times and average speeds in each direction for each proposed BRT route, and for the peak and off-peak periods, are summarized in **Table 15**. The table also shows a comparison between travel by automobile and travel by BRT, demonstrating that projected BRT travel speeds would be comparable to automobile travel speeds. In the southbound direction for both Routes 1 and 2, **travel by BRT is projected to result in a shorter trip time than travel by automobile during the peak period** (i.e., approximately five minutes shorter for Route 1 and three minutes shorter for Route 2). While this may seem surprising, it is very feasible when a BRT system operates in a dedicated runningway and the mixed traffic lanes are subject to heavy congestion. This is a very promising development because the BRT system would make stops for customers to board and alight, whereas people traveling in automobiles do not have to make such stops. This means that between stations, **the BRT system—unconstrained by traffic congestion in its dedicated lane—would be traveling at a higher speed than general traffic, which would result in reduced trip times.** Additionally, many BRT customers could experience an improved quality of travel, no longer needing to spend their travel time driving a car.

Overall, the average net BRT travel speeds are projected to be 22-23 miles per hour (mph) along Route 1, and 19-20 mph along Route 2. **These travel speeds are comparable to, and in fact higher than, several BRT systems that currently operate in the United States** (**Table 16**).

Appendix J presents proposed weekday (Monday – Thursday) timetables for the two proposed BRT routes, reflecting the service policy assumptions and travel time estimates. To maximize ridership potential, the timetables include an offset of departure times for the two proposed BRT routes in the southbound direction such that there would functionally be a reduced headway (i.e., greater frequency of service) along the overlapping portions of the two routes. Thus, between Stony Brook and Portion Road, this AA modeled a five-minute interval with Routes 1 and 2 combined. During Preliminary Engineering, additional information will be available to further refine the ridership model, and it may be determined that different frequencies may be proposed for the BRT service.

7.4 RIDERSHIP FORECAST FOR THE LPA

Table 17 through **Table 19** summarize the results of the ridership forecast for the LPA in the horizon year (2040); ridership forecasts for the LPA in the current year (2014) are included in Appendix J. As shown in **Table 17**, the Year 2040 Build scenario attracts a total of approximately 2,240 weekday boardings on the two proposed BRT routes (combined), in addition to approximately 3,550 weekday boardings on the existing Suffolk County Transit Corridor Routes. The total projected ridership of all routes combined (i.e., both BRT routes and the existing Suffolk County Transit Corridor Routes) is approximately 5,790 weekday boardings, an increase of approximately 1,790 (approximately 45%) compared to total ridership in the

	ESTIMATED TRAVEL TIME (AVERAGE SPEED) (ROUNDED TO THE NEAREST 1 MINUTE AND 1 MPH)							
	ROUTE 1: STONY BROOK-PATCHOGUE				ROUTE 2: STONY BROOK-RONKONKOMA-PATCHOGUE			
	SOUTHBOUND		NORTHBOUND		SOUTHBOUND		NORTHBOUND	
	PEAK	OFF-PEAK	PEAK	OFF-PEAK	PEAK	OFF-PEAK	PEAK	OFF-PEAK
Automobile	51 min (20 mph)	42 min (24 mph)	40 min (24 mph)	39 min (25 mph)	72 min (18 mph)	60 min (22 mph)	64 min (20 mph)	60 min (21 mph)
BRT (LPA)	46 min (22 mph)	45 min (22 mph)	42 min (23 mph)	42 min (23 mph)	69 min (19 mph)	64 min (20 mph)	67 min (19 mph)	64 min (20 mph)

TABLE 15: Comparison of Estimated Travel Times and Average Speeds – BRT (LPA) and Automobile

Source: Google Maps; Parsons Brinckerhoff; Traffic Databank; GPI

No-Build scenario. The source of projected BRT ridership is a combination of approximately 450 existing Suffolk Country Transit customers shifting to the new service, as well as approximately 1,790 new transit users who previously used another mode of transportation. The increased patronage in the ridership forecast is due in large part to the revised routing along Main Street/Patchogue-Holbrook Road, the revised routing to serve the proposed SCCC station, and the improved service frequency due to the schedule offset.

Whereas **Table 17** presents the ridership forecast in terms of number of weekday boardings (i.e., "unlinked trips") on any given transit route or service, **Table 18** also presents the ridership forecast in terms of number of "linked trips," which count just the original boarding for all trips that connect home, work, and other origins or destinations. Accordingly, a trip that includes one transfer would be counted as two boardings/unlinked trips (i.e., one for the first vehicle that was boarded and another for the transfer) but one linked trip. As shown in **Table 18**, the number of linked trips was used to calculate the number of diverted private vehicle trips associated with the proposed BRT service (1,190), which in turn was used to calculate the percentage of BRT trips attributed to the diverted vehicle trips (53%). The ridership forecast also demonstrated that **implementation of the two proposed BRT routes would result in a reduction of approximately 16,550 daily vehicle miles traveled (VMT)** compared to the No-Build condition in the horizon year (2040).

Table 19 summarizes the number of projected weekday BRT boardings by mode of access for each proposed station. The proposed BRT station at the LIRR Ronkonkoma Station is projected to have the highest ridership (615 weekday boardings), which is more than double that of the LIRR Patchogue Station (265 weekly boardings), which is projected to have the second highest ridership. At these stations, the majority of BRT customers are projected to transfer from another transit service (either bus or rail). However, system-wide, more customers are projected to access BRT by walking (approximately 1,145) as opposed to transferring from another service (approximately 930). The percentage split in mode of access to the BRT system is approximately 51% walk, 42% transfer, and 7% kiss-ride/park-ride.

Overall, the ridership forecast projected that implementation of BRT along the Corridor would result in approximately 1,790 new weekday transit boardings in the horizon year (2040) compared to the No-Build condition, which corresponds to an approximately 45% increase in weekday transit boardings. Additionally, as discussed earlier, the projected ridership for the LPA is higher than the projected ridership for the Short List Alternatives, which could reflect—among other factors—the reduced travel time and added markets served for Route 2 under the LPA compared to that under the Short List Alternatives.

BRT SYSTEM	LOCATION	APPROXIMATE ROUTE DISTANCE (MILES)	PEAK TRAVEL TIME (MINUTES, PER SCHEDULE)	ESTIMATED NET PEAK TRAVEL SPEED (MPH)
Lane Transit District Emerald Express (EmX)	Eugene/Springfield, OR	4.0	16	15
Hillsborough Area Regional Transit (HART) MetroRapid	Tampa, FL	17.5	64	16
CDTA BusPlus	Albany/Schenectady, NY	17.0	62	17
KCATA MAX	Kansas City, MO	12.0	39	19
CT*fastrak*	Hartford/New Britain, CT	9.4	29	19
Nicolls Road BRT (Route 1, Northbound)	Suffolk County, NY	16.1	42	23

TABLE 16: BRT Travel Speeds for Sample BRT Systems in the United States

Sources: Lane Transit District; HART; CDTA; KCATA; CTfastrak; Parsons Brinckerhoff

ROUTE	2014 EXISTING (STOPS CALIBRATED ESTIMATE)[1]	2040 NO-BUILD	2040 BUILD
Proposed BRT Route 1	-	-	660
Proposed BRT Route 2	-	-	1,580
Subtotal, Proposed BRT Routes	-	-	2,240
Suffolk County Transit Corridor Routes	3,080	4,000	3,550
Total, All Routes	3,080	4,000	5,790
		Change in Total (vs. No-Build)	1,790

TABLE 17: Summarized Ridership Forecast for the LPA (Weekday Boardings, by Scenario)

Source: Suffolk County; RSG; STOPS Version 1.52; Parsons Brinckerhoff
Note: All numbers rounded to the nearest 10 boardings
[1] The ridership forecast for the LPA was prepared using an updated version of the STOPS model (specifically, V1.52 instead of V1.51). The output of the model included refined estimates for existing and No-Build conditions, as well as estimates for the Build condition that better reflect traveler mode preferences than under the previous version of the STOPS model.

	2040 BUILD
BRT Boardings	2,240
Incremental Linked Transit Person Trips (new transit = removed auto person trips)	1,310
Removed Auto Vehicle Trips (assumes 1.1 occupancy)	1,190
Percentage of Auto Vehicle Trips to BRT Trips	53%

TABLE 18: Summary of Diverted Vehicle Trips for Proposed Nicolls Road BRT System

Source: RSG; STOPS Version 1.52; Parsons Brinckerhoff
Note: All numbers rounded to the nearest 10 boardings/trips

	MODE OF ACCESS				
	WALK	KISS-RIDE	PARK-RIDE	TRANSFER	TOTAL, ALL MODES OF ACCESS
LIRR Stony Brook Station	15	-	-	70	85
Stony Brook University	10	-	-	-	10
Stony Brook University Hospital	65	-	-	10	75
Stony Brook University Cancer Center	95	-	-	-	95
Oxhead Road/Sycamore Drive	75	-	5	15	95
Pond Path	85	5	5	-	95
Hammond Road	100	15	10	-	125
NY 25 / Middle Country Road	45	5	5	20	75
Suffolk County Community College	70	10	-	-	80
Portion Road	65	10	10	10	95
LIRR Ronkonkoma Station / MacArthur Airport	35	5	10	565	615
Ronkonkoma Hub	35	-	-	-	35
Downtown Holbrook	55	-	-	-	55
Springmeadow Drive	70	-	-	-	70
Greenbelt Parkway/Islip Pines	85	10	15	-	110
Gateway Plaza	55	5	20	5	85
St. Joseph's College	60	5	-	30	95
Downtown Patchogue	50	-	-	30	80
LIRR Patchogue Station	75	5	10	175	265
TOTAL, ALL BRT STATIONS	1,145	75	90	930	2,240

TABLE 19: BRT Station Ridership Forecast (Weekday Boardings, by Mode of Access, 2040)

Source: RSG; STOPS Version 1.52; Parsons Brinckerhoff
Note: All numbers rounded to the nearest five boardings; sum of boardings at individual stations does not equal total boardings as reported in Table 17 due to disaggregation of data

It is important to note that ridership will likely be higher than currently projected due to a number of additional factors:

» The continued growth of MacArthur Airport as a regional economic driver will likely expand ridership potential for the proposed BRT system. As air traffic continues to grow at New York City's three primary airports, the secondary airports (MacArthur, Westchester and Newburgh) will inevitably see additional traffic as well. Air travelers greatly value the convenience of smaller airports but they are hard to access under current conditions.

» As previously noted, the I-Zone vision is anchored by a multi-modal plane, train and BRT station at Ronkonkoma that would greatly enhance transit connectivity. Additionally, the possibility of adding international flights to/from MacArthur Airport could also boost long-term BRT ridership potential. According to a January 2016 press release, New York State Governor Andrew Cuomo's 2016 agenda calls for expanding a federal inspection station at MacArthur Airport that is estimated to generate 1,200 new jobs in addition to paving the way for international air travel at MacArthur Airport. The combination of additional airport employees and more travelers, in conjunction with the long-term vision for the new terminal, will serve to increase BRT ridership.

» Future transit-supportive development opportunities within the study area—in addition to Ronkonkoma Hub and Islip Pines—will likely add to the potential ridership base of the BRT system. Improved transit service on the Corridor, when coordinated with effective land use planning and zoning, can provide a transportation spine to anchor development around a series of transit nodes, consistent with the *Connect Long Island* plan and the I-Zone. Indeed, the proposed BRT system could catalyze transit-supportive development, thereby generating additional potential riders for the BRT service.

» The model does not reflect integration of the SBU Transit system with the proposed BRT system.

» The regionally-significant Ronkonkoma Hub and Islip Pines developments are located in very large transportation analysis zones (TAZs) that dilute the concentration of development expected for the area, which in turn may dilute the ridership projection.

» Travel time savings associated with implementation of TSP and queue jumps will likely be greater than what is reflected in the current BRT operating plans.

» The model does not currently include details about capacity or pricing of parking at LIRR stations.

7.5 ORDER-OF-MAGNITUDE COST ESTIMATES FOR THE LPA

Based on the conceptual engineering and operations planning efforts, order-of-magnitude capital and O&M cost estimates were prepared for the LPA using the methodology outlined for the Short List Alternatives (refer to Section 6.3.6). The cost estimates will be refined as appropriate as the project advances through NEPA and Project Development, reflecting the continuous nature of the cost estimating process.

7.5.1 CAPITAL COST

As shown in **Table 20**, the total order-of-magnitude capital cost for the LPA was calculated as the sum of the capital cost for the proposed BRT system and the capital cost for the proposed hiking/biking trail. The capital cost for the proposed BRT system is approximately $185 million and includes construction costs, ROW costs, and vehicle costs (based on a fleet requirement of 30 vehicles), with the balance covering soft costs/professional services and contingencies. It was assumed that the cost of any storage/maintenance facilities would be borne by the vendor. The capital cost for the proposed hiking/biking trail is approximately $15 million, although this estimate is based on a preliminary assessment of the potential alignment for the hiking/biking trail. In total, the capital cost for the LPA is approximately $200 million, which is within the range of capital cost estimates for the Short List Alternatives (i.e., between $166 million for Alternative E3 and $217 million for Alternative E1).

The total costs are expressed in 2015 dollars and are for planning purposes only. The estimates do not reflect the costs of a longer building period where midpoint of construction costs would be calculated. A detailed line item estimate based on the conceptual engineering is provided in Appendix J.

The capital cost for the proposed BRT system reflects the hybrid nature of the LPA that includes a combination of elements from each of the Short List Alternatives, most notably the BRT alignments/guideway. Implementation

TABLE 20: Order-of-Magnitude Capital Cost Estimate for the LPA

Source: Parsons Brinckerhoff; GPI; Toscano Clements Taylor; Suffolk County
[1] Includes $25 million for noise wall

FTA STANDARD COST CATEGORIES (SCC) ITEM	TOTAL COST (2015$)
Guideway	$17,350,000
Stations	$9,200,000
Support Facilities	$0
Sitework and Special Conditions[1]	$54,530,000
Systems	$430,000
Construction Subtotal	$81,510,000
Right-of-Way (ROW)	$1,630,000
Vehicles	$22,500,000
Subtotal (Construction + ROW + Vehicles)	$105,650,000
Soft Costs/Professional Services (40%)	$33,260,000
Contingency (40%)	$46,560,000
Subtotal, BRT (2015$)	$185,460,000
Subtotal, Hiking/Biking Trail (2015$)	$14,960,000
Total (2015$)	$200,430,000

The HealthLine in Cleveland, Ohio has been cited as a national model for economic development catalyzed by public investment in BRT
Source: Transportation Issues Daily

of the median transitway (Alternative E1) portion of the proposed alignment would require paving most of the existing grass median to accommodate BRT and construction of a raised concrete median to separate BRT from the mixed traffic lanes. This would also require extensive drainage work to address the increase in impervious surface area associated with this alignment. The addition of a new dedicated BRT lane as the right-most travel lane (Alternative E2) along a portion of Nicolls Road would require less drainage work because a smaller amount of grass median would be paved. This portion of the proposed alignment would also require intersection alterations (i.e., reconstruction of left turn lanes). The shoulder-running (Alternative E3) segments would be the least expensive portion of the proposed dedicated lane alignment due to the addition of less new pavement, the lack of disturbance to the existing grass median (thereby resulting in the least impact on drainage), and because it would not require alignment changes to turn lanes or travel lanes.

As under each of the Short List Alternatives, the capital cost estimate for the LPA includes a noise wall with an estimated order-of-magnitude cost of $25 million. Detailed studies will be prepared in subsequent design stages, which will enable a more refined cost estimate of noise abatement measures.

Overall, the LPA would have total and per mile capital costs (approximately $200 million total and $8.5 million per route mile) that are comparable to, and in fact lower than, several BRT systems in the United States (**Table 21**). This includes the Cleveland HealthLine (approximately $200 million total and $21.3 million per mile), which is regularly cited as a model for how BRT can promote economic development. Indeed, the Cleveland HealthLine has generated approximately $5 billion in economic value through redevelopment policies and planning in conjunction with implementation of the BRT system. Based on research completed for the ongoing CT*fastrak* TOD planning initiative, other noteworthy BRT systems that have generated economic value include the Denver 16th Street Mall service ($1 billion) and the Los Angeles Red Line service ($500 million). Suffolk County and the region could derive a return on investment through implementation of the Nicolls Road BRT system.

The estimated capital cost will be refined as necessary during Preliminary Engineering and Final Design.

7.5.2 O&M COST

As shown in **Table 22**, the total O&M cost for the proposed BRT system ($12.4 million) was calculated as the sum of the O&M cost for each of the two BRT routes. The estimated O&M costs accounted for the BRT service only, excluding costs associated with increased highway maintenance, off-board fare collection, the proposed hiking/biking trail, and any potential park/kiss-and-ride lots.

The annual O&M cost for Route 2 ($7.0 million) would be higher than for Route 1 ($5.4 million) because of the greater distance and thus the greater number of annual vehicle revenue miles associated with this route. However, the modified, more streamlined routing for Route 2 (i.e., using Main Street/Patchogue-Holbrook Road instead of NY 454/Veterans Memorial Highway) reduces the mileage compared to the Short List Alternatives, which results in a reduction in O&M costs. As such, the total O&M cost for the proposed BRT system ($12.4 million) is less than the total O&M cost for any of the Short List Alternatives, which ranged from $12.9 million under Alternative E1 to $14.2 million under Alternative E3.

The estimated O&M cost will be refined as necessary during Preliminary Engineering and Final Design.

Overall, the LPA was defined by selecting the most suitable elements from each of the Short List Alternatives to design a BRT system that best meets the project's Purpose and Need. As a hybrid of the Short List Alternatives, the LPA addresses several shortcomings of the individual alternatives as demonstrated in the Short List Screening.

BRT SYSTEM	LOCATION	APPROXIMATE ROUTE DISTANCE (MILES)	APPROXIMATE CAPITAL COST	APPROXIMATE CAPITAL COST PER MILE
Montgomery County Rapid Transit System (four corridors)*	Montgomery County, MD	39.0	$1.603 billion	$41.1 million
CT***fastrak***	Hartford/New Britain, CT	9.4	$573 million	$61.0 million
Port Authority of Allegheny County West Busway	Pittsburgh, PA	8.1	$327 million	$40.4 million
Greater Cleveland Regional Transit Authority (RTA) HealthLine	Cleveland, OH	9.4	$200 million	$21.3 million
Nicolls Road BRT	Suffolk County, NY	23.5**	$200 million	$8.5 million
King County Metro Transit B Line	Seattle, WA	10.0	$190 million	$19.0 million
King County Metro Transit A Line	Seattle, WA	11.0	$190 million	$17.3 million
Port Authority of Allegheny County of Martin Luther King, Jr. East Busway	Pittsburgh , PA	9.1	$115 million	$12.6 million
MBTA Silver Line Phase I	Boston, MA	2.4	$26 million	$10.8 million
LYNX LYMMO	Orlando, FL	3.0	$21 million	$7.0 million

TABLE 21: Capital Cost Comparisons for Sample BRT Systems in the United States

Source: National BRT Institute; Montgomery County Transit Authority
* Planned BRT system; not yet operational
** Includes non-duplicating mileage of both routes

ROUTE	ANNUAL VEHICLE REVENUE MILES	TOTAL ANNUAL O&M COST (2015$)[1]
Route 1: Stony Brook-Patchogue	899,480	$5,373,000
Route 2: Stony Brook-Ronkonkoma-Patchogue	1,174,550	$7,016,000
Total, All Routes	2,074,030	$12,389,000

TABLE 22: Order-of-Magnitude Annual O&M Cost Estimates for the LPA

Source: Parsons Brinckerhoff; Suffolk County
[1] Based on a cost of $5.97363 per revenue mile

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8 NEXT STEPS FOR IMPLEMENTATION

The purpose of the Nicolls Road AA was to define and evaluate alternatives for transit investment in the study area to arrive at a recommendation for an LPA that would best address the project Purpose and Need and goals and objectives. Through a multi-tiered screening process, the AA identified a preferred Nicolls Road BRT system that would include two routes operating between Stony Brook and Patchogue, with one route diverting to Ronkonkoma. The LPA will likely be refined in the Project Development process that will follow this AA.

8.1 FTA PROJECT DEVELOPMENT

While the forthcoming Nicolls Road BRT Preliminary Engineering work is utilizing Federal Highway Administration (FHWA) funding, it is anticipated that the Federal Transit Administration (FTA) Small Starts program will likely be one of the key funding options to be pursued to help pay for implementation, and thus ongoing coordination will be necessary with both FHWA and FTA. Small Starts is a discretionary grant program administered by the FTA that provides federal grants to transit capital investments. Small Starts provides support for eligible projects less than $250 million in cost that are seeking less than $75 million in federal grants.

Project Development is a required step in the federal process to be eligible for the FTA Small Starts grant program (**Figure 39**). Following this AA, the next step in the federal process is to request entry into Project Development. Elements of the request to enter Project Development include—but are not limited to—a discussion of the proposed project and alternatives under consideration, a cost estimate for the proposed project, the anticipated project timeline, and identified funding sources.

As discussed in the following sections, Project Development includes Preliminary Engineering and Final Design, environmental review and associated studies, financial planning/documentation of local financial commitment, and ongoing agency coordination and stakeholder/public engagement. The work completed in Project Development will inform potential refinements to the LPA. Potential concepts for consideration in Project Development are summarized in **Table 23**.

8.2 PRELIMINARY ENGINEERING AND FINAL DESIGN

This AA included the preparation of alignment plans at a conceptual level of engineering (Appendix J), which generally depicted the elements of the proposed project in enough detail to estimate order-of-magnitude capital costs and identify potential geometric design constraints. The Preliminary Engineering phase will entail site-specific topographic and ROW survey and basemapping as necessary to complete approximately 30% engineering

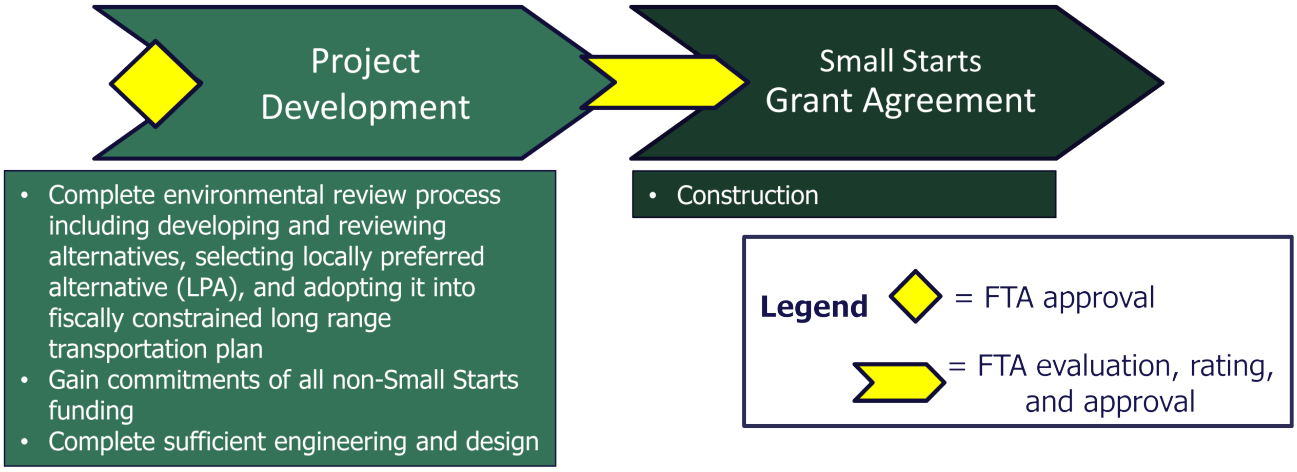

FIGURE 39: FTA Small Starts Process
Source: FTA

CONCEPT	DESCRIPTION
• Refine the BRT alignment on Nicolls Road based on existing traffic safety and operational issues	• Identify treatments in the vicinity of Greenbelt Parkway to help address existing queue spillback and related safety problems • Identify treatments in the vicinity of the LIE to help address existing weaving conflicts while accommodating a dedicated BRT lane • Identify treatments in the vicinity of SCCC to minimize conflicts between BRT vehicles accessing the proposed station within the W Road traffic circle and motorists entering the campus; also consider opportunities to bring the BRT as close to the center of campus as possible
• Define the details of the proposed BRT system	• Explore different options for identifying the dedicated BRT lanes, potentially including colored pavement, pavement markings, signage, etc. (with consideration for ongoing operational, maintenance, and life cycle costs for the Suffolk County Department of Public Works) • Consider different vehicle and station design options, incorporating the recommendations from the forthcoming *Suffolk County BRT Design Standards Study*
• Conduct detailed planning and design of the Nicolls Road hiking/biking trail	• Determine the specific routing and alignment of the hiking/biking trail to comply with design guidelines and minimize roadside hazards • Determine the routing for segments off Nicolls Road to create a continuous trail, effectively integrated with residential neighborhoods • Identify logical termini at both ends of the trail, and consider extensions of the trail to promote integration with the bicycle/pedestrian network within SBU and the Village of Patchogue, as well as connections to the Patchogue-Watch Hill Ferry Terminal
• Refine the proposed BRT routing to serve a new state-of-the-art airport terminal on the north side of MacArthur Airport	• Consider relocating the proposed BRT station at the LIRR Ronkonkoma Station from the north side of the LIRR tracks to the south side, incorporating the findings from the forthcoming Ronkonkoma Railroad Station/Long Island MacArthur Airport-Train to Plane Connectivity Study
• Refine the assumptions about kiss-/park-and-ride lots and facilities	• Specify the locations, capacity, and pricing of parking at LIRR stations and proposed kiss-/park-and-ride lots and facilities, incorporating the findings from the ongoing *Ronkonkoma Hub – Nicolls Road Corridor Parking Analysis*
• Define the specific locations of proposed BRT stations with pedestrian access limitations	• Consider different options for serving proposed stations at grade-separated interchanges (Nicolls Road at NY 25/Middle Country Road and Portion Road) and at locations that would require a pedestrian overpass (Gateway Plaza on Sunrise Highway)
• Modify service policy and/or fare policy assumptions for the BRT system	• Consider integrating the SBU Transit system with the proposed BRT system • Consider proposing different service policies (i.e., frequency and span of service) for one or both BRT routes • Consider proposing different fares and/or transfer fees for the BRT routes compared to existing Suffolk County Transit fare policy • Explore opportunities for coordinated ticketing policies with the LIRR
• Revisit the intersections proposed for TSP and queue jumps (in conjunction with detailed traffic analysis and modeling to understand potential impacts)	• Coordinate with agencies responsible for signal operation and maintenance to confirm viability of TSP and queue jumps, and identify software and hardware requirements for each location
• Coordinate with local municipalities and NYSDOT to implement station-area pedestrian improvements	• Explore opportunities for intersection enhancements near BRT stations and elsewhere along Nicolls Road, as well as along intersecting side streets

TABLE 23: Potential Concepts for Consideration in Project Development

Source: Parsons Brinckerhoff, GPI

[Continued on next page]

TABLE 23, Continued: Potential Concepts for Consideration in Project Development

Source: Parsons Brinckerhoff, GPI

CONCEPT	DESCRIPTION
• Modify the assumptions for the underlying transit service in the horizon year	• In collaboration with Suffolk County, consider proposing modifications to existing Suffolk County Transit local bus service • In collaboration with the LIRR, consider refining the assumptions for future service on one or more of the branches within the study area to reflect additional components of the I-Zone (e.g., relocation of the LIRR Yaphank Station to Brookhaven National Lab; additional long-term electrification; stronger transit links to Cold Spring Harbor Laboratory; etc.)
• Recommend an initial operating segment or an initial phase of implementation to align with available funding and as warranted by demand	• Consider proposing a portion of the BRT system as an initial operating segment • Consider proposing one of the two BRT routes as an initial operating phase

for all capital components of the proposed project, including—but not limited to—roadway improvements (such as pavement replacement, signs, and markings), stations and the associated passenger amenities, pedestrian infrastructure, and utility relocation. Preliminary Engineering will advance the work completed in this AA, and may result in refinements to the LPA where the proposed alignment may have to be modified due to existing traffic safety and operational issues. Additional refinements may be proposed based on the need for additional pedestrian access improvements and the goal to accommodate a continuous and safe hiking/biking trail along Nicolls Road.

Following completion of Preliminary Engineering, the Final Design phase will advance engineering to 100% completion. Final Design will entail the production of all plans and specifications necessary for construction, showing dimensions, elevations, sections, and other details as applicable (e.g., construction phasing and sequencing). This will include coordination across a range of disciplines, potentially including planning, traffic/civil/structural/mechanical/electrical engineering, and architecture for all applicable capital components of the proposed project.

8.3 ENVIRONMENTAL REVIEW AND ASSOCIATED STUDIES

One of the critical tasks that will be conducted as part of Preliminary Engineering is environmental review. The environmental review for the proposed project will include separate findings for the federal National Environmental Policy Act (NEPA) process and the State Environmental Quality Review (SEQR) process. It is assumed that FTA/FHWA and Suffolk County would serve as the Lead Agencies for NEPA and SEQR, respectively. It is currently anticipated that the proposed project will qualify for a Categorical Exclusion (CE) under NEPA and a Negative Declaration under SEQR, meaning that the project will not result in significant adverse environmental impacts and that an Environmental Impact Statement (EIS) will not be required. This will be verified in Project Development through completion of the FTA Region 2 CE Worksheet, the Federal Environmental Approvals Worksheet, and either the Short or Long SEQR Environmental Assessment Form (EAF), supplemented as necessary by discrete environmental analyses.

One environmental impact category that warrants additional analysis is traffic, as it will be necessary to confirm that the implementation of BRT travel lanes will not result in adverse effects to general traffic on Nicolls Road. Likewise, as currently proposed, the project calls for implementation of TSP at most signalized intersections along the two BRT routes, which could potentially result in traffic effects on intersecting cross streets. As part of Preliminary Engineering, a traffic analysis will be completed to determine the optimal balance between reducing travel time for BRT and maintaining acceptable levels of service for traffic flow along the cross streets. Additionally, while this AA applied assumptions regarding time savings for TSP based on guidance from TCRP Report 118, a traffic study for the proposed project will calculate Corridor-specific time savings based on traffic conditions along the BRT routes.

It will also be necessary to conduct detailed noise and air quality studies during the environmental review due to the proposed addition of new travel lanes along Nicolls Road. Furthermore, drainage and stormwater management will also merit consideration during the environmental review. Implementation of the LPA alignment along Nicolls Road would require paving portions of the existing grass median to accommodate BRT, which would in turn

require extensive drainage work to address the increase in impervious surface area.

Other discrete environmental analyses may also be warranted to supplement the CE Worksheet and EAF for other environmental impact categories, such as environmental justice, cultural and natural resources (archaeological, historic, park and recreational lands, etc.), hazardous materials, construction impacts, cumulative and indirect impacts, and property acquisition. The CE Worksheet and EAF will inform the need for these and/or other discrete environmental analyses.

8.4 FINANCIAL PLANNING: DOCUMENTING LOCAL FINANCIAL COMMITMENT

The financial planning process provides a foundation for identifying and securing commitments of specific funding sources for implementation of the proposed Nicolls Road BRT project. There are a range of potential federal, state, local, and project-specific funding sources that could address the estimated capital and O&M costs for the proposed project.

A large portion of the project's capital cost may be funded through federal funds. By statute, the maximum federal share of funding is 80% of the capital cost of the project, but most Small Starts applicants receive no more than 50% of the capital cost of the project. In consultation with NYMTC, Suffolk County could also pursue federal formula funds to complement Small Starts. A wide range of state, local, and project-specific funding sources should be considered to cover the balance of the capital costs (i.e., those that would not be covered by anticipated federal sources) and the annual O&M costs of the proposed project. These sources could potentially include:

» Fare revenue
» Suffolk County general funds
» Potential New York State/LIREDC Consolidated Funding Application grants
» Parking fees
» Tax Increment Finance (TIF)
» Special assessments
» Developer contributions
» Joint development

The first step in the financial planning process will be to evaluate a range of funding options using a number of factors, including—but not limited to—revenue potential, ability to keep pace with inflation, equity, stability, legal authority, and political support. The commitment of state, local, and/or project-specific funding sources to demonstrate local financial commitment is a key requirement for competing for federal Small Starts funding. Phased implementation could be explored in Project Development, which could enable implementation of discrete segments of the full project as funding becomes available. The documentation of local financial commitment must also show the budget for completing Preliminary Engineering and Final Design.

8.5 AGENCY COORDINATION AND STAKEHOLDER/PUBLIC ENGAGEMENT

As indicated on **Figure 39**, one step of the Project Development process is to adopt the LPA into the fiscally constrained long-range transportation plan. This will require an action by NYMTC based upon a recommendation from Suffolk County to include the proposed project in the fiscally constrained portion of the Plan 2040 RTP. Coordination with NYMTC will also be necessary for inclusion of the proposed project in the medium-range TIP and the Transportation Conformity Determination, which includes a regional mobile source emissions analysis that documents compliance with the Clean Air Act Amendments of 1990.

This should be complemented by coordination with FTA (and FHWA as appropriate) throughout the Project Development process, as well as coordination with subject matter experts from local and regional agencies with transportation and/or land use regulatory authority. This could include the following public sector agencies, institutions, and transit operators, in addition to internal coordination between the Suffolk County Department of Economic Development & Planning, Suffolk County Department of Public Works, and Suffolk County Transit:

» NYSDOT
» LIRR
» MTA
» SBU, SBU Hospital, and SBU Transit
» SCCC
» St. Joseph's College
» Town of Brookhaven
» Town of Islip, including representatives from MacArthur Airport
» Village of Patchogue

Furthermore, broad-based and proactive stakeholder and public outreach will be critical to inform interested groups and individuals about the project status, get feedback at key milestones, and build a network of advocates to support the project's implementation. Therefore, Suffolk County will continue to engage a range of civic groups, chambers of commerce, and advocacy organizations in promoting the *Connect Long Island* plan, the I-Zone, and the proposed Nicolls Road BRT project (refer to sidebar on page 100).

ONGOING STAKEHOLDER AND PUBLIC OUTREACH FOR *CONNECT LONG ISLAND* AND THE I-ZONE

Suffolk County Executive Steven Bellone chose to engage the public during the study process through a grassroots approach, in order to reach as many communities and users as possible. The County Executive met with multiple community groups across the County and gave formal presentations of his I-Zone vision, which is anchored by the Nicolls Road BRT. The County Executive also reached out to various stakeholders, such as SBU and St. Joseph's College, to engage them in the planning process. Through this approach to public engagement, the County Executive was able to expand awareness of the I-Zone, increase community participation in key decision making, and generate further support for this vision. These meetings were convened throughout the development of the plan and will continue to be an ongoing effort as the project moves into its next phase.

Since January 2015, the County Executive has discussed *Connect Long Island* and the I-Zone at over 35 meetings with community groups/organizations, including 12 meetings to date with groups that are located within the Nicolls Road AA study area.

- Centereach Civic Organization (2/25/15)
- Bayport/Blue Point Chamber of Commerce (2/25/15)
- Holbrook Chamber of Commerce (4/3/15)
- Three Village Chamber of Commerce (4/15/15)
- Parkland Civic Organization (4/20/15)
- Jefferson's Ferry Assisted Living Center, Centereach (5/18/15)
- Bayport Civic Organization (5/19/15)
- St. Joseph's College (9/28/15)
- Affiliated Brookhaven Civic Organization (10/28/15)
- Ronkonkoma Civic Association (1/14/16)
- Parkland Civic Organization (1/20/16)
- St. Joseph's College Political Science Club (5/2/16)

Photos from stakeholder engagement
Source: Suffolk County

9 CONCLUSION

This Final Report has documented the process and outcome of the Nicolls Road AA. The planning process set the stage for implementation of a fast, frequent, and high-quality BRT service along Nicolls Road to connect all three lines of the LIRR and improve north-south mobility and multi-modal connectivity along this traditionally auto-oriented Corridor. The LPA provided the framework for a transit-oriented future along Nicolls Road and in the broader study area.

The guiding principle of this AA was that sustainable economic development requires close coordination and integration of transportation improvements with land use policy, consistent with the fundamental tenet of the *Connect Long Island* plan. This AA complemented other ongoing local and regional initiatives to transform the land use character and transportation network of the study area, which could collectively enhance the long-term potential of Nicolls Road and the I-Zone.

It is anticipated that the proposed project will be advanced in the Project Development process, leading to evaluation, rating, and consideration by the FTA for approval of a Small Starts Grant Agreement. The combination of federal funding with state, local, and/or project-specific funding can provide the necessary resources to move from plan to implementation for this transformative project that has the potential to result in far-reaching benefits for the Nicolls Road Corridor, Suffolk County, and the surrounding region.

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APPENDICES

NICOLLS ROAD ALTERNATIVES ANALYSIS