Alternatives Analysis Report

Prepared for: **Nassau County**




JACOBS
August 2014

U.S. Department of Transportation
Federal Transit Administration

THE NASSAU HUB STUDY

ALTERNATIVES ANALYSIS / ENVIRONMENTAL IMPACT STATEMENT

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A MESSAGE FROM COUNTY EXECUTIVE EDWARD P. MANGANO

Nassau County has emerged from a national economic crisis and weather-related events such as Superstorm Sandy to become stronger, more resilient and ready to take on any and all new challenges that may face us. Getting through those challenges was not easy, but my administration, along with the support of our residents, stands ready to embrace and create a new Nassau County that does not compromise all of our good qualities and makes this County an even better place to live, work and raise a family.

My vision for our *new* Nassau County is focused on preserving our suburban quality of life while simultaneously creating opportunities for economic development following a smart-growth approach. This will allow us to expand our tax base, create new jobs, address the challenges of increasing traffic congestion and add more affordable housing so our young people can raise their own families in the community they were raised in.

The cornerstone of my program is the redevelopment of the Nassau Veterans Memorial Coliseum property in the Nassau Hub into a year-round destination for residents and tourists alike. A key element for making this initiative successful will be the implementation of the recommendations detailed in this report to introduce a new modern streetcar rapid transit service in the heart of our County.

This report also discusses how a modern streetcar can be woven into our existing transportation network to provide advanced travel options while maintaining a vibrant and sustainable landscape that will ultimately benefit thousands of residents, employees, students and others who live, work or visit this area.

The Nassau Hub Study was developed using an open and transparent process with the assistance and guidance of professional consultants, our residents, civic and political leaders, and regional planning and transportation agencies.

Working together as a team I believe we now have a blueprint for a transportation vision that can better help Nassau achieve the goals I previously noted.

I am grateful for all who participated in the process and am excited by the prospect of moving the recommendations from the planning to the environmental review process. Once again, it will take a team effort to bring this vision to reality, but I am confident that we are up for the challenge. Please remain involved and I welcome your comments and questions.

Best regards,

Edward P. Mangano
County Executive

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1. Introduction

1.1 The Nassau Hub Study Overview

Nassau County has completed an Alternatives Analysis (AA) to address transportation problems in the area known as the Nassau Hub. The AA comprises the first phase of the Nassau Hub Study, the purpose of which is to define new transportation options and identify land use strategies that will help promote economic development, create jobs in the Study Area, and improve access and mobility; this, in turn, will enhance the quality of life for all Nassau County residents. The AA examined opportunities for introducing realistic and practical transit improvements within the Hub Study Area, and was conducted in cooperation with the Federal Transit Administration (FTA) and in accordance with FTA requirements. The purpose of the AA is to select a Locally Preferred Alternative (LPA). This AA Report documents the technical studies and public and agency involvement comprising the AA process and recommends the LPA.

Following formal selection of the LPA and with the FTA's concurrence, Nassau County will conduct an environmental review in accordance with the National Environmental Policy Act (NEPA) of 1969. The review will result in the preparation of a draft environmental document (Environmental Assessment [EA] or Environmental Impact Statement [EIS]) for public review and comment. Nassau County anticipates that the environmental review will be concluded with a final EA and Finding of No Significant Impact (FONSI) or Final EIS and Record of Decision (ROD) and, if successful, federal funding to implement the LPA.

Transit projects seeking funding from the FTA New Starts or Small Starts program must follow a standard process (see Figure 1-1). New/Small Starts is the Federal funding program for new transit initiatives and Nassau County must follow a prescribed process to be eligible to receive these funds. An important early step in this standardized planning process is the preparation of an AA that documents existing and future transportation problems, evaluates a range of potential alternatives to address those problems, and selects an LPA.[1] An environmental review document is then prepared to fully disclose any potential impacts of the LPA on the human and natural environment. During both the AA and environmental review processes, the public and other stakeholders are given opportunity to review the analyses and provide comments and other input.

[1] The Safe, Accountable, Flexible, Efficient Transportation Equity Act: A Legacy for Users ([SAFETEA-LU] Public Law 109-59), which governed federal surface transportation spending until its expiration in 2009, required that an AA be completed before a project sponsor could apply to the FTA Capital Investment Program (Section 5309). The Moving Ahead for Progress in the 21st Century Act (MAP-21), enacted in 2012, eliminated the requirement for a stand-alone AA under Section 5309 and instead relies on the evaluation of options that may occur during the metropolitan planning process and the review of alternatives that occurs to meet NEPA requirements. Project sponsors may still conduct a stand-alone AA separate from the NEPA review if they wish. This may ultimately streamline the environmental review process because the results of prior planning work evaluating alternatives may be incorporated in the NEPA review (http://www.fta.dot.gov/12304_15522.html; information retrieved August 1, 2014).

Figure 1-1: AA/EIS Process Flow Chart

Source: Jacobs, 2010.

1.2 Background

In 2003, the Nassau County Planning Department[2] began efforts to position the County to be eligible for Federal grants related to improving, upgrading and extending the transit network within the County, specifically the Study Area. The results were documented in the 2006 *Nassau Hub Major Investment Study Final Report* (the MIS) that examined and analyzed the demographic, economic and transportation issues within an area known as the "Nassau Hub." The MIS concluded that the County should further study potential transit and related land use improvements, within the context of the FTA's project development process.

1.3 The Nassau Hub Study Area

1.3.1 Primary Study Area

The Nassau Hub Primary Study Area (Study Area) occupies an approximate 11.7 square-mile area in the heart of Nassau County, and is home to Hofstra University (existing campus and planned medical school), Nassau Community College, Museum Row, the Nassau Veterans Memorial Coliseum, the County Government Center, Nassau University Medical Center, Mitchel Field, Eisenhower Park, Roosevelt Field, and other notable County features (see Figure 1-2). Additionally, thousands of residents, employees, students and others live and work in the area. This crucial economic center, so vital to the future of Nassau County, has substantial traffic congestion, lacks efficient and direct transit choices and includes large areas of disjointed land use patterns. These factors have contributed to long commutes, decreased environmental quality, and overall difficulty in traveling to, from and within the area.

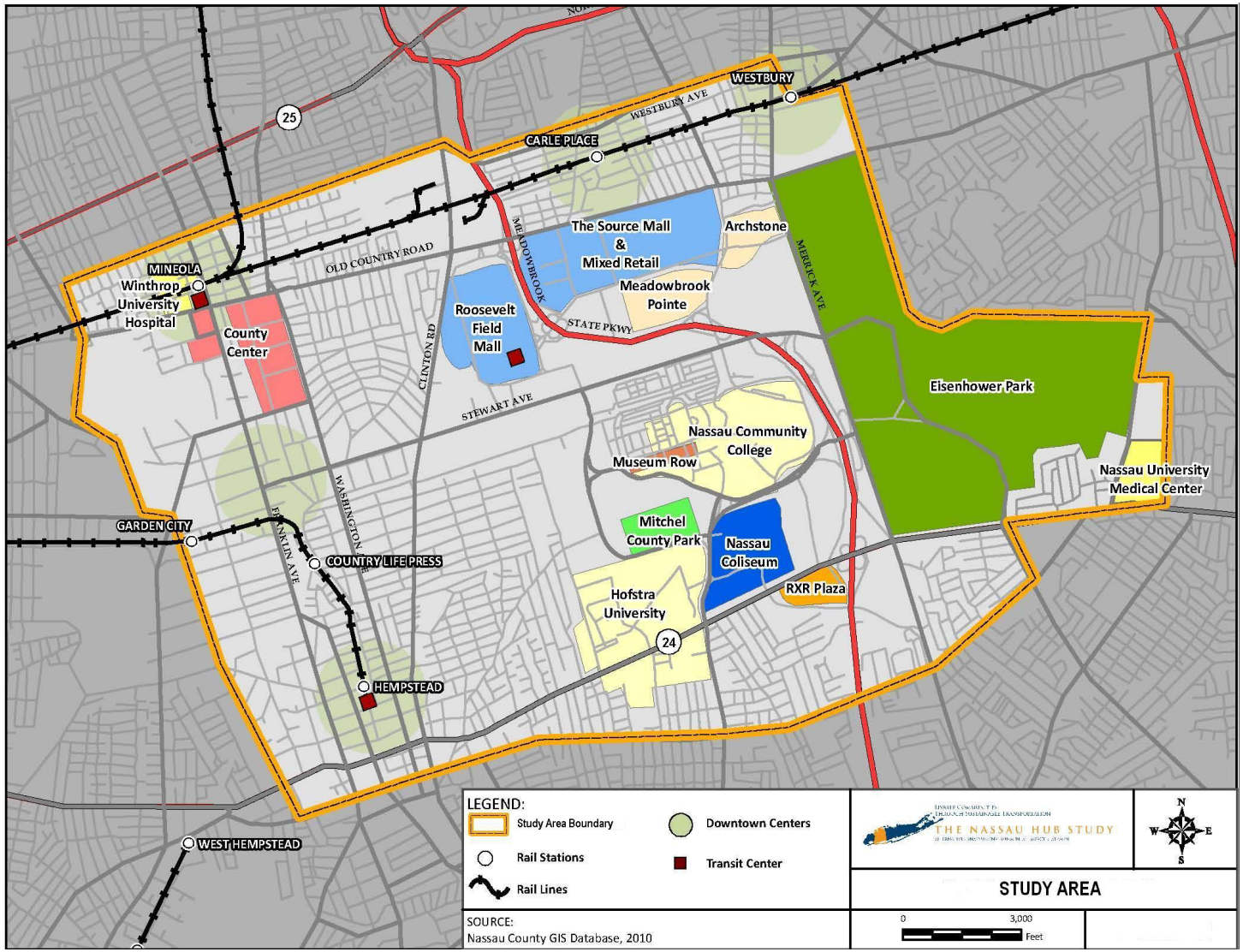
The Primary Study Area was established as the geographic focus of this Study and is the area where it was anticipated the majority of physical improvements associated with any given alternative may occur.

1.3.2 Regional Study Area

A Regional Study Area has also been defined and refined during the Study based on travel patterns, potential opportunities for connections among activity centers, and key economic development opportunities outside the Study Area. Building on the conclusions of the MIS, coupled with a need to incorporate areas that have the greatest potential for economic development, boundaries were initially established. As the Study progressed, the Regional Study Area was expanded to capture the context of the larger travel market to the Study Area and to be consistent with the New York Metropolitan Transportation Council's (NYMTC) 2014 – 2040 Regional Transportation Plan, or Plan 2040 (see Figure 1-3).

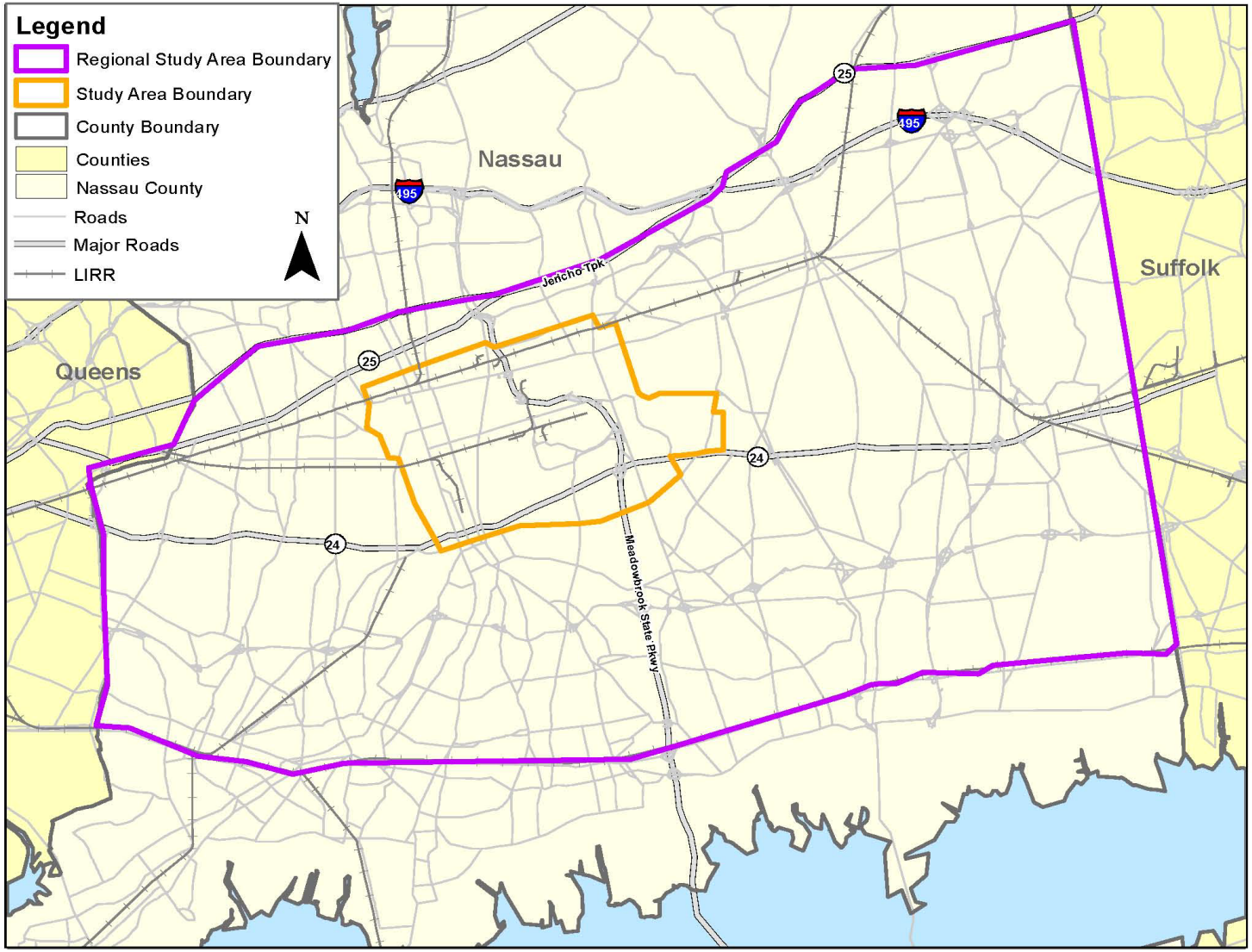
[2] The Nassau County Planning Department is now the Nassau County Department of Public Works/Planning Division.

Figure 1-2: Study Area



Source: Jacobs, 2010.

Figure 1-3: Regional Study Area



Source: Jacobs, 2010.

2. Existing Conditions

2.1 Historic Development Patterns

Nassau County, then part of Queens County, was first settled in the early 1600s by colonists from Connecticut. At the center of Nassau County was an area known as the Hempstead Plains, one of the few natural prairies east of the Allegheny Mountains. Remnants of the prairie remain in the Hempstead Plains Preserve and parts of Eisenhower Park. In the early years, settlers established agricultural and fishing communities. One of the oldest commercial centers is the Village of Hempstead in the southwest corner of the Study Area. Other colonial era settlements include the Village of Mineola and the Village of Westbury. The agricultural towns grew slowly through the early 1700s. By the late 1800s, Long Island supplied the Greater New York City area with farm products and was known as a resort area for wealthy New Yorkers. Also by this time, the basic road network that serves the area was in place. This included the 'hub and spoke' road network that is centered on the Village of Hempstead, with Old Country Road in the north and Hempstead Turnpike in the south.

In 1834, the Long Island Rail Road Company (LIRR) was chartered to create a connection from New York City to Boston. Due to the difficult terrain across southern Connecticut, the connection was to be via rail to Greenport on Long Island's North Fork and then by ferry to Stonington, Connecticut, where passengers would continue to Boston by rail. Since its plan was to serve long distance transportation, the LIRR did not initially serve existing communities along the shores of Long Island, but rather ran through the middle portion of the Island. In 1850, a rail route through Connecticut was constructed and the new rail line siphoned off passengers from the Long Island route. LIRR soon changed its emphasis to local service and constructed branches off its main line to connect to existing shoreline villages to increase ridership. By the late 1860s, other railroad companies built their own routes to fill voids within the system, many of which were later sold or leased to the LIRR. Many of these original rail stations are at the heart of Nassau County's traditional downtowns including the Village of Mineola, the Village of Westbury, the Village of Garden City and the Village of Hempstead in the Study Area and Hicksville, the Village of Rockville Center, the Village of Freeport and Merrick in the Regional Study Area. Train service was supplemented at first by private trolley lines, and later by private bus lines. In 1973, the remaining 11 private bus lines were consolidated as part of Nassau County's takeover of the system.

The most significant increase in Nassau County's population occurred after World War II when returning veterans moved to Long Island and started families. This growth was supported by the earlier development of Long Island's network of parkways that was first constructed in the 1920s and 1930s to provide access to the Island's natural and scenic beauty. They included the Meadowbrook State Parkway (MSP) within the Study Area and the Northern State Parkway and Wantagh and Southern State Parkways in the Regional Study Area. The full parkway system in the Study Area was not completed until 1956 when, with the closing of Mitchel Field, the last section of the MSP was constructed through the former military base. In the late 1950s, the portion of the Long Island Expressway just north of the Regional Study Area was constructed, thereby strengthening connections to New York City. Development followed the parkways and highways, and Long Island began its transformation as the paradigm of America's suburbs. Perhaps the best known of these new post-war suburbs is Levittown, located in the eastern portion of the Regional Study Area. In May of 1947, Levitt and Sons announced their plan to build 2,000 mass-produced homes. Demand was so great that they announced plans for an additional 4,000 houses. The auto-oriented community had its own schools, shopping centers, playgrounds, and community center. The impact of Levittown was so significant that, in 1950, William Levitt was featured on the cover of

Time magazine. Just a year later, Levitt and Sons had constructed close to 17,500 homes in Levittown and the surrounding areas.[1]

This development pattern predominated and led to Nassau County's status throughout the mid- to late-1900s as a bedroom suburb of New York City. The population doubled in 10 years, from 1950 to 1960, increasing from 672,000 to 1,300,700, reaching a peak of 1,428,838 in 1970. As suburban development and the reliance upon the automobile for transportation increased following World War II, the parkways, which had been designed for a different era, came under increasing pressure from commuter-related and other general increases in traffic.

Historically, the Study Area developed in a piecemeal fashion that encouraged low-density sprawl and the use of private automobiles. When capacity improvements were needed, the typical solution was to widen the travel ways and/or add lanes, which likewise encouraged the use of private automobiles. Transportation has always driven the development pattern and, today, Nassau County is served by a multitude of transportation systems designed to serve earlier eras: a local road network laid out in colonial times, a rail system first laid out in the 1800s, remnants of private bus networks, a parkway system first planned over 75 years ago, and an expressway designed for earlier generations.

2.2 Land Use

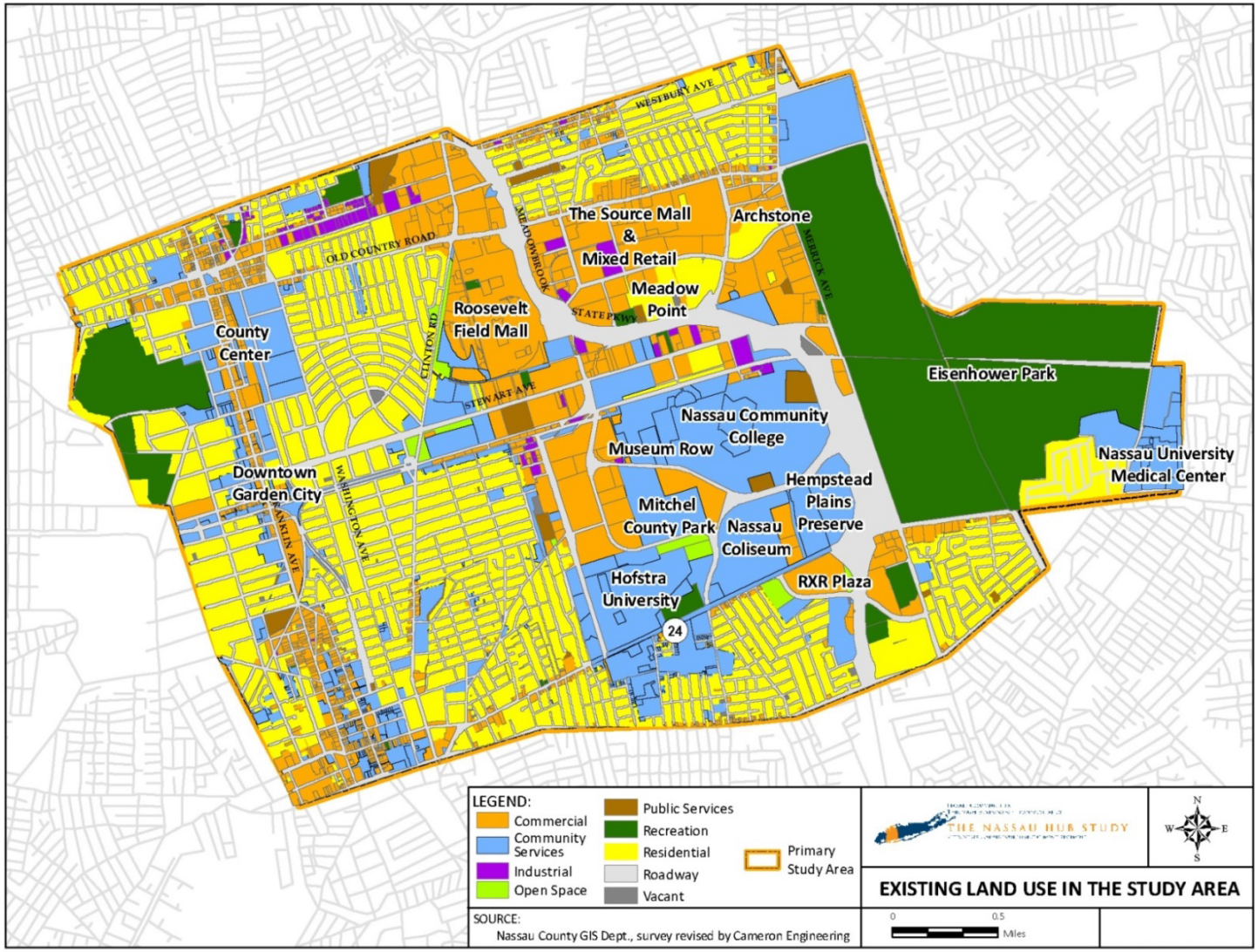
The Study Area comprises the largest concentration of commercial uses within Nassau County, including two regional malls, numerous office complexes and a wide variety of shops, restaurants and service establishments. And, with its equally expansive and diverse collection of community services, the Study Area easily establishes itself as Nassau County's heart of commercial, cultural, educational and governmental activities.

Figure 2-1 locates several of the major activity centers within the Study Area. These include significant cultural, educational, medical and recreational destinations such as the Nassau Veterans Memorial Coliseum, Mitchel County Park, Museum Row, Eisenhower Park, Hofstra University, Nassau Community College, Nassau University Medical Center and Winthrop University Hospital. The locations of the Study Area's two regional malls, Roosevelt Field and the Source Mall, are also shown on Figure 2-1.

The downtown cores of the Villages of Westbury, Hempstead, Garden City and Mineola and the Hamlet of Carle Place are also significant commercial centers that support a variety of local stores, offices and service establishments. The Nassau County Government Complex, situated in the northwestern quadrant of the Study Area, includes the County courts and the offices for many of the County's departments and bureaus. Figure 2-1 and Table 2-1 show that the Study Area also contains large residential areas, particularly in the central western, northeast and southeast portions of the Study Area.

[1] Levittown Historical Society. *Levittown History*. http://www.levittownhistoricalsociety.org/history.htm (August 25, 2010)

Figure 2-1: Existing Land Use in the Study Area



Source: Jacobs, 2011.

Table 2-1: Existing Land Use Summary for the Study Area

Land Use	Description	Acreage	Percent of Study Area
Residential	Areas used for housing	1,941	26.0%
Roadways	Areas for highways, collectors and local roads	1,476	19.8%
Community Services	Areas used for educational, health, cultural and government services	1,384	18.5%
Commercial	Areas used for offices, retail, services and other commercial uses	1,330	17.8%
Recreation/ Parks	Areas used for recreation uses (parks, playgrounds, golf courses, etc.)	1,131	15.1%
Public Services	Areas for electrical, water and other utilities	70	0.9%
Industrial	Areas for used for manufacturing	69	0.9%
Conservation	Areas used for nature preserves	45	0.6%
Vacant	Areas of unused land	19	0.3%

Source: Nassau County GIS updated with 2010 field surveys conducted as part of this Study.
Note: Due to rounding, figures may not total 100 percent.

Table 2-1 provides a summary of the percent coverage of land use by type within the approximately 11.7 square-mile Study Area. Approximately 36 percent of the land is dedicated to commercial and community services, which account for 17.8 percent and 18.5 percent of the land use, respectively. Residential uses occupy 1,941 acres or approximately 26 percent of the total land area. Parks and other recreational uses account for another significant land use, occupying about 1,131 acres or 15.1 percent of the total. Much of this is the 930-acre Eisenhower Park, which includes an aquatic center, golf courses, athletic fields, tennis courts, picnic areas, playgrounds, and fitness trails. The remaining land (i.e., 2.7 percent of the total) comprises industrial, public services, vacant and conservation uses.

The Study Area also supports large office parks including the Nassau West Corporate Center (1.1 million square feet) just west of Mitchel Field and the RXR Plaza (1.1 million square feet), which is adjacent to the Nassau Veterans Memorial Coliseum. As listed in Table 2-2, there are 11 other office buildings and corporate parks that are larger than 200,000 square feet. These large complexes account for over 5.3 million square feet of office space; there are also numerous other office buildings and complexes within the Study Area.

The Study Area contains an extensive supply of off-street parking, which represents a significant land use feature of the area (Table 2-3). Much of this supply, approximately 25 percent, consists of surface parking dedicated to seasonal or event use, which is not needed to meet regular demand. The majority of the identified surface parking in the Study Area is associated with various retail uses (e.g., Roosevelt Field, the Source Mall) and Nassau Veterans Memorial Coliseum. Parking for these uses is typically defined for a peak-demand period and, in the case of Nassau Veterans Memorial Coliseum, for a limited number of events. In all, the Study Area contains over 600 acres (approximately 75,000 spaces) of parking, which represents approximately 9 percent of the total land cover of the Study Area. The inability to share these parking facilities during varying peak demands requires additional travel between uses without the ability to link trips.

Table 2-2: Office Buildings Larger than 200,000 Square Feet in the Study Area

Office Buildings	Square Feet
RXR Plaza	1,100,000
Nassau West Corporate Center	1,064,932
100-400 Garden City Plaza	573,000
Franklin Avenue Plaza	464,785
711 Stewart Avenue	300,000
One Old Country Road	269,000
The Pavilion	259,874
90 Merrick Avenue	234,202
Atria West	233,000
Imperial Square	230,000
60 Charles Lindbergh Blvd	219,066
Eisenhower Atrium Center	220,000
Atria East	203,000
Total	**5,370,859**

Source: Long Island Business News 2010 Book of Lists.
Note: Names and data for the office buildings and corporate parks listed in Table 2-2 were compiled in 2010; Table 2-2 does not reflect any changes that may have occurred since the 2010 data collection effort.

Table 2-3: Existing Surface Parking in the Study Area

Subarea	Surface Parking in Square Feet
Mineola/County Center	1,825,600
Garden City	1,931,200
Hempstead	2,283,300
Nassau Veterans Memorial Coliseum	5,120,200
Mitchel Field	2,773,400
Roosevelt Field	3,854,800
Carle Place	2,065,500
Source Mall / Westbury Plaza Vicinity	6,750,100
Totals	**26,604,100**

Source: Jacobs, 2010.

Parking usage is difficult to quantify as it varies greatly based on a number of variables including time of day, season, and use. Given these conditions, parking acreage has the potential with improved transit and reduced parking requirements to be redeveloped for more productive uses. With transit-supportive zoning, there is an opportunity in the Study Area for future transit-oriented developments that combine retail, commercial and housing uses.

The Study Area is undergoing many changes, in terms of both future planning initiatives and recent and proposed developments that will significantly affect its future. Developments completed in the Study Area in recent years include the LIRR's Mineola Intermodal Center, higher-density residential developments (such as Archstone Meadowbrook Crossing and Meadowbrook Pointe on Corporate Drive in the Roosevelt Raceway area), the Nassau County Firefighters Museum along Museum Row, decommissioning of some County offices on County Seat Drive (with possible redevelopment as residences) and the relocation of the Nassau County Department of Health and Human Services to County Seat Drive.

There are a number of development initiatives in varying stages of the planning process that are currently underway in and near the Study Area that will further change the character of the Study Area. These trends and initiatives are discussed in Chapter 7.

2.3 Socioeconomic Conditions and Trends

2.3.1 Population

Based on data from the 2010 U.S. Census, the 2010 population of the Study Area was recorded as 122,223 persons (Table 2-4).[2] The Study Area population represents approximately 9.2 percent of Nassau County's total population of 1,332,947. Based on data obtained from the New York Metropolitan Transportation Council's (NYMTC) Best Practice Model (BPM),[3] population in the Study Area is projected to slowly but steadily increase between 2010 and 2035 by over 14,000 persons (11.9 percent) to 136,204 persons. This trend is slightly higher than the County's projected population increase of 10.9 percent by 2035.

Table 2-4: Existing Population and Projected Population Change 2010 – 2035

Year	Study Area		Nassau County	
	Population	Percentage Change	Population	Percentage Change
2010	122,223	-	1,332,947	-
2020	125,452	3.0%	1,334,724	1.4%
2030	132,936	6.0%	1,421,877	6.5%
2035	136,204	2.5%	1,459,969	2.7%
Change 2010 - 2035	14,544	11.9%	145,291	10.9%

Source: U.S Census Bureau 2010; NYMTC, BPM 2035 Forecast Series, based on 2005 base population and employment data.

Historically, Nassau County experienced tremendous population growth from the end of World War II through the 1960s. The County's population doubled in the 10 years from 1950 to 1960, increasing from 672,000 to 1,300,700, before reaching a peak of 1,428,838 residents in 1970.[4] Subsequently, between 1970 and 2005, the County experienced a population decline of approximately 90,000 residents.[5]

As evidenced by the historic population trends, Nassau County experienced enormous population growth and corresponding suburban development considerably earlier than did many of the other suburban counties in the region. As a result, since it is an already mature suburban county, Nassau is anticipated to gain residents only gradually through 2035. Factors contributing to this gradual but slow population growth include projected increases in the County's elderly population as well as an out-migration of young adults between the ages of 20 and 34.

Net migration forecasts by age cohort through 2030 for Nassau County are provided in Table 2-5. Totals in parentheses represent declines indicating an out-migration, or people moving away from Nassau. Numbers without parentheses represent growth indicating an in-migration to the County. Net migration trends from 2010 through 2020 project individuals moving from the County, albeit at lower rates than in previous years (2000 to 2005). However, from 2020 through 2030, this out-migration is anticipated to

[2] The information presented in this section was prepared in 2010, prior to the adoption and release of NYMTC's Plan 2040.
[3] The BPM predicts changes in future travel patterns in response to changes in demographic profiles and transportation systems within the NYMTC region. NYMTC socioeconomic forecasts for Nassau County are based on national economic projections, historic economic and demographic data for the region, and input from the Nassau County Department of Public Works/Planning Division. These forecasts are incorporated into the model and used, in part, to predict future travel characteristics. More specifically, employment forecasts help to project whether a region is generating or losing jobs, thereby influencing travel patterns in a region. Population forecasts provide information regarding travel habits and help to identify potential transportation investments that can improve the mobility of a population. Demographic and socioeconomic forecasts through 2035 were adopted on September 24, 2009, as part of the 2010-2035 Regional Transportation Plan.
[4] Nassau County. *History of Nassau County.* https://www.nassaucountyny.gov/website/EN/facts_stats_maps/history_of_NC.html (August 25, 2010).
[5] Nassau County 2010 Draft Master Plan. Chapter 1. p. 1-1.

reverse as a result of greater numbers of people moving into the County. Table 2-5 shows that over the next 20 years more adults aged 30 to 44 and children aged 5 to 14 will enter the County than leave it.[6] This population growth includes an increase in families as the Millennial generation, defined as persons born in the 1980s and 1990s, begins having children and establishing families within the County. Additionally, more senior citizens aged 75 to 79 will enter Nassau than leave.

Table 2-5: Nassau County Net Migration by Age, 2000 – 2030

Age	2000-2005	2005-2010	2010-2015	2015-2020	2020-2025	2025-2030
Under 5	(5,707)	(1,421)	(1,533)	(1,665)	(1,765)	(1,964)
5 - 9	(876)	6,901	7,272	7,936	8,462	9,166
10 – 14	(942)	4,743	5,971	6,576	7,276	7,803
15 – 19	(2,024)	(2,895)	(2,110)	(461)	1,359	2,101
20 – 24	(6,203)	(10,253)	(9,462)	(9,460)	(5,855)	(3,699)
25 – 29	(6,314)	(4,017)	(4,762)	(4,738)	(1,623)	(536)
30 – 34	(113)	5,668	5,528	4,680	7,565	7,313
35 – 39	889	10,056	10,052	9,958	12,472	12,600
40 – 44	1,086	4,321	4,107	3,232	5,187	5,012
45 – 49	1,549	(2,282)	(2,595)	(2,817)	(222)	(1,166)
50 – 54	435	1,536	885	(395)	2,117	1,759
55 – 59	789	(3,487)	(4,580)	(5,549)	(2,213)	(1,882)
60 – 64	(145)	(5,320)	(6,430)	(8,386)	(4,955)	(4,409)
65 – 69	(3,581)	(4,481)	(5,373)	(5,386)	(5,740)	(5,321)
70 – 74	(3,483)	(663)	(747)	(841)	(818)	(794)
75 – 79	(584)	1,122	1,197	1,483	1,931	2,040
80 – 84	(846)	(415)	(347)	(336)	(392)	(451)
85 & Over	(5,219)	(4,697)	(5,244)	(5,201)	(5,282)	(5,900)
Total	(31,288)	(5,584)	(8,172)	(11,370)	17,504	21,672

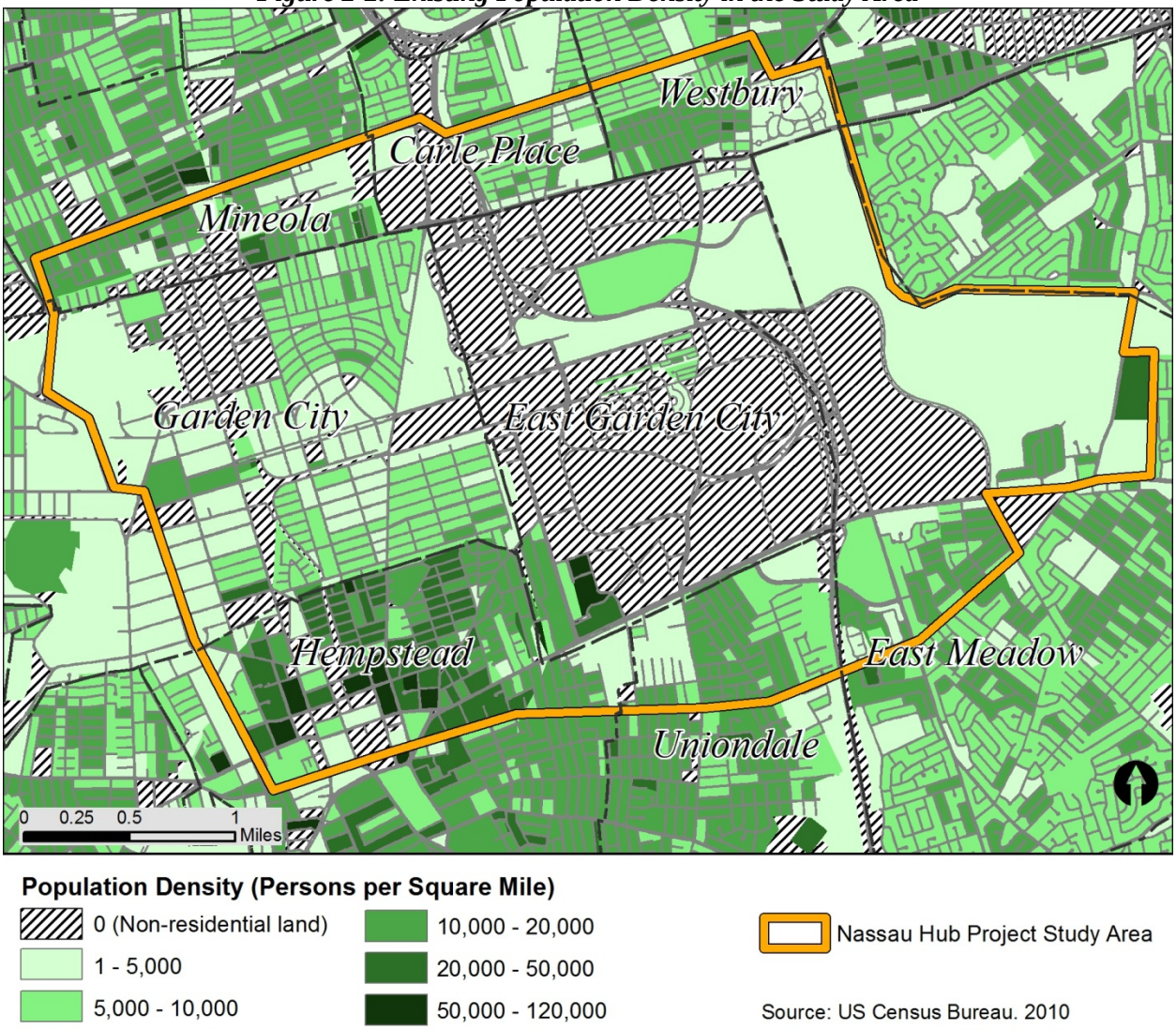
Source: Nassau County 2010 Draft Master Plan

2.3.2 Population Density

Population density (Figure 2-2) varies across the Study Area. There are low density (i.e., less than 5,000 to 10,000 persons per square mile) suburban settings in the Village of Garden City and moderate density (i.e., 10,000 to 20,000 persons per square mile) settings within the hamlets of Carle Place, East Meadow and Uniondale. Higher densities (i.e., 20,000 to 50,000 persons per square mile), such as those characteristic of urbanized areas within small cities, are found within the older downtowns of the Village of Mineola, in particular around the LIRR train station, the Village of Westbury and around the downtown area of the Village of Hempstead. Several blocks within downtown Village of Hempstead, which contain multi-story apartment complexes, have population densities in excess of 50,000 persons per square mile. The East Garden City Census Designated Place (CDP), with the exception of condominium and apartment complexes north of the MSP and residences north and south of Eisenhower Park, is primarily non-residential in character and with low-density population.

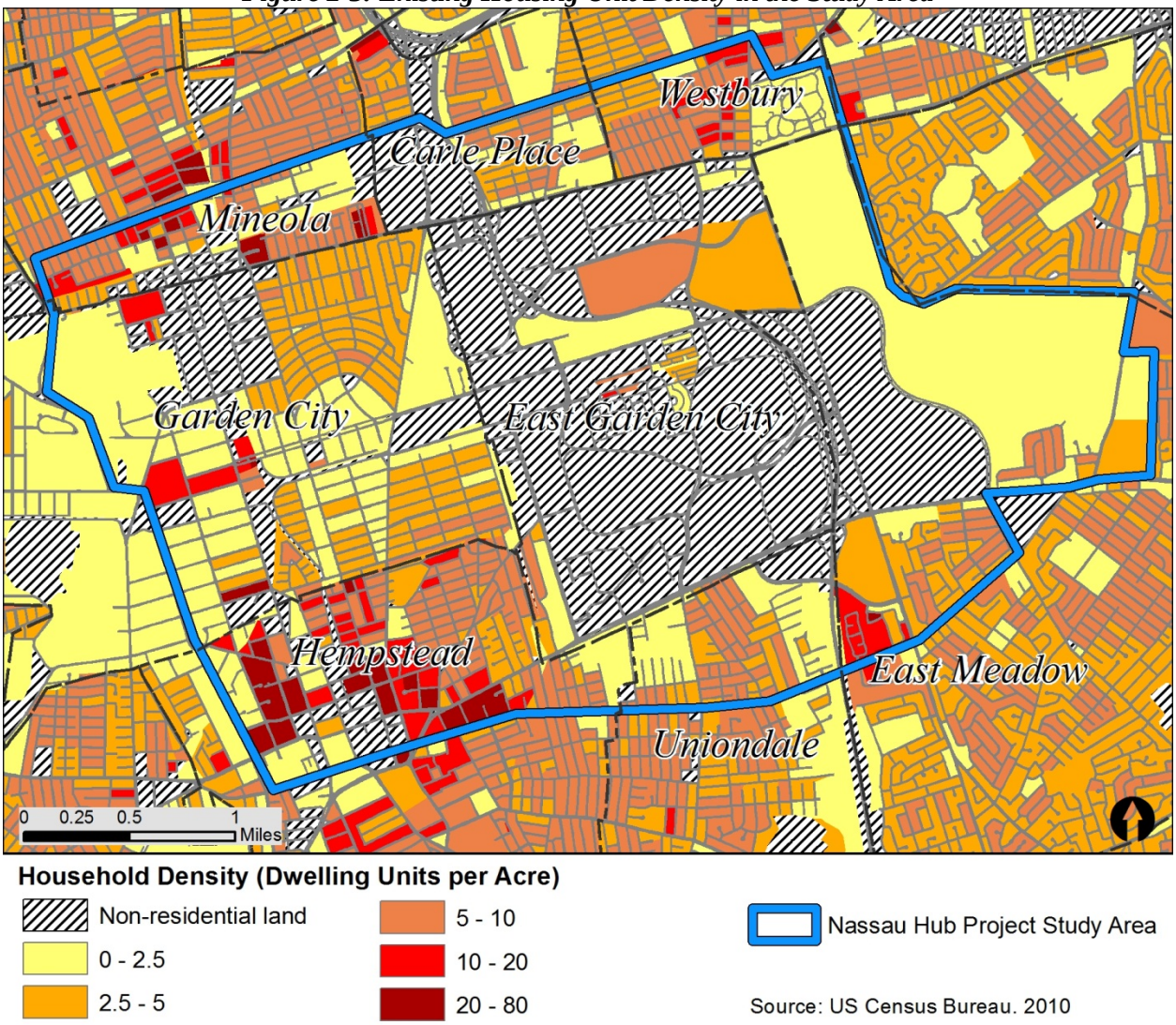
[6] Nassau County 2010 Draft Master Plan. Chapter 1, p. 1-7.

Figure 2-2: Existing Population Density in the Study Area



Nassau County (as a whole) is more densely populated than are other suburban counties in New York State, such as Suffolk, Westchester, and Rockland counties. While Suffolk County has a slightly higher total population than does Nassau County, the population density of Nassau County is higher because it contains significantly less land than does Suffolk County. Population density is generally consistent with – or is driven by – housing unit density within the Study Area (Figure 2-3). The highest housing unit densities, which range from 20 to 80 units per acre, are located primarily within the downtown core of the Village of Hempstead and also around the LIRR train station in the Village of Mineola; these areas are, also, the most densely populated locations within the Study Area. Several blocks within the downtown of the Village of Westbury support moderate-to-high housing unit densities consistent with its moderate population density, compared with the rest of the Study Area. With the exception of the East Garden City CDP, the Village of Garden City, which generally comprises suburban neighborhoods of less than 5 units per acre, is the least densely populated portion of the Study Area.

Figure 2-3: Existing Housing Unit Density in the Study Area



2.3.3 Employment

Employment data illustrate where jobs are concentrated, which is a useful consideration in planning for transportation improvements. As shown in Table 2-6, there are currently nearly 124,000 jobs in the Study Area with retail- and office-based employment accounting for the largest segments of employment. These segments are roughly equal in size with retail-based and office-based employment, comprising approximately 35 and 33 percent, respectively, of total employment within the Study Area. The Nassau University Medical Center is also a sizeable employer with approximately 3,400 employees in its system (see Section 2.3.4 for healthcare employment data).[7] The high concentration of employment in the Study Area is due to activity centers (i.e., malls and offices) principally in Roosevelt Field and Mitchel Field. Commercial uses comprise approximately 18 percent of land use within the Study Area (Table 2-1). The Study Area houses several major office complexes including RXR Plaza, the Omni at 333 Earle Ovington

[7] NuHealth. *Raising the Bar*. http://www.numc.edu/raisingthebar.asp (August 25, 2010).

Boulevard, and office buildings located at 50, 55, and 60 Charles Lindbergh Boulevard. Additionally, the County Government Complex in the Village of Mineola and office complex along Franklin Avenue in the Village of Garden City are significant office concentrations in the Study Area. Roosevelt Field and the Source Mall represent major retail activity centers.

Table 2-6: Existing Study Area Employment and Projected Employment Change 2010 -2035

Year	Total Employment		Retail-Based Employment		Office-Based Employment	
	Number	% change	Number	% change	Number	% change
2010	123,990	-	43,336	-	41,799	-
2020	127,247	2.6%	44,273	2.2%	43,233	3.4%
2030	131,167	3.1%	45,638	3.1%	44,565	3.1%
2035	134,364	2.4%	46,755	2.4%	45,655	2.4%
Change 2010 – 2035	10,374	8.4%	3,419	7.9%	3,856	9.2%

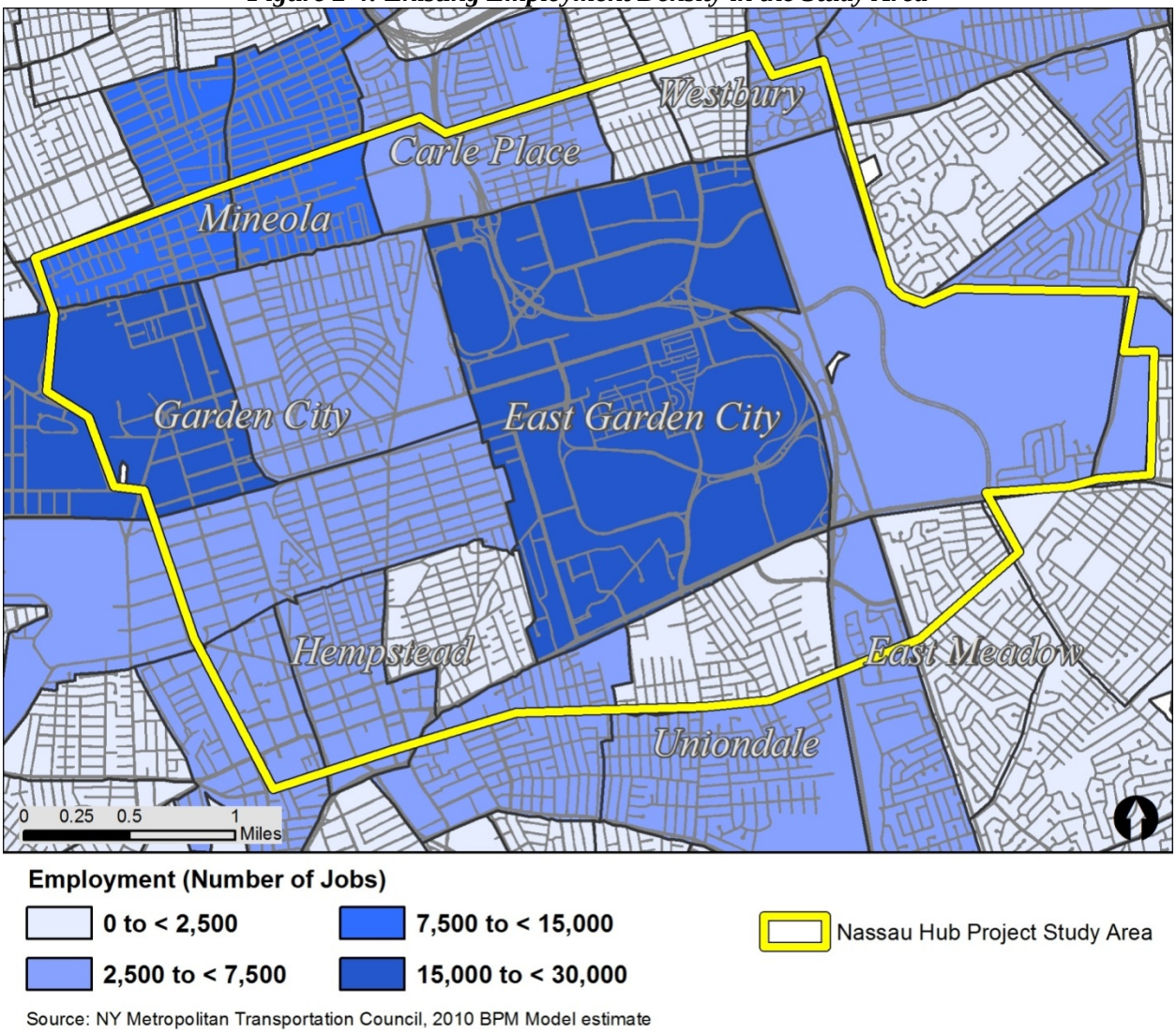
Source: NYMTC, BPM 2035 Forecast Series, based on 2005 base population and employment data.

Overall employment in the Study Area, based on County-wide forecasts, is anticipated to increase by more than 10,000 jobs (8.4 percent) between 2010 and 2035.[8] Both retail- and office-based employment is projected to grow during this period. Overall, office-based employment is anticipated to grow by more than 9 percent with retail employment increasing by more than 8 percent. By comparison, employment growth throughout the region is projected to be significantly higher than in Nassau County between 2010 and 2035. During this time period, employment in Suffolk County is anticipated to increase by approximately 23 percent, while employment in Rockland and Westchester Counties is projected to grow by 27 percent and 26 percent, respectively.[9]

Employment density tends to be heavily concentrated within certain areas (Figure 2-4) of the Study Area rather than being evenly distributed; these areas include the Village of Mineola, in particular around the LIRR train station, and the western portions of the East Garden City CDP and the Village of Garden City, which are primarily non-residential in character. The western half of the East Garden City CDP, which supports a number of large uses, including the Source Mall, Roosevelt Field and Nassau Community College, is estimated to support over 26,000 jobs. The northwestern portion of the Village of Garden City has over 15,000 jobs, a substantial portion of which serve the Nassau County Government Complex. There are approximately 11,000 people employed within the Village of Mineola. The remaining portions of the Study Area, including the Hamlet of Carle Place, the Village of Westbury and the Village of Hempstead, are characterized by a mix of residential and non-residential uses; employment is substantial but less heavily concentrated in these areas, compared with the East Garden City CDP, the Village of Mineola and the western portion of the Village of Garden City.

[8] NYMTC. *2010-2035 NYMTC Regional Transportation Plan.* Chapter 2, Table 2.2, p. 2-9. September 2009.
[9] NYMTC. *2010-2035 NYMTC Regional Transportation Plan*. Chapter 2, Table 2.2, p. 2-9. September 2009.

Figure 2-4: Existing Employment Density in the Study Area



2.3.4 Healthcare and Education

Nassau County has developed a market for educational and medical institutions and services, which represent the fastest growing sectors of the County's economy, employing over 100,000 individuals as of 2006.[10] These institutions are a significant presence within Nassau County and the Study Area itself. As described above, Nassau University Medical Center, a major employer within the Study Area, is anticipated to develop a mix of new healthcare facilities, medical offices and affordable housing within the Study Area as part of its capital investment program. In 2009, the Nassau University Medical Center provided inpatient care to approximately 23,000 patients.[11] Located in the Village of Mineola, the nearly

[10] Nassau County 2010 Draft Master Plan. Chapter 2, p. 2-30.
[11] NuHealth. *Raising the Bar*. http://www.numc.edu/raisingthebar.asp (October 4, 2010).

600-bed Winthrop-University Hospital is within walking distance of the LIRR Mineola Station. The hospital employs 6,000 staff and, in 2009, provided inpatient care to more than 33,000 patients.[12]

Nassau County is home to 11 colleges and universities with a combined total enrollment of over 78,000 students. Two institutions, Hofstra University and Nassau Community College (NCC), are located within the Study Area. Hofstra University has a total enrollment of approximately 12,000, while approximately 22,000 full- and part-time students and 15,000 continuing and professional education students are enrolled at NCC. Hofstra University has 1,830 employees[13] and NCC has 2,242 employees.[14]

Major medical facilities often collaborate with academic institutions. This cooperation is exemplified by the North Shore-Long Island Jewish Hospital (beyond the Study Area limits), which plans construction of a medical school and dormitories on the Hofstra Campus. In addition, Adelphi University, with a total enrollment of approximately 8,000 students, is located in the Village of Garden City, just west of the Study Area.[15] This academic institution is the fourth largest nursing school in the nation and offers clinical service support for the Nassau University Medical Center.

2.3.5 Commercial Development

In September 2009, an analysis of commercial and residential growth was conducted to estimate the distribution of commercial and residential growth for the Study Area and 18 selected downtowns within the County through 2030. [16] This study, conducted by Urbanomics on behalf of Nassau County and titled *20 Year Downtown Growth Allocation*, estimated that approximately 22.5 percent of the 19.2 million square feet of commercial development projected for all of Nassau County would occur in the Study Area with the remainder dispersed among 18 downtowns, at large-scale redevelopment projects and in other County-wide development. The analysis contained within the *20 Year Downtown Growth Allocation* was based on the maximum build-out scenario developed from the *Nassau Hub Major Investment Study and* adjusted to incorporate input from County planning staff. While the distribution of potential future development may change, the study reinforces the importance of the Study Area as a central focus for development in Nassau County.

2.4 Transportation Network

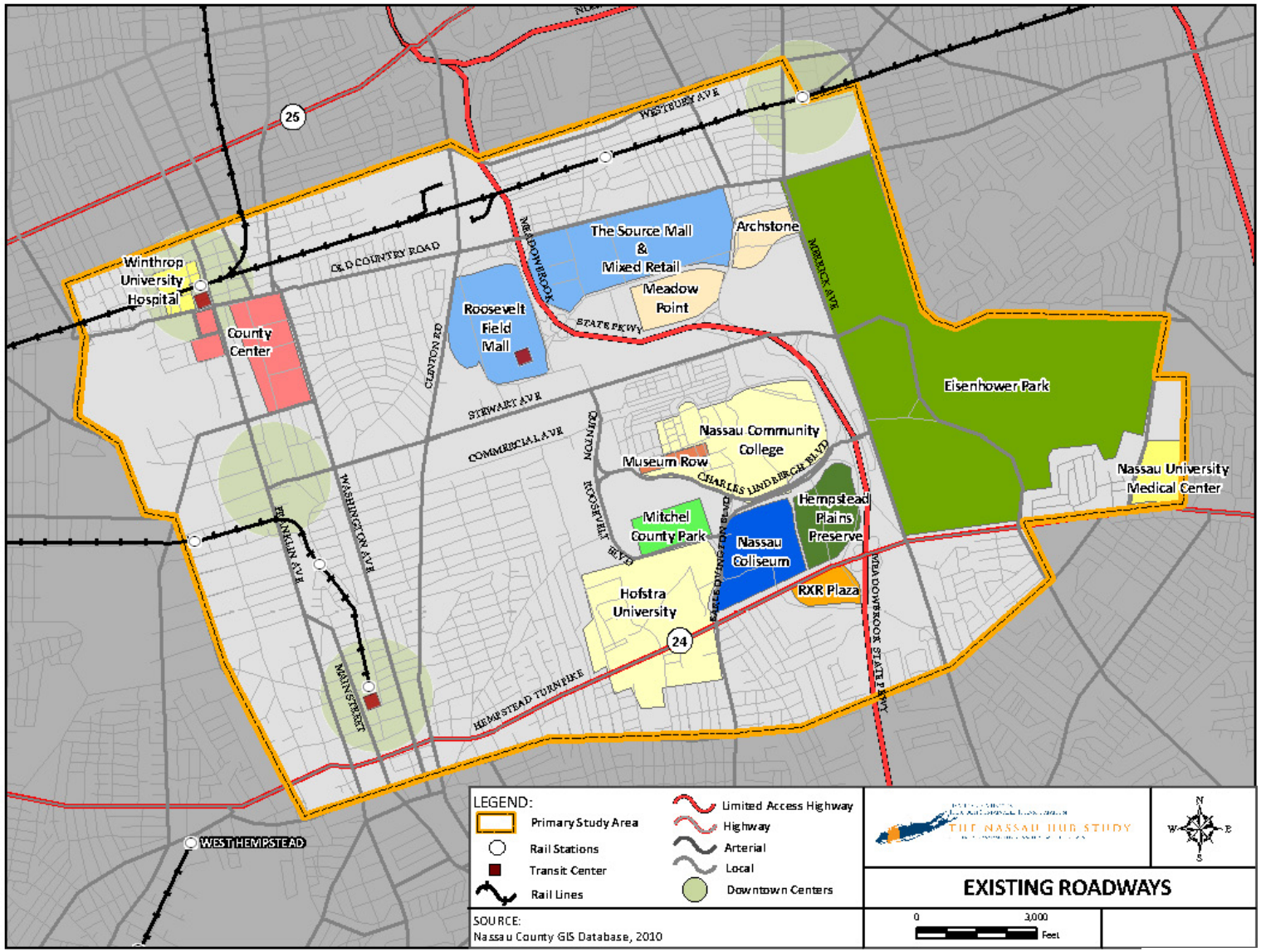
2.4.1 Roadway Network

The Study Area contains a network of roadways comprising state, county, and local roads. Figure 2-5 indicates the primary routes in and around the Study Area.

The MSP is the primary north-south travel route, and provides connections to other regional roadways, such as I-495/Long Island Expressway (indirectly), the Northern State Parkway, and the Southern State Parkway. The MSP is a limited-access, grade-separated highway consisting of three traffic lanes in each travel direction and separated by a median. Within the Study Area, full or partial interchanges are provided to east-west travel routes and are located at Old Country Road (Exit M1), Zeckendorf Boulevard (Exit M2), Merchants Concourse and Stewart Avenue (Exit M3), and Hempstead Turnpike (Exits M4 and M5).

[12] NuHealth. *Raising the Bar*. http://www.numc.edu/raisingthebar.asp (October 4, 2010).
[13] 2012. http://aaup-hofstra.org/wp-content/uploads/2013/03/HofstraUniversityFinancialAnalysis_march2013.pdf
[14] http://www.nassaucountyny.gov/agencies/comptroller/documents/NassauCommunityCollege_1_7_14.pdf
[15] Adelphi University. *Quick Facts*. http://www.adelphi.edu/about/facts.php (September 7, 2010).
[16] Nassau County, *20 Year Downtown Growth Allocation*, 2009.

Figure 2-5: Existing Roadways in the Study Area



The primary east-west travel routes in the Study Area are Old Country Road (under Nassau County Department of Public Works jurisdiction) and Hempstead Turnpike (under New York State Department of Transportation [NYSDOT] jurisdiction).

Old Country Road is a major east-west roadway within the Study Area that contains a varying number of travel lanes, attributable both to available right-of-way and to adjacent land uses, which generate substantial traffic demands that have necessitated a wider cross-section. Some sections have four travel lanes with or without street parking, while other sections have six to eight lanes with no parking. Old Country Road contains numerous curb cuts to allow access to adjacent land uses while major intersections are controlled by traffic signals. The roadway typically has a 40 mile-per-hour (mph) speed limit throughout, except for 30 mph limits posted in the Hamlet of Carle Place and the Village of Mineola. Left- and right-turn lanes are also provided at many locations, such as intersections with major north-south streets and at access points to major activity areas.

Hempstead Turnpike (NYS Route 24) is a principal arterial with a wide median along much of its length (until it enters the Village of Hempstead), and generally has three travel lanes in each direction plus left- and right-turn lanes at major intersections. West of Oak Street (in the Hamlet of Uniondale) and approaching the Village of Hempstead downtown, Hempstead Turnpike's cross-section narrows to two lanes in each direction. Hempstead Turnpike also has numerous curb cuts to allow access to adjacent land uses; major intersections are controlled by traffic signals. Hempstead Turnpike has a 40 mph speed limit throughout the Study Area, except in the Village of Hempstead where the limit is 30 mph.

Other significant east-west roads, such as Stewart Avenue, also serve many of the area's major commercial and institutional developments, as well as pass through primarily residential sections of the Village of Garden City.

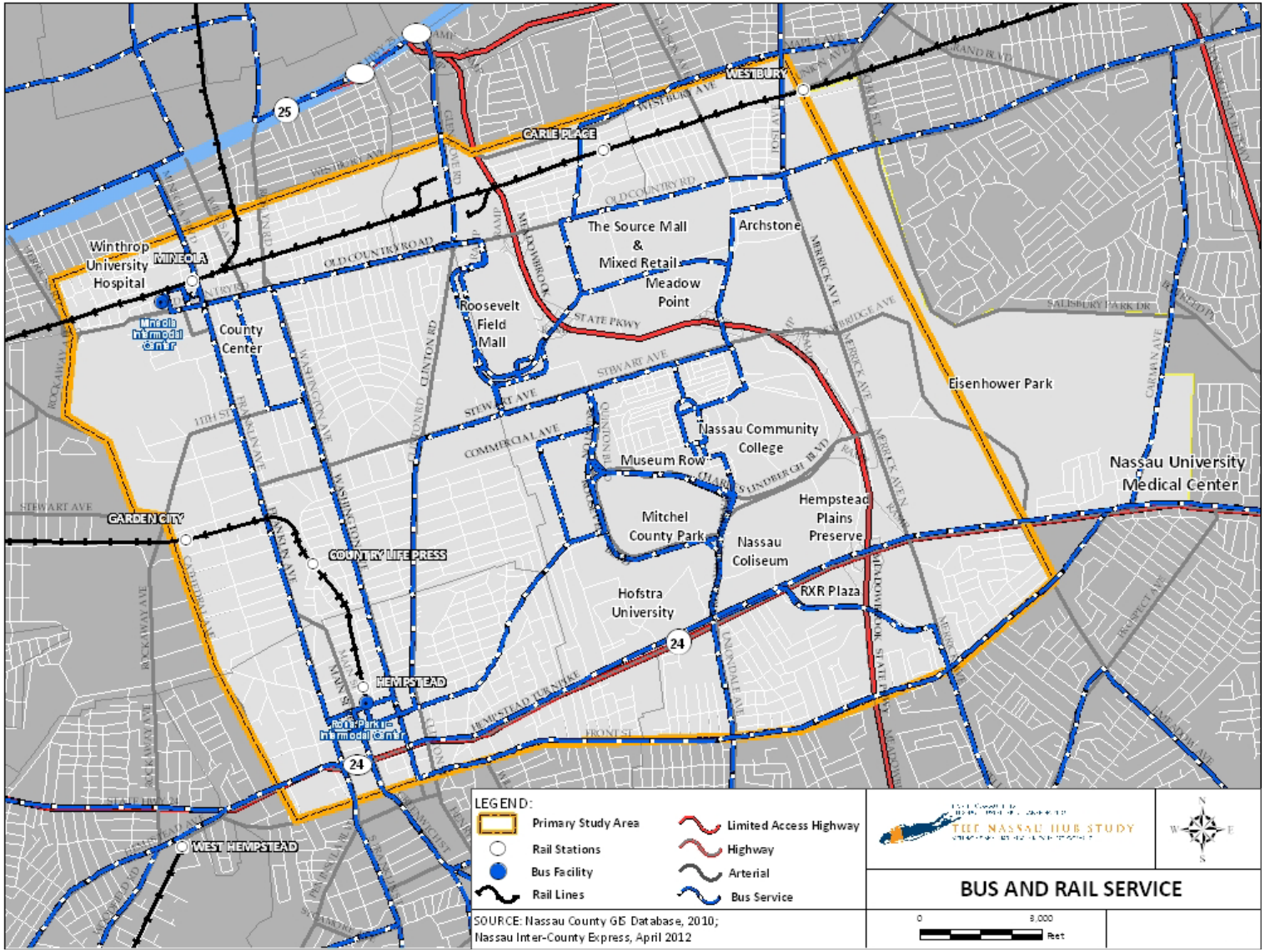
The Study Area is also crossed by several other roads that provide access to major development areas or internal circulation within or between major activity centers. These include Zeckendorf Boulevard, Merchants Concourse, Ellison Avenue, Charles Lindbergh Boulevard, Earl Ovington Boulevard, Endo Boulevard, Quentin Roosevelt Boulevard, Oak Street, Merrick Avenue, and Commercial Avenue.

Many of the Study Area intersections have been improved to include through lanes or auxiliary lanes. Since these roadways have been expanded to the extent possible, given available right-of-way, further widening would now be infeasible or, at least, extremely expensive and would involve significant right-of-way acquisition.

2.4.2 Transit Network

The two main components of the existing transit network are commuter rail and local bus (Figure 2-6), which are described in the following sections.

Figure 2-6: Existing Bus and Rail Service in the Study Area



2.4.2.1 Metropolitan Transportation Authority (MTA)–Long Island Rail Road (LIRR)

The LIRR is a heavy-rail commuter system that handles about 287,000 one-way passenger trips per weekday on ten branches.[17] Three of those branches (Port Jefferson, Oyster Bay, and Hempstead) provide daily service to the outskirts of the Study Area. Only the Oyster Bay Branch offers LIRR north-south connectivity. A fourth branch (West Hempstead) terminates within 1/2 mile of the Study Area perimeter, and currently provides only weekday service.

East-west LIRR service is geared to bringing large volumes of commuters to and from Manhattan, predominantly in the peak travel direction (i.e., AM - westbound, PM - eastbound). The major anchors of the LIRR's east/west orientation are Jamaica and Hunterspoint Avenue/Long Island City Stations (Queens), Atlantic Terminal (Brooklyn) and Pennsylvania Station (Manhattan).

Access to the Study Area via the LIRR is provided at six stations, all of which are located along the western and northern perimeters. There is no direct rail service to the southern or eastern sections, or to many of the major destinations located within the Study Area. Mineola Station on the Port Jefferson Branch has the highest levels of service, connects with more LIRR stations, has the greatest number of parking spaces, and the fastest travel times to Manhattan due to scheduled express services. It also is the busiest, accommodating almost as many boardings and alightings as the other six Study Area stations combined (Table 2-7). Current LIRR travel time between Manhattan and Mineola ranges between 32 and 42 minutes. On the other branches where express services are not operated, travel time from Pennsylvania Station to Hempstead ranges from 50 to 53 minutes and between 49 and 53 minutes to West Hempstead. These significantly slower travel times are exacerbated by the need to transfer at Jamaica for many trips.

Table 2-7: LIRR Total Weekday Boardings and Alightings at Stations within the Study Area

LIRR Line / Station	Boardings	Alightings
Port Jefferson Branch		
Mineola	5,522	4,826
Carle Place	411	361
Westbury	2,073	1,830
Hempstead Branch		
Garden City	650	751
Country Life Press	653	583
Hempstead	1,763	1,851

Source: 2006 LIRR Origin and Destination Study, Total Boardings Eastbound and Westbound.

2.4.2.2 Nassau Inter-County Express (NICE) Bus

The second component of the existing Study Area transit network is the NICE Bus[18] system, which is operated by Veolia Transportation Services, Inc. under a lease and operating agreement with Nassau County. The entire 38-route NICE Bus network operates along public streets. Seventeen of these routes serve the Study Area (Table 2-8 and Figures 2-7 and 2-8). The majority of these routes (ten) provide service to and from areas south of the Study Area: four connect destinations to/from the east, two to/from the north and one to/from the west.

[17] Metropolitan Transportation Authority. *The MTA Network, December 2009.* http://www.mta.info/mta/network.htm (September 10, 2010).
[18] NICE Bus replaced MTA LI Bus as the county bus operator January 1, 2012.

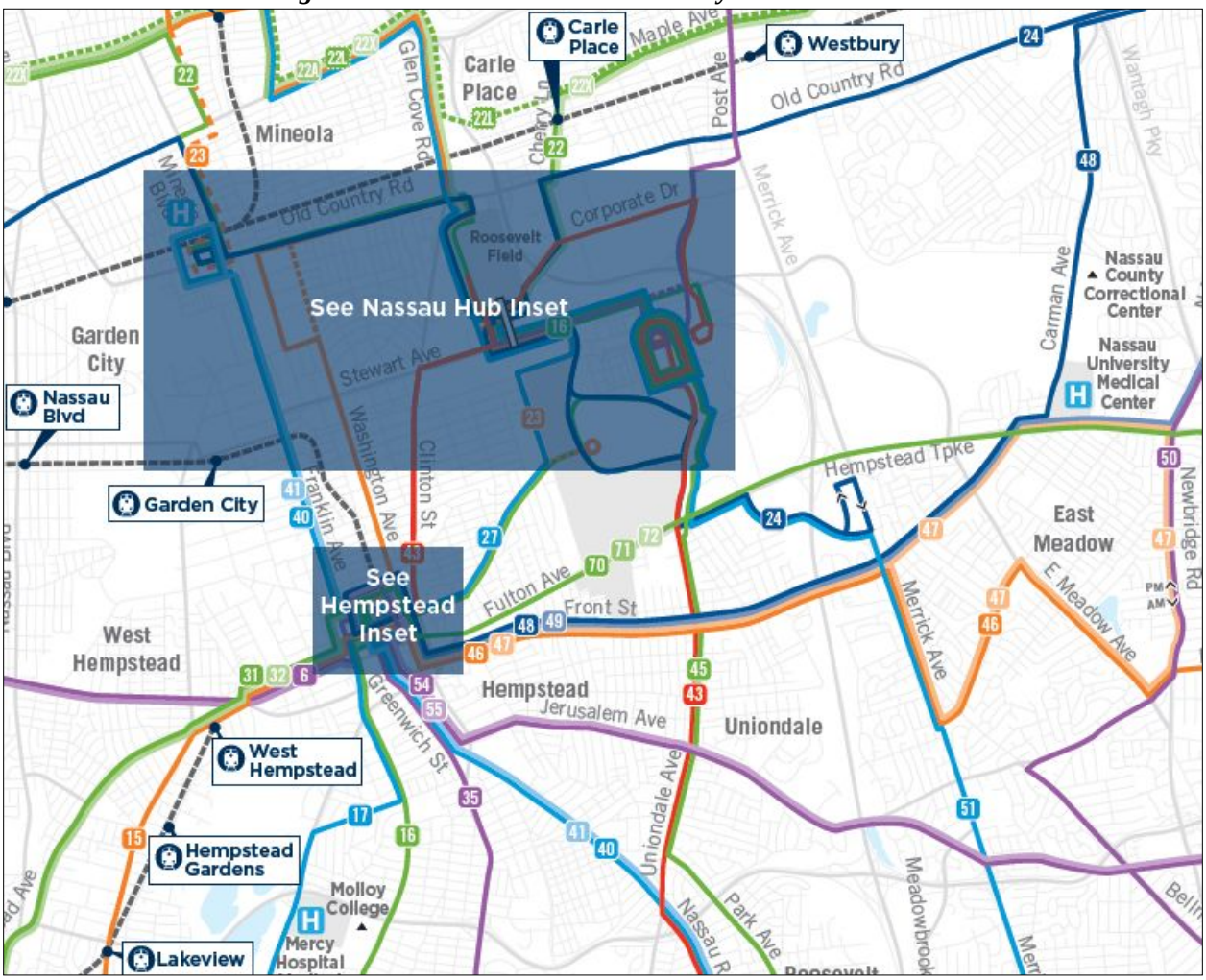
Table 2-8: NICE Bus Service in the Study Area

Route	Route Description	Average Weekday Ridership				Change 1998-2012		Change 2010-2012	
		1998	2010	2011	2012	Riders	Percent	Riders	Percent
6 / 6X	Hemp.-Jamaica (via Hemp. Tpke.)	11,409	14,749	14,870	14,744	3,335	29.2%	-5	0.0%
15	Lng Beach- Hempstead- Roos Fld	6,954	6,472	6,284	5,791	-1,163	-16.7%	-681	-10.5%
16	Hempstead- Rockville Centre LIRR	2,384	3,160	3,155	2,545	161	6.8%	-615	-19.5%
17	Hempstead-Rockvl Ctr-Mercy Hosp	146	184	N/A	N/A	-146	-100.0%	-184	n/a
22/22A/22L/22X	Jamaica-Mineola- Roos Fld-Hksvl	6,242	7,264	7,473	7,235	993	15.9%	-29	-0.4%
23	Manorhaven-Mineola-Hempstead	1,877	2,044	2,092	2,668	791	42.1%	624	30.5%
27	Hempstead-Roos. Field-Glen Cove	1,708	2,058	2,042	1,537	-171	-10.0%	-521	-25.3%
31	Far Rockaway- Lynbrook-Hemp	1,824	1,904	2,098	1,986	162	8.9%	82	4.3%
32	Far Rockaway- Lynbrook-Hemp	3,447	4,020	3,524	3,051	-396	-11.5%	-969	-24.1%
35	Baldwin-Hempstead- Westbury	2,085	3,536	3,408	3,462	1,377	66.0%	-74	-2.1%
40	Freeport- Hempstead-Mineola	5,391	4,785	4,534	4,023	-1,368	-25.4%	-762	-15.9%
41	Freeport- Hempstead-Mineola	4,631	4,640	4,244	3,809	-822	-17.7%	-831	-17.9%
43	Freeport-Roosevelt Field-Hempstead	N/A	1,544	1,540	1,928	1,928	N/A	384	24.9%
45	Bellmore- Roosevelt Field	495	377	330	241	-254	-51.3%	-136	-36.1%
46	Hemp-E. Meadow-Bellmore	481	415	413	466	-15	-3.1%	51	12.3%
47	Hemp-E. Meadow-Bellmore	336	308	299	322	-14	-4.2%	14	4.5%
48	Hemp.- Hicks-Jericho Quad	1,529	1,304	1,193	1,032	-497	-32.5%	-272	-20.9%
49	Hemp.- Hicks-Jericho Quad	1,476	1,445	1,469	1,419	-57	-3.9%	-26	-1.8%
51	Merrick-Roosevelt Field	289	215	196	244	-45	-15.6%	29	13.5%
54	Amityville-Sunrise Mall-Hemp	1,001	1,084	1,121	1,054	53	5.3%	-30	-2.8%
55	Amityville-Sunrise Mall-Hemp	852	1,001	980	920	68	8.0%	-81	-8.1%
70	Hemp-Sun. Mall-Farm-Babylon	1,603	1,539	1,295	1,591	-12	-0.7%	52	3.4%
71	Hemp-Sun. Mall-Farm-Babylon	1,125	1,127	989	1,070	-55	-4.9%	-57	-5.1%

Source: Long Island (LI) Bus 13 Year Comparison of Average Weekday Ridership - MTA LI Bus; Nassau Inter-County Express Bus Map and Schedules April 2012 (www.nicebus.com).

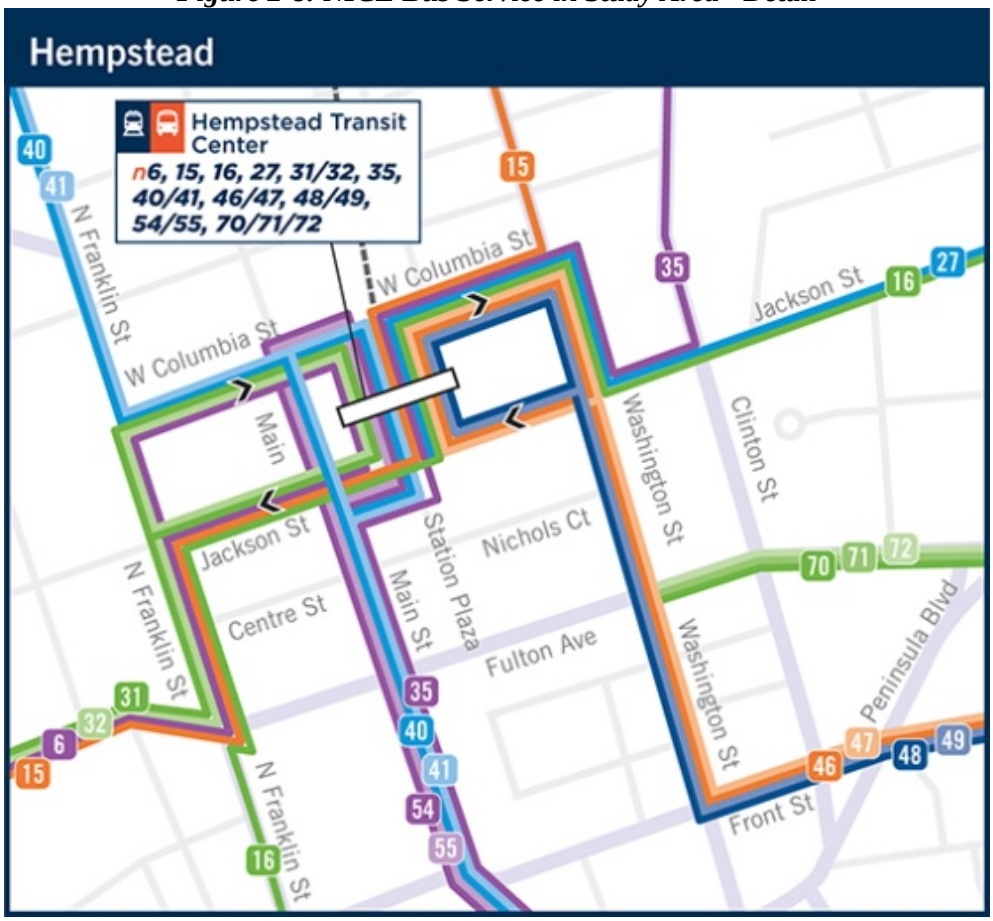
Note: Shaded routes are paired and listed on the same schedule.

Figure 2-7: NICE Bus Service in Study Area - Overview



Source: Nassau Inter-County Express (www.nicebus.com), April 2012.

Figure 2-8: NICE Bus Service in Study Area - Detail



Source: Nassau Inter-County Express (www.nicebus.com), April 2012.

The Study Area is home to three off-street transit centers: the Rosa Parks–Hempstead Transit Center and the Mineola Intermodal Center are intermodal (offering physically convenient transfers among buses and to the LIRR on the periphery of the Study Area), while the Roosevelt Field Bus Facility serves bus riders only. The Rosa Parks–Hempstead Transit Center is a more modern and slightly relocated version of a terminal that served the Village of Hempstead in the 1950s, when it was the retail and employment center of the County. When the County consolidated private bus operations in 1974, the Rosa Parks–Hempstead Transit Center was envisioned as the center of a hub-and-spoke arrangement, with extensive transferring activity. The Mineola Intermodal Center functions most strongly as a LIRR connection for New York City-bound trips, and for inter-and intra-County trips to the medical/commercial/governmental activities that are within walking distance of Mineola Station. Increases and decreases in ridership have been experienced throughout the system over the last decade. Average weekday ridership on the NICE Bus network was approximately 99,000 in 2012. [19]

[19] NICE Bus, Historical Ridership Data 4th Quarter 1998-2013.

2.5 Travel Patterns

The Study Area encompasses a range of activity centers including residential, office, government services (i.e., courts and administration), retail, manufacturing, cultural, educational, and recreational uses. As such, it generates extensive demands on the existing transportation system, especially on roadways serving it. Travel patterns in the Study Area in 2010 were analyzed and are illustrated on "tripshed" maps (Figures 2-9 and 2-10) that graphically depict travel behavior of people traveling to and within the Study Area. These graphics illustrate the number of trips that are attracted to the Study Area (receiving area) from all surrounding zones (sending areas), showing both the distribution and intensity of trips attracted to the Study Area.

Traffic Analysis Zones (TAZ) are commonly used in transportation planning models to represent areas with unique or significant travel characteristics. The TAZ is the analysis unit used in NYMTC's BPM[20] to analyze the travel patterns across the different geographies comprising the NYMTC region.

These data are useful in providing insights on the origins of trips into the Study Area, predominant directions of travel, and the number of trips made into the Study Area. These data assisted in evaluating whether there are adequate access and mode choices to travel to the Study Area as well as informing the development of specific routings and/or alignments for the alternatives to be developed in this Study.

2.5.1 Travel Patterns to the Study Area by Direction

Figures 2-9 and 2-10 and Table 2-9 depict predominant travel patterns by direction for trips originating from the surrounding TAZs (sending areas) and traveling to destinations in the Study Area (receiving areas). Predominant travel patterns depict the AM peak-period (6:00-10:00 AM) trips, as defined in NYMTC's BPM. The data are categorized by their NYMTC groupings. For highway trips, the categories are "Drive Alone" (i.e., single-occupant vehicle trips), "Carpool" (i.e., 2-person and 3-person high-occupancy vehicle [HOV] ride share), "Trucks, "Externals" (i.e., trips from outside the NYMTC region to the Study Area) and "Other Commercial." For transit trips, the data are categorized as "Walk to Transit" (i.e., bus), "Drive to Transit" (i.e., bus), "Walk to Commuter Rail," and "Drive to Commuter Rail."

As shown in Table 2-9, in 2010 the Study Area attracted a considerable number of trips, including 97,000 trips in the AM peak period (6:00-10:00 AM). Eighty percent of trips entering the Study Area were highway trips and 20 percent were transit trips (MTA LI Bus and MTA LIRR commuter rail). While the share of transit trips is higher than expected for a suburban area, the Study Area is not a typical suburban setting. It is unique due to its high concentration of destinations and activity centers, including two regional malls (Roosevelt Field and the Source Mall), several large office parks, downtown cores for Villages of Garden City, Mineola, and Hempstead, two large colleges (NCC and Hofstra University), the Nassau University Medical Center, Museum Row, and the Nassau County Government Complex. As this area developed over time, transit services, particularly bus service, have been introduced to try to serve these destinations. Still, as discussed below, the automobile is the predominant mode used for traveling to the Study Area.

[20] The BPM, which is NYMTC's regional travel demand forecasting model, predicts changes in future travel patterns in response to changes in demographic profiles and transportation systems within the NYMTC region. The BPM incorporates transportation behavior and relationships based on an extensive set of data that include a major travel survey of households in the region, land-use inventories, socioeconomic data, traffic and transit counts, and travel times.

Figure 2-9: Total AM Peak-Period Vehicle Trips to Study Area ("Tripshed")

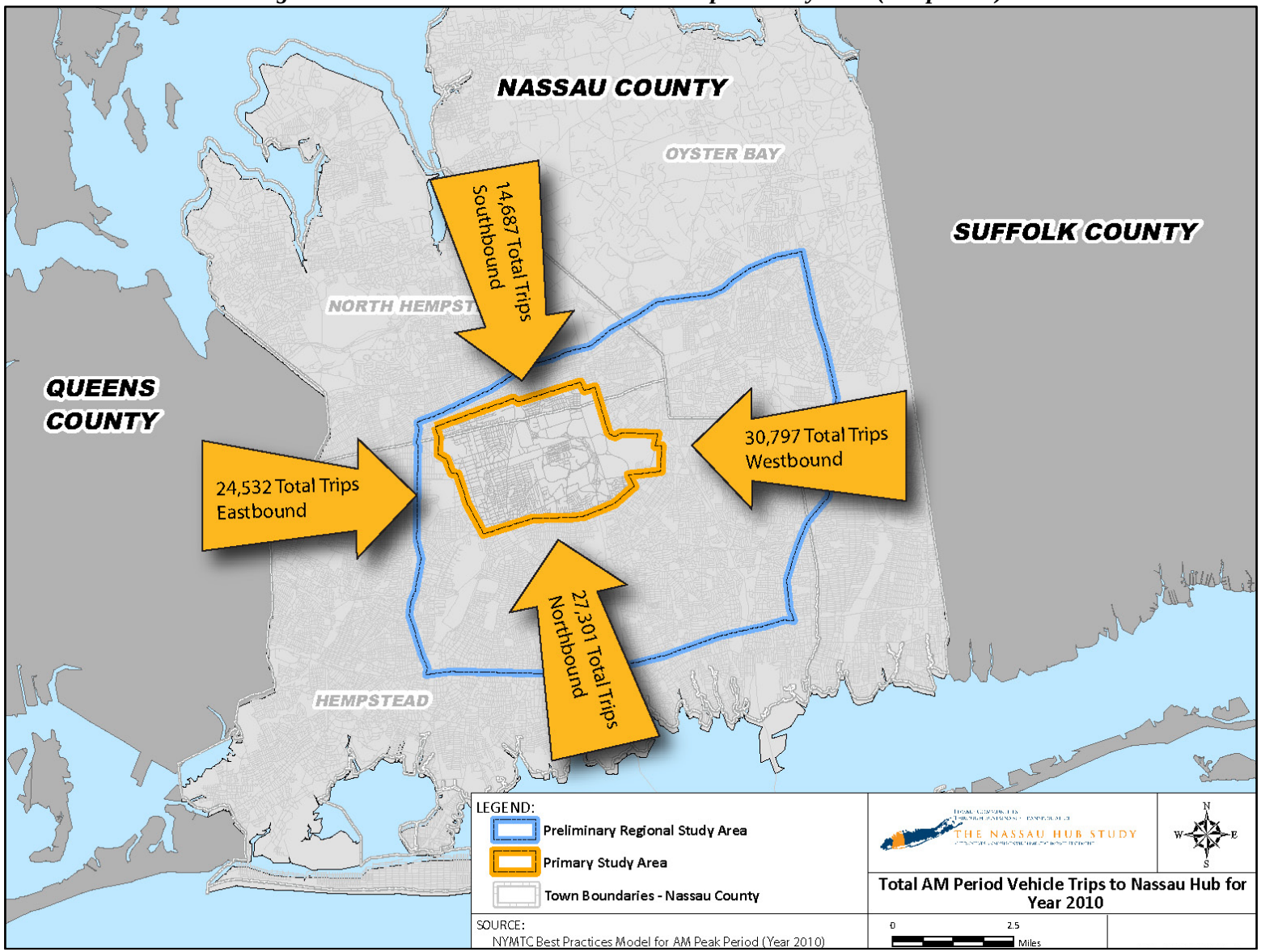


Figure 2-10: Total AM Peak-Period Transit Trips to the Study Area ("Tripshed")

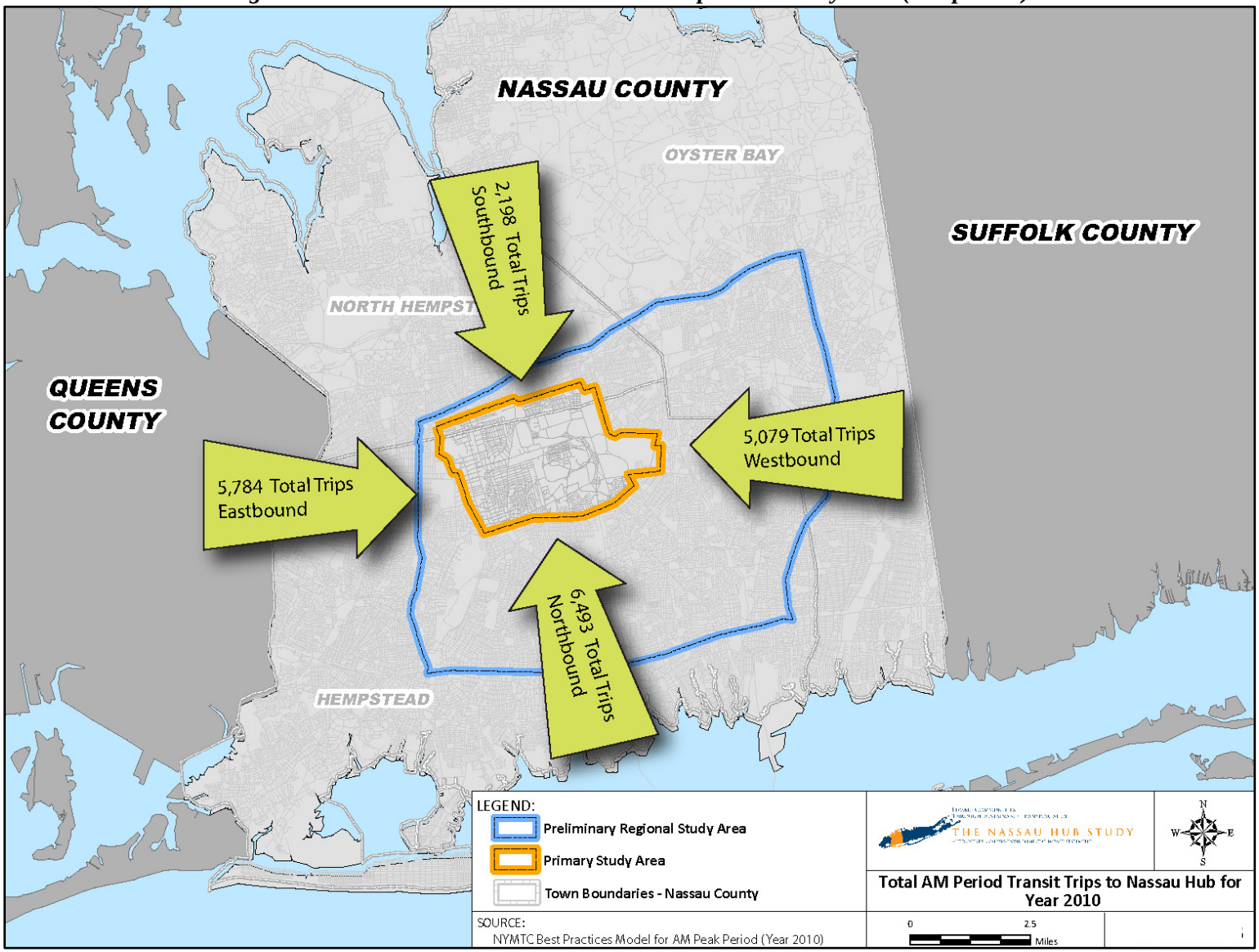


Table 2-9: AM Peak-Period Travel Patterns by Direction to the Study Area – 2010

Sending Area	Highway Trips	% Highway	Transit Trips	% Transit	Total Trips	% Total Trips
Northbound	20,808	76.2%	6,493	23.8%	27,301	28.1%
Southbound	12,489	85.0%	2,198	15.0%	14,687	15.1%
Westbound	25,718	83.5%	5,079	16.5%	30,797	31.6%
Eastbound	18,748	76.4%	5,784	23.6%	24,532	25.2%
Total	**77,763**	**79.9%**	**19,554**	**20.1%**	**97,317**	**100.0%**

Source: NYMTC, BPM for AM Peak Period (Year 2010).

The NYMTC data for 2010 show that the predominant direction of travel to the Study Area is westbound, or from areas located to the east, accounting for just over 31 percent of all AM peak-period trips (30,797 trips). Conversely, southbound travel (i.e., from areas to the north) produced the lowest share of trips, representing only 15 percent of total trips bound for the Study Area (14,687 trips). In terms of the transit share of trips made to the Study Area by direction, the highest levels were those heading northbound (6,493 trips) and eastbound (5,784 trips).

2.5.2 External and Internal Travel Patterns of the Study Area

Table 2-10 displays internal travel patterns (i.e., trips beginning and ending *within* the Study Area) and external travel patterns (i.e., trips originating from areas *outside* the Study Area that end *inside* the Study Area). The data are further organized by highway trips and transit trips. These data reflect travel behavior in terms of where trips begin and end and which modes of travel are used to make these trips.

Table 2-10: AM Peak-Period Internal and External Trips by Mode for the Study Area – 2010

Highway Trips

Mode	Internal	External	Total	% of Total Highway Trips
Drive Alone	6,399	46,292	52,691	67.8%
Carpool[1]	2,947	17,490	20,437	26.3%
Trucks[2]	1,363	2,101	3,464	4.5%
Other Commercial	530	641	1,171	1.5%
Subtotal	**11,239**	**66,524**	**77,763**	
% of Total Highway Trips	14.5%	85.5%	100.0%	

Transit Trips[3]

Mode	Internal	External	Total	% of Total Transit Trips
Walk to Transit (Bus)	3,217	13,161	16,378	83.8%
Drive to Transit (Bus)	34	375	409	2.1%
Walk to Commuter Rail	163	1,275	1,438	7.4%
Drive to Commuter Rail	41	1,288	1,329	6.8%
Subtotal	**3,455**	**16,099**	**19,554**	
% of Total Transit Trips	17.7%	82.3%	100.0%	
GRAND TOTAL	**14,694**	**82,623**	**97,317**	
% of Total Trips	**15.1%**	**84.9%**	**100.0%**	

Source: NYMTC, BPM for AM Peak Period (Year 2010)
Notes:
[1]Carpool = 2-person and 3-person HOV ride share.
[2]Trucks plus "Externals" (i.e., trips from outside NYMTC region to Study Area, though minimal at only 63 trips).
[3]The NYMTC model defines Transit as “Walk to Transit” (i.e., bus), “Drive to Transit” (i.e., bus), “Walk to Commuter Rail,” and “Drive to Commuter Rail.”

During the AM peak period, 85 percent of all trips (both highway and transit trips) made to the Study Area in 2010 originated from areas outside of it. The remaining 15 percent of the total trips were internally generated. These percentages were generally the same for both internal and external highway and transit trips. Comparing internal to external trips for highway trips only, 14.5 percent of highway trips originated within the Study Area and 85.5 percent originated outside of it. Internally generated transit trips were slightly higher (17.7 percent) compared to external transit trips (82.3 percent).

The automobile is the predominant mode of travel for highway trips. During the AM peak period, 94 percent of all highway trips to the Study Area are "Drive Alone" and "Carpool," accounting for over 73,000 trips. The remaining 6 percent of highway trips are truck and other commercial vehicles (approximately 4,600 trips).

In terms of transit trips to the Study Area, trips made by bus account for nearly 86 percent of all transit trips (approximately 16,800 trips). Commuter rail represents only 14 percent of the share of transit trips or just over 2,700 trips. People traveling by commuter rail were almost as likely to drive and park at a station (1,329 trips) as they were to walk to a station (1,438 trips). As there are six LIRR stations within the Study Area, the commuter-rail share is low, which helps illustrate the fact that commuter rail is not used extensively for travel to and within the Study Area.

2.6 Transportation Limitations

2.6.1 Land Use

While the Nassau Hub is the County's commercial, government, institutional and entertainment center, the multiple destinations and activity nodes within the Study Area are themselves dispersed and poorly connected. The major activity centers in the Study Area tend to be isolated by large parking lots and multi-lane arterial roadways that function as physical barriers. Additionally, the location of Eisenhower Park, with no major east-west through roads, presents a physical obstacle to linking facilities to the east to the remainder of the Study Area. Due to these conditions, the current transportation system does not efficiently link uses within the Study Area, which poses potential constraints to future development and increased economic activity should no transportation improvements be implemented to correct this deficiency.

2.6.2 Roadway Congestion

One of the most prevalent transportation issues in Nassau County, in general, and in the Study Area, in particular, is persistent and recurring traffic congestion on major roadways. The private automobile is the dominant mode of transportation into and around the Study Area, serving as the travel mode for the vast majority of all Study Area trips. Non-work trips (shopping, entertainment, and recreational) are more likely to be auto-oriented than commuting trips, which are somewhat more likely to be made via transit.

The peak commuter hours typically occur on weekdays from 8:00 to 9:00 AM and 5:00 to 6:00 PM, but traffic volumes are also consistently high throughout the midday period.[21] Congestion often occurs from the midday through the late afternoon/early evening peak period. Several roadways, such as Old Country Road and Hempstead Turnpike, experience high traffic volumes and high levels of congestion even on weekends. In addition to congestion related to commuting hours, the Study Area's event-based land uses

[21] Peak period refers to the time period(s) of the day in which the background traffic and/or project-generated traffic is at or anticipated to be at its highest level.

create non-standard traffic patterns. For example, the Nassau Veterans Memorial Coliseum currently generates high volumes of traffic related to sporting and entertainment events held in the evenings and on weekends. Of particular note, evening events tend to have start times that partially overlap the peak commuting hour, further exacerbating traffic conditions in the Study Area. Traffic conditions around Nassau Veterans Memorial Coliseum are expected to change dramatically with the planned move of the New York Islanders to a new arena in Brooklyn in 2015. The current redevelopment proposal for Nassau Veterans Memorial Coliseum will resize the venue and add more attraction dates, which may yield increases in traffic on the surrounding road network.

The MSP carries traffic volumes that, at times, exceed 6,400 vehicles per hour (vph), which surpasses the roadway's capacity. These substantial traffic volumes result in queuing at interchange ramps and in weaving areas along the MSP during peak weekday commuter and shopping periods, as well as many off-peak periods throughout the week. Traffic exiting the MSP, where interchange exit ramps are regulated by traffic signals or yield signs, can form long queues that back up onto the parkway's travel lanes, creating potentially dangerous conditions. Volumes entering and exiting the MSP vary widely for the five entrances/exits in the Study Area, with over 1,000 vph occurring just on the northbound off-ramp at Old Country Road. The Study Area has only this one free-flowing highway or parkway; all other travel occurs on arterials and local streets.

Many of the Study Area's principal arterials experience severe congestion along much, if not all, of their length during peak commutation hours, as well as midday and weekend shopping, recreational, and entertainment hours. Old Country Road and Hempstead Turnpike, the two primary east-west arterials in the area, carry substantial traffic volumes, at times reaching close to 3,000 vph and operating at levels of service (LOS) E or F in some locations. At numerous locations where these two primary east-west arterials intersect with major north-south roads, the capacity of those intersections cannot adequately accommodate the volumes traveling through them. A major source of traffic congestion occurs at the many locations where key east-west and north-south roads intersect.[22]

Examples of this are at the intersections of Old Country Road and Glen Cove Road/Clinton Road, Old Country Road and Merrick Avenue/Post Avenue, and Hempstead Turnpike and Merrick Avenue, which operate at congested overall LOS E or F in both the morning and evening peak hours, and at numerous other intersections that operate at LOS E or F in at least one of the two peak hours, if not both. An intersection operating at overall LOS E or F generally means that either one specific traffic movement is operating at severe congestion levels or that multiple movements are operating at LOS E or F conditions. According to the year 2008 analyses published in the *DGEIS for the Lighthouse at Long Island*, seven of 27 intersections analyzed in the Study Area and along key feeder routes leading to it operated at overall LOS E or F conditions in the weekday AM peak hour and another eight intersections operated overall at LOS D. In the weekday PM peak hour, 11 of the 27 intersections operated at overall LOS E or F and another 10 operated at overall LOS D. In the Saturday midday peak hour, four intersections operated at overall LOS E or F and another eight operated at overall LOS D (see Table 2-11 and Figures 2-11 through 2-13). Congestion delays at many of these intersections are already severe. Even at an intersection's

[22] Level of service (LOS) represents overall operating conditions confronting a motorist, based on traffic congestion and travel speed. LOS criteria, as defined in the *Highway Capacity Manual 2000 (HCM 2000)*, are stated in terms of the average stopped delay per vehicle. Levels of service range from "A" to "F," with "A" representing free-flow conditions and "F" constituting breakdown or congested conditions. Typically, LOS A through C are considered acceptable with LOS D considered marginally acceptable. LOS E and F are at or near failing conditions.

overall marginally acceptable/unacceptable LOS D, one or more traffic movements within the intersection may have been operating in congested conditions.

In order to accommodate existing traffic demands, many of the area's roadways have already been widened at critical locations with left-turn lanes and/or right-turn lanes and curb parking has been prohibited to improve roadway operations. One prominent example is the intersection of Old Country Road and Glen Cove Road/Clinton Road, where there are seven westbound lanes (two left-turn lanes, four through lanes, and a right-turn lane), six eastbound lanes (two left-turn lanes, three through lanes, and a right-turn lane), and four to five travel lanes per direction along Glen Cove Road/Clinton Road.

Even though these measures have added much-needed capacity, this intersection still operates at severely congested levels of service with 6,500 to more than 7,000 vehicles passing through it during peak hours. This intersection is currently operating at LOS E during weekday and weekend peak hours, which indicates that it does not have the capacity to adequately process existing volumes. There are numerous similar examples of existing congested conditions throughout the Study Area.

NYSDOT forecasts that traffic in the Study Area will increase by approximately ½ percent per year. The Highway Data Services Bureau is responsible for collecting and reporting highway data (including volume counts) in New York State. The NYSDOT Traffic Monitoring System obtains 24-hour traffic count data on all State roads and many local roadways to determine current conditions and to project current and future conditions based on prior-year traffic counts. NYSDOT currently utilizes the 0.5-percent annual growth to project future traffic conditions on roadways within the Study Area. The use of this growth rate is justified based upon historic data and NYSDOT's ongoing traffic count program. This data source was used to predict ambient traffic growth.

By the year 2035 (the Nassau Hub Study's future analysis year), overall traffic volumes are expected to increase by almost 15 percent compared to existing volumes. Even without any significant land development or redevelopment projects, vehicle traffic within the Study Area is expected to increase by thousands of vehicles, and it is logical to conclude that congestion and delays throughout the Study Area will increase substantially. Applying NYSDOT's growth rate to key intersections in the Study Area predicts hundreds of additional trips (Figure 2-14). With this projected traffic growth, traffic conditions at all Study Area intersections currently operating at overall congested LOS E or F will deteriorate further, with substantially increased delays. It is also likely that traffic conditions at Study Area intersections currently operating at overall marginally acceptable/unacceptable LOS D will deteriorate to congested LOS E or F. In the most critical weekday peak hour between 5:00 and 6:00 PM, this would mean that 20 of the 27 intersections included in Table 2-11 would be classified as failing. With no physical room and right-of-way to make improvements to handle this additional traffic, congestion and delays will worsen, causing traffic diversions to lower order roads, potentially including residential streets. This condition will be common throughout the entire Study Area.

Table 2-11: Overall Intersection Traffic Level of Service (2008 Existing Conditions)

INTERSECTION	WEEKDAY AM	WEEKDAY PM	SATURDAY MIDDAY
OLD COUNTRY ROAD & MINEOLA BLVD / FRANKLIN AVE	○	◑	○
OLD COUNTRY ROAD & WILLIS AVE	N/A	N/A	N/A
OLD COUNTRY ROAD & ROSLYN ROAD / WASHINGTON AVE	N/A	N/A	N/A
OLD COUNTRY ROAD & GLEN COVE ROAD / CLINTON ROAD	●	●	●
OLD COUNTRY ROAD & ROOSEVELT FIELD ENTRANCE	○	●	●
OLD COUNTRY ROAD & MEADOWBROOK PARKWAY SB EXIT RAMP	N/A	N/A	N/A
OLD COUNTRY ROAD & MEADOWBROOK PARKWAY NB EXIT RAMP	N/A	N/A	N/A
OLD COUNTRY ROAD & EAST GATE BLVD	N/A	N/A	N/A
OLD COUNTRY ROAD & ZECKENDORF BLVD	N/A	N/A	N/A
OLD COUNTRY ROAD & ELLISON AVE / MERCHANTS CONCOURSE	○	●	○
OLD COUNTRY ROAD & POST AVE / MERRICK AVE	●	●	◑
OLD COUNTRY ROAD & SCHOOL STREET / SALISBURY PARK DRIVE	◑	◑	○
FULTON AVE & NORTH FRANKLIN STREET	○	●	◑
FULTON AVE & PENINSULA BLVD	○	○	○
HEMPSTEAD TURNPIKE & OAK STREET	○	◑	○
HEMPSTEAD TURNPIKE & HOFSTRA BLVD / CALIFORNIA AVE	◑	○	●
HEMPSTEAD TURNPIKE & EARLE OVINGTON BLVD / UNIONDALE AVE	◑	●	●
HEMPSTEAD TURNPIKE & GLENN CURTISS BLVD	◑	◑	○
HEMPSTEAD TURNPIKE & MERRICK AVE	●	●	◑
HEMPSTEAD TURNPIKE & PARK BLVD / EAST MEADOW AVE	◑	●	○
HEMPSTEAD TURNPIKE & CARMAN AVE	●	◑	○
HEMPSTEAD TURNPIKE & NEWBRIDGE ROAD	●	●	◑
STEWART AVE & FRANKLIN AVE	●	◑	◑
STEWART AVE & WASHINGTON AVE	N/A	N/A	N/A
STEWART AVE & CLINTON STREET	◑	◑	○
STEWART AVE & ROOSEVELT FIELD RING ROAD (WEST)	○	○	○
STEWART AVE & QUENTIN ROOSEVELT BLVD	○	●	○
STEWART AVE & MERCHANTS CONCOURSE / ENDO BLVD	◑	●	◑
STEWART AVE & MERRICK AVE	◑	◑	◑
CHARLES LINDBERGH BLVD & EARLE OVINGTON BLVD	○	○	○
CHARLES LINDBERGH BLVD & MERRICK AVE	○	○	○
MERRICK AVE & CORPORATE DRIVE	○	○	○
FRONT STREET & UNIONDALE AVE	○	◑	○
FRONT STREET & MERRICK AVE	●	◑	◑

Legend:
- ○ Level of Service A,B,C (acceptable)
- ◑ Level of Service D (marginally acceptable/unacceptable)
- ● Level of Service E,F (unacceptable)

Notes:
1. Levels of service are for the overall intersection. LOS E and F indicate congestion or severe congestion, potentially for multiple traffic movements at the intersection. Overall LOS C and D may also have one or more individual traffic movements at congested LOS E or F.
2. Levels of service (LOS) A,B and C indicate acceptable conditions, LOS D indicates increased delays, while LOS E and F indicate congested or severely congested conditions.
3. N/A = Not analyzed
4. Source: The Lighthouse at Long Island EIS

Source: DGEIS for the Lighthouse at Long Island, 2009.

Figure 2-11: Overall Intersection Traffic Levels of Service: 2008 Existing Conditions-Weekday AM Peak Period

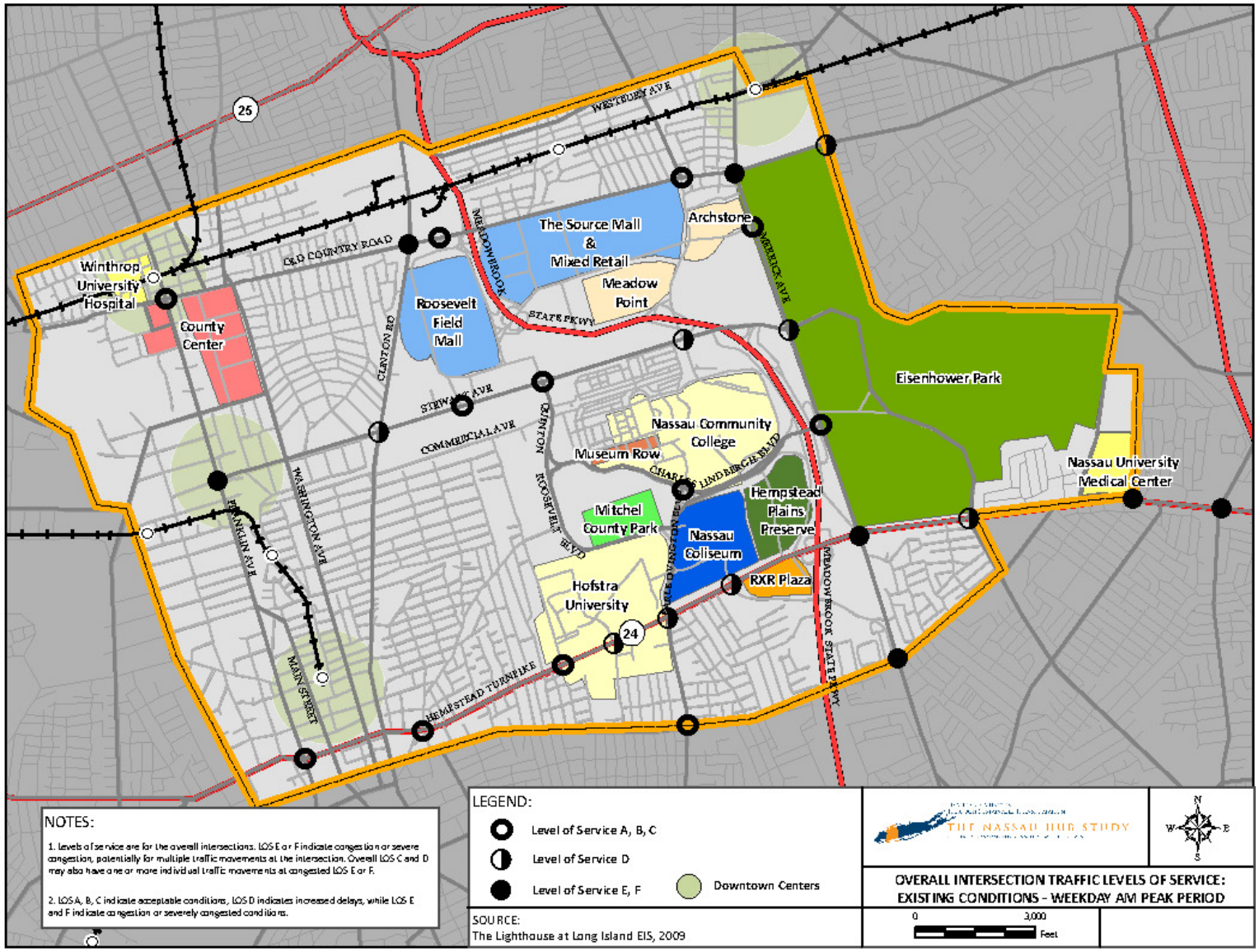


Figure 2-12: Overall Intersection Traffic Levels of Service: 2008 Existing Conditions-Weekday PM Peak Period

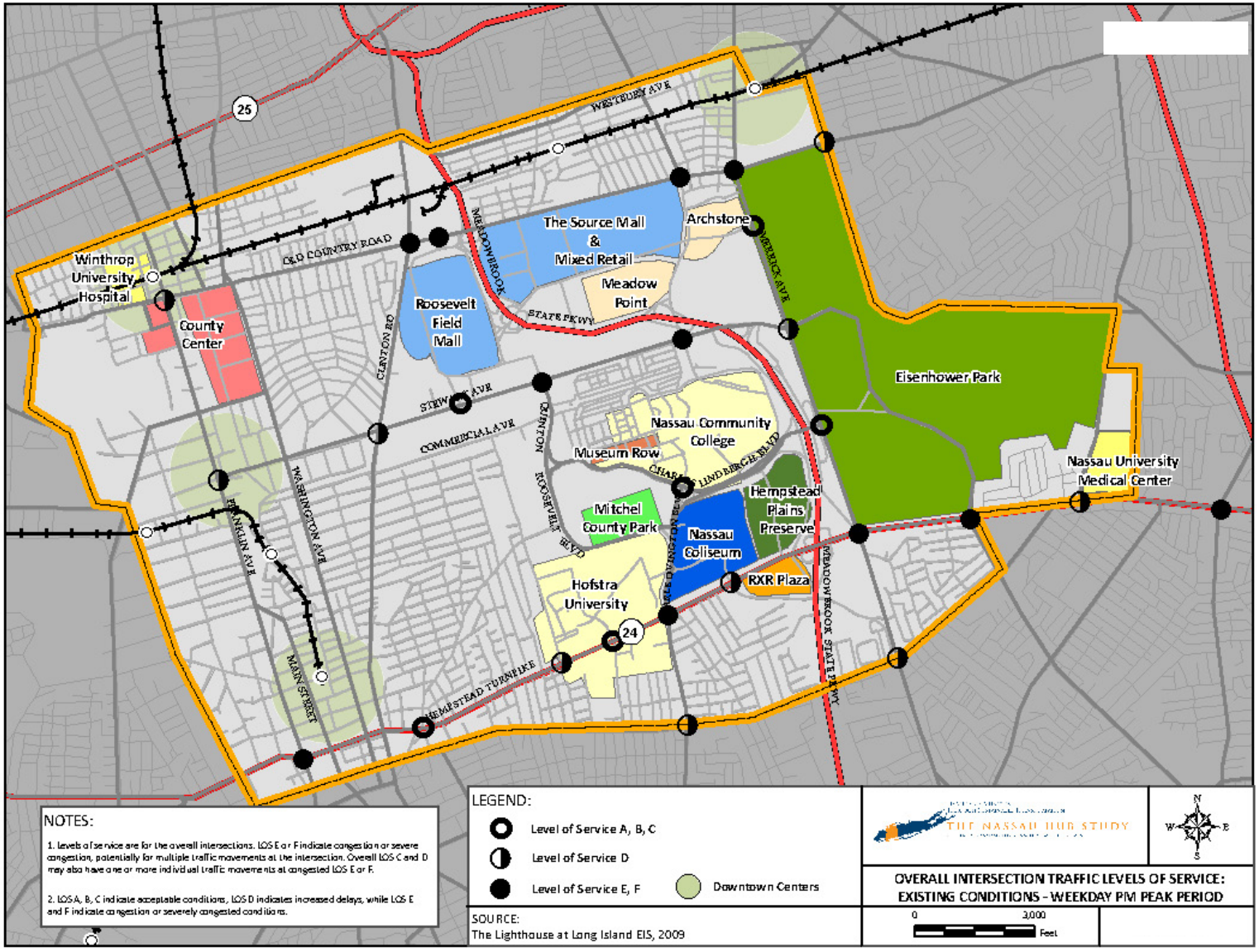


Figure 2-13: Overall Intersection Traffic Levels of Service: 2008 Existing Conditions-Saturday Midday

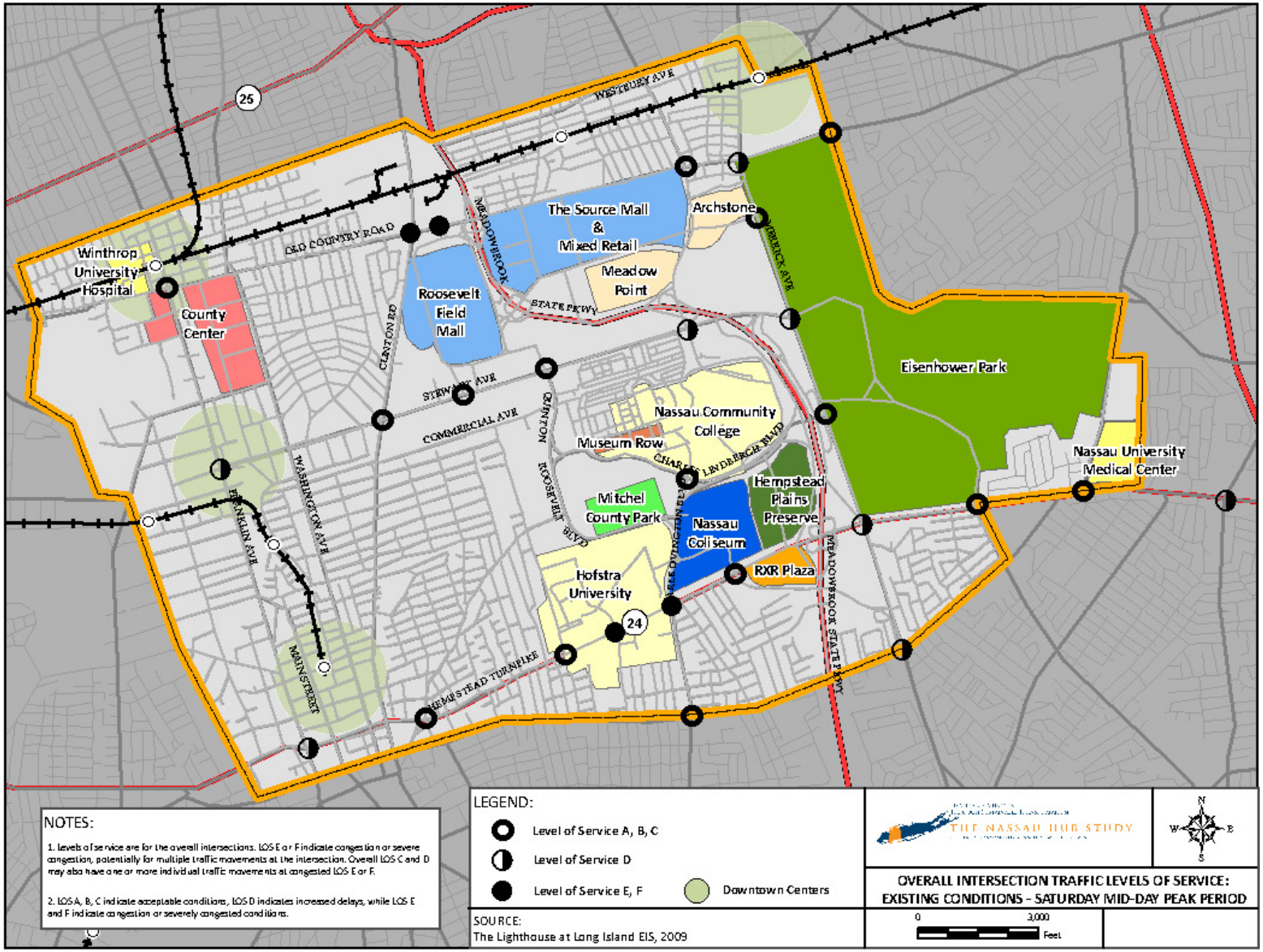
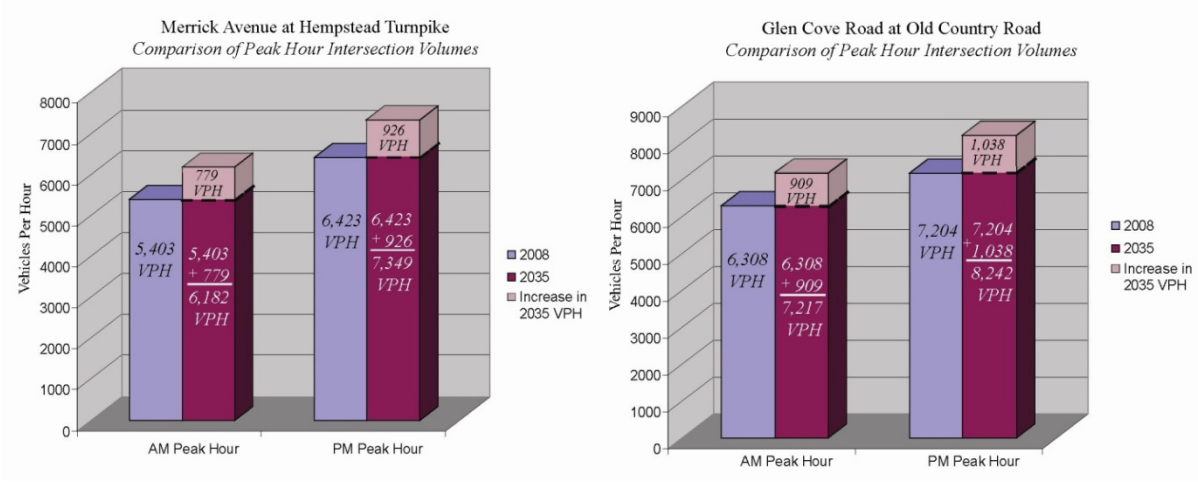


Figure 2-14: Merrick Avenue at Hempstead Turnpike and Glen Cove Road at Old Country Road – Comparison of Peak-Hour Intersection Volumes, 2008 and 2035



Sources: 2008 traffic counts from DGEIS for the Lighthouse at Long Island, 2009; NYSDOT growth rate for Town of Hempstead.

2.6.3 Planned or Committed Roadway Improvements

The NYSDOT Region 10 Transportation Improvement Program (TIP) lists federally funded projects with money allocated through the next several fiscal years. The current TIP, adopted September 4, 2013, covers Federal Fiscal Years (FFY) 2014-2018.[23]

A review of the current TIP lists several signal improvement projects in the Study Area, which will improve roadway capacity and efficiency. These include a project to update existing signals and construct new signal systems on Old Country Road from Herrick Road to Apex Lane in Nassau County so they can be controlled and optimized with the County's computerized traffic signal control system and a project to expand the County's existing fiber optic network to provide communications to additional traffic signals, which will optimize signal timing and reduce vehicular congestion. The TIP also includes standard maintenance and operations projects to be implemented within the Study Area.

2.6.4 Transit Network Limitations

The existing LIRR and NICE Bus networks face a number of challenges in attracting new transit riders and adequately accommodating Study Area-bound and intra-Study Area travel for those who have no other travel options. These challenges include:

- **Rail**
  - LIRR service is oriented east/west for travel to/from Nassau County and New York City.
  - Train stations are located on the outskirts of the Study Area, beyond the typical 1/2-mile walking distance to/from many of Study Area's activity centers.
  - Reverse-peak rail service tends to be slower, infrequent, and has AM and PM peak-period gaps.
  - There is no direct rail access from the south shore to the Study Area.

[23] NYMTC, *Federal Fiscal Years 2014-18 Transportation Improvement Program*, Adopted September 4, 2013.

- **Bus**
  - Bus distributor routes serving Study Area destinations from LIRR train stations are infrequent, have service for limited hours, and are not schedule-coordinated.
  - Of only five bus routes that currently offer frequent service to the Study Area all day, two serve only the outskirts of the Study Area.
  - Intra-Study Area bus service tends to be fragmented and infrequent, which can be confusing for potential riders.
  - There are no priority bus treatments (e.g., exclusive bus lanes, signal priority, bus bulbs) in the Study Area, with the result that bus service is often delayed and irregular due to existing general traffic congestion.
  - Almost all of the north shore and the southeast quadrant of Nassau County lack any direct transit connection to the Study Area.

3. Problem Statement, Purpose and Need, Goals and Objectives

3.1 Problem Statement

Based on the conclusions of the previously completed *2006 Nassau Hub Major Investment Study* (MIS) and the current review of pertinent data and trends summarized in Chapter 2, Nassau County has determined that a number of key, pervasive transportation and related problems exist within the Study Area. These problems stem from current and projected roadway congestion; the lack of frequent, direct and convenient transit service; and large-lot, dispersed development patterns that encourage auto trips and contribute to environmental degradation. These problems limit the County's ability to grow, capitalize on economic development opportunities, and preserve the high quality suburban lifestyle that residents and businesses have come to expect.

The following four overarching problems have been identified.

(1) Traffic congestion is currently pervasive and recurrent at many locations within the Study Area, making it difficult to travel to, from and within the Study Area.

The Study Area contains a diverse mix of uses ranging from employment centers to retail, residential, recreation, and entertainment destinations, all of which generate high levels of traffic on the roadway network. Currently, roadways throughout the Study Area are severely congested, exacerbating travel to and from destinations within the Study Area and through the Study Area. The issues described below relate to existing and future congestion as well as the inability to implement viable roadway capacity expansions.

- *Severe congestion currently exists at numerous locations.*

  Congestion often occurs within the Study Area during the morning peak period and from midday through the late afternoon/early evening peak period. Several area roadways also experience high levels of traffic volume and congestion on the weekends. Numerous locations along the main traffic routes through the Study Area are frequently congested, most notably where major east-west and north-south roadways intersect, such as at the intersection of Old Country Road and Glen Cove Road/Clinton Road. Eleven of 27 intersections considered in the Study Area and their key feeder routes operate at overall levels of service (LOS) E or F during the weekday PM peak hour. An additional 10 intersections operate at LOS D, which is considered to be marginally acceptable and, in some cases, include individual traffic movements operating at LOS E or F.

- *Major roadway choke points have been expanded to their limits.*

  Many of the critical roadway locations in the Study Area have been widened, signal timing and cycle lengths have been maximized, and capacity improvements have been introduced over the years with little remaining opportunity to further improve traffic flow. Due to the magnitude of traffic volumes and/or the limited availability of remaining right-of-way, further capacity improvements are not practical at many Study Area intersections that have already reached their physical limits. Roadway widening is not an adequate long-term solution to the Study Area's congestion and mobility problems.

- *Congestion is projected to increase in the future.*

  Population and employment within the Study Area will continue to grow over the next two decades with an attendant increase in the number of trips to, from and within the Study Area. Even without

major new development initiatives or redevelopment projects, congestion and vehicle traffic within the Study Area would increase as a result of the typical increase in background traffic each year. Assuming a conservative background traffic growth rate of ½ percent per year, already congested intersections and roadway segments will worsen in the future.

- *Economic development initiatives within the Study Area will increase congestion.*

  The implementation of any large economic development projects in the Study Area that predominantly rely on auto access will potentially increase this congestion even more. Severely congested roadways will degrade significantly and traffic may divert from these roadways to currently less congested, lower-order roadways. Conditions on these lower-order roads would then, also, likely deteriorate. The existing transportation system, which is already burdened by current travel demands, cannot adequately sustain future increases in automobile trips without engendering severe levels of congestion.

- *Land use patterns and the existing road network configuration limit choices for accessing Study Area destinations.*

  Traffic congestion is further exacerbated by the area's disjointed land use pattern. Residential neighborhoods, retail stores, and commercial areas are generally separated by major roadways or are in areas with very limited transit access. Additionally, the dispersed large-lot land uses found in portions of the Study Area disrupt the street grid, making it difficult to travel between uses on foot, by public transit, or even by automobile. Since the roadway network is influenced by the area's land use pattern, travel routes through and within the Study Area are circuitous and inefficient.

(2) Transit service within the Study Area does not adequately serve trips to, from and within the Study Area.

Transit service to the Study Area is provided via Nassau Inter County Express (NICE) Bus and Long Island Rail Road (LIRR) commuter rail service. LIRR service is not well-suited to address intra-Study Area transit needs, as its service is primarily oriented to east-west, Manhattan-bound travel; the rail lines are located at the periphery of the Study Area; rail stations connect few attractions within the Study Area; rail service operates infrequently at most times to be an effective option in the Study Area; and a number of stations are skipped by express service during peak hours. There is no service between the Study Area and the south shore or any meaningful north-south rail service. Some north-south bus lines serve multiple Study Area destinations, but none directly links areas north and south of the Study Area. Due to these factors, transfers between transit vehicles are required to complete a large share of transit trips to/from Study Area destinations. Transit network challenges within the Study Area are as follows.

- *Transit accessibility to Study Area destinations is limited by the uncoordinated nature of the various bus routes and their connection to the LIRR system.*

  The Study Area includes two intermodal transit facilities and one bus transfer facility. Their operations are not fully coordinated to enhance overall Study Area access or circulation. These facilities have become the end-point for many bus routes as they first enter the Study Area, forcing many transit users to transfer to another bus to reach Study Area destinations. In addition, most bus routes within the Study Area do not follow a common path between common points, fragmenting service and reducing effective headways.

- *There is a lack of direct LIRR service to many major Study Area destinations.*

  Since the LIRR stations are located on the Study Area's periphery, most activity centers in the Study Area are not within acceptable walking distance of existing rail service. With little direct service to activity centers, rail transit trips often require a transfer to another mode to reach Study Area destinations. LIRR lines directly serve the downtowns of the Villages of Hempstead, Mineola, Westbury and Garden City, which originally developed around the LIRR stations. Newer retail, commercial, and recreation development has sprung up beyond their reach over the past 50 years. Most of the vacant and low-density properties that are likely locations for future development are also not within convenient distance of the LIRR.

- *The Study Area currently lacks a fast, coordinated and efficient distribution system to/from the LIRR stations along the Study Area's edges.*

  The LIRR's potential to enhance the Study Area as a regional attraction is dependent on the presence of a frequent, reliable distribution system to deliver its customers to Study Area destinations that are beyond walking distance. At present, rail and bus schedules are not fully coordinated for trips to/from the Study Area, resulting in extended transfer wait times and long trips for transit users. Prior efforts at dedicated feeder/circulators have lacked customer-convenient attributes, such as frequent headways and quick schedule connections.

- *Infrequent service levels during off-peak periods and in the reverse-peak direction limit transit access to major destinations within the Study Area.*

  LIRR service is oriented for peak-period commute trips to and from Manhattan. As such, reverse peak and off-peak service to stations within the Study Area is not prioritized due to the high demand for service to and from Manhattan, thereby limiting travel options at certain times of the day. Additionally, only six of the 27 bus routes serving the Study Area offer peak and off-peak service levels that would be attractive to discretionary riders. The balance has only limited amounts of service available, particularly during off-peak and reverse-peak periods, creating long wait times for single transit-vehicle trips and very long wait times for trips requiring a transfer. For travel to many of the Study Area's activity centers (e.g., Hofstra University, Nassau Community College, Roosevelt Field, Nassau Veterans Memorial Coliseum, etc.), which attract people during off-peak hours (evenings and on weekends), the reduced availability of transit service at these times creates a disincentive for using transit.

- *Gaps in transit service limit access to the Study Area.*

  There are large segments of Nassau County that have either no transit service to the Study Area, or services that are so inconvenient as to deter all but those with no other travel option. Nearly the entire County north of Jericho Turnpike falls into this category. The entire southeast quadrant of the County either lacks direct transit connectivity to the Study Area (most bus service is oriented to Hicksville) or has infrequent and geographically distant service. This discourages transit use for the large population in these areas and exacerbates traffic congestion in the Study Area. The LIRR cannot tap the Study Area-bound travel market from the populous south shore (from The Village of Lynbrook to southwest Suffolk) due to the absence of coordinated connecting bus service from its stations. The LIRR Babylon branch bisects the south shore, offering service attributes (frequent peak and reverse-peak service and at least half-hourly service for 18 hours each day) that could make transit a viable option for Study Area-bound travel. The one true north shore-to-south shore transit service in the County

(Route N25) is one of the most heavily used bus routes in the County, but its routing bypasses the Study Area.

(3) Dispersed and disjointed land use patterns within the Study Area limit transit service and increase reliance on auto travel.

Contemporary development patterns within the Study Area and County as a whole have been geared primarily toward automobile-based travel. These automobile-dependent land use patterns are characterized by the dispersion of uses (i.e., single-use residential, retail, office and industrial developments), wide arterial highways and a predominance of large parking lots.

- *The ability to pursue more transit-friendly economic development opportunities is constrained by the limited transit choices within the Study Area.*

  Nassau County's economic growth is not projected to be as robust compared to other counties in the New York Metropolitan Transportation Council (NYMTC) region, and new investments are needed to support sustainable development. The lack of transportation options and increasing traffic congestion in the Study Area are discouraging businesses from locating or expanding there. If current development patterns continue and transportation problems remain unaddressed, the economic vitality of the Study Area and the County as a whole will be further constrained from meeting their full economic potential in the future.

  National development and redevelopment trends are shifting away from automobile-dependent land use patterns toward mixed-use and higher-density developments. Through an approved development plan, the Village of Hempstead is advancing a 26-acre, mixed-use, transit-oriented development in its downtown, and the Village of Westbury has recently redeveloped its downtown. While both of these areas are within walking distance of LIRR stations, there are considerable additional opportunities for redevelopment of the Study Area that are not currently well-served by transit. These include the planned redevelopment of the Nassau Veterans Memorial Coliseum and the associated redevelopment of the former Mitchel Field where the Town of Hempstead has adopted a mixed-use zoning district. The County has selected developers for both projects and redevelopment plans are being advanced.

- *Transit infrastructure is insufficient to support the Study Area's transition from automobile-dependent to transit-friendly development patterns.*

  Nassau County has adopted a set of broadly defined Complete Streets Guidelines, and is currently working to add greater specificity to the guidelines. A number of municipalities within the Study Area, including the Town of Hempstead and the Village of Westbury, are adopting plans and policies that support sustainable and transit-friendly development. The framework for these redevelopment initiatives focuses on the concepts of mixed-use and denser development and improved connectivity. Major proposed and pending developments within the Study Area, such as the Village of Hempstead's North Main Street project and the redevelopment of the Nassau Veterans Memorial Coliseum site, will most likely consist of a mix of residential, retail and/or recreational uses.

  The limited reach of stations, corridors and other transit infrastructure will constrain the creation of synergies among the developments, uses and users. For these developments to reach their full economic development potential, they will need to be complemented by a more targeted transit network that is better positioned to address current and future needs. New investments in transit will be needed to support these higher-density, mixed-use developments and their residents, employees and visitors, while maintaining a balance with the County's quality-of-life ideals and values. Recently

completed examples of transit-oriented development in the Village of Mineola include the 'Winston' and 'Churchill' residential complexes consisting of 275 units and 36 units, respectively, on and adjacent to Old Country Road and within walking distance to the Mineola Intermodal Center.

- *Land use patterns in large areas of the Study Area are not transit-supportive.*

  The development of the Study Area, like much of the County, has been predominantly auto-dependent. The current land use patterns within the Study Area were established years after the closing of Roosevelt Field, a former airfield, and Mitchel Field, a former Air Force base. When these airfields were redeveloped, distance between land uses was considered desirable; therefore, redevelopment of these areas was typified by large parcels with single uses (e.g., big box retail, recreational areas) that were isolated from each other by surface parking and roadways. The development pattern in the Roosevelt Field and Mitchel Field areas is dominated by commercial buildings that are separated by vast parking lots. This development pattern of low-density land use and a reliance on the automobile as the primary means of transportation resulted in high levels of traffic congestion. As described in Section 2.3.2, the Study Area contains large areas of off-street parking. Much of this surface parking supply is used for special event or seasonal use and is not needed to meet regular demand. There is little shared parking. Typically, retail, industrial, and office developments in the Study Area are set back from roadways and encircled by expansive surface parking areas. This existing development pattern and the physical barriers presented by these parking areas contribute to further reliance on auto travel within the Study Area.

- *Development patterns and inconsistent pedestrian infrastructure discourage walking.*

  The orientation of and distance between buildings in the Study Area discourages walking and reinforces the automobile as the most viable means of travel. Single-use developments are bounded by wide, multiple-lane roadways with limited pedestrian facilities. Buildings are set back from their access roadways and are surrounded by surface parking lots. Separated and disconnected single-use development effectively hinders the ability to create convenient pedestrian and bicycle connections between Study Area destinations. Uses may be separated by fences or have limited pedestrian access points or require long walks through surface parking lots. This auto-oriented development pattern discourages pedestrian access because of long walking distances between activity centers, lack of pedestrian access points and linkages, and unsafe or unattractive pedestrian environments. While portions of the Study Area, particularly west of Clinton Road, are characterized by a grid of short, walkable blocks, few connections are available to major destinations such as Roosevelt Field or Nassau Community College.

(4) The lack of transit choices within the Study Area limits the County's ability to positively affect environmental quality and sustainability and degrades the area's livability.

Nassau County is characterized by suburban development patterns that emphasize the separation of land uses. This reinforces driving as the dominant mode of transportation and creates dependence on automobile travel for most trips. Over time, this type of development has led to roadway congestion, encouraged sprawling consumption of land, and deprioritized the historic suburban centers within the Study Area. This development pattern has negatively affected quality of life and is no longer sustainable.

- *Air quality in the County and wider NYMTC region is currently in non-attainment, impacting livability and public health.*

  Nassau County, like much of the New York/New Jersey metropolitan region, has been designated as a non-attainment area for ozone and a maintenance area for particulate matter ($PM_{2.5}$) and carbon monoxide (CO).[1] Particulate matter is emitted into the atmosphere from multiple sources, including vehicular emissions. The prevalence of automobile usage and resulting roadway congestion has contributed to air quality problems in Nassau County. Additionally, exposure to poor air quality has the potential to result in public health impacts. The continued growth in auto trips to, through and within the Study Area will diminish the County's ability to move toward air quality conformity.

- *The County is within an Environmental Protection Agency (EPA)-designated Sole Source Aquifer and the reliance on auto travel and the land use patterns that support it may limit the County's ability to meet EPA water quality standards.*

  The Nassau-Suffolk Sole Source Aquifer system underlies the Study Area and Nassau County. Due to the prevalence of auto travel and historically dispersed land use patterns that have been favorable to the automobile, the Study Area contains large areas of impervious surface comprising primarily parking lots and roadways. Runoff from these surfaces contributes to water quality degradation. New development strategies are needed to reduce water quality impacts within the County. These include creating higher density, compact, and walkable developments. Future developments oriented toward transit, as well as the inclusion of impervious surface treatments, would help improve water quality within the Study Area. Attempts to alleviate roadway congestion by expanding capacity will only increase impervious surfaces and reduce recharge to the sole source aquifer, thereby resulting in less ground water being available to the region.

- *Severe traffic congestion results in travel delays, degraded noise conditions, and traffic accidents that diminish the quality of life for County residents, businesses, and visitors.*

  These issues limit the County's ability to grow, capitalize on economic development opportunities, and ensure the continued maintenance of the high quality suburban lifestyle expected by County residents and businesses. The County has instituted several environmental policies, including Healthy Nassau, a multi-dimensional environmental campaign to improve the County's environment and sustain the health and quality of life of its residents. New investments in transit will be needed to enhance quality of life for County residents and businesses by decreasing the negative impacts associated with reliance on auto travel within the Study Area.

3.2 Purpose of the Alternatives Analysis

The purpose of the Alternatives Analysis (AA) is to identify a solution that would help increase mobility to, from and within the Study Area by improving transit services and providing additional travel options other than via the automobile. Additionally, in order to improve mobility to, from, and within the Study Area, the AA examined and proposes potential improvements to key linkages between the Study Area and Regional Study Area. This AA report has been prepared following the conclusion of a number of technical studies documented through various Technical Memoranda, which are noted in Appendix C of the this report. All technical findings documented in this report are based on the aforementioned Technical Memoranda.

[1] *USEPA Green Book Nonattainment Areas for Criteria Pollutants*, http://epa.gov/airquality/greenbook/ , 2014.

The Nassau Hub Study, in response to identified problems, is intended to achieve the following purposes:

- Improve public transit service to, from, and within the severely congested Study Area by providing increased transit capacity and faster, convenient access to and from major Nassau County employment and activity centers for residents, employees and visitors.
- Enhance regional connectivity to and from the Study Area by expanding and interconnecting local transit services with LIRR in Nassau County and improve intermodal transit hubs where rail, bus, auto, bicycle and pedestrian links meet.
- Increase transit ridership by expanding transit services and facilities in an area with ever-increasing travel demand that can no longer be met by existing or proposed roadway facilities.
- Mitigate congestion through the provision of attractive, efficient travel-mode options.
- Support transportation solutions that will be instrumental in improving the economic vitality and continuing redevelopment of the Study Area.
- Improve mobility for residents, employees, and visitors to employment, educational, recreational, medical and retail centers.
- Improve regional air quality by reducing or slowing the growth in auto emissions.
- Support local and regional land use plans and facilitate Study Area municipalities' efforts to direct redevelopment opportunities in transit-oriented development.

Improved transit in the Study Area is consistent with the goals and objectives defined for prior studies of transportation in the Study Area and responds to needs identified in the Regional Transportation Plan (RTP) Update adopted September 2013 by NYMTC. The next RTP Update is scheduled for adoption September 2017 by NYMTC; Nassau County will continue to coordinate with NYMTC for consistency between the Study and the goals enumerated in the next RTP Update and to include Study findings into the fiscally constrained portion of the RTP.

3.3 Needs in the Study Area

Based on the existing conditions and trends in the Study Area, a series of transportation and related issues were identified, as described in Section 3.1, with the following corresponding needs identified:

- **Support transit-oriented economic development opportunities and land use plans**. Nassau County and many of the Study Area's municipalities have identified land use and development goals that support greater transit services. New transit service will not only support land use plans but also make future developments more viable and ultimately make all new proposed developments more successful.
- **Expand transportation system capacity**. There is a need to expand capacity in the transportation network to accommodate existing demand and projected growth.
- **Increase travel choices**. Modal options for travel to, from and within the Study Area are limited to automobiles and local bus service operating within the congested traffic network. Additional travel options will improve the ability to pursue more transit-friendly economic development opportunities within the Study Area.

- **Provide more reliable travel times**. Congested traffic conditions create longer transit travel times, thereby reducing the reliability of the existing transit services. A reduction in traffic congestion by improving alternative travel modes to the automobile will improve travel time reliability for all modes.
- **Improve transit access and connectivity**. There is a need for improved transit access and connectivity to the Study Area from the west and south and for new services from the east and north.
- **Better integrate LIRR service into local and regional transit options**. The primary means of access between LIRR stations and activity centers in the Study Area is the automobile. There is not a frequent, reliable distribution system to deliver LIRR customers to Study Area locations that are beyond walking distance. Connectivity and accessibility would be greatly enhanced if transit service were enhanced between activity centers and LIRR stations.
- **Provide better off-peak and reverse-peak trip-making options**. The high concentration of medical, retail, and event/recreation-related facilities in the Study Area results in a need to provide high levels of off-peak and reverse-peak transit service.
- **Improve operational efficiency**. Increasingly scarce operating resources require more efficient transit services.
- **Improve environmental quality**. More efficient growth and sustainable development patterns are necessary to reduce impacts to the local and global environment.

3.4 Goals and Objectives

The following goals and objectives were defined based on the problems and associated needs identified in the Study Area and the purpose of the Study. The goals and objectives identified in this section were used to develop the evaluation criteria and evaluation measures used to screen the Study alternatives, ultimately leading to the selection of a Locally Preferred Alternative (LPA).

GOAL: Develop transit improvements that will provide additional realistic and practical travel options to, from and within the Study Area and help to mitigate congestion on roadways in a cost-effective manner.

OBJECTIVES:

- Reduce travel time and costs associated with congestion.
- Reduce dependence on the use of automobiles for trips to, from and within the Study Area.
- Increase public transportation options and use as a means of access to and from the Study Area.
- Increase public transportation options and use as a means of circulation within the Study Area.
- Develop a public transportation alternative that will attract new riders.
- Identify a transit alternative that is capable of growing and adapting to changes in the demand for service.
- Develop a transit alternative that takes advantage of the use of existing transportation infrastructure, where appropriate.

- Develop a transit alternative that encourages use of alternate transportation modes (walking, bicycling, carpool and other travel demand management methods) to travel by auto, where practicable.

GOAL: Develop transit improvements that will enhance mobility to, from and within the Study Area in a cost-effective manner.

OBJECTIVES:

- Utilize a high quality, attractive transit vehicle technology.
- Develop a transit alternative that provides travel time savings compared to existing options.
- Develop a seamless, convenient and integrated regional transportation system.
- Develop transportation alternatives that attract transit-dependent and non-transit-dependent riders.
- Provide improved transit access to, from and within the Study Area.
- Locate transit to enhance the economic competitiveness of the Study Area, creating new job opportunities and supporting existing businesses.
- Expand the geographical capture area for Study Area employment centers by providing access to workers who are transit-dependent.
- Develop an alternative that will have a capital cost that is consistent with anticipated financial resources for construction.
- Develop an alternative that will have an operating and maintenance cost that can feasibly be funded annually with state and local resources.
- Develop an alternative that is capable of being funded for construction through traditional or alternative/innovative funding mechanisms.
- Explore alternatives that can be phased incrementally, consistent with available funding.

GOAL: Develop transit improvements that encourage the development of sustainable, transit-friendly land use patterns and support economic development activities.

OBJECTIVES:

- Develop a transit alternative that can be supported by local land use plans and development policies.
- Use transit to enable more compact land uses that could better support a transit-oriented development scenario.
- Use transit to promote mixed-use development as a means of discouraging auto-dependent, single-use patterns of development.
- Encourage redevelopment of underutilized parcels.
- Use transit to better serve existing activity centers.
- Accommodate proposed land uses and react to anticipated development growth in the Study Area in the future.

- Support development with a mix of uses that remain vibrant throughout the day and night.
- Address volume, availability and economics for the use of land for parking in the Study Area.
- Provide improved access to open space resources.
- Encourage uses at street level that will support a lively streetscape on a pedestrian scale with diverse activity in the vicinity of station areas.

GOAL: Develop transit improvements that enhance quality of life and minimize adverse environmental impact.

OBJECTIVES:

- Use transit as part of a regional approach to address congestion-related air quality concerns and regional air quality conformity.
- Use transit as part of a regional approach to mitigate greenhouse gas emissions.
- Develop a transit alternative that mitigates overall energy consumption for trip making.
- Incorporate alternative fuels and energy sources into the transit alternative, as appropriate.
- Coordinate transit infrastructure and services with land use to promote sustainability and livability and enhance quality of life.

GOAL: Develop transit improvements that support and complement transit-friendly and economically sustainable parking strategies.

OBJECTIVES:

- Encourage reduced parking ratios for developments that can be accessed via transit.
- Encourage the reduction, consolidation and relocation of surface and structured parking from transit-accessible sites for the purpose of encouraging land uses that are more economically vibrant and sustainable.
- Encourage transit use and mitigate roadway congestion by creating regional parking facilities at major transit centers and other appropriate locations.

4. Long-List Alternatives Considered and Screened

4.1 Preliminary Long-List Alternatives

Following definition of the Study's purpose and need and associated goals and objectives, preliminary transit-improvement alternatives that appeared to have the potential to address them were identified and conceptually defined. For each preliminary alternative, the primary routing of its alignment and connections between activity centers (i.e., uses and locations that generate and/or attract trip-making) in the Study Area were defined to provide a potentially viable circulation and distribution pattern. The alternatives were developed through discussions with stakeholders and the public, Study Team review of previous transportation improvements considered for the Study Area, and preliminary analysis of trip attractors and generators.

The Preliminary Long-List of Alternatives was identified based on the following considerations, focused on the defined Nassau Hub Study Area:

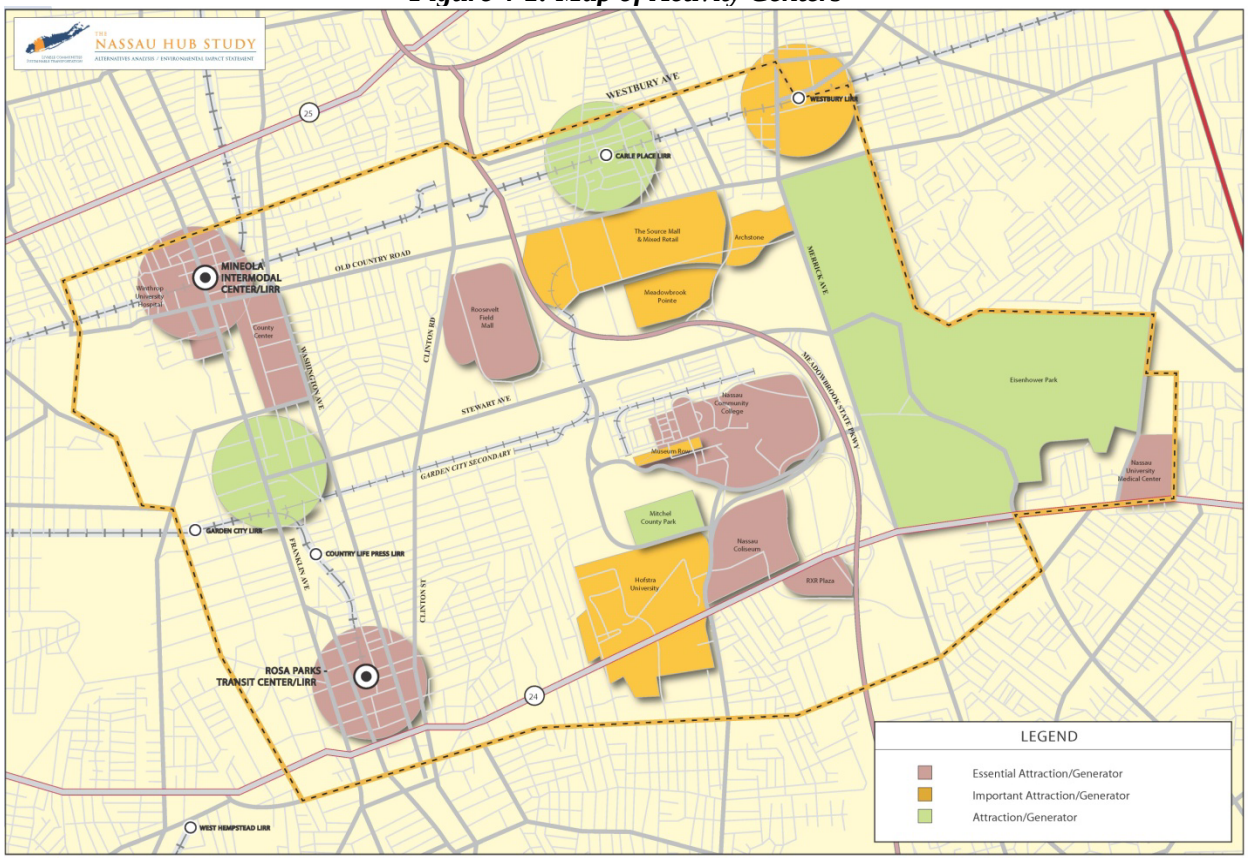
- The existing transportation network and services;
- Existing travel patterns;
- Capacity of existing transportation infrastructure, and operating conditions;
- Existing land use patterns and proposed major development;
- Linkages between existing and proposed activity centers; and
- Input received from stakeholders and the general public.

4.1.1 Activity Centers

As a precursor to conceptually defining each alternative's alignment, activity centers in the Study Area (Figure 4-1) were identified based on work completed for the Nassau Hub Major Investment Study (MIS) (2006) and on this Study's initial consideration of opportunities to support improved transit access and increased transit use to, from, through and within the Study Area. A key consideration in developing the Preliminary Long-List of Alternatives was to provide viable service to as many activity centers in the Study Area as possible. Once identified, the activity centers were categorized based on their relative significance as trip attractors/generators and which, as a result, would likely generate the greatest transit ridership and realize the greatest benefit from improved transit service. The priority of types of activity centers to be served by a given alternative was defined as follows:

- Essential attractors/generators – activity centers that would be crucial locations to serve by any new transit improvements;
- Important attractors/generators – activity centers that should be served by any new transit improvements wherever possible; and
- Attractors/generators – activity centers that are not vital to be connected by new transit service, but doing so would provide additional transit coverage within the Study Area.

Figure 4-1: Map of Activity Centers



Source: Jacobs, 2011.

There were 11 essential attractors/generators, five important attractors/generators, and five additional attractors/generators identified in the Study Area:

1) *Essential Attractors/Generators*

- Downtown Village of Mineola
- Mineola Intermodal Center
- Downtown Village of Hempstead
- Rosa Parks - Hempstead Transit Center
- Roosevelt Field
- Roosevelt Field Bus Facility
- Nassau Community College
- Nassau Veterans Memorial Coliseum
- RXR Plaza
- Nassau County Government Complex
- Nassau University Medical Center (NuHealth)

2) *Important Attractors/Generators*

- Hofstra University
- Source Mall
- Museum Row
- Downtown Village of Westbury
- Westbury Long Island Rail Road (LIRR) Station

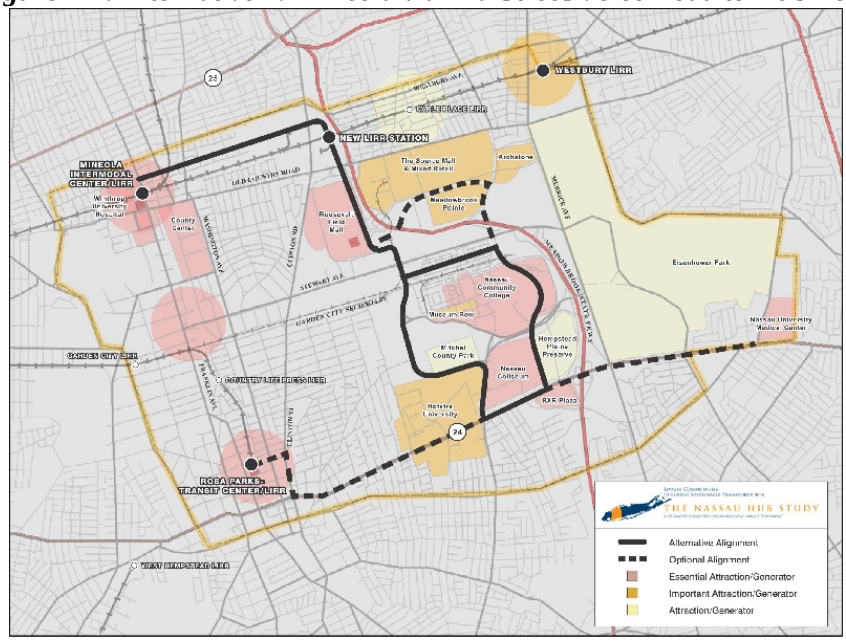
3) *Attractors/Generators*

- Garden City LIRR Station
- Eisenhower Park
- Country Life Press LIRR Station
- Carle Place LIRR Station
- Downtown Village of Garden City

4.1.2 Primary Alignment Alternatives

Fourteen alternative alignments were identified for consideration through discussion with the Study's Technical Advisory Committee (TAC), Stakeholder Committee and the general public regarding the purpose of and need for transit improvements in the Study Area, review of previously considered transit-improvement options, and preliminary analysis of trip attractors and generators. For each alternative, primary routing and connections between one or more of the LIRR stations to a number of activity centers within the Study Area were defined. The alternatives' alignments were conceptual in nature and a specific transit technology, related infrastructure and operational details were not associated with the alternatives at this stage of the screening process. The maps in Figures 4-2 through 4-15 show the general alignment for each of the preliminary alignment alternatives. A number of optional alignments, depicted on the maps with dotted lines, were also identified, along with certain additional features, as potential improvements that may be phased in over time, creating the potential for short- and long-term implementation of elements of the alternatives.

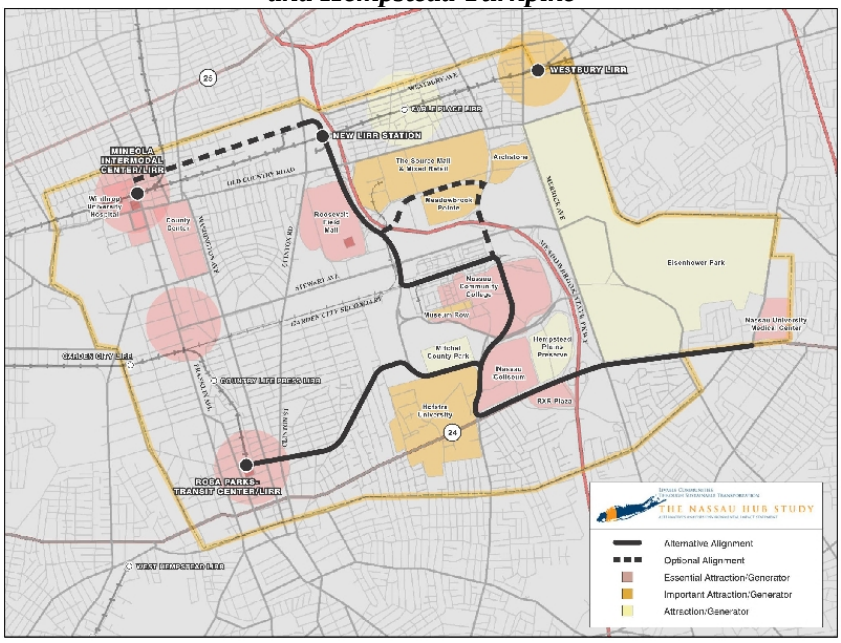
Figure 4-2: Alternative 1: Mineola via 2nd Street/Voice Road to Hub Loop



Source: Jacobs, 2011.

Includes alignment options to the Source Mall area and from downtown Village of Hempstead to NuHealth via Hempstead Turnpike.

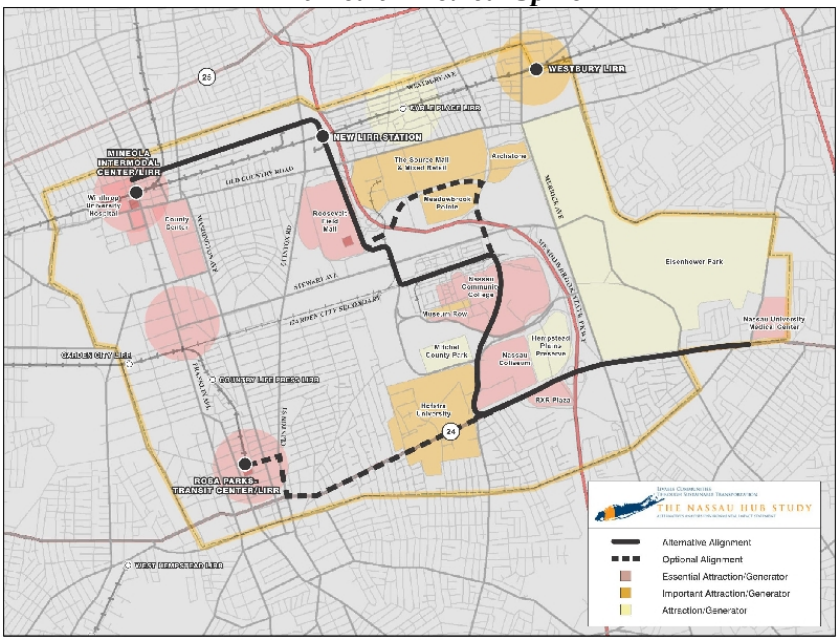
Figure 4-3: Alternative 2: New Port Jefferson Branch Station to Hub Area and Hempstead to NuHealth via Jackson Street, Westbury Boulevard, Roosevelt Boulevard, Earle Ovington Boulevard, and Hempstead Turnpike



Source: Jacobs, 2011.

Includes alignment options to Nassau County Government Center and the Source Mall area.

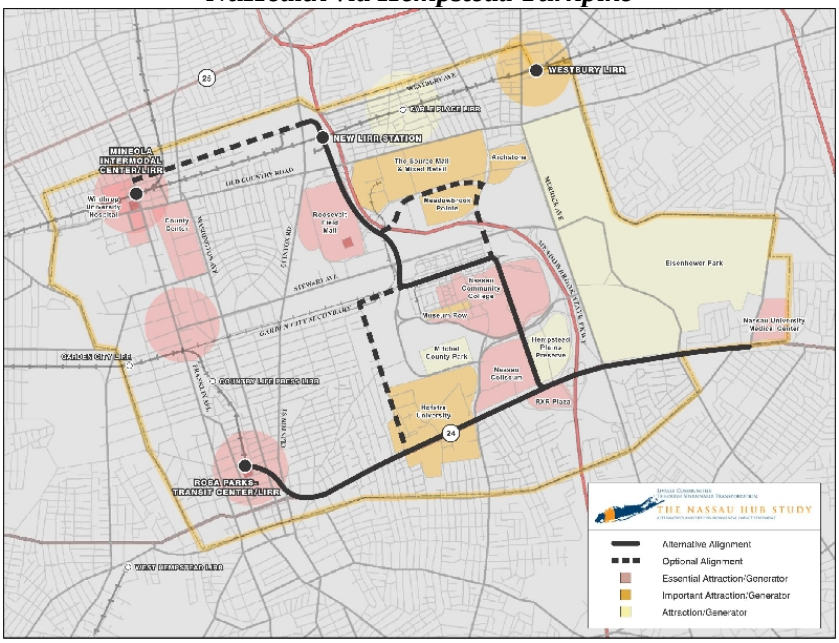
Figure 4-4: Alternative 3: Mineola via 2nd Street/Voice Road/Garden City Secondary to Hub Area and NuHealth Medical Spine



Source: Jacobs, 2011.

Includes alignment options to the Source Mall area and from downtown Village of Hempstead to Nassau Veterans Memorial Coliseum / RXR Plaza area via Hempstead Turnpike.

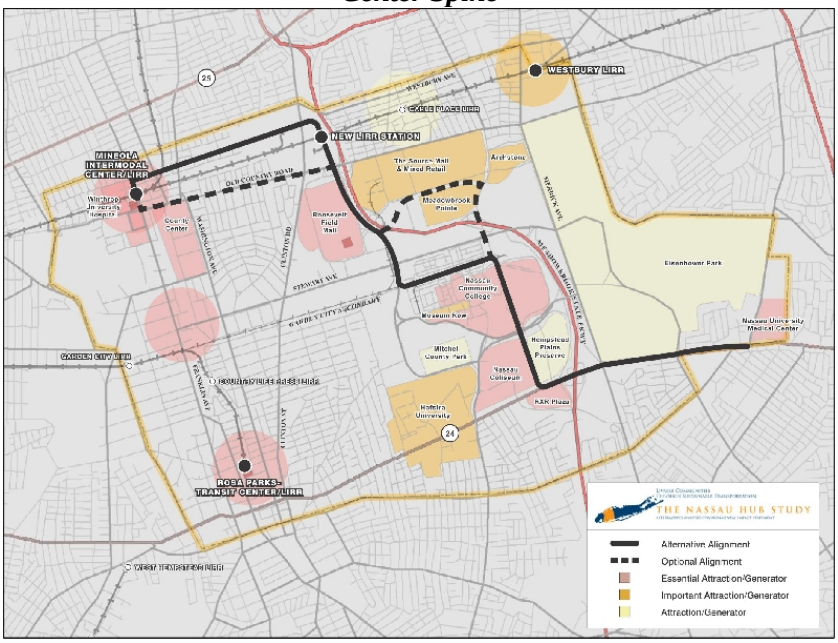
Figure 4-5: Alternative 4: New Port Jefferson Branch Station to Hub Area and Hempstead to NuHealth via Hempstead Turnpike



Source: Jacobs, 2011.

Includes alignment options to Nassau County Government Center, the Source Mall area and Oak Street to Hempstead Turnpike.

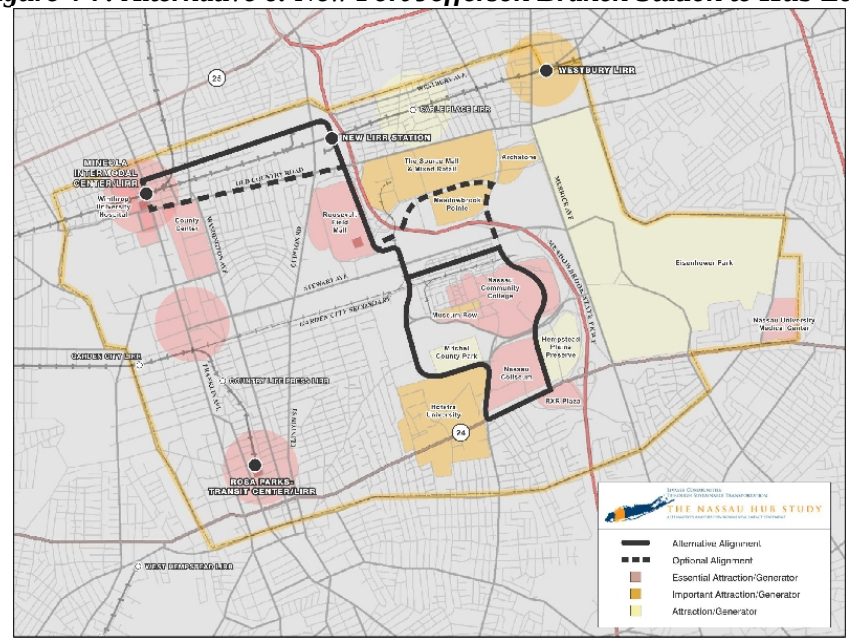
Figure 4-6: Alternative 5: New Port Jefferson Branch Station to Hub Area and NuHealth Medical Center Spine



Source: Jacobs, 2011.

Includes alignment options to Nassau County Government Center and the Source Mall area.

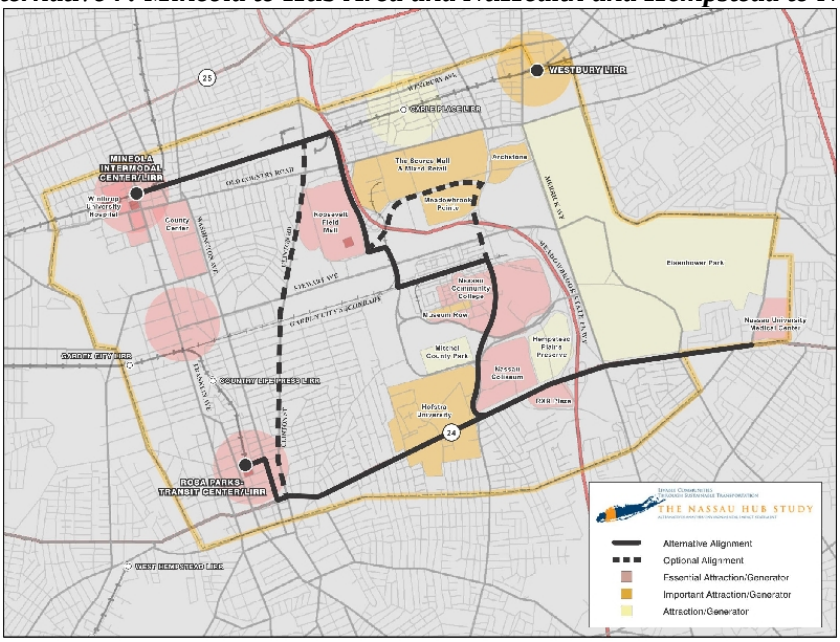
Figure 4-7: Alternative 6: New Port Jefferson Branch Station to Hub Loop



Source: Jacobs, 2011.

Includes alignment options to Nassau County Government Center and the Source Mall area.

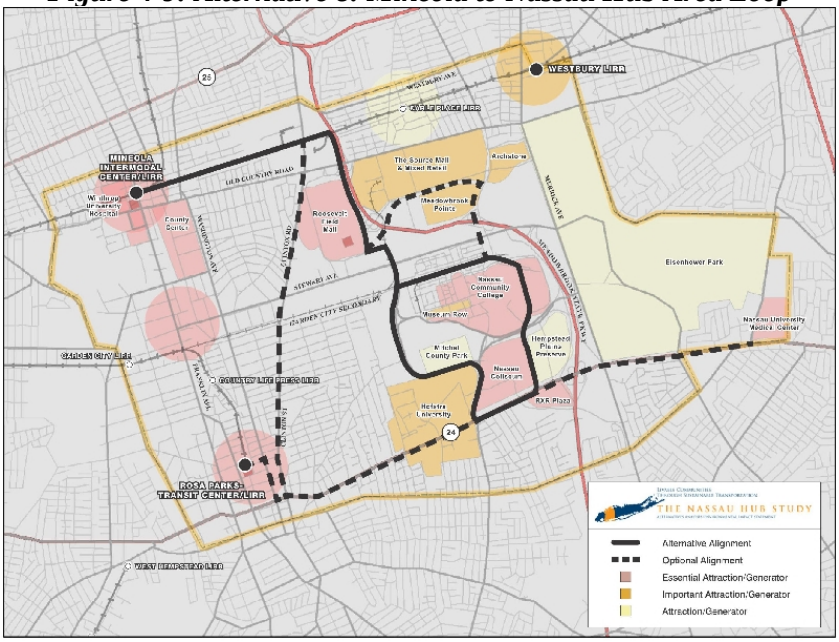
Figure 4-8: Alternative 7: Mineola to Hub Area and NuHealth and Hempstead to NuHealth Spine



Source: Jacobs, 2011.

Includes alignment options from Nassau County Government Center to downtown Village of Hempstead via Clinton Road/Clinton Street and the Source Mall area.

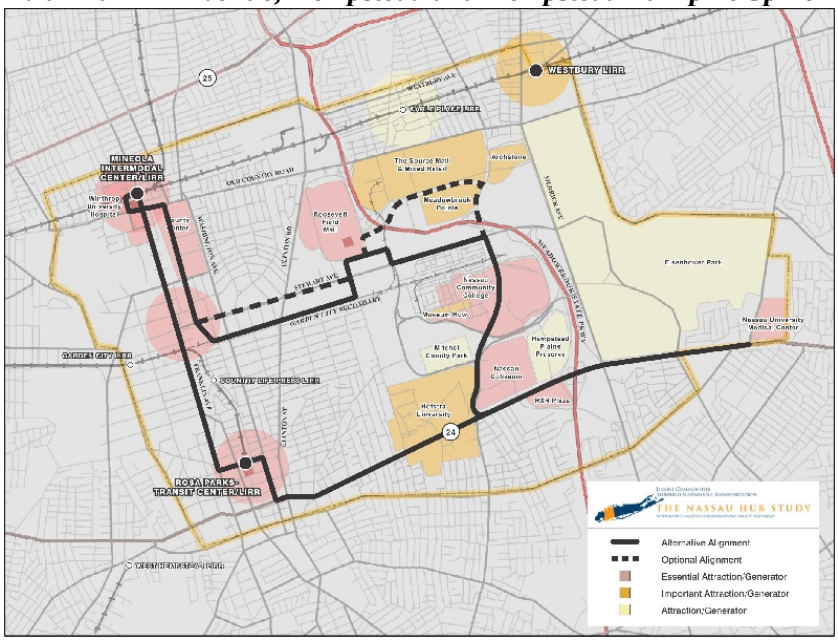
Figure 4-9: Alternative 8: Mineola to Nassau Hub Area Loop



Source: Jacobs, 2011.

Includes alignment options to downtown Village of Hempstead and NuHealth via Clinton Road /Clinton Street and Hempstead Turnpike and to the Source Mall area.

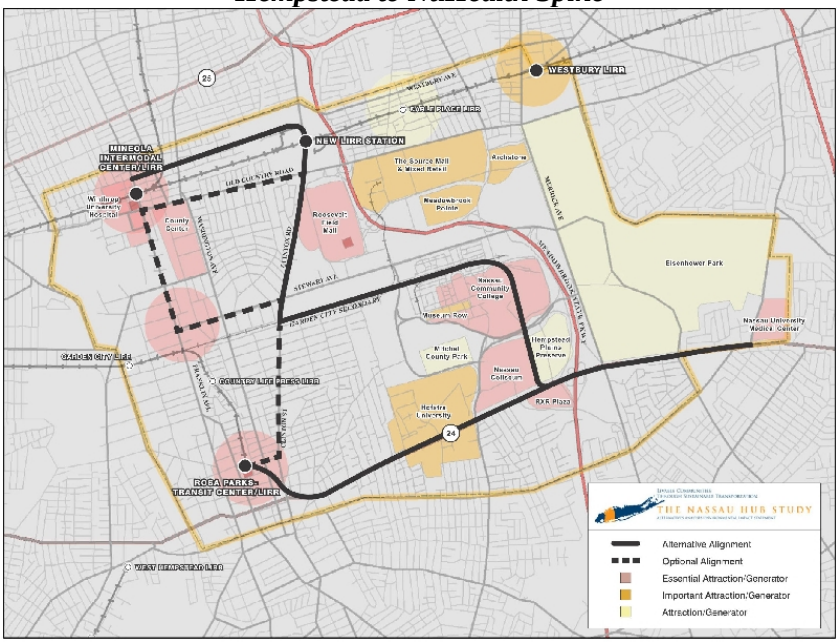
Figure 4-10: Alternative 9: Mineola to Hub Area via Garden City Secondary and Mineola to NuHealth via Franklin Avenue, Hempstead and Hempstead Turnpike Spine



Source: Jacobs, 2011.

Includes alignment options via Stewart Avenue and to the Source Mall area.

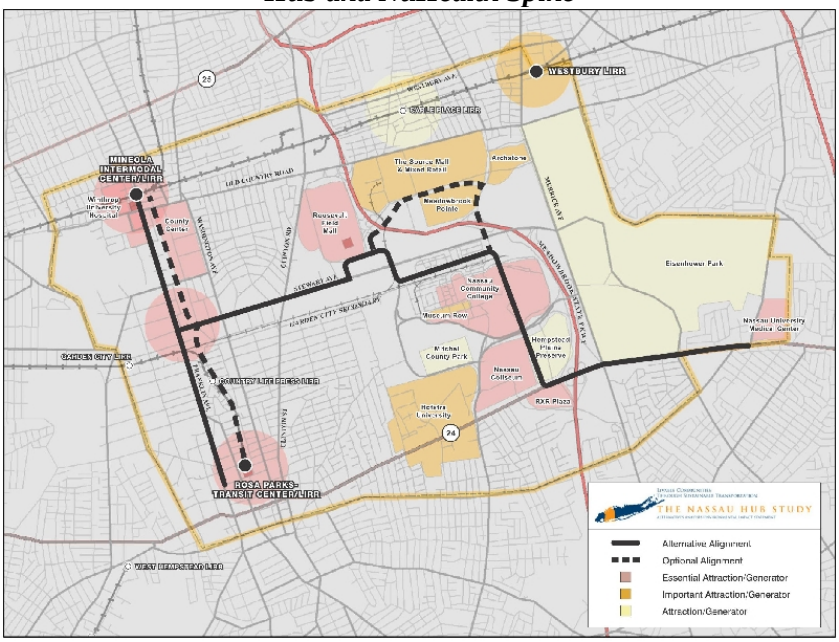
Figure 4-11: Alternative 10: Mineola to Hub Area via Clinton Road/Garden City Secondary and Hempstead to NuHealth Spine



Source: Jacobs, 2011.

Includes alignment options to Nassau County Government Center / downtown Village of Garden City / downtown Village of Hempstead.

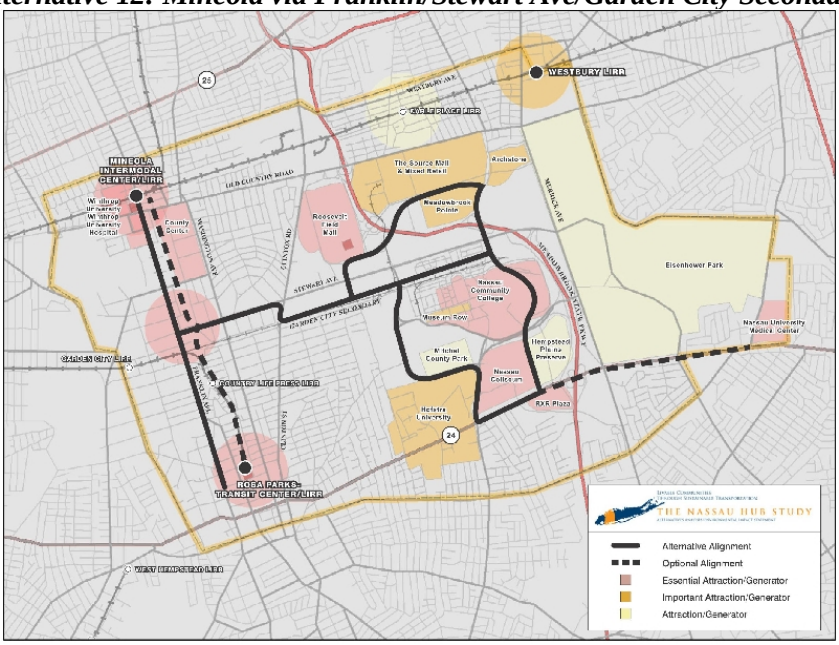
Figure 4-12: Alternative 11: Mineola via Franklin Avenue/Stewart Avenue/Garden City Secondary to Hub and NuHealth Spine



Source: Jacobs, 2011

Includes alignment options to the Source Mall area and Nassau County Government Center to downtown Village of Hempstead.

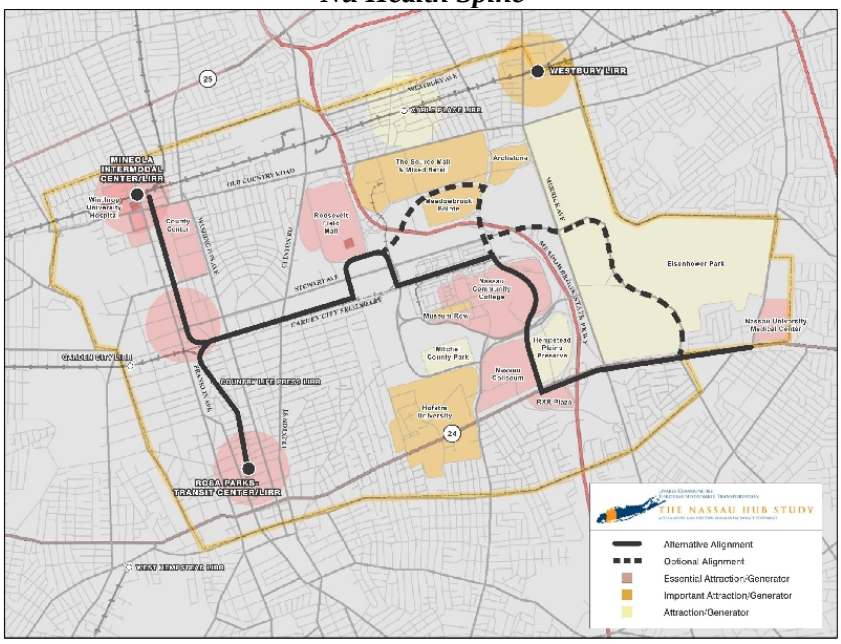
Figure 4-13: Alternative 12: Mineola via Franklin/Stewart Ave/Garden City Secondary to Hub Loop



Source: Jacobs, 2011.

Includes alignment options to NuHealth and Nassau County Government Center to downtown Village of Hempstead.

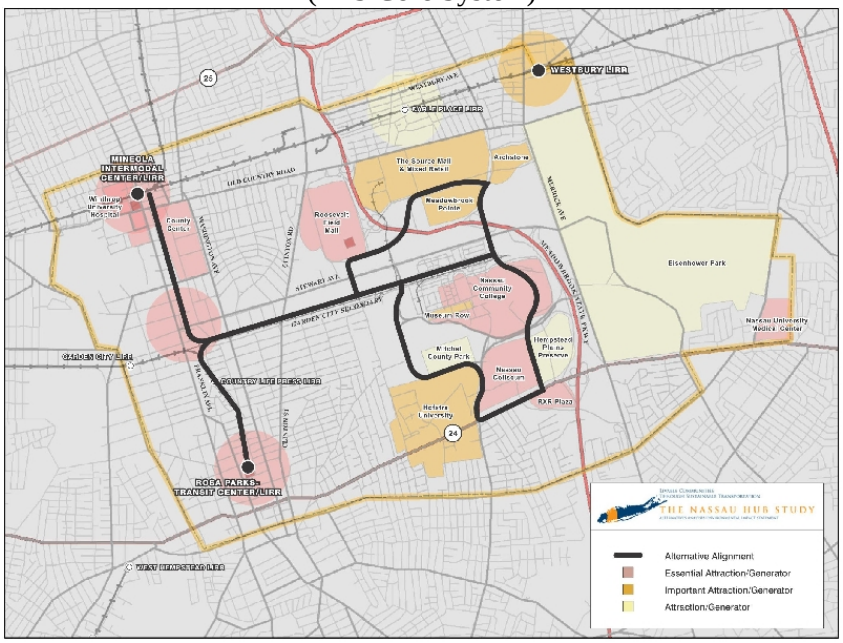
Figure 4-14: Alternative 13: Mineola/Hempstead via Garden City Secondary to Hub and Nu Health Spine



Source: Jacobs, 2011.

Includes alignment options to the Source Mall area and Eisenhower Park.

Figure 4-15: Alternative 14: Mineola/Hempstead via Garden City Secondary to Hub Loop
(MIS Core System)



Source: Jacobs, 2011.

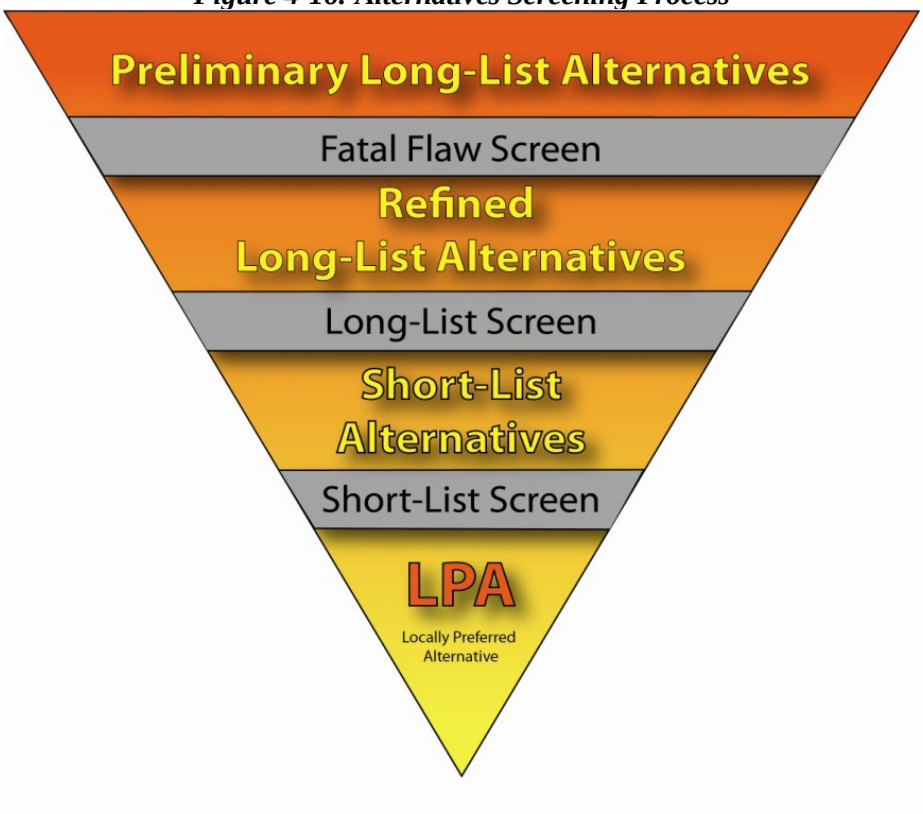
Selected as the preferred alternative at the conclusion of the Nassau Hub MIS (2006).

4.2 Screening Process Overview

A three-phase screening evaluation process was established for the Nassau Hub Study Alternatives Analysis (AA). This process was designed to initially eliminate any alternatives with fatal flaws, highlight the comparative strengths and weaknesses of potentially feasible and reasonable alternatives and, finally, identify one or more alternative(s) that should be recommended for further evaluation in the subsequent Study stage of detailed environmental analysis per the National Environmental Policy Act (NEPA). The screening criteria are progressively more quantitative and detailed with each successive screening phase. Figure 4-1 illustrates the screening evaluation process and milestones. The three phases are:

1. Fatal-flaw screening to eliminate alternatives found to be infeasible early in the evaluation process and refine the Preliminary Long-List Alternatives to a Refined Long-List;
2. Refined Long-List Alternatives screening to broadly analyze the Refined Long-List Alternatives for their ability to address Study goals and, on that basis, identify the Short-List Alternatives; and
3. Short-List Alternatives screening to analyze the Short-List Alternatives in greater detail to ultimately lead to the selection of the Locally Preferred Alternative (LPA).

Figure 4-16: Alternatives Screening Process



Source: Jacobs, 2011.

4.3 Fatal-Flaw Screening

The purpose of the fatal-flaw screening was to identify any Preliminary Long-List Alternative that was deemed infeasible, based on consideration of the alternatives against a set of fatal-flaw screening criteria. The screening evaluation was qualitative and considered the Preliminary Long-List Alternatives in terms of their alignments and basic attributes. Four project objectives were taken into consideration in this initial phase of alternatives screening. These objectives were used to develop the evaluation criteria and evaluation measures utilized in conducting the fatal-flaw screening (Table 4-1).

Each of the Preliminary Long-List Alternatives was screened using the fatal-flaw evaluation criteria listed in Table 4-1. The related evaluation measure was applied and a qualitative assessment performed in order to identify the presence of any fatal flaw for the alternative relative to that measure.

Table 4-1: Fatal-Flaw Screening Criteria

Objective	Evaluation Criterion	Evaluation Measure
GOAL: Develop transit improvements that will provide additional realistic and practical travel options to, from and within the Study Area and help to mitigate congestion on roadways in a cost-effective manner.		
Develop a transit alternative that takes advantage of existing transportation infrastructure, where appropriate.	An alternative must be capable of being implemented in a location where there is potential physical and operational capacity to accommodate the route alignment.	Does the alternative's alignment contain physical, institutional, or operational restrictions that would not permit its realistic implementation or operation?
GOAL: Develop transit improvements that will enhance mobility to, from and within the Study Area in a cost-effective manner.		
Provide improved transit access to, from and within the Study Area.	An alternative must serve mobility needs efficiently.	Does the alternative's alignment provide service to areas that have low demand for transit as identified in the origin-destination survey?
GOAL: Develop transit improvements that encourage the development of sustainable, transit-friendly land use patterns and support economic development activities.		
Use transit to better serve existing activity centers.	An alternative must serve most of the essential attractors and generators in the Study Area.	Does the alternative's alignment lack connections to most of the identified essential attractors and trip generators located within the Study Area?
GOAL: Develop transit improvements that enhance quality of life and minimize adverse environmental impact.		
Coordinate transit infrastructure and services with land use to promote sustainability and livability and enhance quality of life.	An alternative must have physical attributes that will conceptually permit integration with the community.	Does the alternative's alignment lack physical attributes that will conceptually permit integration within the community?

Source: Jacobs, 2011.

The findings and results of the fatal-flaw screening are discussed in the following section.

4.3.1 Physical and Operational Capacity to Accommodate Route Alignment

Evaluation Measure: *Does the alternative's alignment contain physical, institutional, or operational restrictions that would not permit its realistic implementation or operation?*

A qualitative analysis of potential physical, institutional, or operational flaws of the alignment segments comprising each alternative was conducted. Based on the analysis, the following alignment segments were identified as fatally flawed due to institutional or physical restrictions that would not permit realistic implementation or operation of any alternative that contains one or more of the fatally flawed segments:

- LIRR Garden City Secondary between Franklin Avenue and Clinton Road: This alignment segment was identified as being fatally flawed because of the generally single-family, low-density residential land use patterns in the vicinity of this segment of the alignment, which are not consistent with transit operations. Also, by agreement, the LIRR Garden City Secondary alignment is currently limited to

use by the once yearly circus train operations and storage, thereby further complicating potential future transit operations.

- LIRR Hempstead Branch between the Garden City Station and Rosa Parks–Hempstead Transit Center: This alignment segment was identified as being fatally flawed because it is an active LIRR commuter line; only Federal Railroad Administration (FRA)-compliant rail vehicles could be jointly operated within the same alignment. As other segments would not be located within exclusive rights-of-way, the use of an FRA-compliant vehicle would not be possible along the entire alignment. Therefore, it would not be compatible with transit services proposed for the alignments.
- The former LIRR rail right-of-way between the Village of Mineola and the Garden City Secondary paralleling Franklin Avenue: This alignment segment has been acquired by various adjoining property owners and is no longer available for use as a dedicated transit corridor.

Alternative 13 and Alternative 14 were determined to be fatally flawed because they would use the Garden City Secondary between Franklin Avenue and Clinton Road, the LIRR Hempstead Branch and the abandoned right-of-way between the Village of Mineola and the Garden City Secondary.

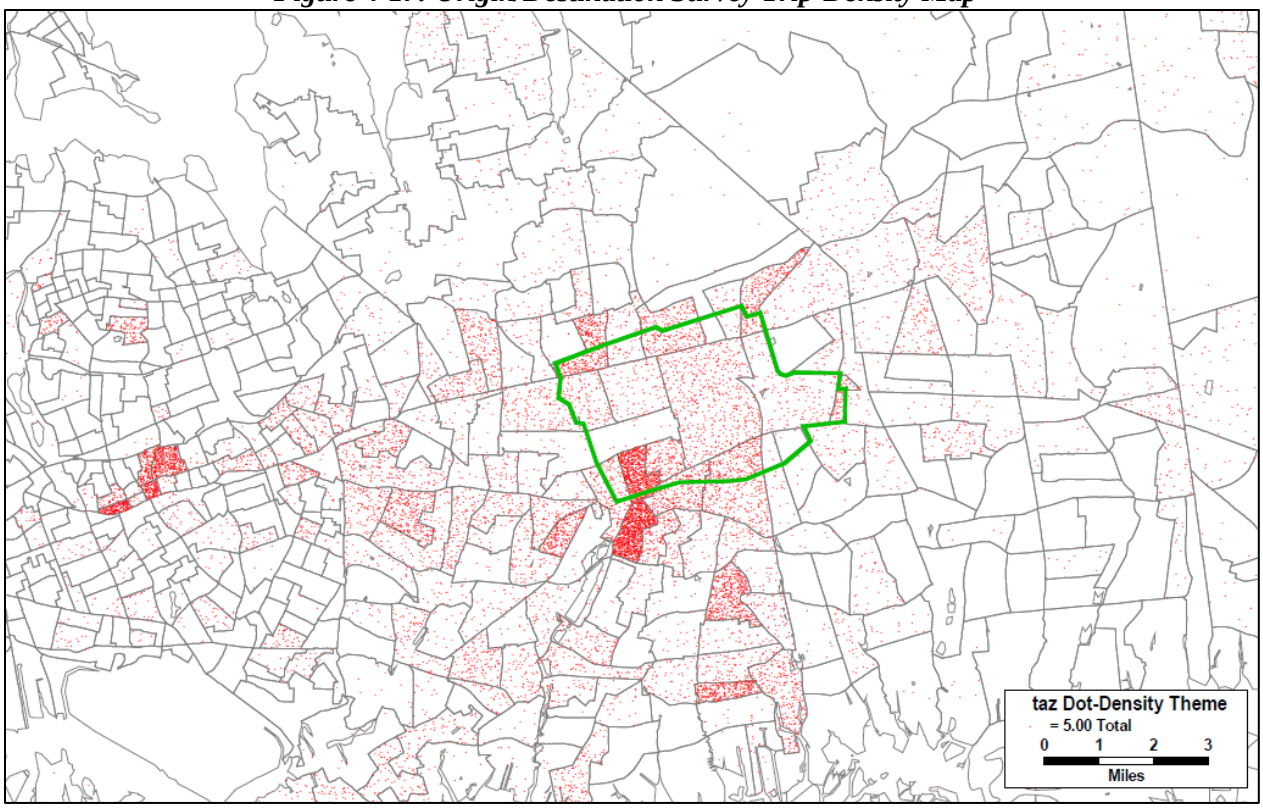
4.3.2 Serving Mobility Needs Efficiently

Evaluation Measure: *Does the alternative's alignment provide service to areas that have low demand for transit as identified in the origin-destination survey?*

An origin/destination (O/D) survey was conducted on the then Long Island Bus (currently Nassau Inter County [NICE] Bus) system in 2010 as part of the Study to obtain information about existing transit travel patterns to, from and within the Study Area. The Preliminary Long-List Alternatives' alignments were compared against the O/D survey results pertaining to the distribution and density of origins and destinations in the Study Area (Figure 4-17), which, in turn, are related to where trip generators and attractors are located. Some alignment segments traverse areas in the Village of Garden City for which the O/D survey results show very low demand. Upon further review of these areas, it was noted that transit trips originating in these areas are primarily Manhattan-focused rather than trips made within the Study Area.

Alternatives 9, 10 11, 12, 13 and 14 were identified as fatally flawed because their alignments traverse areas that currently have low demand for transit, based on the O/D survey results, as well as have land use policies and plans that do not contemplate significant changes that would result in potentially increased transit ridership.

Figure 4-17: Origin/Destination Survey Trip-Density Map



Source: Jacobs, 2011.

4.3.3 Serving Essential Attractors and Generators

Evaluation Measure: *Does the alternative's alignment lack connections to most of the identified essential attractors and trip generators located within the Study Area?*

Major activity centers in the Study Area were identified and categorized as either essential attractors/generators, important attractors/generators or attractors/generators (see Figure 4-1). The alignment of each alternative was reviewed relative to the locations of the essential attractors/generators to determine whether the alignment provides connections to them. None of the alternatives is fatally flawed for this evaluation measure as it was determined that each would provide a connection to the essential attractors/generators.

4.3.4 Integration with the Community

Evaluation Measure: *Does the alternative's alignment lack physical attributes that will conceptually permit integration within the community?*

Primary land use (see Section 2.3) along each of the alternatives' alignments was examined to determine if the character of uses (type, density, levels of activity) would be consistent with transit service. Portions of the Study Area where the primary land use is large-lot, single-family, low-density residential were not found to have the characteristics needed to support transit. Review of current zoning and master plans indicates that these conditions will continue in the future. Alternatives in these locations were found to be fatally flawed.

Alternatives 9, 10, 11, 12, 13 and 14 were identified as fatally flawed because they traverse areas with land use and densities that are not transit-supportive and are limited from becoming so in the future due to existing zoning and planning guidelines.

4.4 Fatal-Flaw Screening Results

The following table summarizes the results of the fatal-flaw screening. Alternatives found to have one or more fatal flaws for the screening criteria are indicated as "yes." Alternatives 9 through 14 were found to have one or more fatal flaws and were not recommended for advancement to the next phase of screening. Alternatives 1 through 8 were found to have no fatal flaws and were advanced as the Revised Long-List Alternatives for further screening evaluation (see Section 5).

Table 4-2: Fatal-Flaw Screening Results

Alt #	Screening Status	Fatal-Flaw Screening Criteria			
		Does the alternative's alignment contain physical, institutional or operational restrictions that would not permit its realistic implementation or operation?	**Does the alternative's alignment provide service to areas that have low demand for transit as identified in the origin-destination survey?**	**Does the alternative's alignment lack connections to the identified essential attractors and trip generators located within the Study Area?**	**Does the alternative's alignment lack physical attributes that will conceptually permit integration within the community?**
1	Advanced	No	No	No	No
2	Advanced	No	No	No	No
3	Advanced	No	No	No	No
4	Advanced	No	No	No	No
5	Advanced	No	No	No	No
6	Advanced	No	No	No	No
7	Advanced	No	No	No	No
8	Advanced	No	No	No	No
9	Flawed	No	Yes	No	Yes
10	Flawed	No	Yes	No	Yes
11	Flawed	No	Yes	No	Yes
12	Flawed	No	Yes	No	Yes
13	Flawed	Yes	Yes	No	Yes
14	Flawed	Yes	Yes	No	Yes

Source: Jacobs, 2011.

The alternatives with no identified fatal flaws were advanced for further detail and evaluation in a second round of screening. Based upon the screening performed, Alternatives 1 through 8 were advanced to the next level of evaluation.

5. Refined Long-List Alternatives Considered and Screened

5.1 Refined Long-List Alternatives

The eight Long-List Alternatives advanced from the fatal-flaw screening to the second, comparative-screening evaluation (see Section 4.4) were refined and developed in more detail for key characteristics, including:

- Travel time;
- Daily trips;
- Trips per track/lane mile;
- Trips per annual vehicle mile; and,
- Connections and activity centers served.

Each of the Refined Long-List Alternatives is described in the following sections, accompanied by a map of its route and tabulations of its characteristics relative to the factors listed above.

5.1.1 Refined Long-List Alternative 1

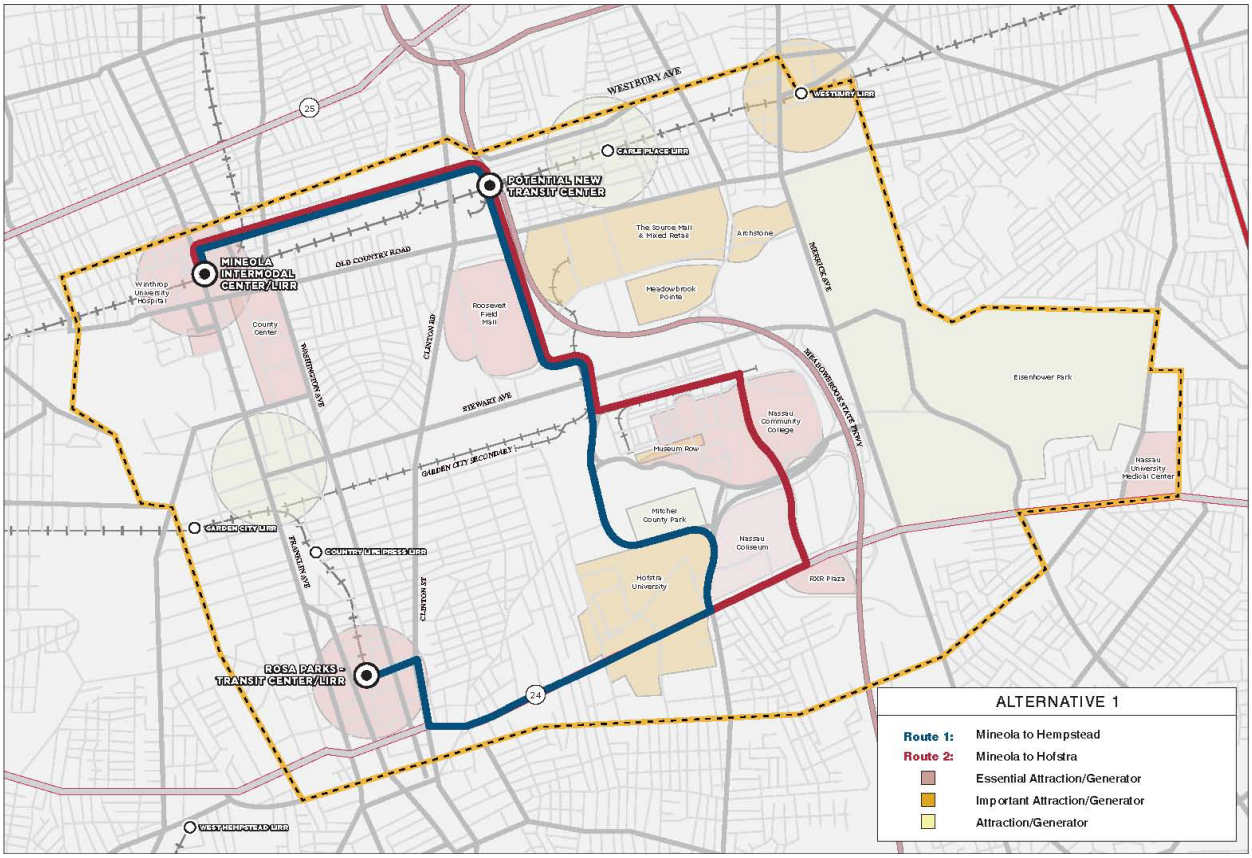
The primary alignment would generally travel east from the Mineola Intermodal Center utilizing 2nd Street and Voice Road to Glen Cove Road. The connection between 2nd Street and Voice Road may require a taking of property to establish a direct right-of-way to allow for a transit-only connection.[1] The route would then turn south and make a connection with the potential new transit center, located in the vicinity of the Macy's Furniture Store on Glen Cove Road. The proposed transit center would include a new station on the Long Island Rail Road (LIRR), which would supplement or replace the existing LIRR Carle Place Station. The LIRR has no current plans for constructing a new station at this location; therefore, any new facility would be part of the Nassau Hub transit alignment. The alignment would then continue south along the eastern edge of the Roosevelt Field property. (The exact routing of this Roosevelt Field connection was not determined at this phase of alternatives development.) The alignment would then travel south along South Street, which transitions to Quentin Roosevelt Boulevard/Charles Lindbergh Boulevard as it crosses Stewart Avenue. The alignment would diverge at the Garden City Secondary into two separate branch routes.

Route 1 would continue south and enter a one-way, counter-clockwise loop by following the flow of traffic along Quentin Roosevelt Boulevard/Charles Lindbergh Boulevard. It would then rejoin the primary alignment at the intersection of Quentin Roosevelt Boulevard/Charles Lindbergh Boulevard and Earle Ovington Boulevard. Route 1 southbound would rejoin the primary alignment by turning south on Earle Ovington Boulevard to Hempstead Turnpike. It would then turn west on Hempstead Turnpike toward downtown Village of Hempstead, make a slight right turn onto Fulton Avenue, right onto Clinton Street and finally left onto Jackson Street. The Route 1 alignment would terminate at the Rosa Parks–Hempstead Transit Center. The vehicle would then turn and operate eastbound and then northbound along the same alignment in the reverse direction except along the Quentin Roosevelt Boulevard/Charles Lindbergh Boulevard loop where it would again enter a one-way, counter-clockwise loop following the flow of traffic.

[1] This concept will require additional coordination with the Village of Mineola.

Route 2 would diverge from the main alignment at Quentin Roosevelt Boulevard/Charles Lindbergh Boulevard and the Garden City Secondary[2] and follow the rail alignment in an easterly direction to Endo Drive. It would then turn to the south and follow the southeastern boundary of Nassau Community College utilizing parking lot right-of-way. The Route 2 alignment would then rejoin the primary alignment at the intersection of Charles Lindbergh Boulevard and Earle Ovington Boulevard. From this point, the Route 2 alignment would continue south on Earle Ovington Boulevard and terminate at Hempstead Turnpike. The vehicle would then turn and operate northbound along the same alignment.

Figure 5-1: Refined Long-List Alternative 1 Route



Source: Jacobs, 2011.

[2] The alignment for this alternative uses part of the Garden City Secondary east of the section where there is active rail service; therefore, this alternative was not fatally flawed in the previous alternatives screening.

Table 5-1: Key Characteristics of Refined Long-List Alternative 1[1,2]

	Hempstead to Roosevelt Field		Mineola to Coliseum		Potential Daily Trips 2035	Trips per Track/Lane Mile	Trips per Annual Vehicle Mile
	Travel Time	Transfers	Travel Time	Transfers			
Mixed Flow[3]	14:17	0	17:48	0	4,600	285	1.90
Exclusive ROW[4]	10:32	0	12:30	0	6,100	378	2.52

Source: Jacobs, 2011.
Notes1: Statistics reflect the shortest travel time/distance between locations using either Route 1 or 2.
Note 2: Preliminary forecasts of potential ridership in this phase of the alternatives screening process employed a standard planning-level model. This type of model provided the Study Team with order-of-magnitude ridership estimates that could be used to compare and contrast the Refined Long-List Alternatives under evaluation. The model used for this purpose is the Aggregate Rail Ridership Forecasting Model (ARRF), which is a travel demand modeling tool developed by the Federal Transit Administration (FTA) to estimate ridership for proposed new fixed-guideway transit projects in areas where there are no existing or similar transit services. Therefore, the ARRF model is appropriate for evaluating the potential travel market in the Study Area. Ridership projections were estimated using the ARRF model for the forecast year 2035 (see Section 9).
Note 3: Mixed-flow segments are those where the transit vehicle would operate within existing road right-of-way.
Note 4: Exclusive right-of-way segments would be used exclusively by transit vehicles.

Table 5-2: Refined Long-List Alternative 1 Connections and Activity Centers Served

Transit Connections	Mineola Intermodal Center Potential New Transit Center & LIRR Station Stop Rosa Parks–Hempstead Transit Center
Activity Centers Served	Downtown Village of Mineola Downtown Village of Hempstead Roosevelt Field Nassau Community College Nassau Veterans Memorial Coliseum Hofstra University

Source: Jacobs, 2011.

5.1.2 Refined Long-List Alternative 2

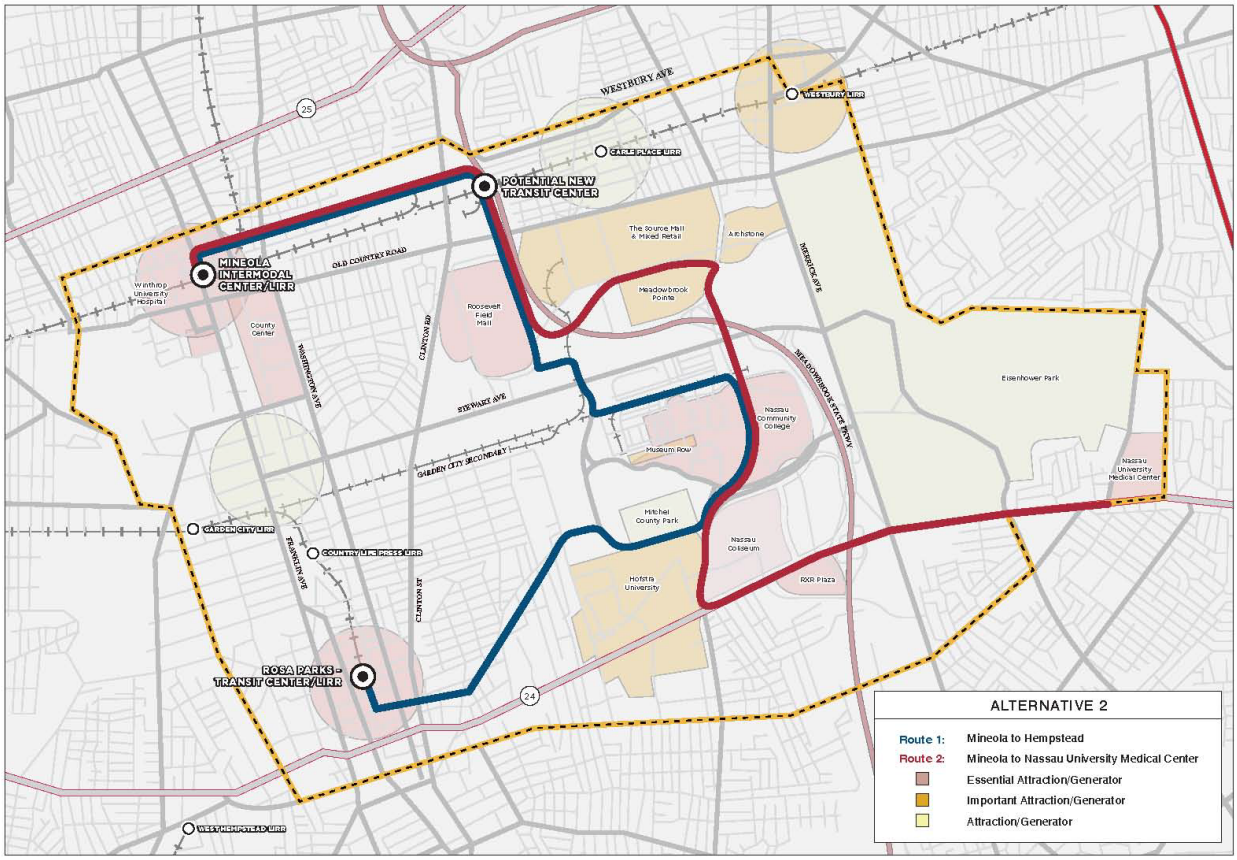
The first segment of this alternative is the same as Alternative 1. The alignments change at their respective divergence points. Alternative 2 would diverge into two separate branch routes near the southeastern corner of Roosevelt Field.

Route 1 would continue south from Roosevelt Field along South Street, which transitions to Quentin Roosevelt Boulevard/Charles Lindbergh Boulevard as it crosses Stewart Avenue. It would then turn east onto the Garden City Secondary and follow the rail alignment to Endo Drive. It would then rejoin the primary alignment by turning to the south and hugging the southeastern boundary of Nassau Community College, utilizing parking lot right-of-way to the intersection of Charles Lindbergh Boulevard and Earle Ovington Boulevard. It would then turn west onto Quentin Roosevelt Boulevard/Charles Lindbergh Boulevard and follow the counter-clockwise loop around as it turns to the south. The alignment would then turn right onto Meadow Street, cross Oak Street and continue west along Westbury Boulevard. Near downtown Village of Hempstead, the alignment would turn slightly to the right to Jackson Street and terminate at the Rosa Parks–Hempstead Transit Center. The vehicle would then turn and operate eastbound and then northbound along the same alignment in the reverse direction except along the Quentin Roosevelt Boulevard/Charles Lindbergh Boulevard loop. At this point, the northbound alignment would again enter a one-way, counter-clockwise loop following the flow of traffic back to the intersection

of Charles Lindbergh Boulevard and Earle Ovington Boulevard where it would rejoin the main Route 1 alignment through the Nassau Community College parking lot right-of-way.

Route 2 would diverge from the primary alignment near the southeastern corner of Roosevelt Field and cross over the Meadowbrook State Parkway on an existing or newly constructed bridge. It would then follow Zeckendorf Boulevard/Corporate Drive past the Source Mall to Merchants Concourse. It then would turn south and run along Merchants Concourse and Endo Boulevard before rejoining the primary alignment at the Garden City Secondary. The primary alignment would hug the southeastern boundary of Nassau Community College, utilizing parking lot right-of-way to the intersection of Charles Lindbergh Boulevard and Earle Ovington Boulevard. From this point, the Route 2 alignment would continue south on Earle Ovington Boulevard and turn left onto Hempstead Turnpike. Traveling east, the alignment would pass RXR Plaza and Eisenhower Park before terminating at Nassau University Medical Center. The vehicle would then turn and operate westbound and then northbound along the same alignment in the reverse direction.

Figure 5-2: Refined Long-List Alternative 2 Route



Source: Jacobs, 2011.

Table 5-3: Key Characteristics of Refined Long-List Alternative 2

	Hempstead to Roosevelt Field		Mineola to Coliseum		Potential Daily Trips 2035	Trips per Track/Lane Mile	Trips per Annual Vehicle Mile
	Travel Time	Transfers	Travel Time	Transfers			
Mixed Flow	14:04	0	17:43	0	6,200	283	1.89
Exclusive ROW	11:06	0	12:30	0	8,100	370	2.47

Source: Jacobs, 2011.
Note: Statistics reflect the shortest travel time/distance between locations using either Route 1 or 2.

Table 5-4: Refined Long-List Alternative 2 Connections and Activity Centers

Transit Connections	Mineola Intermodal Center Potential New Transit Center & LIRR Station Stop Rosa Parks–Hempstead Transit Center
Activity Centers Served	Downtown Village of Mineola Downtown Village of Hempstead Roosevelt Field Nassau Community College Nassau Veterans Memorial Coliseum RXR Plaza Nassau University Medical Center Hofstra University Source Mall Museum Row Mitchel Field Eisenhower Park

Source: Jacobs, 2011.

5.1.3 Refined Long-List Alternative 3

The primary alignment would travel east from the Mineola Intermodal Center along 2nd Street and Voice Road to Glen Cove Road. The connection between 2nd Street and Voice Road may require a taking of property to establish a direct right-of-way.[3] The route would then turn south and make a connection with a potential new transit center and LIRR station stop. It would then continue south along the eastern edge of the Roosevelt Field property. (The exact routing of this connection was not determined at this phase of alternatives development.)

The alignment continues south from Roosevelt Field along South Street, which transitions to Quentin Roosevelt Boulevard/Charles Lindbergh Boulevard as it crosses Stewart Avenue. It would then make a short easterly jog onto Commercial Avenue and then turn south onto W Road. Turning left onto Davis Road, the alignment would pass Museum Row and then turn right past the Nassau Community College student union. Utilizing parking lot right-of-way, the route would travel south to the intersection of Charles Lindbergh Boulevard and Earle Ovington Boulevard and continue on Earle Ovington Boulevard to Hempstead Turnpike.

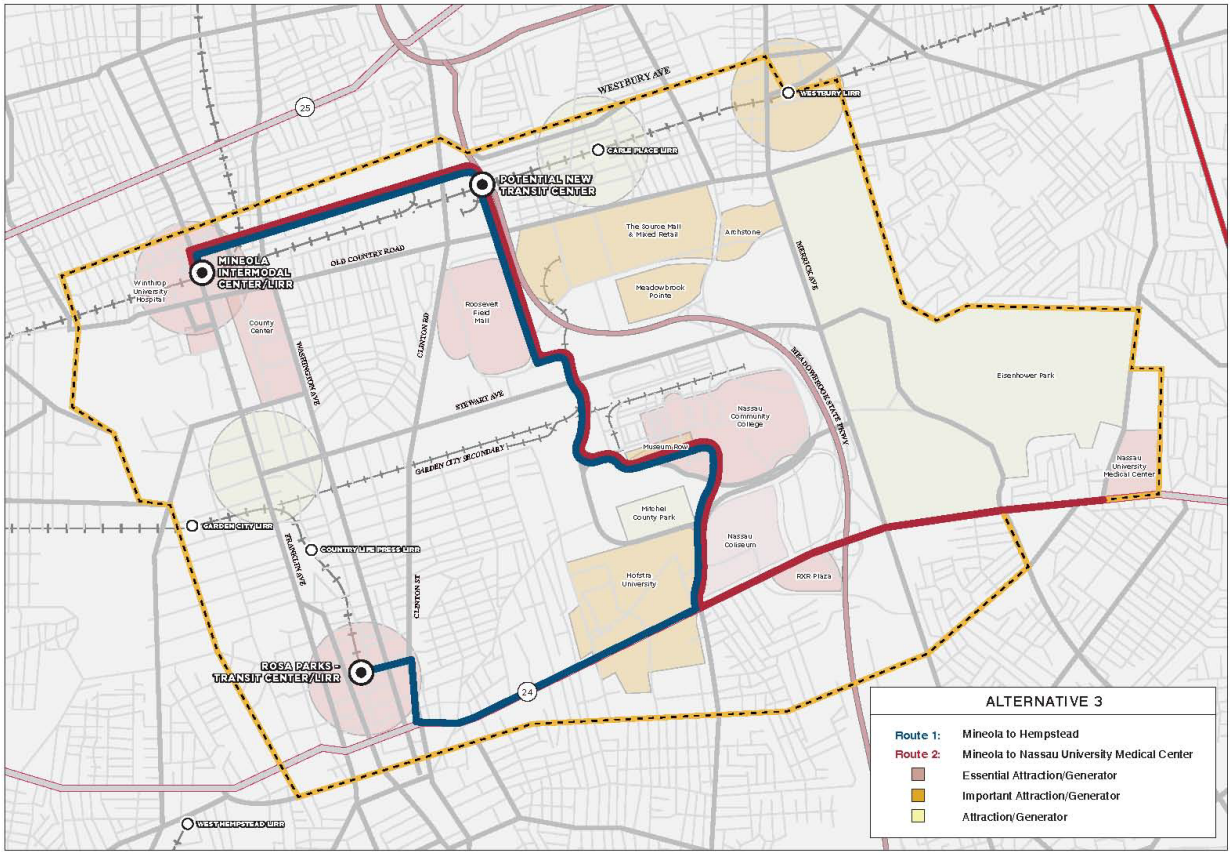
Route 1 would diverge from the primary alignment at Hempstead Turnpike and turn west toward downtown Village of Hempstead. The alignment would make a slight right turn onto Fulton Avenue, right

[3] This concept will require additional coordination with the Village of Mineola.

onto Clinton Street and finally left onto Jackson Street to terminate at the Rosa Parks–Hempstead Transit Center. The vehicle would then turn and operate eastbound and then northbound along the same alignment in the reverse direction.

Route 2 would diverge from the primary alignment at Hempstead Turnpike and turn east. The alignment would pass RXR Plaza and Eisenhower Park before terminating at Nassau University Medical Center. The vehicle would then turn and operate westbound and then northbound along the same alignment in the reverse direction.

Figure 5-3: Refined Long-List Alternative 3 Route



Source: Jacobs, 2011.

Table 5-5: Key Characteristics of Refined Long-List Alternative 3

	Hempstead to Roosevelt Field		Mineola to Coliseum		Potential Daily Trips 2035	Trips per Track/Lane Mile	Trips per Annual Vehicle Mile
	Travel Time	Transfers	Travel Time	Transfers			
Mixed Flow	14:13	0	14:42	0	6,100	349	2.33
Exclusive ROW	10:19	0	10:18	0	8,000	458	3.05

Source: Jacobs, 2011.

Note: Statistics reflect the shortest travel time/distance between locations using either Route 1 or 2.

Table 5-6: Refined Long-List Alternative 3 Connections and Activity Centers

Transit Connections	Mineola Intermodal Center Potential New Transit Center & LIRR Station Stop Rosa Parks–Hempstead Transit Center
Activity Centers Served	Downtown Village of Mineola Downtown Village of Hempstead Roosevelt Field Nassau Community College Nassau Veterans Memorial Coliseum RXR Plaza Nassau University Medical Center Hofstra University Museum Row Eisenhower Park

Source: Jacobs, 2011.

5.1.4 Refined Long-List Alternative 4

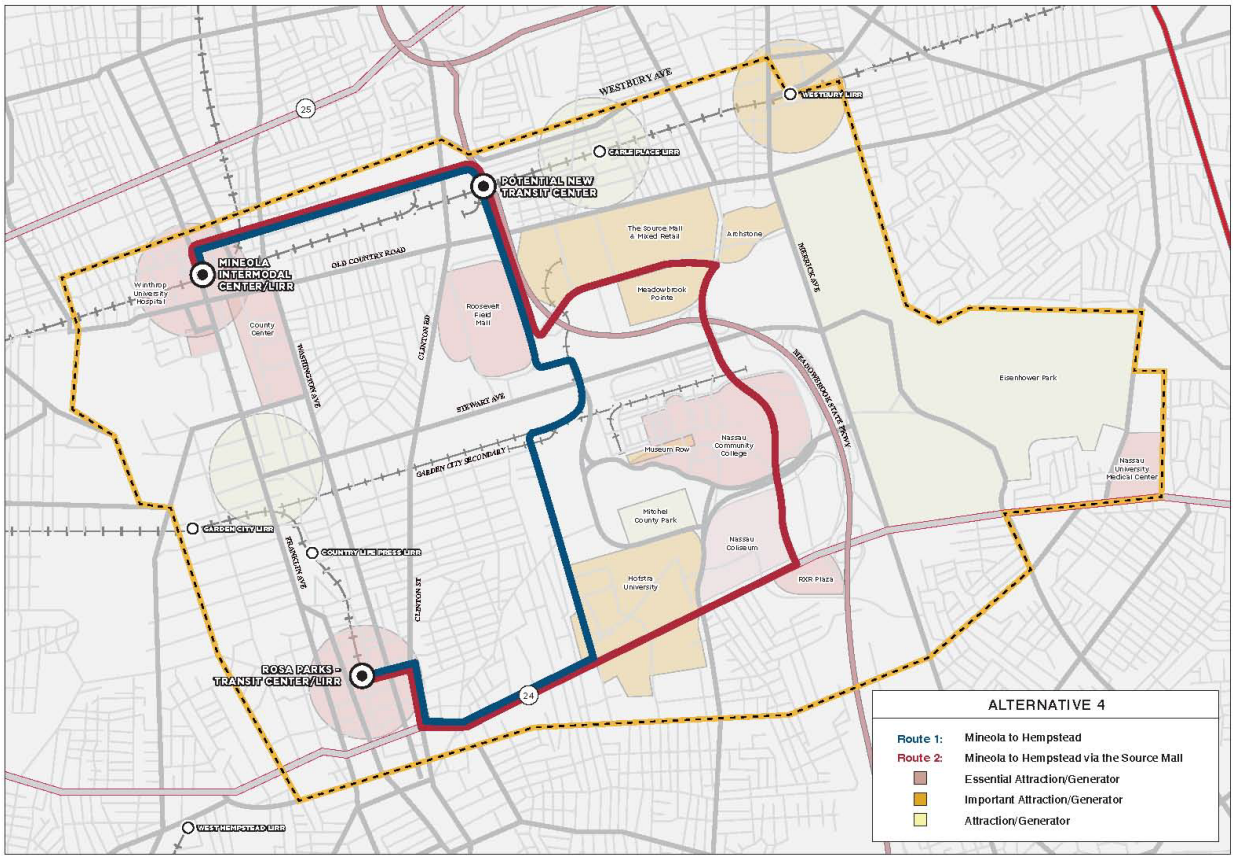
The primary alignment would travel east from the Mineola Intermodal Center along 2nd Street and Voice Road to Glen Cove Road. The connection between 2nd Street and Voice Road may require a taking of property to establish a direct right-of-way.[4] The route would then turn south and make a connection with a potential new transit center and LIRR station stop. It would then continue south along the eastern edge of the Roosevelt Field property. (The exact routing of this connection was not determined at this phase of alternatives development.) The alignment would diverge into two separate branch routes near the southeastern corner of Roosevelt Field.

Route 1 would continue south from Roosevelt Field along South Street, which transitions to Quentin Roosevelt Boulevard/Charles Lindbergh Boulevard as it crosses Stewart Avenue. It would turn right onto Commercial Avenue and then left onto Oak Street. Route 1 would rejoin the primary alignment at Hempstead Turnpike and turn west toward downtown Village of Hempstead. The alignment would make a slight right turn onto Fulton Avenue, right onto Clinton Street and finally left onto Jackson Street to terminate at the Rosa Parks–Hempstead Transit Center. The vehicle would then turn and operate eastbound and then northbound along the same alignment in the reverse direction.

Route 2 would diverge from the primary alignment near the southeastern corner of Roosevelt Field and cross over the Meadowbrook State Parkway on an existing or newly constructed bridge. It would then follow Zeckendorf Boulevard/Corporate Drive past the Source Mall to Merchants Concourse. It then would turn south and run along Merchants Concourse and Endo Boulevard and hug the southeastern boundary of Nassau Community College, utilizing parking lot right-of-way to the intersection of Charles Lindbergh Boulevard and Earle Ovington Boulevard. The alignment would then turn left and follow Charles Lindbergh Boulevard for a short distance and then turn to the south and travel through the Nassau Veterans Memorial Coliseum parking lot right-of-way to Hempstead Turnpike. It would then turn right and travel west toward downtown Village of Hempstead. The alignment would make a slight right turn onto Fulton Avenue, right onto Clinton Street and finally left onto Jackson Street to terminate at the Rosa Parks–Hempstead Transit Center. The vehicle would then turn and operate eastbound and then northbound along the same alignment in the reverse direction.

[4] This concept will require additional coordination with the Village of Mineola.

Figure 5-4: Refined Long-List Alternative 4 Route



Source: Jacobs, 2011.

Table 5-7: Key Characteristics of Refined Long-List Alternative 4

	Hempstead to Roosevelt Field		Mineola to Coliseum		Potential Daily Trips 2035	Trips per Track/Lane Mile	Trips per Annual Vehicle Mile
	Travel Time	Transfers	Travel Time	Transfers			
Mixed Flow	11:09	0	17:26	0	4,700	258	1.72
Exclusive ROW	7:56	0	12:27	0	6,300	346	2.31

Source: Jacobs, 2011.

Note: Statistics reflect the shortest travel time/distance between locations using either Route 1 or 2.

Table 5-8: Refined Long-List Alternative 4 Connections and Activity Centers

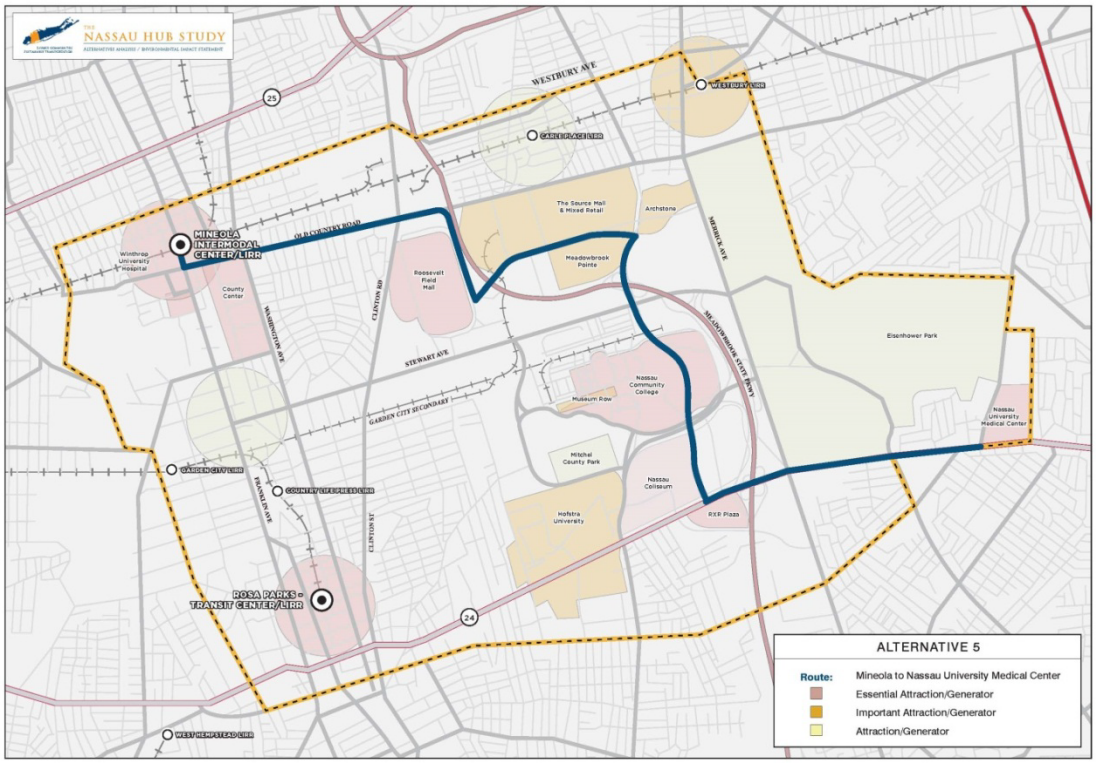
Transit Connections	Mineola Intermodal Center Potential New Transit Center & LIRR Station Stop Rosa Parks–Hempstead Transit Center
Activity Centers Served	Downtown Village of Mineola Downtown Village of Hempstead Roosevelt Field Nassau Community College Nassau Veterans Memorial Coliseum RXR Plaza Hofstra University Source Mall

Source: Jacobs, 2011.

5.1.5 Refined Long-List Alternative 5

The primary alignment would travel south from the Mineola Intermodal Center along Mineola Boulevard. The route would then turn east and travel along Old Country Road. It would then continue south along the eastern edge of the Roosevelt Field property. (The exact routing of this connection was not determined at this phase of alternatives development.) The alignment would then cross over the Meadowbrook State Parkway on an existing or newly constructed bridge and follow Zeckendorf Boulevard/Corporate Drive past the Source Mall to Merchants Concourse. It then would turn south and run along Merchants Concourse and Endo Boulevard and hug the southeastern boundary of Nassau Community College, utilizing parking lot right-of-way to the intersection of Charles Lindbergh Boulevard and Earle Ovington Boulevard. The alignment would then turn left and follow Charles Lindbergh Boulevard for a short distance and then turn to the south and travel through the Nassau Veterans Memorial Coliseum parking lot right-of-way to Hempstead Turnpike. It would then turn left and travel east passing RXR Plaza and Eisenhower Park before terminating at Nassau University Medical Center. The vehicle would then turn and operate westbound and then northbound along the same alignment in the reverse direction.

Figure 5-5: Refined Long-List Alternative 5 Route



Source: Jacobs, 2011.

Table 5-9: Key Characteristics of Refined Long-List Alternative 5

	Hempstead to Roosevelt Field		Mineola to Coliseum		Potential Daily Trips 2035	Trips per Track/Lane Mile	Trips per Annual Vehicle Mile
	Travel Time	Transfers	Travel Time	Transfers			
Mixed Flow	-	-	17:34	0	3,700	244	1.63
Exclusive ROW	-	-	12:33	0	4,800	316	2.11

Source: Jacobs, 2011.

Table 5-10: Refined Long-List Alternative 5 Connections and Activity Centers

Transit Connections	Mineola Intermodal Center
Activity Centers Served	Downtown Village of Mineola Roosevelt Field Nassau Community College Nassau University Medical Center Nassau Veterans Memorial Coliseum RXR Plaza Source Mall Eisenhower Park

Source: Jacobs, 2011.

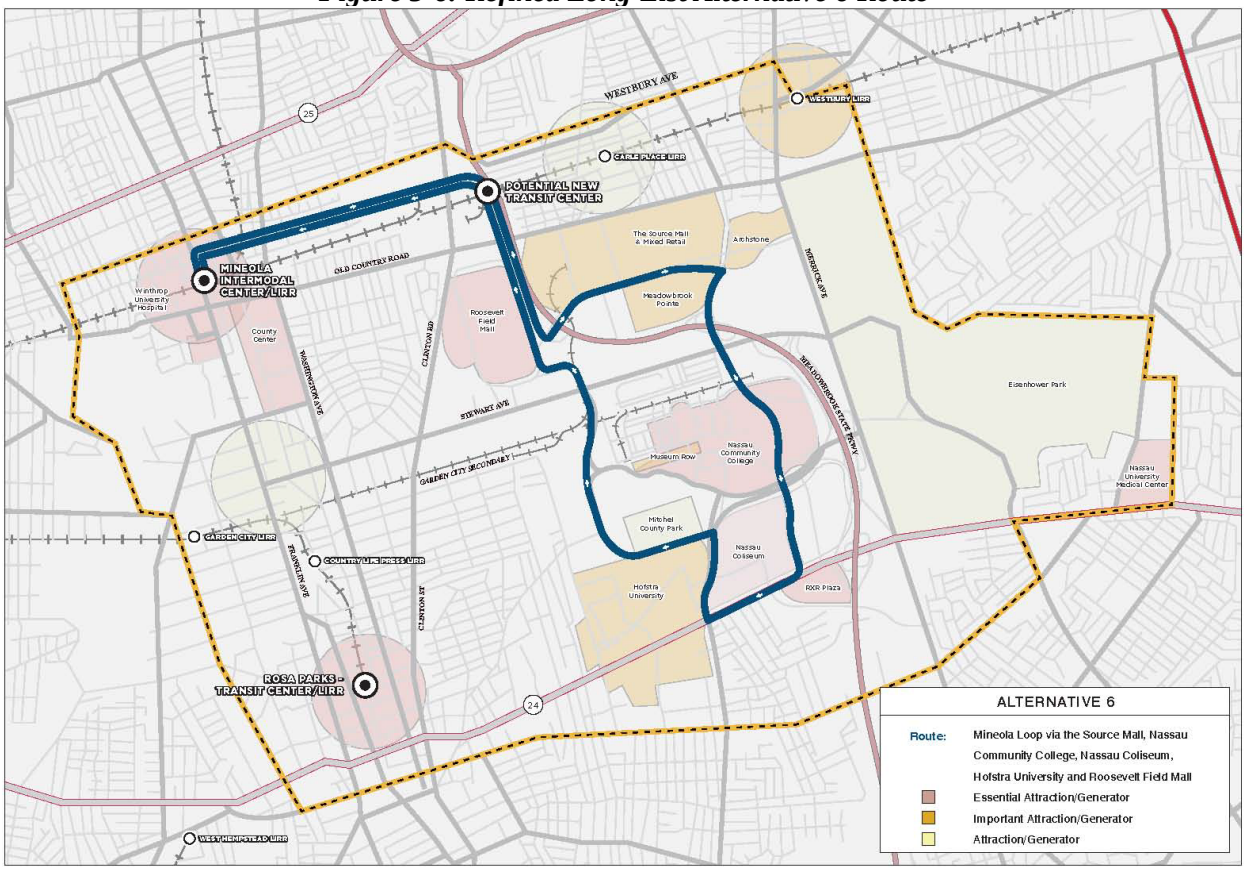
5.1.6 Refined Long-List Alternative 6

The primary alignment would travel east from the Mineola Intermodal Center along 2nd Street and Voice Road to Glen Cove Road. The connection between 2nd Street and Voice Road may require a taking of property to establish a direct right-of-way.[5] The route would then turn south and make a connection with a potential new transit center and LIRR station stop. It would then continue south along the eastern edge of the Roosevelt Field property. (The exact routing of this connection was not determined at this phase of alternatives development.)

The alignment would then enter one-way operation by crossing over the Meadowbrook State Parkway on an existing or newly constructed bridge and follow Zeckendorf Boulevard/Corporate Drive past the Source Mall to Merchants Concourse. It then would turn south and run along Merchants Concourse and Endo Boulevard and hug the southeastern boundary of Nassau Community College, utilizing parking lot right-of-way to the intersection of Charles Lindbergh Boulevard and Earle Ovington Boulevard. The alignment would then turn left and follow Charles Lindbergh Boulevard for a short distance and then turn to the south and travel through the Nassau Veterans Memorial Coliseum parking lot right-of-way to Hempstead Turnpike. It would then turn right and travel west past RXR Plaza to Earle Ovington Boulevard. Turning north onto Earle Ovington Boulevard, the alignment would then turn left onto Quentin Roosevelt Boulevard/Charles Lindbergh Boulevard and provide service to Museum Row and Mitchel Field. It would then continue north to Stewart Avenue. Quentin Roosevelt Boulevard/Charles Lindbergh Boulevard transitions to South Street as it crosses Stewart Avenue, and the alignment would continue north to rejoin the two-way alignment at Roosevelt Field and return to the Mineola Intermodal Center.

[5] This concept will require additional coordination with the Village of Mineola.

Figure 5-6: Refined Long-List Alternative 6 Route



Source: Jacobs, 2011.

Table 5-11: Key Characteristics of Refined Long-List Alternative 6

	Hempstead to Roosevelt Field		Mineola to Coliseum		Potential Daily Trips 2035	Trips per Track/Lane Mile	Trips per Annual Vehicle Mile
	Travel Time	Transfers	Travel Time	Transfers			
Mixed Flow	-	-	14:43	0	3,100	203	1.36
Exclusive ROW	-	-	10:59	0	4,100	269	1.80

Source: Jacobs, 2011.

Table 5-12: Refined Long-List Alternative 6 Connections and Activity Centers

Transit Connections	Mineola Intermodal Center Potential New Transit Center &LIRR Station Stop
Activity Centers Served	Downtown Village of Mineola Roosevelt Field Nassau Community College Nassau Veterans Memorial Coliseum RXR Plaza Hofstra University Source Mall Mitchel Field

Source: Jacobs, 2011.

5.1.7 Refined Long-List Alternative 7

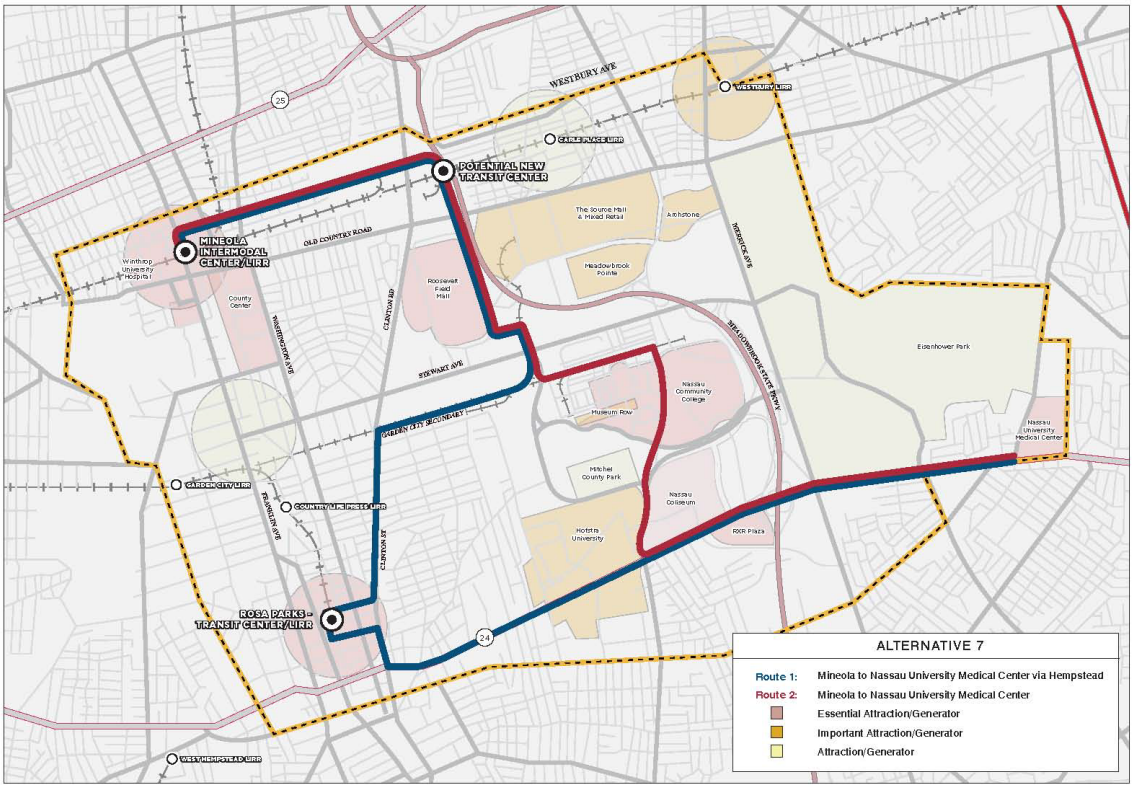
The primary alignment would travel east from the Mineola Intermodal Center along 2nd Street and Voice Road to Glen Cove Road. The connection between 2nd Street and Voice Road may require a taking of property to establish a direct right-of-way.[6] The route would then turn south and make a connection with a potential new transit center and LIRR station stop. It would then continue south along the eastern edge of the Roosevelt Field property. (The exact routing of this connection was not determined at this phase of alternatives development.) The alignment would continue south from Roosevelt Field along South Street, which transitions to Quentin Roosevelt Boulevard/Charles Lindbergh Boulevard as it crosses Stewart Avenue. The alignment would diverge into two separate branch routes at the Garden City Secondary.

Route 1 would turn right onto the Garden City Secondary and travel west along the rail right-of-way to Clinton Road. It would turn left and travel southwest toward downtown Village of Hempstead. The alignment would turn right onto Jackson Street and stop at the Rosa Parks–Hempstead Transit Center. The vehicle would then turn around and travel eastbound on Jackson Street back to Clinton Street where it would turn right. The alignment would then turn left onto Fulton Avenue and then merge slightly left onto Hempstead Turnpike and travel east to Earle Ovington Boulevard. The alignment would then rejoin the primary alignment and continue traveling eastbound along Hempstead Turnpike, past RXR Plaza and Eisenhower Park before terminating at Nassau University Medical Center. The vehicle would then turn and operate westbound and then northbound along the same alignment in the reverse direction.

Route 2 would turn left onto the Garden City Secondary and follow the rail alignment in an easterly direction to Endo Drive. It would then turn to the south and follow the southeastern boundary of Nassau Community College, utilizing parking lot right-of-way to the intersection of Charles Lindbergh Boulevard and Earle Ovington Boulevard. It would continue south on Earle Ovington Boulevard to Hempstead Turnpike where it would turn left and rejoin the primary alignment. It would travel east passing RXR Plaza and Eisenhower Park before terminating at Nassau University Medical Center. The vehicle would then turn and operate westbound and then northbound along the same alignment in the reverse direction.

[6] This concept will require additional coordination with the Village of Mineola.

Figure 5-7: Refined Long-List Alternative 7 Route



Source: Jacobs, 2011.

Table 5-13: Key Characteristics of Refined Long-List Alternative 7

	Hempstead to Roosevelt Field		Mineola to Coliseum		Potential Daily Trips 2035	Trips per Track/Lane Mile	Trips per Annual Vehicle Mile
	Travel Time	Transfers	Travel Time	Transfers			
Mixed Flow	8:17	0	15:46	0	6,200	279	1.86
Exclusive ROW	6:27	0	11:11	0	8,100	364	2.43

Source: Jacobs, 2011.

Note: Statistics reflect the shortest travel time/distance between locations using either Route 1 or 2.

Table 5-14: Refined Long-List Alternative 7 Connections and Activity Centers

Transit Connections	Mineola Intermodal Center Potential New Transit Center & LIRR Station Stop
Activity Centers Served	Downtown Village of Mineola Roosevelt Field Nassau Community College Nassau Veterans Memorial Coliseum RXR Plaza Hofstra University Source Mall Mitchel Field

Source: Jacobs, 2011.

5.1.8 Refined Long-List Alternative 8

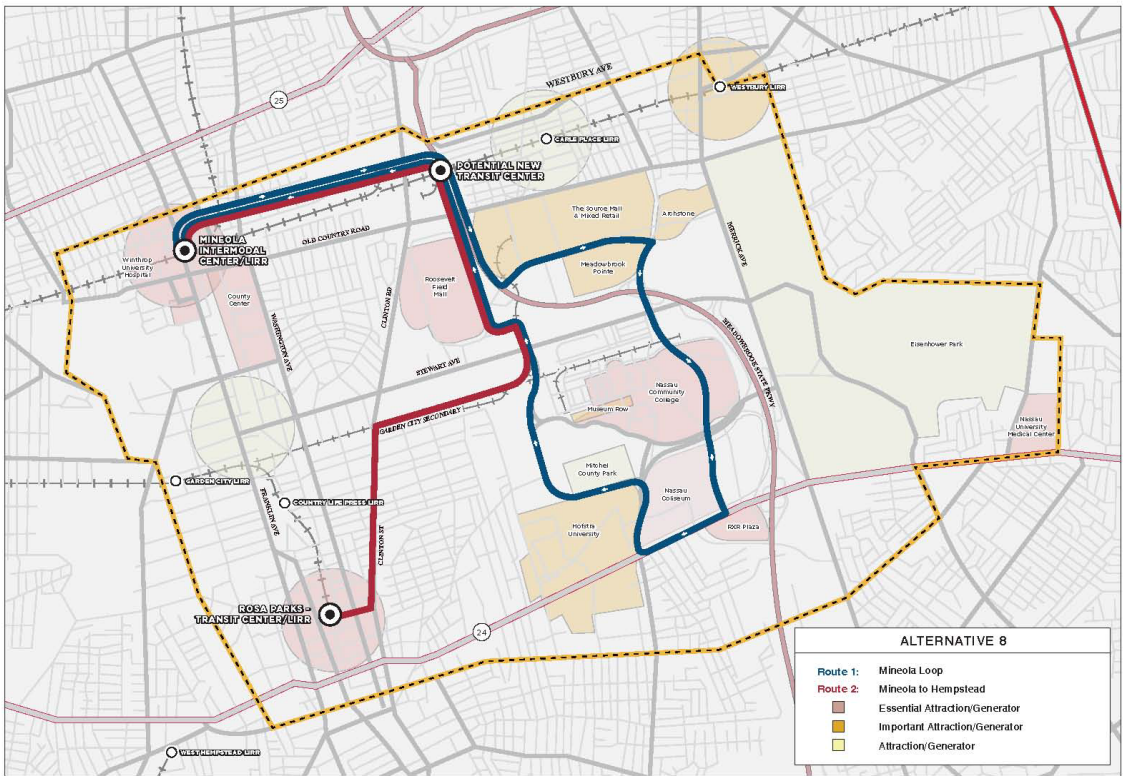
The primary alignment would travel east from the Mineola Intermodal Center along 2nd Street and Voice Road to Glen Cove Road. The connection between 2nd Street and Voice Road may require a taking of property to establish a direct right-of-way.[7] The route would then turn south and make a connection with a potential new transit center and LIRR station stop. It would then continue south along the eastern edge of the Roosevelt Field property. (The exact routing of this connection was not determined at this phase of alternatives development.) The alignment would continue south from Roosevelt Field along South Street, which transitions to Quentin Roosevelt Boulevard/Charles Lindbergh Boulevard as it crosses Stewart Avenue. The alignment would diverge into two separate branch routes at the Garden City Secondary.

Route 1 would turn right onto the Garden City Secondary and travel west along the rail right-of-way to Clinton Road. It would turn left and travel southwest toward downtown Village of Hempstead. The alignment would turn right onto Jackson Street and stop at the Rosa Parks–Hempstead Transit Center. The vehicle would then turn around and travel eastbound and then northbound along the same alignment in the reverse direction.

Route 2 would operate in one-way loop operation by diverging from the primary alignment near the southwest corner of Roosevelt Field by crossing over the Meadowbrook State Parkway on an existing or newly constructed bridge. It would then follow Zeckendorf Boulevard/Corporate Drive past the Source Mall to Merchants Concourse, turn south and run along Merchants Concourse and Endo Boulevard. The alignment would hug the southeastern boundary of Nassau Community College, utilizing parking lot right-of-way to the intersection of Charles Lindbergh Boulevard and Earle Ovington Boulevard. It would then turn left and follow Charles Lindbergh Boulevard for a short distance and then turn to the south and travel through the Nassau Veterans Memorial Coliseum parking lot right-of-way to Hempstead Turnpike. It would then turn right and travel west past RXR Plaza to Earle Ovington Boulevard. Turning north to Earle Ovington Boulevard, the alignment would then turn left onto Quentin Roosevelt Boulevard/Charles Lindbergh Boulevard and provide service to Museum Row and Mitchel Field. It would then continue north to rejoin the two-way primary alignment at the Garden City Secondary and return to the Mineola Intermodal Center.

[7] This concept will require additional coordination with the Village of Mineola.

Figure 5-8: Refined Long-List Alternative 8 Route



Source: Jacobs, 2011.

Table 5-15: Key Characteristics of Refined Long-List Alternative 8

	Hempstead to Roosevelt Field Mall		Mineola to Coliseum		Potential Daily Trips 2035	Trips per Track/Lane Mile	Trips per Annual Vehicle Mile
	Travel Time	Transfers	Travel Time	Transfers			
Mixed Flow	8:17	0	15:05	0	4,600	235	1.57
Exclusive ROW	6:27	0	10:24	0	6,100	312	2.08

Source: Jacobs, 2011.
Note: Statistics reflect the shortest travel time/distance between locations using either Route 1 or 2.

Table 5-16: Refined Long-List Alternative 8 Connections and Activity Centers

Transit Connections	Mineola Intermodal Center Potential New Transit Center & LIRR Station Stop Rosa Parks–Hempstead Transit Center
Activity Centers Served	Downtown Village of Mineola Downtown Village of Hempstead Roosevelt Field Nassau Community College Nassau Veterans Memorial Coliseum RXR Plaza Hofstra University Source Mall Mitchel Field

Source: Jacobs, 2011.

5.2 Refined Long-List Alternatives Screening

The purpose of the second phase of the screening process was to broadly analyze the Refined Long-List Alternatives for their ability to address Study goals and, on that basis, identify the Short-List Alternatives. This phase of screening identified the alternatives that would best provide mobility and accessibility improvements. While this step incorporated the quantitative data developed at this stage of the AA, some of the evaluation measures remained qualitative in nature. Each of the alternatives received a ranking based upon its ability to meet each of the more rigorous screening criteria defined for the Study goals and objectives that were identified for use in this second phase of screening (see Table 5-17). Alternatives that did not perform well in their ability to meet the stated purpose, needs, goals and objectives, based on their comparative performance against the screening criteria, were eliminated from further consideration. The highest-performing alternatives were advanced as the Short-List Alternatives for the final screening phase.

Table 5-17: Refined Long-List Alternatives Screening Evaluation Criteria and Measures

Objective	Evaluation Criterion	Evaluation Measure
GOAL: Develop transit improvements that will provide additional realistic and practical travel options to, from and within the Study Area and help to mitigate congestion on roadways.		
Develop a public transportation alternative that will attract a maximum number of riders.	Total daily transit riders should be maximized.	Relative strength of ridership, utilizing preliminary outputs from a sketch planning model developed by the FTA
GOAL: Develop transit improvements that will enhance mobility to, from and within the Study Area in a cost-effective manner.		
Develop an alternative that will have a capital cost that is consistent with anticipated financial resources for construction.	Projected capital costs should be minimized.	Trips per track/lane mile
Develop an alternative that will have an operating and maintenance cost that can feasibly be funded annually with state and local resources.	Annual operating and maintenance (O&M) costs should be minimized.	Trips per annual vehicle mile
GOAL: Develop transit improvements that encourage the development of sustainable, transit-friendly land use patterns and support economic development activities.		
Develop a seamless, convenient and integrated regional transportation system.	The number of transfers between a standard set of activity centers should be minimized.	Number of transfers between activity centers (2 pairs – Village of Mineola to Nassau Veterans Memorial Coliseum, Village of Hempstead to Roosevelt Field)

Source: Jacobs, 2011.

A series of three distinct screening matrices was developed to preclude bias in the screening process and determination of which Refined Long-List Alternatives should be advanced for further study. As described below, the three screening matrices used different weightings for the evaluation measures used with each matrix to assess how the alternatives performed against the Study goals and objectives. Ultimately, the results of the weighting in each matrix were evaluated and averaged for each matrix to determine the best performing alternatives to be advanced. The screening matrices were:

- Matrix 1 used five evaluation measures to screen the performance of the alternatives for the Study goals, objectives and evaluation criteria:
  - Potential daily trips (2035)

- Trips per track/lane mile
- Trips per annual vehicle mile
- Travel time between the Village of Hempstead and Roosevelt Field and travel time between the Village of Mineola and Nassau Veterans Memorial Coliseum
- Number of transfers between the Village of Hempstead and Roosevelt Field and number of transfers between the Village of Mineola and Nassau Veterans Memorial Coliseum.

Each evaluation measure used in Matrix 1 was given equal weight in the calculation of the ranking of the Refined Long-list Alternatives shown in the last column of this matrix. This places the most emphasis on the goal to "Develop transit improvements that will enhance mobility to, from and within the Study Area in a cost-effective manner" because three of the five evaluation measures address this goal. Less emphasis is placed on the other two goals, which have one evaluation measure each.

- Matrix 2 used six evaluation measures to screen the performance of the alternatives for the Study goals, objectives and evaluation criteria:
  - Potential daily trips (2035)
  - Trips per track/lane mile
  - Trips per annual vehicle mile
  - Travel time between the Village of Hempstead and Roosevelt Field and travel time between the Village of Mineola and Nassau Veterans Memorial Coliseum
  - Number of transfers between the Village of Hempstead and Roosevelt Field and number of transfers between the Village of Mineola and Nassau Veterans Memorial Coliseum
  - Number of essential activity centers served

  Each evaluation measure used in Matrix 2 was given equal weight in the calculation of the Refined Long-list Alternatives ranking in the last column of the matrix. This places the most emphasis on the goal to "Develop transit improvements that will enhance mobility to, from and within the Study Area in a cost-effective manner" because three of the six evaluation measures address this goal. Some emphasis is placed on the goal to "Develop transit improvements that encourage the development of sustainable, transit-friendly land use patterns and support economic development activities," as there are two evaluation measures for this goal. The least emphasis is placed on the goal to "Develop transit improvements that will provide additional realistic and practical travel options to, from and within the Study Area and help to mitigate congestion on roadways," as there is only one evaluation measure for this goal.

- Matrix 3, similar to Matrix 2, also used six evaluation measures to screen the performance of the alternatives for the Study goals, objectives and evaluation criteria:
  - Potential daily trips (2035)
  - Trips per track/lane mile
  - Trips per annual vehicle mile

- Travel time between the Village of Hempstead and Roosevelt Field and travel time between the Village of Mineola and Nassau Veterans Memorial Coliseum
- Number of transfers between the Village of Hempstead and Roosevelt Field and number of transfers between the Village of Mineola and Nassau Veterans Memorial Coliseum
- Number of essential activity centers served

Matrix 3 averaged the ranking among the Refined Long-List Alternatives by goal rather than evaluation measure, as was done in Matrices 1 and 2. Equal weight was given to each of the three Study goals in the calculation of the ranking shown in the last column of this matrix. Matrix 3 places equal emphasis on each goal. This gives more weight to the evaluation measure "Potential daily trips" because it is the only measure for that goal. The least weight is given to the evaluation measures of "Trips per track/lane mile," "Trips per annual vehicle mile," and "Travel time between the Village of Hempstead and Roosevelt Field and travel time between the Village of Mineola and Nassau Veterans Memorial Coliseum" because these are all associated with the same goals; the evaluation measure ranks for these measures were averaged together to determine the individual rank for that goal.

The three matrices are presented in Tables 5-18, 5-19, and 5-20.

The following section describes the findings of the three-matrix analysis presented in Tables 5-18, 5-19, and 5-20.

5.2.1 Relative Strength of Ridership

The Study goal to "Develop transit improvements that will provide additional realistic and practical travel options to, from and within the Study Area and help to mitigate congestion on roadways" has an associated objective to "Develop a public transportation alternative that will attract a maximum number of riders." This objective is measured through relative strength of ridership. Relative strength of ridership utilizes preliminary outputs from the travel demand model used for this Study (see Table 5-1 Note 2 on page 5-3). Alternatives 2, 3, and 7 each received top ranking with potential daily ridership numbers in the 6,100 to 8,100 range.

5.2.2 Trips per Track/Lane Mile

This evaluation measure is related to the Study goal to "Develop transit improvements that will enhance mobility to, from and within the Study Area in a cost-effective manner." The evaluation criterion that "Projected capital costs should be minimized" measures order-of-magnitude relative costs by ranking the alternatives based on the trips per track/lane mile. Alternative 3 received the highest ranking, registering 349 trips per track/lane mile for a mixed-flow alignment and 458 trips per track/lane mile for an exclusive right-of-way alignment. Alternative 1 received the second highest ranking, with 285 trips per track/lane mile for a mixed-flow alignment and 378 trips per track/lane mile for an exclusive right-of-way alignment. Alternative 2 was the third highest ranked alternative, with 280 trips per track/lane mile for a mixed-flow alignment and 365 trips per track/lane mile for an exclusive right-of-way alignment.

Table 5-18: Matrix 1—Five Evaluation Measures Equally Weighted

Alternative	GOAL: Develop transit improvements that will provide additional realistic and practical travel options to, from and within the Study Area and help to mitigate congestion on roadways.		GOAL: Develop transit improvements that will enhance mobility to, from and within the Study Area in a cost-effective manner.									GOAL: Develop transit improvements that encourage the development of sustainable, transit-friendly land use patterns and support economic development activities.					REFINED LONG-LIST RANK
	Total daily transit riders should be maximized.		Projected capital costs should be minimized		Annual operating and maintenance (O&M) costs should be minimized.		An alternative should shorten travel time between a standard set of Activity Centers.					The number of transfers between a standard set of Activity Centers should be minimized.					
	Relative Strength of Ridership		Trips Per Track/Lane Mile		Trips Per Annual Vehicle Mile		Representative Travel Times					Number of Transfers Between Activity Centers					
	Potential Daily Trips 2035*	Evaluation Measure Rank	Trips Per Track/Lane Mile*	Evaluation Measure Rank	Trips Per Annual Vehicle Mile*	Evaluation Measure Rank	Travel Time, Hempstead to Roosevelt Field Mall*	Rank	Travel Time, Mineola to Coliseum*	Rank	Evaluation Measure Rank	Transfers, Hempstead to Roosevelt Field Mall	Rank	Transfers, Mineola to Coliseum	Rank	Evaluation Measure Rank	
3	6,100 / 8,000	3	349 / 458	1	1.91 / 2.51	1	10:19 / 14:13	4	10:18-14:42	1	3	0	1	0	1	1	1.7
2	6,200 / 8,100	1	280 / 365	3	1.53 / 2.00	3	10:30 / 14:04	5	10:47-14:43	4	5	0	1	0	1	1	2.5
7	6,200 / 8,100	1	279 / 364	4	1.53 / 2.00	4	06:27 / 08:17	1	11:11-15:46	6	4	0	1	0	1	1	2.7
1	4,600 / 6,100	5	285 / 378	2	1.56 / 2.07	2	10:32 / 14:17	6	10:32-14:48	3	5	0	1	0	1	1	2.9
4	4,700 / 6,300	4	258 / 346	5	1.42 / 1.90	5	07:56 / 11:09	3	12:27-17:26	7	5	0	1	0	1	1	4.0
8	4,600 / 6,100	5	235 / 312	7	1.29 / 1.71	7	06:27 / 08:17	1	10:24-15:05	2	2	0	1	0	1	1	4.5
5	3,700 / 4,800	7	244 / 316	6	1.34 / 1.73	6	--	8	12:33-17:34	8	8	-	8	0	1	5	6.3
6	3,100 / 4,100	8	203 / 269	8	1.12 / 1.48	8	--	8	10:59-14:43	5	7	-	8	0	1	5	7.0

* Values for Relative Strength of Ridership, Trips per Track/Lane Mile, Trips per Annual Vehicle Mile and Representative Travel Times are displayed with the first reflecting mixed-flow operation and the second value reflecting operation within a dedicated right-of-way. Each alternative is comprised of both mixed-flow and dedicated ROW segments and the values for each measure would likely be within a range of the two numbers.

Source: Jacobs, 2011.

Table 5-19: Matrix 2—Six Evaluation Measures Equally Weighted

Alternative	GOAL: Develop transit improvements that will provide additional realistic and practical travel options to, from and within the Study Area and help to mitigate congestion on roadways.		GOAL: Develop transit improvements that will enhance mobility to, from and within the Study Area in a cost-effective manner.									GOAL: Develop transit improvements that encourage the development of sustainable, transit-friendly land use patterns and support economic development activities.							
	Total daily transit riders should be maximized.		Projected capital costs should be minimized		Annual operating and maintenance (O&M) costs should be minimized.		An alternative should shorten travel time between a standard set of Activity Centers.					The number of transfers between a standard set of Activity Centers should be minimized.					Number of Essential Activity Centers Served		
	Relative Strength of Ridership		Trips Per Track/Lane Mile		Trips Per Annual Vehicle Mile		Representative Travel Times					Number of Transfers Between Activity Centers					Number of Essential Activity Centers Served		
	Potential Daily Trips 2035*	Evaluation Measure Rank	Trips Per Track/Lane Mile*	Evaluation Measure Rank	Trips Per Annual Vehicle Mile*	Evaluation Measure Rank	Travel Time, Hempstead to Roosevelt Field Mall*	Rank	Travel Time, Mineola to Coliseum*	Rank	Evaluation Measure Rank	Transfers, Hempstead to Roosevelt Field Mall	Rank	Transfers, Mineola to Coliseum	Rank	Evaluation Measure Rank	Number of Essential Activity Centers Served	Evaluation Measure Rank	REFINED LONG-LIST RANK
3	6,100 / 8,000	3	349 / 458	1	1.91 / 2.51	1	10:19/14:13	4	10:18/14:42	1	3	0	1	0	1	1	7	1	1.6
2	6,200 / 8,100	1	280 / 365	3	1.53 / 2.00	3	10:30/14:04	5	10:47/14:43	4	5	0	1	0	1	1	7	1	2.3
7	6,200 / 8,100	1	279 / 364	4	1.53 / 2.00	4	06:27/08:17	1	11:11/15:46	6	4	0	1	0	1	1	7	1	2.4
1	4,600 / 6,100	5	285 / 378	2	1.56 / 2.07	2	10:32/14:17	6	10:32/14:48	3	5	0	1	0	1	1	5	6	3.4
4	4,700 / 6,300	4	258 / 346	5	1.42 / 1.90	5	07:56/11:09	3	12:27/17:26	7	5	0	1	0	1	1	5	6	4.3
8	4,600 / 6,100	5	235 / 312	7	1.29 / 1.71	7	06:27/08:17	1	10:24/15:05	2	2	0	1	0	1	1	6	4	4.4
5	3,700 / 4,800	7	244 / 316	6	1.34 / 1.73	6	--	8	12:33/17:34	8	8	-	8	0	1	5	6	4	5.9
6	3,100 / 4,100	8	203 / 269	8	1.12 / 1.48	8	--	8	10:59/14:43	5	7	-	8	0	1	5	4	8	7.2

* Values for Relative Strength of Ridership, Trips per Track/Lane Mile, Trips per Annual Vehicle Mile and Representative Travel Times are displayed with the first reflecting mixed-flow operation and the second value reflecting operation within a dedicated right-of-way. Each alternative is comprised of both mixed-flow and dedicated ROW segments and the values for each measure would likely be within a range of the two numbers.

Source: Jacobs, 2011.

Table 5-20: Matrix 3—Six Evaluation Measures Weighted by the Three Goals

Alternative	GOAL: Develop transit improvements that will provide additional realistic and practical travel options to, from and within the Study Area and help to mitigate congestion on roadways.		GOAL: Develop transit improvements that will enhance mobility to, from and within the Study Area in a cost-effective manner.									GOAL: Develop transit improvements that encourage the development of sustainable, transit-friendly land use patterns and support economic development activities.							
	Total daily transit riders should be maximized.		Projected capital costs should be minimized		Annual operating and maintenance (O&M) costs should be minimized.		An alternative should shorten travel time between a standard set of Activity Centers.					The number of transfers between a standard set of Activity Centers should be minimized.					Number of Essential Activity Centers Served		
	Relative Strength of Ridership		Trips Per Track/Lane Mile		Trips Per Annual Vehicle Mile		Representative Travel Times					Number of Transfers Between Activity Centers					Number of Essential Activity Centers Served		
	Potential Daily Trips 2035*	Evaluation Measure Rank	Trips Per Track/Lane Mile*	Evaluation Measure Rank	Trips Per Annual Vehicle Mile*	Evaluation Measure Rank	Travel Time, Hempstead to Roosevelt Field Mall*	Rank	Travel Time, Mineola to Coliseum*	Rank	Evaluation Measure Rank	Transfers, Hempstead to Roosevelt Field Mall	Rank	Transfers, Mineola to Coliseum	Rank	Evaluation Measure Rank	Number of Essential Activity Centers Served	Evaluation Measure Rank	REFINED LONG-LIST RANK
2	6,200/8,100	1	280 / 365	3	1.53 / 2.00	3	10:30/14:04	5	10:47/14:43	4	4	0	1	0	1	1	7	1	1.8
3	6,100/8,000	3	349 / 458	1	1.91 / 2.51	1	10:19/14:13	4	10:18/14:42	1	3	0	1	0	1	1	7	1	1.8
7	6,200/8,100	1	279 / 364	4	1.53 / 2.00	4	06:27/08:17	1	11:11/15:46	6	4	0	1	0	1	1	7	1	1.9
1	4,600/6,100	5	285 / 378	2	1.56 / 2.07	2	10:32/14:17	6	10:32/14:48	3	5	0	1	0	1	1	5	6	3.8
4	4,700/6,300	4	258 / 346	5	1.42 / 1.90	5	07:56/11:09	3	12:27/17:26	7	5	0	1	0	1	1	5	6	4.2
8	4,600/6,100	5	235 / 312	7	1.29 / 1.71	7	06:27/08:17	1	10:24/15:05	2	2	0	1	0	1	1	6	4	4.2
5	3,700/4,800	7	244 / 316	6	1.34 / 1.73	6	--	8	12:33/17:34	8	8	-	12	0	1	7	6	4	6.3
6	3,100/4,100	8	203 / 269	8	1.12 / 1.48	8	--	8	10:59/14:43	5	7	-	12	0	1	7	4	8	7.6

* Values for Relative Strength of Ridership, Trips per Track/Lane Mile, Trips per Annual Vehicle Mile and Representative Travel Times are displayed with the first reflecting mixed-flow operation and the second value reflecting operation within a dedicated right-of-way. Each alternative is comprised of both mixed-flow and dedicated ROW segments and the values for each measure would likely be within a range of the two numbers.

Source: Jacobs, 2011.

5.2.3 Trips per Annual Vehicle Mile

This evaluation measure is related to the Study goal to "Develop transit improvements that will enhance mobility to, from and within the Study Area in a cost-effective manner." The evaluation criterion that "Annual operating and maintenance (O&M) costs should be minimized" measures order-of-magnitude relative operating costs by ranking the alternatives based on the trips per annual vehicle miles traveled (VMT). Alternative 3 received the highest score, registering 1.91 trips per annual VMT for a mixed-flow alignment and 2.51 trips per annual VMT for an exclusive right-of-way alignment. Alternative 1 was the second highest ranked alternative, with 1.53 trips per annual VMT for a mixed-flow alignment and 2.07 trips per annual VMT for an exclusive right-of-way alignment. Alternative 2 was the third highest ranked alternative, with 1.53 trips per annual VMT for a mixed-flow alignment and 2.00 trips per annual VMT for an exclusive right-of-way alignment.

5.2.4 Number of Transfers Between Activity Centers

This evaluation measure is related to the Study goal to "Develop transit improvements that encourage the development of sustainable, transit-friendly land use patterns and support economic development activities." The evaluation criterion that "The number of transfers between a standard set of Activity Centers should be minimized" relates to the additional travel time and passenger inconvenience that would result from a required transfer in order to travel between the selected travel-destination pairs. While travel times will differ by mode and by alignment characteristics, the travel time between destination pairs should change at the same relative level based upon the travel distance and stopping patterns. Most of the alternatives received the highest possible ranking for this measure because the alternatives' alignments were designed to minimize transfers. Only Alternatives 5 and 6 received poor scores due to their lack of a connection to the Rosa Parks–Hempstead Transit Center.

5.2.5 Representative Travel Times

This evaluation measure is related to the Study goal to "Develop transit improvements that will enhance mobility to, from and within the Study Area in a cost-effective manner." The evaluation criterion that "An alternative should shorten travel time between a standard set of Activity Centers" measures the travel time for two sample trips, one between the Village of Hempstead and Roosevelt Field and the other between the Village of Mineola and the Nassau Veterans Memorial Coliseum. While travel times will differ by mode and by alignment characteristics, the travel time between destination pairs should change at the same relative level based upon the travel distance and stopping patterns. Alternative 8 received the highest combined score for travel time, with trips between the Village of Hempstead and Roosevelt Field projected to be 7:56 minutes for an exclusive right-of-way alignment and 11:06 minutes for a mixed-flow alignment. Trips between the Village of Mineola and the Nassau Veterans Memorial Coliseum were projected to be 10:24 minutes for an exclusive right-of-way alignment and 15:05 minutes for a mixed-flow alignment. Alternative 3 was the second highest ranked alternative for travel time, with trips between the Village of Hempstead and Roosevelt Field projected to be 10:19 minutes for an exclusive right-of-way alignment and 14:13 minutes for a mixed-flow alignment. Trips between the Village of Mineola and the Nassau Veterans Memorial Coliseum were projected to be 10:18 minutes for an exclusive right-of-way alignment and 14:42 minutes for a mixed-flow alignment. Finally, Alternative 7 placed third in the ranking for travel time, with trips between the Village of Hempstead and Roosevelt Field projected to be 6:27 minutes for an exclusive right-of-way alignment and 8:17 minutes for a mixed-flow alignment. Trips between the Village of Mineola and the Nassau Veterans Memorial Coliseum were

projected to be 11:11 minutes for an exclusive right-of-way alignment and 15:46 minutes for a mixed-flow alignment.

5.2.6 Number of Essential Activity Centers Served

This evaluation measure is related to the Study goal to "Develop transit improvements that encourage the development of sustainable, transit-friendly land use patterns and support economic development activities." The objective to "Develop a seamless, convenient and integrated regional transportation system" relates to the value in providing high-quality and reliable connections between the essential activity centers within the Study Area. The evaluation criterion that "The number of transfers between a standard set of Activity Centers should be minimized" relates to the additional travel time and passenger inconvenience that would result from a required transfer in order to travel between the selected travel-destination pairs. Alternatives 2, 3 and 7 received the highest rankings for this measure because they would provide direct connectivity to seven essential activity centers. Alternatives 5 and 8 would provide direction connections between six essential activity centers, Alternatives 1 and 4 would connect five while Alternative 6 would connect only four essential activity centers.

5.3 Refined Long-List Alternatives Screening Results

Table 5-21 lists the alternatives based on their respective rankings from the results of each of the three screening matrices.

Table 5-21: Refined Long-List Alternatives Screening Results

Matrix 1		Matrix 2		Matrix 3	
Alt	Rank	Alt	Rank	Alt	Rank
3	**1.7**	3	**1.6**	2	**1.8**
2	**2.5**	2	**2.3**	3	**1.8**
7	**2.7**	7	**2.4**	7	**1.9**
1	**2.9**	1	**3.4**	1	**3.8**
4	**4.0**	4	**4.3**	4	**4.2**
8	**4.5**	8	**4.4**	8	**4.2**
5	**6.3**	5	**5.9**	5	**6.3**
6	**7.0**	6	**7.2**	6	**7.6**

Source: Jacobs, 2011.

Note: Route 1 and Route 2 of individual alternatives are included if the alternative has two routes.

Based on the quantitative rankings summarized in the preceding sections, detailed in the three screening matrices (Tables 5-18, 5-19, and 5-20) and summarized in Table 5-21, Alternative 2 and Alternative 3 ranked the best cumulatively and, therefore, were advanced for further study as the Short-List Alternatives. Alternatives 1, 4, 5, 6, 7 and 8 were eliminated at this stage of the screening process.

5.4 Transit Technology Assessment

With Alternatives 2 and 3 advanced from the Refined Long-List screening, the next effort involved the consideration of transit technology along those alternatives' alignments. A series of transit technology evaluation measures, derived from the Study's goals and objectives, were developed. The technologies were rated based on performance against the measures and technologies were then recommended to be advanced for further Study with Alternatives 2 and 3.

5.4.1 Potential Transit Technologies

The consideration of transit technologies in the Nassau Hub Study AA/EIS builds upon the work of the Nassau Hub Major Investment Study. This section describes the universe of transit technologies that was considered in the development of the Short-List Alternatives and consistent with FTA guidelines.

The following review of transit technologies is provided as a means to inventory potential transit applications in the Study Area. A reference to use of a given technology in the New York metropolitan region is also given, if applicable. This review classifies the various modes in the following three categories based on the degree of grade separation that would be required: street transit, semi-separated transit, and separated transit.

5.4.1.1 Street Transit

Jitney

Jitneys are passenger vans or smaller buses operating with fixed routes but no fixed schedules. They are generally privately owned and operated services that are typically free of government assistance, but are regulated through a public service commission, state or local government. Jitneys generally operate under franchise agreements; fares tend to be regulated and are subject to special insurance requirements. Vehicle capacity varies from eight to 30 people or more, and the vehicle may be owned or leased by the operator. Additionally, jitney services may also be operated as general public demand-responsive service (also known as "dial-a ride") or as deviated fixed-route service (also known as flex-routes).

Circulator Bus

A circulator bus or shuttle bus serves an area confined to a specific locale, such as a downtown area or suburban business district, with connections to other transit services. Circulator bus service is used to provide short localized trips, such as from home to a shopping center or between two nearby activity centers. Circulator bus services may employ smaller vehicles that are better able to provide service within neighborhoods, office complexes and shopping centers.

Commuter Bus

Commuter bus service operates along a fixed route, primarily in one direction during peak periods, with limited stops. The intent is to serve commuters traveling from an outlying area to the central business district or a connecting transit service. The service can be integrated with managed lanes for better performance. Commuter bus passengers generally tend to be peak hour-oriented, and many use multi-ride passes to pay for the service. Vehicles are typically motor coaches, which prioritize comfort over rapid boarding and alighting.

Conventional Bus

Fixed-route or conventional bus service involves a system of vehicles operated along prescribed routes and according to a fixed schedule. Fixed-route bus services can be operated as local, limited stop or express services such as provided by the Nassau Inter County Express (NICE) Bus system. Local bus service stops to allow passengers to board or alight at all stops along the route. Limited-stop service is typically operated in peak periods or along long corridors with high demand. Express bus service is a more restrictive form of limited-stop service in which the bus serves one to a few stops at the beginning of the route, and then operates directly to its destination. Fixed-route bus service is typically very effective in dense areas where there is nearly constant demand for services on the route. Less dense, suburban areas can also support effective fixed-route bus service and perform well in terms of ridership.

Trolley Bus

Trolley buses are rubber-tired, passenger vehicles that operate in mixed traffic on paved streets in much the same manner as conventional buses. However, unlike the diesel, hybrid or compressed natural gas (CNG) conventional buses, trolley buses are powered by overhead electric or catenary, which limits the flexibility to alter routes or pass other transit vehicles. Hybrid vehicles that permit trolley buses to detach from the catenary and operate on battery power are currently in service in a number of cities across the country.

Modern Streetcar

Modern streetcars are steel-wheeled passenger vehicles that generally operate along tracks laid in the street right-of-way and are typically powered by overhead electric catenary wires. Modern streetcars may operate in mixed-traffic or in a dedicated running-way and can be coupled together to form small trains. Modern streetcars are generally smaller than conventional light rail vehicles, have stops that are similarly spaced to bus routes and typically travel at lower speeds than other rail vehicles.

5.4.1.2 Semi-Separated Transit

Bus Rapid Transit (BRT)/Premium Bus

Bus rapid transit (BRT)/premium bus vehicles and related systems are intended to accommodate higher capacity, improve speed, provide greater passenger convenience and comfort, and improve reliability and predictability of service. BRT/premium bus routing may occur in exclusive rights-of-way, reserved lanes in streets, or lanes shared with other traffic. Treatments such as signal prioritization, distinctive stations and vehicles, and off-board fare collection have proven successful in speeding passengers around traffic congestion that would slow conventional buses. Collectively, BRT/premium bus services are designed to allow a quality of service that is close to that of light rail transit while still providing the cost savings associated with bus transit. In New York City, BRT/premium bus has been implemented with shared lanes as the Select Bus Service, while the Los Angeles Orange Line operates within a dedicated alignment placed within a former railroad right-of-way.

Light Rail Transit (LRT)/Modern Streetcar

Light Rail Transit (LRT) utilizes lightweight passenger vehicles to provide service with a lower capacity than heavy rail systems. Light rail may use shared or exclusive rights-of-way, high- or low-platform loading and single- or multi-vehicle trains. Due to their light weight and limited crash worthiness, the Federal Railroad Administration (FRA) safety regulations prohibit LRT from operating on railroad tracks at the same time as freight or commuter rail trains. This requirement would preclude the operation of a LRT alternative on LIRR tracks without strict temporal (time-based)

separation. Light-rail vehicles are either electrically powered from overhead catenary wires (e.g., New Jersey Transit's Hudson-Bergen Light Rail) or utilize smaller, bus-like diesel engines (e.g., New Jersey Transit's RiverLine). Modern LRT vehicles offer high levels of performance (acceleration, braking, speed) and passenger comfort. Passenger capacity for each vehicle is generally 75 persons seated, with room for almost 150 standees. Multiple vehicles may be coupled together to increase passenger capacity.

5.4.1.3 Separated Transit

Aerial Tram

Aerial tram systems consist of passenger vehicles suspended from a cable, which is supported by towers. The cable is pulled in a loop or back and forth by large motors at the terminus of the system. Most aerial tram systems are used to climb a steep grade or bridge a body of water. The largest vehicles can support up to 100 people. Generally, aerial trams are used over short distances to cross an obstruction, but can be used to cross larger distances and circulate commuters. Stations can be built freestanding or can be incorporated into existing or future structures.

Automated Guideway Transit (AGT)

Automated Guideway Transit (AGT) refers to a number of related technologies that operate on a fixed aerial or underground guideway and typically have no onboard operator present. These technologies include monorails, people movers, and personal rapid transit (PRT) systems. Computers are used to control vehicle speed, spacing and stopping. AGT systems are widely used in airports (e.g., JFK AirTrain) or other small collector areas, but have also been successfully implemented in a number of large urban locations such as Vancouver, British Columbia.

Cable Drawn Systems (CDS)

Cable drawn systems are similar to AGT systems, except that they utilize unpowered vehicles that are propelled along cables that run within the guideway. Modern cable drawn systems typically operate along dedicated, elevated or underground rights-of-way. This system allows for lightweight and inexpensive vehicles and smaller guideways. Many historic cable drawn systems were implemented to climb steep inclines, while modern cable drawn transit has typically been implemented in automated people-mover systems.

Commuter Rail

Commuter rail utilizes passenger trains, which generally operate between a central city, its suburbs and/or another central city. It may be propelled by electrified third rail (LIRR), overhead electric catenary wire (NJ Transit), or diesel locomotives (LIRR East-End services and the Oyster Bay Branch). Service is characterized by station-to-station or zone-based fares, conventional railroad crew employment practices, and usually only one or two stations in the central business district(s). Stations generally have attached parking lots and customer amenities. Commuter rail trains are built to FRA standards, and often share track or right-of-way with freight or intercity passenger trains.

Heavy Rail Transit

Heavy rail transit systems are high-volume passenger railways that are characterized by high-frequency and high-speed service, exclusive rights-of-way, third-rail electric propulsion, multi-vehicle trains, sophisticated signaling and high-platform stations. Trains are generally longer and stations are generally spaced further apart than with LRT systems. Heavy rail differs from commuter rail in that service is operated at much higher frequencies and stations are located closer together. Tracks may be placed at ground level, elevated on aerial structures, buried in tunnels, or all three, as is the case with New York City Transit's subway system.

5.4.2 Transit Technology Screening

5.4.2.1 Methodology

The Refined Long-List Alternatives screening (see Section 5.3) identified alignment alternatives for advancement to the more detailed Short-List Alternatives phase of screening. The final step of the Refined Long-List Alternatives screening was a largely qualitative exercise in which the potential transit technologies were evaluated in terms of their basic attributes. That screening of transit technologies was used to select the most appropriate modes to be combined with Alternatives 2 and 3, which were advanced for further evaluation. The results of the alignment and technology screenings were combined to create the Short-List Alternatives for the final phase of the alternatives screening process.

A set of transit technology-related criteria and a qualitative rating system of "*Good*," "*Fair/Neutral*" and "*Poor*" were defined to screen the transit technologies and weight them using the following point system:

Good (full circle) = 1

Neutral (half circle) = 3

Poor (empty circle) = 5

The following criteria were defined to focus specifically on the performance of each transit mode and to reflect the Study goals and objectives:

- The preferred technology should be **flexible** for use in a variety of operating environments, while taking advantage of existing transportation infrastructure, where appropriate.
- The preferred technology should provide sufficient operating **capacity** for potential **ridership.**
- The preferred technology should be able to adapt to increasing passenger demands by increasing **service frequency or vehicle capacity**.
- The preferred technology should minimize impacts to existing traffic patterns and contribute to mitigation of traffic **congestion** in the Study Area.
- The preferred technology should **minimize costs** relative to the other technologies under consideration, based on generally accepted unit costs for each technology, and given the need to obtain capital and operating funding.
- The preferred technology should provide an adequately **accessible system** for passengers.
- The preferred technology should be **compatible** with existing and planned transportation systems and improvements and travel needs in the Study Area.
- The system should be reliable and based on **proven technology**.
- The preferred technology should be compatible with existing and planned **land uses,** development densities, neighborhood character and other factors that could affect the level of transit demand.
- The preferred technology should minimize **environmental impacts** to air, water, visual, and other environmental resources.

The ranking of technologies was a qualitative assessment based on typical characteristics of each technology and how it would be applied in the Study Area. Each technology was evaluated and ranked according to these criteria, as summarized below.

5.4.1.2 Technology Screening Results

Table 5-22 summarizes the findings of the screening of transit technologies. To select the technologies that should be advanced as part of the Short-List Alternatives, each modal technology's performance against each criterion was rated as good, neutral or poor (Table 5-22).

Table 5-22: Transit Technology Assessment Matrix

	Street Transit						Semi-Separated Transit		Separated Transit				
	Jitney	Circulator Bus	Conventional Bus	Commuter Bus	Trolley Bus	Modern Streetcar	BRT/ Premium Bus	Light Rail/Modern Streetcar	Aerial Tram	Cable Drawn System	Automated Guideway Transit	Commuter Rail	Heavy Rail
The preferred technology should be **flexible** for use in a variety of operating environments, while taking advantage of existing transportation infrastructure, where appropriate.	●	●	●	●	◖	◖	●	◖	○	○	○	○	○
The preferred technology should provide sufficient operating **capacity** for potential **ridership.**	○	○	○	○	○	●	●	●	◖	●	●	◖	●
The preferred technology should be able to adapt to increasing passenger demands by increasing **service frequency**.	◖	◖	◖	◖	◖	●	●	●	○	●	●	◖	●
The preferred technology should minimize impacts to existing traffic patterns and contribute to mitigation of traffic **congestion** in the Study Area.	◖	◖	○	○	○	◖	◖	◖	●	●	●	◖	●
The preferred technology should **minimize costs** relative to the other technologies under consideration, based on generally accepted unit costs for each technology, and given the need to obtain capital and operating funding.	◖	●	●	●	●	◖	●	◖	○	○	○	◖	○
The preferred technology should provide the most **accessible system** for passengers.	●	●	●	●	●	●	●	●	○	◖	◖	○	○
The preferred technology should be **compatible** with existing and planned transportation systems and improvements and travel needs in the Study Area.	◖	●	●	●	●	◖	●	◖	○	◖	◖	○	◖
The system should be reliable and based on **proven technology**.	●	●	●	●	◖	●	●	●	◖	◖	◖	●	●
The preferred technology should be compatible with existing and planned **land uses,** development densities, neighborhood character and other factors that could affect the level of transit demand.	◖	◖	◖	◖	◖	●	◖	●	○	○	○	●	●
The preferred technology should minimize **environmental impacts** to air, water, visual, and other environmental resources.	◖	◖	◖	◖	●	●	◖	●	○	○	○	○	◖
	26	22	24	24	26	18	18	18	42	32	32	34	26

Source: Jacobs, 2011.

5.4.1.3 Recommended Technologies

Based on the results shown in Table 5-22, the following transit technologies were advanced to the Short-List Alternatives:

- BRT/premium bus
- Modern streetcar

BRT/premium bus technology was recommended for advancement based on the following findings:

- *System Flexibility rating is Good (●):* BRT/premium bus services can offer frequent stops, providing a high degree of accessibility to most potential passengers. BRT/premium bus can operate on a busway, in dedicated lanes or in mixed traffic with preferential treatments.
- *Ridership/Capacity rating is Good (●):* BRT/premium bus vehicles and fleets can be sized to meet demand and can be operated efficiently because they are given preferential treatment. Therefore, they are not limited by traffic congestion and other factors that affect operating speeds for traditional bus service.
- *Service Frequency rating is Good (●):* BRT/premium bus services can be adapted to increasing passenger demand by increasing bus frequency. Buses operating every few minutes on a single route in a congested corridor can be cost-effective, often comparable to similar rail transit services.
- *Congestion Mitigation rating is Neutral (◖):* BRT/premium bus vehicles that operate within a dedicated right-of-way do not contribute to traffic congestion. BRT/premium bus services that utilize the current street network require use of existing roadway capacity; however, there is a neutral or net positive effect on traffic congestion if the service attracts existing automobile drivers and removes those vehicles from the roadway.
- *Relative Cost rating is Good (●):* BRT/premium bus improvements are generally less expensive than are new rail systems. While high-quality, distinctive vehicles are often a component of BRT/premium bus service, a new system would not necessarily require procurement of a new vehicle type or new maintenance facilities.
- *System Accessibility rating is Good (●):* Feeder bus services can provide system access, but passengers could have direct (walk) access to the BRT/premium bus system depending on the alignment and station locations that are selected.
- *System Compatibility rating is Good (●):* BRT/premium bus would be compatible with the existing NICE Bus fleet and operations and maintenance facilities.
- *Proven Technology rating is Good (●):* Buses for BRT/premium bus service are manufactured by numerous vendors in North America and are operated in a wide variety of services, environments, and conditions.
- *Land Use Compatibility rating is Neutral (◖):* BRT/premium bus systems in North America have not been shown to have had a noticeable impact on transit-oriented development or transit-related land uses in either a positive or negative sense.
- *Environmental Impact rating is Neutral (◖):* Emissions can be mitigated through use of alternative fuels, but noise from internal combustion buses can impact residential areas. In most respects, bus-

based services do not affect their operating environments any more significantly than does other traffic.

Modern streetcar technology was recommended for advancement based on the following findings:

- *System Flexibility rating is Neutral (◖):* Expansion of the system would require construction of additional guideway and purchase of new vehicles. Modern streetcar tracks can be extended at grade in many corridors and cross roadways at grade. These extensions can be cost-effective, particularly in areas where grade separation is unnecessary.
- *Ridership/Capacity rating is Good (●):* Modern streetcars generally range from one to two vehicles in length and can accommodate more than twice the number of passengers than can a BRT/premium bus with one operator, resulting in lower operating cost per passenger.
- *Service Frequency rating is Good (●):* Modern streetcar systems have the ability to operate very frequent services of every few minutes on a double-tracked alignment.
- *Congestion Mitigation rating is Neutral (◖):* Modern streetcars typically operate in mixed traffic and within existing traffic congestion. Modern streetcars operate along tracks laid in the street; therefore, they can be delayed if there is an obstruction such as a stalled vehicle in its path. Modern streetcars can have a neutral or net positive effect on traffic congestion if the service attracts existing automobile drivers and removes those vehicles from the roadway.
- *Relative Cost rating is Neutral (◖):* Although rail technologies are often more cost-effective in terms of operating costs than are comparable BRT/premium bus services, modern streetcars have a higher initial capital cost than do buses, requiring a more costly investment in tracks, electrification, and modifications to streets and traffic control.
- *System Accessibility rating is Good (●):* Access to modern streetcar service would be from on-street stops, park-and-ride facilities, or stops in activity centers or at intermodal transit centers.
- *System Compatibility rating is Neutral (◖):* Streetcars would be a new technology in Nassau County, requiring a new vehicle type, guideway, and operating and maintenance facilities.
- *Proven Technology rating is Good (●):* Streetcars are widely used around the world. Modern streetcars are manufactured in both mass production and custom configurations by a number of manufacturers worldwide.
- *Land Use Compatibility rating is Good (●):* Modern streetcar systems have many well-documented examples of encouraging transit-oriented development, allowing new land development around stations that supports economic development and generating additional ridership while reducing automobile usage.
- *Environmental Impact rating is Good (●):* Electrically powered modern streetcars can reduce emissions where ridership is substantial. Modern streetcars are generally quiet and typically have few negative impacts on compatible land uses.

5.5 Recommendations

As a result of the screening of the Refined Long-List Alternatives and potential transit technologies, the following alternatives, including their modal variations, were advanced as Short-List Alternatives for further detailed development and evaluation:

- **Alternative 2 as Modern Streetcar**
- **Alternative 2A as BRT/Premium Bus**
- **Alternative 3 as Modern Streetcar**
- **Alternative 3A as BRT/Premium Bus**

With completion of the Refined Long-List Alternatives screening, the Study undertook a more comprehensive and detailed evaluation of each of the four Short-List Alternatives. The evaluations are discussed in Sections 6 through 12.

6. Physical Characteristics and Improvements

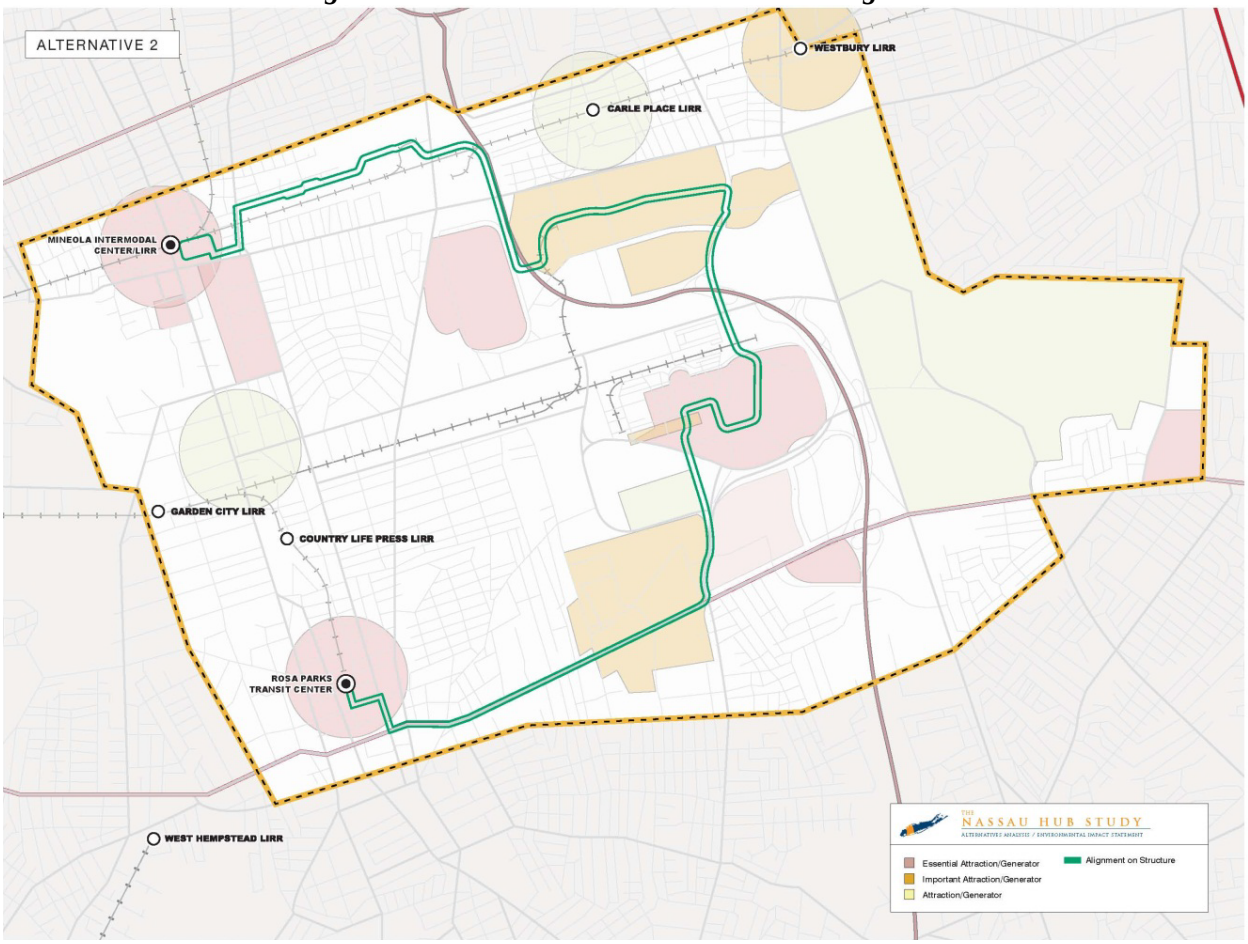
This section provides a description of each Short-List Alternative's alignment and its proposed station locations, first for Alternatives 2 and 3, the modern streetcar alternatives, followed by Alternatives 2A and 3A, the bus rapid transit (BRT)/premium bus alternatives. These alignments and station locations reflect refinements made to the Refined Long-List Alternatives (Section 5), based on further technical analyses and input from local stakeholders and the general public. This section also discusses the general requirements for modern streetcar and BRT/premium bus maintenance facilities and storage areas, and identifies potential locations for these functions.

6.1 Alignment and Stations

6.1.1 Alternative 2 Modern Streetcar

The alignment for Alternative 2 Modern Streetcar is 7.1 route miles in length, extends from the Village of Mineola to Village of Hempstead, and serves the Source Mall area (Figure 6-1). The alignment is primarily two tracks except along a short one-track section in the vicinity of East Gate Boulevard to Zeckendorf Boulevard, where right-of-way width limitations exist.

Figure 6-1: Alternative 2 Modern Streetcar Alignment



Source: Jacobs, 2012.

The modern streetcar would generally operate in mixed traffic, sharing the travel lanes on roadways in the Village of Mineola. In Carle Place, the modern streetcar would operate both in mixed traffic and on exclusive right-of-way adjacent to the Meadowbrook State Parkway (MSP). The alignment would pass under the Long Island Rail Road (LIRR) Main Line embankment and would be on exclusive, elevated right-of-way to cross Old Country Road; it would remain elevated through the Roosevelt Field property, stopping at an elevated station in Roosevelt Field, and crossing over the MSP.

The routing through the Source Mall area, when possible, would take advantage of former rail rights-of-way (including the former rail alignment between East Gate and Zeckendorf boulevards) and available land either on the side of roadways or use landscaped roadway medians to provide a semi-exclusive right-of-way. It is assumed that the alignment through Nassau Community College and the Nassau Veterans Memorial Coliseum property would be exclusive right-of-way via easements through these properties. Along Hempstead Turnpike, it appears that there would be sufficient space along the north side of the curb lane to accommodate an exclusive right-of-way to Oak Street.[1] Along Fulton Avenue in the Village of Hempstead, either the curb lanes or a dedicated center lane would be used for transit vehicles. This operation would require taking some on-street parking, where on-street parking is permitted. The proposed alignment for Alternative 2 Modern Streetcar is described in greater detail, below, by route segment.

The following is a turn-by-turn description of the route beginning at the proposed terminus in the Village of Mineola and ending at the proposed terminus at Rosa Parks–Hempstead Transit Center in the Village of Hempstead. Unless otherwise specified, the alignment would be a double-track right-of-way (i.e., providing inbound and outbound tracks).

Village of Mineola to Carle Place

The Alternative 2 Modern Streetcar alignment would begin in the Village of Mineola at a terminal station located on Front Street between Main Street and Willis Avenue. This segment of Front Street would be converted into a transit mall, i.e., closed to vehicular traffic. This concept will require additional coordination with the Village of Mineola.

Beginning on the mid-block of Front Street between Main Street and Willis Avenue, the alignment would run east to Willis Avenue. At Willis Avenue, it would turn south, operating in mixed traffic, to East 3rd Street. On East 3rd Street, it would continue east to Roslyn Road. Although the alignment would operate in mixed traffic sharing the travel lanes, it is likely that some parking spaces on the south side of East 3rd Street between Willis Avenue and Roslyn Road[2] would need to be acquired to accommodate the curve in the tracks from southbound Willis Avenue onto eastbound East 3rd Street.

On Roslyn Road, the alignment would head north to East 2nd Street, operating in mixed traffic sharing the traffic lane adjacent to the curbs, crossing underneath the LIRR overpass.

At East 2nd Street, the alignment would continue eastbound to its end, operating in mixed traffic. A proposed modern streetcar station would be located on East 2nd Street in the vicinity of Union Street. At

[1] This concept will require additional coordination with the New York State Department of Transportation (NYSDOT) Region 10.

[2] Using Front Street between Willis Avenue and Roslyn Road was considered; however, the warp <crown of> the existing pavement profile at the junction of Front Street and Roslyn Road is too severe to support a practical modern streetcar alignment. Therefore, both the inbound and outbound tracks are proposed on East 3rd Street where it intersects with Roslyn Road, and then proceeding toward Willis Avenue.

the east End of East 2nd Street, the alignment would shift northeast to connect to Voice Road using a strip of the vacant land between these two roads. This through movement would be allowed for transit vehicles only.[3]

Carle Place to Roosevelt Field

On Voice Road, the alignment would continue east to Glen Cove Road. On the western half of Voice Road, the alignment would operate in mixed traffic for approximately 800 feet. On the eastern half of Voice Road, the alignment would shift south and run along the northern portion of the shopping center parking lot at 172-198 Glen Cove Road for approximately 650 feet. This shift in the alignment would avoid conflicts with vehicles accessing the parking spaces along the stores in the building at the northwest corner of the intersection. This building features 90-degree parking perpendicular to the storefronts within its footprint. A proposed modern streetcar station would be located at the intersection of Voice Road and Glen Cove Road.

The alignment would cross Glen Cove Road and continue east in the service alley between the Hale and Hearty and Clocktower Place shopping center towards the MSP. The traffic signal at Voice Road and Glen Cove Road would need to be reconfigured to allow this movement.

Using the western portion of the landscaped strip of the MSP, the alignment would head south, passing underneath the LIRR Main Line using a new, short tunnel constructed in the embankment. The alignment would continue south along the western edge of the MSP right-of-way, traveling adjacent to the well field and transitioning into an elevated structure.

The alignment would be elevated on a viaduct to cross over Old Country Road and the MSP on- and off-ramps for the Old Country Road exit. The alignment would remain elevated within the western edge of the MSP right-of-way to Roosevelt Field. An elevated modern streetcar station would be located at Roosevelt Field adjacent to the northernmost parking garage.

Roosevelt Field to Source Mall

Leaving the Roosevelt Field modern streetcar station, the alignment would turn east and serve the Source Mall, the large-scale retail uses and redevelopment areas along Transverse Drive, Nassau Community College, the Nassau Veterans Memorial Coliseum, and the Village of Hempstead.

The elevated right-of-way at the Roosevelt Field modern streetcar station would turn 90 degrees and head east, crossing over the MSP and descend in the parking lot between the Hampton Inn hotel on the western end of North Avenue and the industrial building (1000 Axinn Avenue) on the western end of Axinn Avenue. The alignment would connect to the abandoned railroad alignment on a double-track right-of-way curving to the north and east behind the Magna Care building's parking lot (825 East Gate Boulevard). A modern streetcar station would be located at East Gate Boulevard. The alignment would continue east, crossing East Gate Boulevard, and continue east on a single-track within the former rail right-of-way located to the south of the Galleria at Westbury Mall. Due to a significant grade change, the alignment would need to transition into an elevated right-of-way to connect to Transverse Drive.

The alignment would continue east on Transverse Drive, transitioning to a two-track right-of-way along the south side of the roadway in the landscaped area adjacent to the curb to Merchants Concourse.

[3] This concept will require additional coordination with the Village of Mineola.

Proposed modern streetcar stations on Transverse Drive would be located at Zeckendorf Boulevard and at the Source Mall at Fortunoff Way.

At Merchants Concourse, the alignment would head south along the west side of the road in the landscaped strip adjacent to the curb to Corporate Drive. A modern streetcar station would be located on Merchants Concourse just north of Corporate Drive. At the intersection of Merchants Concourse and Corporate Drive, the alignment would shift to an exclusive right-of-way in the median (center) of Merchants Concourse and continue south to Stewart Avenue. A modern streetcar station would be located on Endo Boulevard just south of Stewart Avenue.

South of Stewart Avenue, Merchants Concourse becomes Lifetime Brand Boulevard (Endo Boulevard). At this intersection, the alignment would transition from an exclusive right-of-way in the median to operating in mixed traffic, sharing the curb lanes in both directions. The alignment would continue south on Lifetime Brand Boulevard, accessing Nassau Community College's East Campus.

Through the East Campus, the alignment would run in an exclusive right-of-way in a southerly direction to east of the Life Sciences Building and the Cluster A – D buildings, using one bay of parking (i.e., two adjacent rows of parking spaces) and then within the strip between the paved footpath and parking areas. A modern streetcar station would be located on the north side of the campus within the area currently used for the parking bay.

The alignment would continue south, passing around the Physical Education Complex and connecting to North-South Road and then heading south through the parking lot. On North-South Road, the modern streetcar would operate in a combination of mixed traffic and exclusive right-of-way. A modern streetcar station would be located on North-South Road in the vicinity of Library Road West to serve the south side of the campus and Museum Row.

Continuing south from the parking lot, the alignment would cross Charles Lindbergh Boulevard and continue south, operating in mixed traffic via the road between the Mitchel Athletic Complex and the parking garage for the Omni office building. A modern streetcar station would be located at Mitchel Field.

The alignment would shift east, crossing Earle Ovington Boulevard to access the Nassau Veterans Memorial Coliseum property, and head south to Hempstead Turnpike. A modern streetcar station would be located at the Nassau Veterans Memorial Coliseum property.

Hempstead Turnpike/Fulton Avenue Alignment

As the alignment reaches Hempstead Turnpike, it would run along the north side of the roadway in the landscaped strip between the shoulder lane and the jogging/bicycle path. A proposed modern streetcar station would be located just to the west of Oak Street.

West of Oak Street, Hempstead Turnpike becomes Fulton Avenue. Fulton Avenue has two travel lanes in each direction and median lanes that are shared right- and left-turn bays and separate left-turn bays. From Oak Street to Washington Street, Fulton Avenue is approximately 60 feet wide. At Oak Street, the alignment would transition from operating on the north side of Hempstead Turnpike to operating in a dedicated center median lane on Fulton Avenue. The alignment would transition from the center median lane to the curb lanes/parking lanes at the modern streetcar stations. The proposed modern streetcar stations would be located along the curb lanes/parking lanes in the vicinity of Warner Avenue and in the vicinity of Clinton Street.

At Washington Street, the alignment would turn north, operating in mixed traffic to Jackson Street. The alignment would turn west on Jackson Street and terminate in the parking lot of the Rosa Parks–Hempstead Transit Center, operating in mixed traffic. A portion of the eastern edge of the parking lot would need to be acquired for a platform and tracks. Given current traffic operations on Hempstead Turnpike, careful consideration needs to be given to alternatives operating within or adjacent to the roadway. Detailed traffic evaluations will be performed as part of the subsequent environmental review phase of the Study to address this issue.

Alternative 2 Modern Streetcar would have 18 stations, with an average station spacing of 0.4 mile. Table 6-1 lists the proposed stations.

Table 6-1: Alternative 2 Modern Streetcar Stations

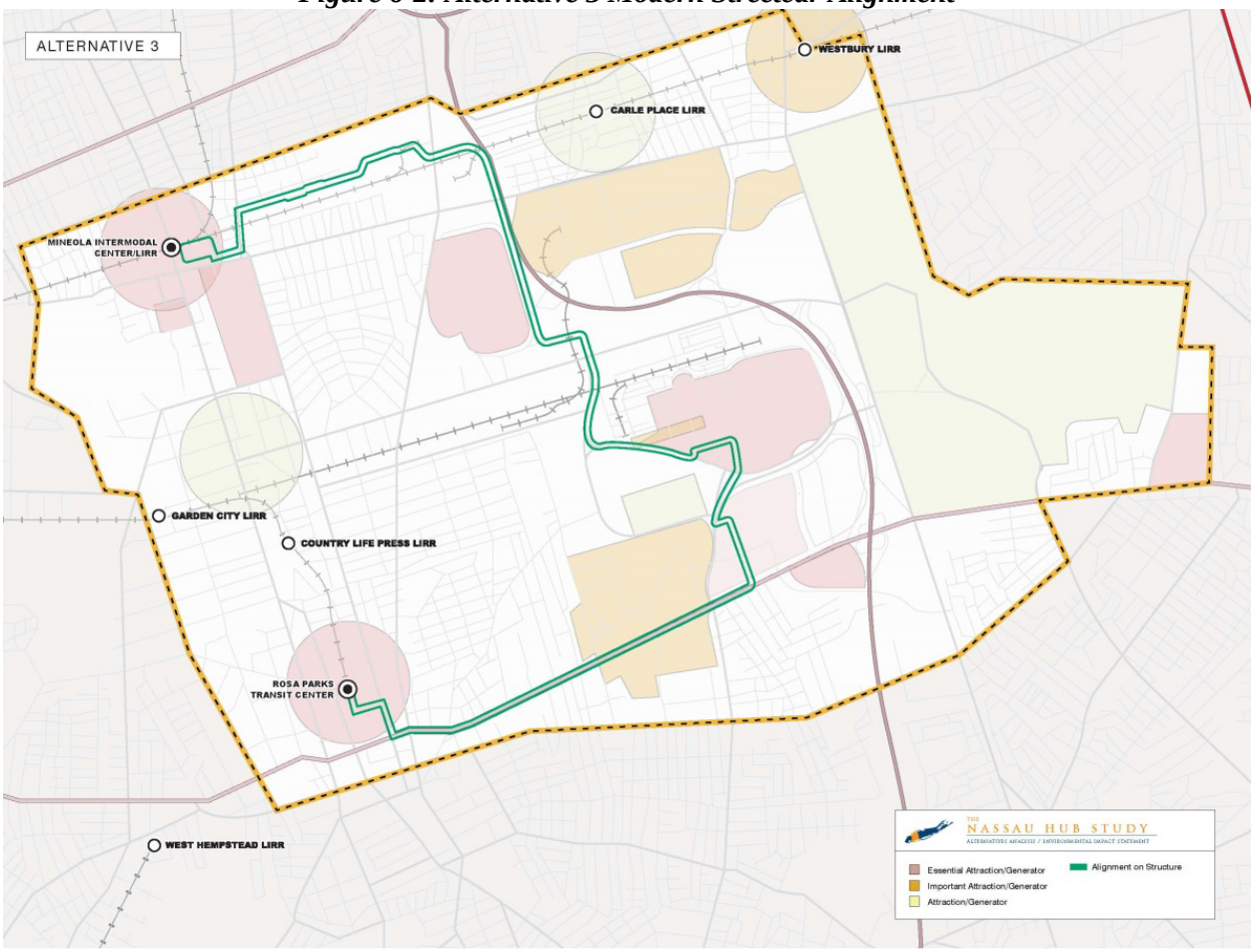
Station	Location/Cross Streets	Attractors/Generators Served
Front Street	Willis Avenue and Main Street	Mineola Intermodal Center (Nassau Inter County Express [NICE] Bus and LIRR), downtown Village of Mineola
2nd Street	Union Street	Neighborhood stop/retail/light industrial
Voice Road	Voice Road and Glen Cove Road	Retail uses along Glen Cove Road
Roosevelt Field	East of Roosevelt Field parking garage	Roosevelt Field, Roosevelt Field Bus Facility (NICE Bus)
East Gate Boulevard	East Gate Boulevard south of North Avenue	The Gallery at Westbury Plaza
Zeckendorf Boulevard	Zeckendorf Boulevard and Transverse Drive	The Gallery at Westbury Plaza
Source Mall	Transverse Drive and Fortunoff Way	Source Mall, Roosevelt Raceway Shopping Center
Merchants Concourse	Merchants Concourse and Corporate Drive	Roosevelt Raceway Shopping Center, Archstone and Meadowbrooke Pointe residential developments
Stewart Avenue	Stewart Avenue and Endo Boulevard	Neighborhood stop, Avalon residential development, office
Nassau Community College North	South of Endo Boulevard, adjacent to Life Sciences Building	Nassau Community College campus
Nassau Community College/Museum Row	Earle Ovington Boulevard (North-South Road) and Library Road W	Nassau Community College campus, Museum Row
Mitchel Field	Along Mitchel Park service road east of Quentin Roosevelt Boulevard and south of Charles Lindbergh Boulevard	Mitchel Field Athletic Complex, Omni office building
Nassau Veterans Memorial Coliseum	West of Earle Ovington Boulevard	Nassau Veterans Memorial Coliseum and other development on the property
Hofstra University	Hempstead Turnpike and Hofstra Boulevard	Hofstra University campus, entertainment venues, retail, neighborhood stop
Oak Street	Hempstead Turnpike and Oak Street	Hofstra University campus
Warner Avenue	Fulton Avenue and Warner Avenue	Neighborhood stop
Clinton Street	Fulton Avenue and Clinton Street	Neighborhood stop
Rosa Parks–Hempstead Transit Center	Jackson Street and Station Plaza	Downtown Village of Hempstead, NICE Bus, Hempstead Station (LIRR)

Source: Jacobs, 2012.

6.1.2 Alternative 3 Modern Streetcar

The alignment for Alternative 3 Modern Streetcar is 6.5 route miles in length and extends from the Village of Mineola to the Village of Hempstead (Figure 6-2). It follows the same routing as described for Alternative 2 from the Village of Mineola to Roosevelt Field, except that the Source Mall area would not be served and Roosevelt Field would be served by two modern streetcar stations, one to the northeast of the Roosevelt Field parking garage and one to the east of Bloomingdale's.

Figure 6-2: Alternative 3 Modern Streetcar Alignment



Source: Jacobs, 2012.

After departing the southern Roosevelt Field Station, the elevated right-of-way would continue south from within the western edge of the MSP right-of-way, crossing over Zeckendorf Boulevard, and continue along the western edge of the retention basin at Ring Road East and South Street. The alignment would descend to grade and travel eastbound in exclusive right-of-way on the north side of South Street, where a station is proposed. At Quentin Roosevelt Boulevard, the alignment would continue southbound in an exclusive right-of-way on the west side of Quentin Roosevelt Boulevard.

On Quentin Roosevelt Boulevard, just north of Commercial Avenue, there is an at-grade railroad crossing with the Garden City Secondary. This could be a potential Federal Railroad Administration (FRA) regulatory issue if this line is considered active; this will be further explored as the Locally Preferred Alternative (LPA) is advanced through the environmental review phase of the Study.

The alignment would turn eastbound onto the south side of Charles Lindbergh Boulevard on exclusive right-of-way and continue to Museum Row and the Nassau Community College West Campus, using the campus parking lots. A modern streetcar station would be located at Museum Row/Nassau Community College. The alignment would continue south past the Physical Education Complex, using the parking lots and vacant land, crossing Charles Lindbergh Boulevard to access the Nassau Veterans Memorial Coliseum.

New traffic signals would be placed on Quentin Roosevelt Boulevard and Charles Lindbergh Boulevard to allow the transit vehicles to cross from the west side of Quentin Roosevelt Boulevard to the south side of Charles Lindbergh Boulevard to avoid conflicts with southbound through-traffic on Quentin Roosevelt Boulevard and traffic using the Charles Lindbergh Boulevard ramp to southbound Quentin Roosevelt Boulevard.

Along Charles Lindbergh Boulevard, there are jogging/bike paths. In sections of Charles Lindbergh Boulevard where an exclusive right-of-way is proposed, these jogging/bike paths would be shifted or relocated to accommodate an exclusive transit right-of-way.

The alignment would continue southbound, traveling through the Nassau Veterans Memorial Coliseum property to Hempstead Turnpike. A modern streetcar station would be located at the Nassau Veterans Memorial Coliseum property.

Once on Hempstead Turnpike, Alternative 3 would follow the same routing as described for Alternative 2 for the Hempstead Turnpike/Fulton Avenue section.

Alternative 3 Modern Streetcar would have 14 stations. The average station spacing is 0.5 mile. Table 6-2 lists the proposed stations.

Table 6-2: Alternative 3 Modern Streetcar Stations

Station	Location/Cross Streets	Attractors/Generators Served
Front Street	Willis Avenue and Main Street	Mineola Intermodal Center (NICE Bus and LIRR), downtown Village of Mineola
2nd Street	Hudson Place and Union Street	Neighborhood stop
Voice Road	Voice Road and Glen Cove Road	Retail uses along Glen Cove Road
Roosevelt Field	East of Roosevelt Field parking garage	Roosevelt Field
Roosevelt Field South	East of Bloomingdale's	Roosevelt Field, Roosevelt Field Bus Facility (NICE Bus)
South Street	South Street and Stewart Avenue	Neighborhood stop
Railroad Avenue	Railroad Avenue and Charles Lindbergh Boulevard	Neighborhood stop
Nassau Community College-Museum Row	Earle Ovington Boulevard (North-South Road) and Student Union Service Road	Nassau Community College campus, Museum Row
Nassau Veterans Memorial Coliseum	West of Earle Ovington Boulevard	Nassau Veterans Memorial Coliseum and/or other development on the property
Hofstra University	Hempstead Turnpike and Hofstra Boulevard	Hofstra University campus

Table 6-2: Alternative 3 Modern Streetcar Stations (continued)

Station	Location/Cross Streets	Attractors/Generators Served
Oak Street	Hempstead Turnpike and Oak Street	Hofstra University campus
Warner Avenue	Fulton Avenue and Warner Avenue	Neighborhood stop
Clinton Street	Fulton Avenue and Clinton Street	Neighborhood stop
Rosa Parks–Hempstead Transit Center	Jackson Street and Station Plaza	Downtown Village of Hempstead, NICE Bus, Hempstead Station (LIRR)

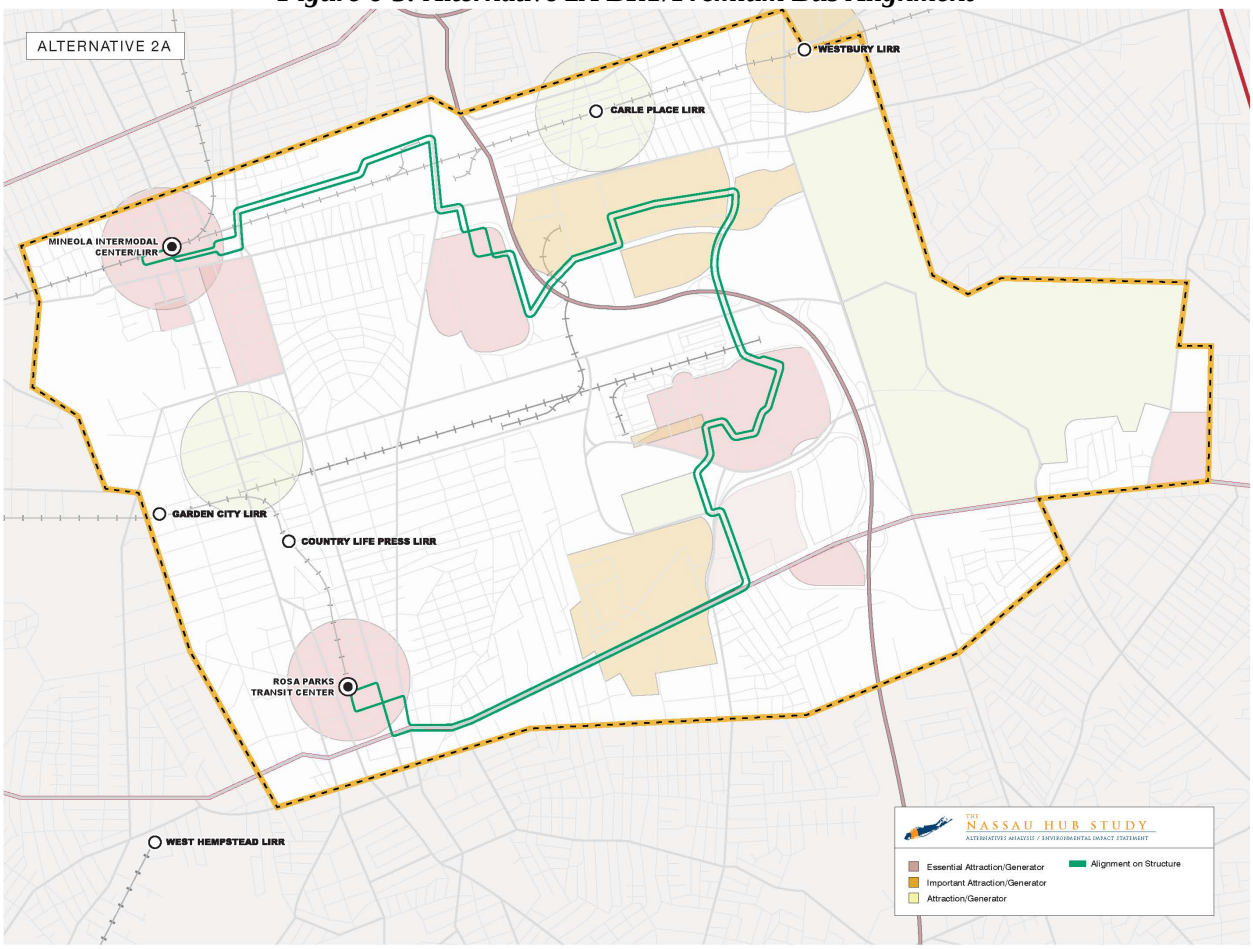
Source: Jacobs, 2012.

6.1.3 Alternative 2A BRT/Premium Bus

The proposed Alternative 2A BRT/Premium Bus outbound alignment from the Village of Mineola to the Village of Hempstead is 8.5 miles in length and the inbound alignment is 8.1 miles in length, primarily operating in mixed traffic with nearly 1.5 miles of proposed exclusive right-of-way near Carle Place, Roosevelt Field, Source Mall, Nassau Community College, and Nassau Veterans Memorial Coliseum (Figure 6-3). The alignment would operate in mixed traffic in the Village of Mineola and Carle Place with a short segment of exclusive right-of-way connecting the dead ends of East 2nd Street and Voice Road[4]. At Roosevelt Field, there would be an exclusive right-of-way for inbound buses across Ring Road North. The alignment would continue to operate in mixed traffic in the Source Mall area, but would make use of available land on the south side of Transverse Drive to provide an exclusive right-of-way. It is assumed that the alignment through Nassau Community College and the Nassau Veterans Memorial Coliseum would be on exclusive right-of-way via easements through these properties. The alignment would continue to operate in mixed traffic along Hempstead Turnpike to its terminus at the Rosa Parks Hempstead Transit Center. The proposed alignment for Alternative 2A BRT/Premium Bus is described in greater detail, below, by route segment.

[4] This concept will require additional coordination with the Village of Mineola.

Figure 6-3: Alternative 2A BRT/Premium Bus Alignment



Source: Jacobs, 2012.

Village of Mineola to Carle Place

The Alternative 2A BRT/Premium Bus alignment would begin in the Village of Mineola at a BRT/premium bus terminal station for boarding passengers along the south curb of Station Road, east of 3rd Avenue. For return trips, the drop-off/ layover area would be on the east curb of 3rd Avenue, just south of Station Road. The alignment would continue on Station Road and alongside Mineola Boulevard to 3rd Street and then east on 3rd Street. The segment of Station Road that is parallel with Mineola Boulevard and intersects 3rd Street is wide enough for the addition of a proposed bus-only lane on the east side of the street. The current travel lane could be converted to a separate bus-only lane on the left-hand side that would lead to a bus-only left turn onto eastbound 3rd Street. This would require a new traffic signal with a separate phase exclusively for buses to cross Mineola Boulevard. The existing hatched area on the right-hand side of Mineola Boulevard could be converted to a lane for general traffic, which would only be allowed to turn right on 3rd Street, as at present. Inbound buses would continue west on 3rd Street and north on 3rd Avenue to access the drop-off area.

The alignment would continue east on 3rd Street to Willis Avenue. Between Main Street and Willis Avenue, 3rd Street is eastbound only. To facilitate westbound/inbound bus movements, there would be a contraflow bus lane on the north side of this segment of 3rd Street. Establishment of the contraflow bus

lane would require the removal of parking along the north side of the street. Eastbound/outbound buses would continue to travel with general traffic.

Between Willis Avenue and Roslyn Road, the outbound alignment would follow 3rd Street while the inbound alignment would follow Front Street. The inbound Willis Avenue BRT/premium bus station would be located on Willis Avenue, just north of 3rd Street and the outbound station on 3rd Street, just east of Willis Avenue. This would serve the courts and residences, which are located too great a distance from the BRT/premium bus terminal station (the modern streetcar terminal station proposed with Alternative 2, located further east, does not require another stop in this location).

At Roslyn Road, the outbound alignment would head north to East 2nd Street. Signalization would be required for the intersection of 3rd Street and Roslyn Road to facilitate bus left turns onto Roslyn Road. The inbound alignment would make a right turn onto Front Street from Roslyn Road to serve the proposed Willis Avenue BRT/premium bus station. From Roslyn Road, the alignment would continue east on East 2nd Street to its end. Bus stations would be located on the north and south sides of East 2nd Street at Union Street. At the east end of East 2nd Street, the alignment would shift northeast to connect to Voice Road, using a strip of the vacant land between these two roads. This exclusive right-of-way would be at least 26 feet in width with treatments to prevent use by private vehicles[5].

Carle Place to Roosevelt Field

On Voice Road, the alignment would continue east to Glen Cove Road, operating in mixed traffic. The inbound Voice Road Station would be located on Voice Road in a built cut-out in the landscaping on the north side of the street west of the Van Heusen entry/exit. To remove potential impediments to free-flowing inbound bus traffic, the conversion of the entry/exit to an entry-only would be required, along with the conversion of head-in parking adjacent to the entry/exit to a physically separated service road with west-facing angled parking. All vehicles leaving the angled-parking spaces would travel west in the separated lane, head north into the rear parking lot and circulate around the building to exit the parking lot directly onto Glen Cove Road or onto Voice Road just west of Glen Cove Road, which could be converted to exit-only. In addition to this separation, Voice Road would be re-striped to provide longer left-turn lanes in both directions to improve through-traffic flow (including buses). At the intersection of Voice Road and Glen Cove Road, the allocation of additional green time would be required for the northbound left-turn phase. The northbound left-turn lane could be lengthened by acquiring land on the west side of Glen Cove Road and offsetting the existing centerline westward to accommodate a new southbound lane. The outbound Voice Road Station would be located on the west side of Glen Cove Road, directly south of Voice Road, out of the general traffic flow. Additional modifications, subject to further study, may reduce or eliminate some left-turn movements in the area.

On Glen Cove Road, the alignment would head south to Old Country Road to the proposed Old Country Road BRT/premium bus station, then east on Old Country Road to Roosevelt Field via Ring Road. The outbound Old Country Station could be located on Old Country Road, just east of Glen Cove Road in front of the local bus stops that are presently located there. For the inbound Old Country Road BRT/premium bus station, the channelized westbound right turn from Old Country Road onto Glen Cove Road has sufficient width to accommodate the station on Glen Cove Road just north of Old Country Road. The right-turn lane could be re-striped so that right-turning traffic could be directed into northbound Glen Cove Road lanes around the BRT/premium bus station during the green signal phase.

[5] This concept will require additional coordination with the Village of Mineola.

The southbound left-turn movement at Glen Cove Road and Old Country Road currently experiences significant traffic queuing and delays despite dual turn lanes being provided. Reconfiguration of the intersection would be done in order to provide a dedicated bus-only southbound queue-bypass left-turn lane. The channelized westbound right-turn lane could be modified by reducing the size of the pork-chop island and eliminating the right-turn receiving lane, as the right turn operates under signal control and the receiving lane may not be needed. By providing only two receiving lanes, the existing southbound left-turn lanes could be lengthened and shifted east with no loss of capacity. Reconstruction of the median would be done to separate northbound and southbound traffic. The proposed bus-only southbound left-turn lane could be constructed between the existing southbound through lanes and the shifted southbound left-turn lanes. The westbound stop markings at this intersection would be re-striped to accommodate southbound left-turn movements.

From Old Country Road, the alignment would continue to Roosevelt Field. A BRT/premium bus station would be located at the north end of Roosevelt Field at the northernmost parking garage. The outbound alignment would follow Ring Road and turn right into the parking lot. For inbound buses, a northbound bus-only through lane would be located between the parking lot and Ring Road North. A signal phase could be activated only when buses are present.

The alignment would continue along Ring Road East to the Roosevelt Field South BRT/premium bus stations and then east on Zeckendorf Boulevard. The inbound Roosevelt Field South Station could make use of acquired land on the east side of Ring Road East, north of Zeckendorf Boulevard. The outbound station would be located on the west side of Ring Road East in a cut-out from the parking lot and would require the removal of parking spaces to construct a BRT/premium bus station. Zeckendorf Boulevard would be widened at the intersection with Ring Road East by reconstructing the on-ramp to the MSP from eastbound Zeckendorf Boulevard. The new width could be used to provide an additional westbound lane on Zeckendorf Boulevard and to extend the exclusive right-turn lane on westbound Zeckendorf Boulevard to the MSP off-ramp.

Roosevelt Field to Source Mall

After turning east onto Zeckendorf Boulevard, the alignment would continue to BRT/premium bus stations proposed at East Gate Boulevard. The proposed outbound East Gate Boulevard Station, located along the south curb of Zeckendorf Boulevard on the far side of the intersection, could make use of the unused curbside area. Extra width for the station could be acquired by narrowing and keeping two eastbound Zeckendorf Boulevard lanes. The inbound station could be located in the curb lane on the far side of the intersection of Zeckendorf Boulevard and East Gate Boulevard.

The alignment would continue east on Zeckendorf Boulevard, then north on Zeckendorf Boulevard to Transverse Drive, where an exclusive two-way transitway is proposed along the south side of Transverse Drive. An outbound Zeckendorf BRT/premium bus station would be located on the west side of Zeckendorf Boulevard, near-side of the intersection with Transverse Drive, making use of unused County-owned property. The inbound Zeckendorf Station would be located in the transitway. A traffic signal would be located at the intersection of Zeckendorf Boulevard and Transverse Drive to facilitate westbound left turns for inbound buses from the transitway. Pedestrian crossings and paths to the Target department store could also be installed at this location. The transitway could be constructed in the landscaped area along the south side of the roadway between Zeckendorf Boulevard and Merchants Concourse. Signage could also be installed at both ends of the transitway to prevent use by general traffic. Running in the transitway, the alignment would serve the Source Mall, large retail uses, and

redevelopment areas along Transverse Drive. The Source Mall BRT/premium bus stations (inbound and outbound) would be located in the transitway at Fortunoff Way.

At Merchants Concourse, the alignment would head south, operating in mixed traffic to Corporate Drive with inbound and outbound BRT/premium bus stations on the south side of this intersection. The northbound left-turn queues at the intersection of Merchants Concourse and Corporate Drive frequently block northbound through traffic. Potential treatments at this location might include the addition of a second northbound left-turn lane by widening the intersection to the east or allocation of additional northbound left-turn green time. After crossing Corporate Drive, the alignment would continue south to Stewart Avenue.

South of Stewart Avenue, Merchants Concourse becomes Lifetime Brands Boulevard (Endo Boulevard). Outbound and inbound Stewart Avenue BRT/premium bus stations would be located on Merchants Concourse/Lifetime Brands Boulevard, near-side of the intersection at Stewart Avenue. To increase the southbound through capacity on the north side of this intersection, an additional southbound thorough lane could be provided by removing one of the northbound through lanes on the north side. Presently, there is only one northbound through lane on the south side of the intersection feeding the northbound through lane north of the intersection. When re-configuring the intersection, extra length could be obtained for the BRT/premium bus station, and crosswalks could be installed.

The alignment would continue south on Lifetime Brand Boulevard (Endo Boulevard) to access the Nassau Community College campus. From Endo Boulevard, the alignment would turn south through the east end of the Nassau Community College parking lot to connect to a proposed exclusive right-of-way. The alignment would run in a southerly direction through the parking lot, adjacent to the campus buildings between the paved footpath and parking areas, to the Nassau Community College North stations. Removal of parking may be required at the north end of the exclusive right-of-way in this section to eliminate conflict between general traffic and buses. There would be stop controls for the intersection of the north end of the exclusive right-of-way and Endo Boulevard.

The alignment would continue south, passing around the gymnasium and connecting to North-South Road (Earle Ovington Boulevard), and then heading south on Library Road West. On North-South Road and Library Road West, the BRT/premium bus would operate in mixed traffic with proposed BRT/premium bus stations to serve the south side of the Nassau Community College campus and Museum Row. The inbound alignment would head northeast from Library Road West across the parking lot to the Nassau Community South-Museum Row Station and then onto North-South Road. The removal of parking spaces would be required for an inbound BRT/premium bus station. The outbound station would be located on North-South Road, just west of Library Road West. In addition, crosswalks are proposed across the roadway to the campus for inbound BRT/premium bus passengers and other pedestrians.

Continuing south from Library Road West, the alignment crosses Charles Lindbergh Boulevard and would continue south operating in mixed traffic via the road between the Mitchel Athletic Complex and the parking garage for the Omni office building. The inbound and outbound Mitchel Field BRT/premium bus stations would be located along this road, north of Quentin Roosevelt Boulevard. There would be realignment and signalization for the intersection of this road and Charles Lindbergh Boulevard to permit through movements across Charles Lindbergh Boulevard.

The alignment would turn east onto Quentin Roosevelt Boulevard and across Earle Ovington Boulevard to access the Nassau Veterans Memorial Coliseum property. Presently, Quentin Roosevelt Boulevard is

eastbound only and outbound buses would continue to operate in mixed traffic. There would be a contraflow bus lane adjacent to the bicycle path along Quentin Roosevelt Boulevard between the Nassau Veterans Memorial Coliseum property and the road between the Mitchel Athletic Complex and the parking garage for the Omni office building to allow for westbound, right-turning bus movements at this location. The intersection of Quentin Roosevelt Boulevard and Earle Ovington Boulevard may warrant the installation of an actuated-coordinated traffic signal.

A BRT/premium bus station would be located at the Nassau Veterans Memorial Coliseum property. The alignment would run in an exclusive right-of-way through the Nassau Veterans Memorial Coliseum property and head south to Hempstead Turnpike.

Hempstead Turnpike/Fulton Avenue Alignment

As the alignment reaches Hempstead Turnpike, it would run along the north side of the roadway in the landscaped strip between the shoulder lane and the jogging/bicycle path. A proposed BRT/premium bus station would be located just to the west of Oak Street.

West of Oak Street, Hempstead Turnpike becomes Fulton Avenue. Fulton Avenue has two travel lanes in each direction and median lanes that are shared left-turn bays and separate left-turn bays. At Oak Street, the alignment would transition from operating on the north side of Hempstead Turnpike to operating in a dedicated center median lane on Fulton Avenue. The alignment would transition from the center median lane to the curb lanes/parking lanes at the BRT/premium bus stations. Proposed BRT/premium bus stations would be located along the curb lanes/parking lanes in the vicinity of Warner Avenue and in the vicinity of Clinton Street. Given the current traffic operations on Hempstead Turnpike, careful consideration needs to be given to alternatives operating within or adjacent to the roadway[6]. Detailed traffic evaluations and changes to circulation patterns will be performed as part of the subsequent environmental review phase of the Study to address this issue.

The outbound alignment would turn north onto Clinton Street, operating in mixed traffic to Jackson Street, and then turn west on Jackson Street and terminate at the south end of Rosa Parks–Hempstead Transit Center. The inbound alignment would continue east on Jackson Street and then south on Station Plaza and east on Nichols Court to Fulton Avenue.

Alternative 2A BRT/Premium Bus would have 21 stations. The average station spacing is 0.4 mile. Table 6-3 lists the proposed stations.

[6] This concept will require additional coordination with NYSDOT, Region 10.

Table 6-3: Alternative 2A BRT/Premium Bus Stations

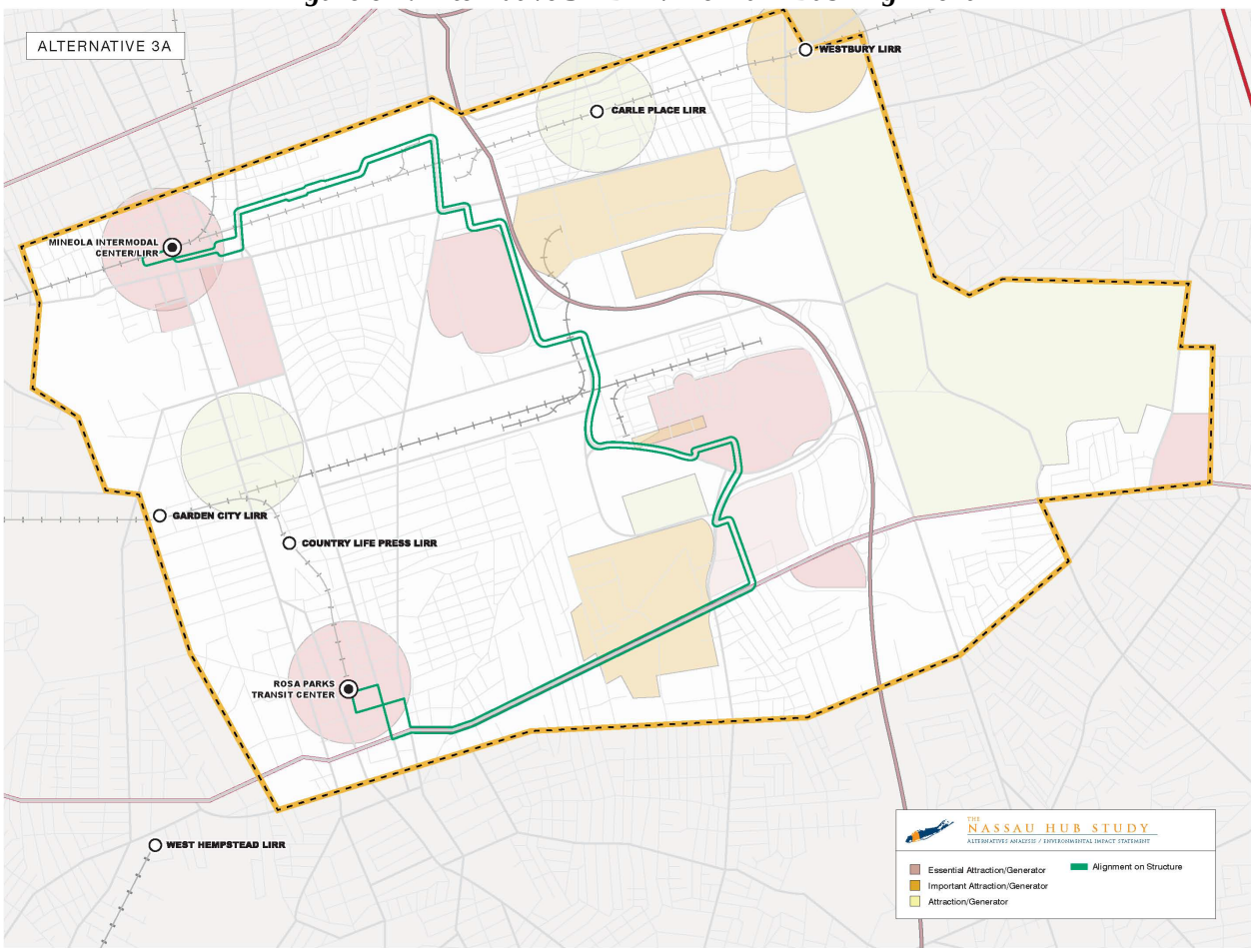
Station	Location/Cross Streets	Attractors/Generators Served
Mineola Intermodal Center	Station Road and 3rd Avenue	Mineola Intermodal Center (NICE Bus and LIRR), downtown Village of Mineola
Willis Avenue	Willis Avenue and 3rd Street	Courts, Residences
2nd Street	East 2nd Street and Union Street	Local stop
Voice Road	Voice Road and Glen Cove Road	Retail uses along Glen Cove Road and Voice Road
Old Country Road	Old Country Road and Glen Cove Road	Local Stop and retail uses along Old Country Road
Roosevelt Field	North of Roosevelt Field parking garage	Roosevelt Field
Roosevelt Field South	Ring Road East and Zeckendorf Boulevard	Roosevelt Field, Roosevelt Field Bus Facility (NICE Bus)
East Gate Boulevard	Zeckendorf Boulevard and East Gate Boulevard	The Gallery at Westbury Plaza
Zeckendorf Boulevard	Zeckendorf Boulevard and Transverse Drive	The Gallery at Westbury Plaza
Source Mall	Transverse Drive and Fortunoff Way	Source Mall, Roosevelt Raceway Shopping Center
Merchants Concourse	Merchants Concourse and Corporate Drive	Roosevelt Raceway Shopping Center, Archstone and Meadowbrooke Pointe residential developments
Stewart Avenue	Stewart Avenue and Merchants Concourse/Lifetime Brand Boulevard	Local stop
Nassau Community College North	South of Endo Boulevard, adjacent to Life Sciences Building	Nassau Community College campus
Nassau Community College South /Museum Row	North-South Road (Earle Ovington Boulevard) and Library Road West	Nassau Community College, Museum Row
Mitchel Field	Mitchel Field service road south of Charles Lindbergh Boulevard	Mitchel Field Athletic Complex, Omni office building
Nassau Veterans Memorial Coliseum	West of Earle Ovington Boulevard	Nassau Veterans Memorial Coliseum and/or other development on the property
Uniondale Avenue	Hempstead Turnpike and Uniondale Avenue	Local stop
Oak Street	Hempstead Turnpike and Oak Street	Hofstra University
Warner Avenue	Fulton Avenue and Warner Avenue	Local stop
Clinton Street	Fulton Avenue and Clinton Street	Local stop
Rosa Parks–Hempstead Transit Center	Jackson Street and Station Plaza	Downtown Village of Hempstead, NICE Bus, Hempstead Station (LIRR)

Source: Jacobs, 2012.

6.1.4 Alternative 3A BRT/Premium Bus

The Alternative 3A BRT/Premium Bus alignment is 6.8 miles in length and follows the same routing as described for Alternative 2A from the Village of Mineola to Roosevelt Field and from the Nassau Veterans Memorial Coliseum to the Village of Hempstead (Figure 6-4). However, Alternative 3A would not serve the Source Mall area as it would continue on Ring Road East from Roosevelt Field and turn east onto South Street instead of turning east onto Zeckendorf Boulevard to serve the Source Mall area.

Figure 6-4: Alternative 3A BRT/Premium Bus Alignment



Source: Jacobs, 2012.

For Alternative 3A, the Roosevelt Field BRT/premium bus station would be located at the northernmost parking garage. An optional pedestrian overpass could be constructed across Ring Road East to the second floor of the parking garage to provide a safe connection for inbound BRT/premium bus passengers.

Alternative 3A would continue to operate in mixed traffic on South Street and cross Stewart Avenue where BRT/premium bus stations would be located on the north side of the intersection. On southbound South Street, the existing right-turn lane could be relocated to the adjacent LIRR right-of-way and could be converted to an exclusive bus lane with an outbound station on the existing sidewalk. The inbound Stewart Avenue Station would make use of the 65-foot layby along northbound South Street just north of Stewart Avenue. The existing median on the south side of the intersection of South Street and Stewart

Avenue could be used to provide a bus queue jump for inbound buses. In addition, the east crosswalk at this intersection could be relocated to the west side of the intersection.

The alignment would continue south on South Street and head east on Charles Lindbergh Boulevard, which is currently westbound only. The inbound alignment would operate in mixed traffic, but the outbound alignment would connect to Charles Lindbergh Boulevard via an exclusive right-of-way across the triangular median at South Street and Charles Lindbergh Boulevard. A bus-actuated signal at the intersection of the exclusive right-of-way and Charles Lindbergh Boulevard would allow the BRT/premium bus to cross to the south side of Charles Lindbergh Boulevard and avoid conflicts with traffic using the Charles Lindbergh Boulevard ramp to southbound Quentin Roosevelt Boulevard. Signal pre-emption may also be considered at this location, as no traffic signal currently exists and the signal would rest on green for general traffic in the absence of a crossing BRT/premium bus.

From the exclusive right-of-way beginning at South Street, the outbound alignment would turn eastbound onto the south side of Charles Lindbergh Boulevard on exclusive right-of-way and continue to the entrance of Museum Row. The inbound alignment would continue to operate in mixed traffic between the entrance to Museum Row and northbound South Street. A BRT/premium bus station would be located at Museum Row. Along Charles Lindbergh Boulevard, there are jogging/bike paths that would need to be shifted or relocated to accommodate an exclusive bus right-of-way. An exclusive bus-activated signal phase would be added at the intersection of Charles Lindbergh Boulevard and the entrance to Museum Row to facilitate bus movements at this location.

The alignment would continue north onto the roadway at the entrance to Museum Row and then turn eastbound on Earle Ovington Boulevard (North-South Road), operating in mixed traffic. A BRT/premium bus station would be located at Nassau Community College. A crosswalk would need to be installed across Earle Ovington Boulevard just west of the proposed BRT/premium bus station.

The alignment would continue to follow Earle Ovington Boulevard eastbound and then southbound, operating in mixed traffic through the Nassau Community College campus parking lots. The alignment would continue southbound traveling across Charles Lindbergh Boulevard to the Nassau Veterans Memorial Coliseum property. Bus queue bypasses for outbound and inbound buses would be located at the intersection of Earle Ovington Boulevard and Charles Lindbergh Boulevard. An inbound/northbound queue-bypass lane could be constructed using the grassy area adjacent to the existing travel lanes at this location. This would require the relocation of the sidewalk and stop bar for the Charles Lindbergh Boulevard eastbound approach lanes. An outbound/southbound queue-bypass lane could be constructed using the existing median. In addition, crosswalks would be installed to facilitate pedestrian movements at this location.

After crossing Charles Lindbergh Boulevard, the alignment would continue southbound on Earle Ovington Boulevard and turn east onto Quentin Roosevelt Boulevard to serve the Nassau Veterans Memorial Coliseum. Alternative 3A would follow the identical alignment and BRT/premium bus station placement as Alternative 2A between the Nassau Veterans Memorial Coliseum and the Rosa Parks–Hempstead Transit Center.

Alternative 3A BRT/Premium Bus would have 16 stations. The average station spacing is 0.4 mile. Table 6-4 lists the proposed stations.

Table 6-4: Alternative 3A BRT/Premium Bus Stations

Station	Location/Cross Streets	Attractors/Generators Served
Mineola Intermodal Center	Station Road and 3rd Avenue	Mineola Intermodal Center (NICE Bus and LIRR), downtown Village of Mineola
Willis Avenue	Willis Avenue and \3rd Street	Courts, Residences
2nd Street	East 2nd Street and Union Street	Local stop
Voice Road	Voice Road and Glen Cove Road	Retail uses along Glen Cove Road
Old Country Road	Old Country Road and Glen Cove Road	Local Stop
Roosevelt Field	East of Roosevelt Field parking garage	Roosevelt Field
Roosevelt Field South	Ring Road East and Zeckendorf Boulevard	Roosevelt Field, Roosevelt Field Bus Facility (NICE Bus)
South Street	South Street and Stewart Avenue	Local stop
Railroad Avenue	Railroad Avenue and Charles Lindbergh Boulevard	Social services and local stop
Nassau Community College- South/Museum Row	Earle Ovington Boulevard (North-South Road) and Student Union Service Road	Nassau Community College campus, Museum Row
Nassau Veterans Memorial Coliseum	West of Earle Ovington Boulevard	Nassau Veterans Memorial Coliseum and/or other development on the property
Uniondale Avenue	Hempstead Turnpike and Uniondale Avenue	Local stop
Oak Street	Hempstead Turnpike and Oak Street	Hofstra University campus
Warner Avenue	Fulton Avenue and Warner Avenue	Local stop
Clinton Street	Fulton Avenue and Clinton Street	Local stop
Rosa Parks–Hempstead Transit Center	Jackson Street and Station Plaza	Downtown Village of Hempstead, NICE Bus, Hempstead Station (LIRR)

Source: Jacobs, 2012.

6.2 Vehicle Base/Maintenance Facility

This section discusses the general requirements for modern streetcar maintenance facilities and storage areas. There are no existing facilities for maintaining and storing modern streetcars in the Nassau Hub Study Area, and the shops needed to maintain a fleet of modern streetcars (Alternatives 2 and 3) are different than those needed to maintain a fleet of BRT/premium buses (Alternatives 2A and 3A). The existing NICE Bus facility at 700 Commercial Avenue has sufficient capacity to store and maintain the BRT/premium bus fleet assumed with Alternatives 2A and 3A, based on discussions with the operators of NICE Bus.

Vehicle base and shop facilities primarily serve the following functions:

- Storage of modern streetcar vehicles, maintenance equipment, and supplies
- Service, maintenance, and inspection of modern streetcar vehicles
- Operator reporting and dispatching
- Miscellaneous infrastructure maintenance and support services

6.2.1 Vehicle Base Function

The vehicle base is the point of dispatch for all modern streetcar operations. From the vehicle base, modern streetcars are inserted or removed from revenue service, serviced, cleaned, and stored overnight. Direct access from the mainline to the storage tracks is desirable, as is a track arrangement that allows efficient movement of cars to and from the mainline and to and from storage tracks to the maintenance facility and car washer.

6.2.2 Vehicle Base Layout

Basic guidelines for a vehicle base layout for the modern streetcar are as follows:

- Direct access from the mainline to the storage tracks;
- A run-around track separate from the storage tracks to access the storage tracks, car washer, and maintenance facility (shop);
- Double-ended storage tracks for maximum flexibility and to reduce revenue-equipment movements;
- A double-throat lead track from the mainline to the vehicle base to allow simultaneous dispatch and receiving of trains and to eliminate the complete blockage of the throat if there is a turnout failure;
- Minimum radius on storage tracks of 82 feet;
- A loop track is desirable for maximum operation flexibility;
- Storage tracks should be constructed to allow for sufficient space for maintenance operations and should allow modern streetcars to be parked/stored on tangent track;
- Paved aisles between storage tracks;
- Parking for personnel as close as possible to work areas in controlled areas;
- Space, as necessary, for storage of miscellaneous equipment and materials including Maintenance-of-Way (MOW) equipment;
- Adequate lighting for safe operations;
- Access roads to serve storage tracks and service aisles; and
- Life safety requirement for emergency vehicle access to vehicle base facility.

6.2.3 Vehicle Shop

The vehicle shop may be designed as an all-purpose facility to facilitate the performance of scheduled inspections, minor running repairs, and interior car cleanings. Functions performed at the shop also include:

- Daily interior car cleaning, which includes the removal of trash and cleaning of stains or spills;
- Heavy interior cleaning, which includes washing the vehicle floors, walls, and mats;
- Maintenance inspection – Vehicles systems (control, brakes, and other systems) are given thorough inspections at scheduled intervals. Inspection bays are used to perform minor repair work and inspection of the vehicle underbody;

- Running repairs – Minor repairs and replacement of small components identified during the inspection process can occur in the shop;
- Major repairs – Major repairs such as collision damage, truck repair, overhauls, component change outs and vehicle body repair can occur at the shop as well; and
- Ancillary facilities – In addition to the vehicle maintenance functions, the shop building includes the yard and rail operations center, administrative offices, and employee facilities (e.g., locker rooms, toilets, kitchen, MOW-related facilities, etc.).

6.2.4 Car Wash

Car exteriors are typically washed daily. A car washer is required to perform this function. Car washers are typically located off the inbound tracks on a through track with access to the storage yard, so that incoming modern streetcars are washed before being stored in the yard tracks.

6.2.5 Potential Vehicle Base Locations

The identification of vehicle base sites able to accommodate modern streetcars is challenging in the intensely developed Nassau Hub Study Area. A potential vehicle base site has to meet the operational needs of the modern streetcar service while being acceptable to the community and with limited impacts of the vehicle base operations on nearby residential and commercial land uses.

It is essential to locate a vehicle base adjacent to the mainline on one end of the route, preferably on the end with the greatest demand heading away from it in the morning and towards it in the evening. This reduces the amount of time spent “dead-heading” or the time moving non-revenue modern streetcars into position to begin service in the morning or return to the vehicle base at night. However, in this case, the terminals in the Village of Hempstead and the Village of Mineola are located in built-up and developed areas where large parcels of land zoned for industrial use and suitable for a vehicle base facility do not exist.

The following siting criteria were applied to identify potential vehicle base locations:

- Site should be adjacent to the proposed modern streetcar alignments;
- Site should be located in a commercial or an industrial area to limit impacts to the surrounding community;
- Site should be sufficient in size and reasonably shaped for the intended use; and
- Site should be accessible from local road and highway network by automobiles, trucks and emergency vehicles (for employees commuting to the facility, truck deliveries of material and supplies, and fire department and ambulance service).

A review of aerial mapping was undertaken to identify potential sites for a modern streetcar facility. It was necessary to identify potential properties midway along the alignment where industrial and large-scale commercial land uses are located and large land parcels exist to accommodate a facility. Two potential sites were preliminarily identified:

- **Axinn Avenue** – a property to the west of Axinn Avenue and to the east of the MSP; and
- **South Street** – a property, which is roughly triangular in shape and is bounded by the southern border of the MSP, the eastern edge of the present Roosevelt Field retention basin, the intersection of South Street and Quentin Roosevelt Blvd, and the east end of South Street.

If either site were to be developed into a vehicle base facility, the property would need to be acquired and the existing buildings demolished. New yard tracks, infrastructure and maintenance facilities would have to be constructed to provide the vehicle base facility components described in the previous sections. During the environmental review phase of the Study, the alternative sites for a vehicle base facility will be further evaluated and a final determination will be made on the most appropriate site.

7. Land Use and Development

Existing and future land use is a significant consideration when planning a transit investment. Land use has a direct correlation to potential transit ridership while, at the same time, transit services can influence land use decisions. In order to understand land use synergies as they relate to the various alternatives studied, an evaluation of current land uses, future land use policies and potential redevelopment opportunities was performed. This section provides a brief summary description of existing land use in the Study Area, followed by discussion of existing and proposed development and potential development and redevelopment opportunities in key jurisdictions and at significant activity centers within the Study Area that would be affected by one or more of the Short-List Alternatives.

7.1 Overview

The 11.7-square-mile Study Area comprises the largest concentration of commercial uses within Nassau County, including two regional malls, numerous office complexes, and a wide variety of shops, restaurants, and service establishments (Figure 2-1). With an equally expansive and diverse array of community services, the Study Area easily establishes itself as the heart of Nassau County's commercial, cultural, educational, and governmental activities. Approximately 36 percent of the land area is dedicated to commercial and community services, while residential uses occupy approximately 26 percent. Parks and other recreational uses account for about 15 percent of the total, much of it in Eisenhower Park.

The extensive supply of off-street parking represents a significant portion of the Study Area's land use. Approximately 25 percent of this parking supply consists of surface parking dedicated to seasonal or event use, which is not necessarily needed to meet regular demand. In all, the Study Area contains approximately 75,000 parking spaces, which represents approximately 9 percent of the total land cover of the Study Area. The inability to share these parking facilities among uses to balance varying peak parking demands requires additional parking, increases travel among activity centers, limits the ability to link trips and limits the economic development potential of the area.

Table 7-1 summarizes the potential scale of development/redevelopment that could be considered in the Study Area. Development potential in the Village of Mineola and the Town of North Hempstead is in the range of 500,000 to 1.5 million gross square feet; in the Village of Hempstead and the Mitchel Field Mixed Use District (MFM), it is in the range of 3 million to 5 million square feet; and the Source Mall area has the greatest potential redevelopment of 3 to 17 million square feet.

Table 7-1: Build-Out Potential of As-of-Right Zoning / Redevelopment Potential[1]

	Residential SF[2]	Retail SF	Office SF	Other SF	Total SF
Village of Mineola	487,600-772,300	41,000-133,900	127,700-267,700	34,000-37,000	760,812-1,210,900
Village of Hempstead	3,031,622 - 4,408,600	283,600	382,100	0 – 1,320,000	5,017,322-5,074,300
North Hempstead - Carle Place	268,900-593,200	119,200-194,200	86,400-555,200	58,400	532,900-1,401,000
Source Mall Area	1,172,500-8,861,400	541,800-1,427,800	1,209,600-4,599,600	199,500-2,066,800	3,123,400-16,955,600
MFM District	390,498-1,130,000	424,850	1,025,000-1,572,000	1,172,030-1,350,030	3,013,586-4,478,850

Source: Jacobs, 2011.
Note 1: As-of- right is the maximum potential development allowed by current zoning.
Note 2: SF = square feet

A number of significant projects are already planned or in progress in the Study Area. These projects were identified by the Nassau County Planning Commission (NCPC) as projects referred to that agency by local municipalities and/or projects being tracked by the NCPC. The projects include expansions of existing stores, office buildings, and institutional facilities and construction of multi-family residential developments, which will add thousands of new apartment and condominium units to the area.

7.2 Land Use and Development

To better understand how the alternatives under consideration would integrate with existing land uses and potential development within the Study Area, an analysis of existing and proposed development and, as appropriate, potential development or redevelopment opportunities in the Study Area's jurisdictions was performed and is described in the following sections. The information was used in the alternatives screening process to address a land use-related evaluation criterion.

7.2.1 Village of Mineola

Existing Development

With the major employment centers of Winthrop University Hospital and the County Government Center, downtown Village of Mineola is a major activity generator (i.e., attracts and generates trips). Its key transit infrastructure includes the Mineola Intermodal Center, which includes the Mineola Long Island Rail Road (LIRR) Station and Nassau Inter County Express (NICE) Bus terminal. Aside from several office buildings and structured parking south of the LIRR tracks and north of Old Country Road, downtown Village of Mineola still retains the fabric of a traditional downtown with an inventory of classic mixed-use buildings with ground-floor retail and residential or office uses above. In recent decades, these smaller-scale retail users have faced increasing competition from large-scale shopping and regional malls in the area such as Roosevelt Field, the Source Mall and the many smaller highway-oriented retail centers.

Proposed Development

There are at least three development projects proposed and/or under construction in the Village Mineola. Winthrop University Hospital is constructing 95,000 square feet of office space. A mixed-use, adaptive reuse project is being constructed on the northwestern corner of Old Country Road and Mineola Boulevard. Polimeni International, in partnership with Mill Creek Residential Trust, will soon complete the 'Winston' and 'Churchill' residential complexes consisting of 275 units and 36 units, respectively, on and adjacent to Old Country Road and within walking distance of the Mineola Intermodal Center. To the west along Old Country Road, a 315-unit rental development is also under construction.

Potential Redevelopment

The 2005 Village of Mineola Comprehensive Plan recognized redevelopment opportunities within the Village of Mineola, including on sites along and within the vicinity of East 2nd Street, a key commercial corridor in the Village. This area contains numerous warehouses, low-density offices and industrial buildings that offer opportunities for re-use redevelopment and other improvements. Such redevelopment could take advantage of the traditional downtown and historic character of the Village.

Based on the Short-List Alternatives' proposed alignments and station areas, the Village's 2005 Comprehensive Plan, existing zoning, and known development projects, the Nassau Hub Study Team

identified opportunities for enhancing transit-oriented development (TOD). The Study Team developed two potential redevelopment scenarios: a minimum redevelopment scenario and a maximum redevelopment scenario. The Village of Mineola already has a TOD overlay district. Each of the two scenarios applies this overlay zoning to downtown Village of Mineola to encourage redevelopment and transit use in a mixed-use, pedestrian-friendly environment. Both scenarios follow the principles outlined in the Village of Mineola's 2005 Comprehensive Plan. The minimum redevelopment scenario is less aggressive in identifying soft sites for redevelopment than is the maximum redevelopment scenario, as described below.

The minimum redevelopment scenario proposes redevelopment on sites that meet the definition of soft sites in the following land use categories: stand-alone warehouses, low-density offices and industrial buildings and parking and vacant lots. The maximum redevelopment scenario proposes redevelopment on sites that meet the definition of soft sites in the following land use categories: retail/residential or retail/office mixed-use buildings that are subject to potential removal or improvement on a conditional basis; stand-alone warehouses, low-density offices and industrial buildings; and parking and vacant lots. Table 7-2 summarizes the development potential in the Village of Mineola in the minimum and maximum redevelopment scenarios.

Table 7-2: Development Potential in Downtown Mineola[1]

Use	Minimum Redevelopment Scenario Gross Area (SF)	Maximum Redevelopment Scenario Gross Area (SF)
Residential	487,600	772,300
Retail	41,000	133,900
Office	127,700	267,700
Institutional	34,000	37,000
Total	760,812	1,210,900
Parking Spaces[2]	974	1,915

Source: Jacobs, 2011.
Note 1: Estimates have not been confirmed with Village of Mineola officials.
Note 2: The number of parking spaces per type of use is calculated as follows: Residential = 1 space/unit (1,000 square feet [SF]); Retail = 4 spaces/1,000 SF; Office and Institutional = 5 spaces/1,000 SF.

7.2.2 Village of Hempstead

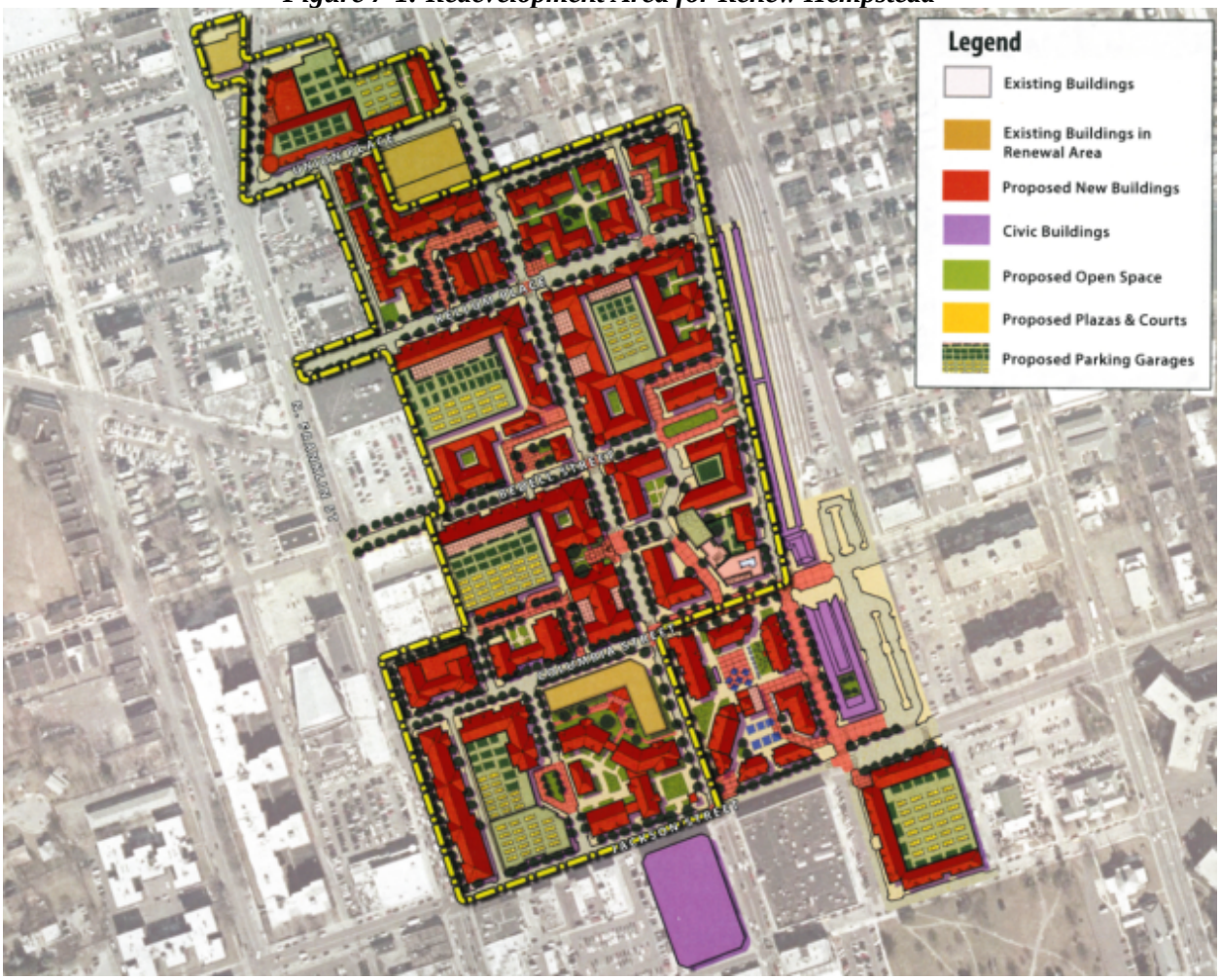
Existing Development

Downtown Village of Hempstead is focused around Main Street, North Franklin Street, Washington Street and Fulton Avenue, from Front Street at the south to Kendig Place in the north. Major transportation assets include the LIRR Hempstead Station and Rosa Parks–Hempstead Transit Center. Denton Green is a significant piece of open space that acts as a central organizing element for the downtown area. Buildings housing civic functions include the District Court, Public Library, Hempstead Village Hall, and Hempstead Town Hall. Large portions of the downtown are devoted to surface parking, with many parcels currently occupied by under-developed commercial uses that could be intensified. Overall, downtown Village of Hempstead is characterized by inconsistent land use and building stock in need of revitalization. While the Village of Hempstead's transit stations and roadways represent significant transportation assets, traffic congestion contributes to an unfriendly pedestrian environment.

Proposed Development

An approved initiative representing a public-private partnership between Renaissance Downtowns-Urban America and the Village of Hempstead is changing its downtown. The project, situated within the Village of Hempstead's central business district, will transform the Village's downtown into a mixed-use, walkable neighborhood that could leverage potential transit enhancements within the Nassau Hub to promote improved quality of life and employment opportunities. Preliminary plans call for a mix of condominiums and rental buildings for residents with various income levels. A hotel, offices, shops, and entertainment uses are also being considered. The project will be a mix of new construction and adaptive reuse of existing structures. Civic buildings, plazas, courtyards and other open space would be incorporated into the urban design (Figure 7-1). This project will redevelop the Village's traditional downtown into a vibrant, mixed-use district comprising over 3,000 multi-family residential units and hundreds of thousands of square feet of new office and retail space. A re-zoning that permits the increased development density and building heights required for the project was approved by the Village Board in July 2012. The initial stages of the development are advancing into construction.

Figure 7-1: Redevelopment Area for Renew Hempstead



Source: Village of Hempstead. *Draft Supplemental Generic Environmental Impact Statement (DSGEIS) Downtown Overlay Zones & Zoning Map Amendments*, May 10, 2012.

Another project is Metro 303, an apartment complex recently completed by Mill Creek Residential Trust, LLC. The project includes 166 market-rate apartment homes in a 5-story building with four residential levels over two levels of garage parking. The project site is a short walk from the Rosa Parks-Hempstead Transit Center. Additionally, The Engel Burman Group is currently in construction on a 3-story, 54-unit condominium complex on the east side of Franklin Avenue near the Village of Garden City/Village of Hempstead border on the former Doubleday property.

7.2.3 Town of North Hempstead – Hamlet of Carle Place

Existing Development

This area of the Town of North Hempstead, known as Carle Place, is in the vicinity of Glen Cove Road, Old Country Road and the Meadowbrook State Parkway, north and south of the LIRR tracks. It is located between the LIRR Mineola and Carle Place Stations and is dominated by several large retail uses (i.e., big-box stores).

Proposed Development

Construction of a new 50,000-square-foot, 150-unit Homewood Suites hotel, located at 40 Westbury Avenue and within 2 miles of the Mineola Intermodal Center, was completed in 2012. Adjacent to Homewood Suites is a planned 120-unit hotel, currently under review by the Town of North Hempstead.

Potential Redevelopment

Given the relatively low-density, highway-oriented character of its land use, this area has considerable potential for redevelopment at a higher density than currently exists. An as-of-right redevelopment scenario, per the Planned Unit Development (PUD) District, was evaluated. PUD zoning typically allows for a mix of land uses including both residential and nonresidential and is generally thought of as transit-oriented. The as-of-right redevelopment scenario was based on I-B District zoning requirements, in which both commercial and residential uses are permitted. The as-of-right redevelopment scenario assumes that one zoning lot with required parking is accommodated across a combination of surface parking lots and on-street parking along streets. Each of the two scenarios includes a mix of commercial and residential uses with a retail/commercial spine running north-south on the western edge of the property and residential uses located to the east along a green mews. Station Plaza, at the heart of each scenario, focuses the community's open space as a transit gateway.

Table 7-3 illustrates the development potential under current zoning. The development potential is the same for the modern streetcar and BRT/premium bus alternatives.

Table 7-3: As-of-Right Development Potential in North Hempstead – Carle Place

Use	Gross Area (SF)	Parking Spaces Required
Residential	268,900	538
Retail	119,200	596
Institutional	58,400	292
Office	86,400	432
Total	**532,900**	**1,858**

Source: Jacobs, 2011.
Note: The number of parking spaces per type of use is calculated as follows: Residential = 2 spaces/unit (1,000 SF); Retail, Office, Institutional = 5 spaces/1,000 SF.

7.2.4 Source Mall, Roosevelt Field, Nassau Community College

Existing Development

Located south of Old Country Road, this area comprises mainly large-scale retail and light industrial functions with scattered office buildings. A number of residential PUDs have been developed. Roosevelt Field, the Source Mall, and Nassau Community College are major retail and institutional anchors within the northern and central portions of this area. They are intermixed with underutilized areas with poor pedestrian access and connectivity.

Pending Development

One large retail project is pending and one large retail project has recently been completed within this area; both are located within walking distance (i.e., 1/4 mile) of proposed transit stations. Roosevelt Field, which would be served by all of the alternatives, is constructing a 100,000-square-foot Neiman Marcus retail space. Construction is currently underway, with an expected opening in 2015. The Gallery at Westbury Plaza, a 330,000-square-foot retail center, has recently opened; it is promoted as one of the premier retail trade areas in the country and incorporates a LEED[1]-certified design.

Avalon Bay Garden City completed construction of a mix of housing types, including 44 townhouses, 160 apartments and single-family homes aimed at attracting singles, empty nesters and young couples on property adjacent to Nassau Community College.

Potential Redevelopment

Unlike Alternatives 3 and 3A, the alignment for Alternatives 2 and 2A serves the Source Mall and its vicinity including the Gallery at Westbury Shopping Plaza, a cinema, hotel and several office and light industrial uses. This area currently suffers from several physical constraints that are not conducive to TOD. The constraints include large areas of surface parking, wide roadways that isolate uses and discourage pedestrians, and large retail uses that are incompatible with pedestrian and bicycle access.

Potential redevelopment scenarios developed for this area include an as-of-right scenario for each alignment. Table 7-4 illustrates the development potential under current zoning.

Table 7-4: As-of-Right Redevelopment Potential for the Source Mall and Vicinity

Use	Gross Area (SF)	Residential Units	Parking Spaces Required
Residential	1,172,500	1,172	3,119
Retail	541,800		2,709
Office	1,209,600		6,048
Open Space	199,500		
Hotel	0		
Total	3,123,400	1,172	11,875

Source: Jacobs, 2011.
Note: The number of parking spaces per type of use is calculated as follows: Residential = 2.66 spaces/unit (1,000 SF); Retail and Office = 5 spaces/1,000 SF.

[1] LEED (Leadership in Energy & Environmental Design) is a green building certification program that recognizes best-in-class building strategies and practices. To receive LEED certification, building projects satisfy prerequisites and earn points to achieve different levels of certification.

7.2.5 Nassau Veterans Memorial Coliseum and Hofstra University

Existing Development

North of Hempstead Turnpike and west of the Meadowbrook State Parkway, this area contains major institutional and public anchors comprising Hofstra University and the Nassau Veterans Memorial Coliseum. Parks and natural areas are also located here, including the Mitchel Field recreation area to the west and the Hempstead Plains Preserve to the southeast. With the announcement that the New York Islanders professional hockey team will vacate the Nassau Veterans Memorial Coliseum at the end of its lease in the summer of 2015, the future redevelopment direction of this site has been resolved with selection by Nassau County of a Master Developer for the property. Plans for redeveloping the property, which are currently being formulated, are anticipated to be largely consistent with current zoning.

Pending Development

The redevelopment of the Nassau Veterans Memorial Coliseum and surrounding area is under design in accordance with the MFM zoning district (Figure 7-2) in the Town of Hempstead. The as-of-right zoning provides for redevelopment through an increase in allowable development density and a range of uses. In addition to the existing Nassau Veterans Memorial Coliseum, which is a major regional sports and entertainment venue, and the Long Island Marriott Hotel and Conference Center, the MFM District could be developed for a range of other uses. Such uses could include offices, bank or financial institutions, retail stores, service establishments, research and development facilities, hospitals, schools, senior citizen care facilities, daycare facilities, health clubs or spas, multi-family dwellings, municipal buildings, and religious and recreational uses.

Figure 7-2: Boundary of the Mitchel Field Mixed-Use (MFM) Zoning District

Source: Renaissance Downtown/Urban America. *The Story of Hempstead Rising*. June 10, 2011.

In addition to redevelopment of the Nassau Veterans Memorial Coliseum property, other projects are proposed or have been recently completed in this area. Vanderbilt Mews at Garden City is a 25-unit condominium project recently constructed on Stewart Avenue just inside the Village of Garden City. The United Food and Commercial Workers Union Local 1500 plans a 15,000-square-foot office for 623 Stewart Avenue in the East Garden City Census Designated Place (CDP).

Potential Redevelopment

Table 7-5 illustrates the development potential in this area, as currently zoned. The assessment of redevelopment potential anticipates a re-purposing of most of the parking areas associated with the Nassau Veterans Memorial Coliseum with a denser development pattern comprising a mix of uses.

Table 7-5: As-of-Right Redevelopment Potential of MFM Zoning District

Use	Gross Area (SF)	Residential Units	Hotel Rooms	Parking Spaces Required
Coliseum	416,000			6,500
Marriott	350,000		617	617
Residential	390,498	390		667
Retail	424,847			2,124
Office	1,026,211			5,131
Park Space	136,030			0
Hotel	270,000		360	360
Total	**3,013,586**	**390**	**977**	**15,399**

Sources: Fox and Fowle, 2011.

7.2.6 Hempstead Turnpike

Existing Developments

With downtown Village of Hempstead at its western end and the Nassau University Medical Center at its eastern end, this section of Hempstead Turnpike connects major activity generators, including Hofstra University, the Nassau Veterans Memorial Coliseum, RXR Plaza, and East Meadow Plaza. The balance of uses is highway-style retail and commercial activities.

Potential Redevelopment

With all four alternatives, opportunities for revitalization of this portion of the Hempstead Turnpike corridor may best be realized through infill development that would support TOD and complement redevelopment in other portions of the Study Area. The western segment of Hempstead Turnpike will connect the future downtown revitalization in the Village of Hempstead to the County's proposed Research and Development Center at the Nassau Veterans Memorial Coliseum site, passing through Hofstra University.

7.3 Conclusions

There are a number of locations within the Study Area that provide transit-supportive land use patterns that would be supported by each of the four alternatives. The distinction that does occur among the alternatives is related to planned and future land use changes within the Study Area: most notably, the redevelopment recently approved in the Village of Hempstead, the designation of a Master Developer for

the Nassau Veterans Memorial Coliseum and the surrounding area and, lastly, the expansion of the retail uses at Roosevelt Field. While the area to the east of the Meadowbrook State Parkway in the vicinity of the Source Mall has significant redevelopment potential, it is anticipated that redevelopment in this area lags further behind than that of the area to the west of the Meadowbrook State Parkway. Therefore, Alternatives 3 and 3A are likely to better meet anticipated land use changes in the foreseeable future than are Alternatives 2 and 2A.

8. Operating Plans

The following Section presents the operating plans for the Short-List Alternatives. The modern streetcar operating plans are presented for Alternatives 2 and 3, followed by bus rapid transit (BRT)/premium bus operating plans for Alternatives 2A and 3A.

8.1 Modern Streetcar – Alternatives 2 and 3

8.1.1 Hours of Service and Service Frequency

The proposed transit services with Alternatives 2 and 3 would operate from 5:30 AM to Midnight, 7 days per week. The most frequent service would be operated during the morning and the evening, reflecting journey-to-work travel patterns, with proposed service frequency every 10 minutes during the weekday peak periods. Given the high concentration of retail uses in the Study Area, the weekday off-peak and weekend periods are likely to generate significant travel demand, as well; therefore, a robust service frequency of every 15 minutes is proposed during weekday off-peak periods and on weekends. Table 8-1 presents the proposed service frequencies by day of the week and time of day.

It is anticipated that departure times at the Village of Mineola and Village of Hempstead termini would be coordinated with Long Island Rail Road (LIRR) and Nassau Inter County Express (NICE) Bus arrival times at the Mineola Intermodal Center and Rosa Parks–Hempstead Transit Center stations. In case of special events at the Nassau Veterans Memorial Coliseum, additional service could be provided.

As part of the Nassau Hub Study, ridership forecasts were developed and a fare structure was assumed based on the existing NICE Bus fares, including free transfers between modern streetcar or BRT/premium bus vehicles and NICE Bus services. No free transfers are proposed between the LIRR and the proposed new transit service.

Table 8-1: Service Frequencies for All Short-List Alternatives by Day of Week and Time of Day

Day of Week	Time of Day	Time Period	Frequency (minutes)
Monday to Friday	Early AM	5:30 AM to 6:59 AM	15
	AM Peak	7:00 AM to 8:59 AM	10
	Midday	9:00 AM to 3:59 PM	15
	PM Peak	4:00 PM to 5:59 PM	10
	Evening	6:00 PM to 12:00 AM	15
Saturday, Sunday, and Holidays	All Day	5:30 AM to 12:00 AM	15

Source: Jacobs, 2012.

8.1.2 Operating Policies

Vehicle loading standards assumed for purposes of the Short-List Alternatives' operations planning are based on guidelines from the Transportation Research Board's (TRB) Transit Cooperative Research Program[1] (TCRP) *Report 100: Transit Capacity and Quality of Service Manual*, 2nd Edition. Transit-vehicle-load levels of service (LOS) are a set of measures used to reflect, from the passenger's point of

[1] The Transit Cooperative Research Program is a program of the National Academies in which research is conducted by transportation industry experts on a variety of transportation issues to provide solutions to operating problems, to adapt new technologies from other industries, and to introduce innovations to the transit industry.

view, the comfort level while on board a transit vehicle. This measure considers the passenger's ability to find a seat and overall crowding levels within the vehicle. For planning purposes, it was assumed that the modern streetcar would have a passenger load corresponding to LOS D (LOS D indicates that all seats are filled and some passengers must stand but can do so comfortably) and a load factor of 1.25 during the peak period.[2] Table 8-2 summarizes the modern streetcar's vehicle capacity.

Table 8-2: Modern Streetcar Vehicle Capacity

Number of Seats in Modern Streetcar Vehicle	74[1]
Level of Service for Passenger Load Level	D
Peak Load Factor	1.25
Additional Standing Passengers Possible	93
Total Passengers per Vehicle (seated and standing)	167
Crush Load[2]	222

Source: Jacobs, 2012.

Note 1: This is typical capacity for a modern streetcar vehicle.

Note 2: *TCRP Report 100: Transit Capacity and Quality of Service Manual*, 2nd Edition, defines "crush load" as "the maximum feasible passenger capacity of a vehicle, that is, the capacity at which one more passenger cannot enter without causing serious discomfort to the others. Note that the crush load specification for some rail transit vehicles does not relate to an achievable passenger loading level but is an artificial figure representing the additional weight for which the car structure is designed or for which the propulsion and braking system will meet minimum performance criteria."

8.1.3 Running Time Estimates

The following assumptions were used to develop station-to-station running times for Alternatives 2 and 3:

- A typical acceleration rate of 3.61 feet per second squared (ft/sec^2) was de-rated to an 80 percent value, or 2.89 ft/sec^2, while the service braking rate of 3.94 ft/sec^2 was de-rated by 60 percent to get a value of 2.36 ft/sec^2. These more conservative acceleration and braking rates were used to adjust the vehicle's speeds for traffic conditions and variations in streetcar-operator driving styles.
- Dwell times at stations were assumed to be 15 seconds. Dwell time represents the time the streetcar spends stopped at a station while passengers board and alight from the vehicle.
- The maximum operating speed in mixed-traffic portions of the alignments was assumed to be consistent with posted speed limits of 30 miles per hour (mph) on local roads. On semi-exclusive right-of-way, the maximum operating speed would be 30 mph where the alignment is directly opposite an arterial roadway (such as on Hempstead Turnpike). The exception is on the fully exclusive right-of-way on the western portion of the landscaped strip of the Meadowbrook State Parkway and the viaduct over Old Country Road to Roosevelt Field, where the maximum operating speed was assumed to be 40 mph. Average operating speeds are assumed to be lower than posted speeds due to traffic congestion and vehicle acceleration and deceleration for station stops.
- All signalized intersections would have transit signal priority.[3]
- Off-board fare collection technology would be used (i.e., via ticket vending machines located at the stations).

[2] The load factor is the ratio of passengers actually carried versus the total passenger seating capacity of a vehicle. A load factor of greater than 1.0 indicates that there are standees on that vehicle.

[3] Transit Signal Priority (TSP) is the preferential treatment of a transit vehicle class (such as a modern streetcar) over a non-transit vehicle class (such as automobiles) at a signalized intersection without causing the traffic signal controllers to drop from coordinated operations.

Station-to-station and end-to-end running times were estimated using a spreadsheet-based model. The model uses inputs for route characteristics (street running, semi-exclusive, and exclusive right-of-way), vehicle acceleration and deceleration rates, distances between stations, curve radii, and grade crossings. Based on the results of the running-time estimation, the one-way running time[4] for Alternative 2 would be 33 minutes. For Alternative 3, the one-way running time would be 28 minutes.

Tables 8-3 and 8-4 present station-to-station distances, one-way running times, and average operating speeds for Alternatives 2 and 3, respectively.

Table 8-3: Running Time Estimates – Alternative 2

From Passenger Station	To Passenger Station	Distance (Miles)	Run Time Without Dwell Time (Min.)	Average Operating Speed (mph)
Rosa Parks–Hempstead Transit Center	Clinton Street	0.4	2.3	9.6
Clinton Street	Warner Avenue	0.5	2.4	12.2
Warner Avenue	Oak Street	0.4	2.3	11.8
Oak Street	Hofstra University	0.3	1.1	14.3
Hofstra University	Nassau Veterans Memorial Coliseum	0.7	2.2	18.8
Nassau Veterans Memorial Coliseum	Mitchel Field	0.2	0.8	15.5
Mitchel Field	Nassau Community College-Museum Row	0.3	1.1	17.6
Nassau Community College - Museum Row	Nassau Community College North	0.4	1.5	17.4
Nassau Community College North	Stewart Avenue	0.3	1.4	14.9
Stewart Avenue	Merchants Concourse	0.5	1.9	15.2
Merchants Concourse	Source Mall	0.3	1.1	14.8
Source Mall	Zeckendorf Boulevard	0.3	0.7	24.3
Zeckendorf Boulevard	East Gate Boulevard	0.3	1.1	16.4
East Gate Boulevard	Roosevelt Field	0.3	1.4	13.3
Roosevelt Field	Voice Road	0.6	2.0	18.9
Voice Road	East 2nd Street	0.6	1.9	19.1
East 2nd Street	Front Street	0.7	3.7	11.4
Subtotals (without dwell)		**7.1**	**28.8**	**14.8**
Dwell Time			**4.0**	
Totals (with dwell)		**7.1**	**32.8**	**13.0**

Source: Jacobs, 2012.

[4] Based on the operating plans, running times in the opposite direction would be the same as presented for the one-way running times.

Table 8-4: Running Time Estimates – Alternative 3

From Passenger Station	To Passenger Station	Distance (Miles)	Run Time Without Dwell Time (Min.)	Average Operating Speed (mph)
Rosa Parks–Hempstead Transit Center	Clinton Street	0.4	2.3	9.6
Clinton Street	Warner Avenue	0.5	2.4	12.2
Warner Avenue	Oak Street	0.4	2.3	11.8
Oak Street	Hofstra University	0.3	1.1	14.3
Hofstra University	Nassau Veterans Memorial Coliseum	0.7	2.2	18.8
Nassau Veterans Memorial Coliseum	Nassau Community College -Museum Row	0.5	1.8	18.4
Nassau Community College - Museum Row	Railroad Avenue	0.4	1.3	19.3
Railroad Avenue	South Street	0.6	1.7	21.2
South Street	Roosevelt Field - South	0.3	1.7	12.4
Roosevelt Field - South	Roosevelt Field	0.4	0.7	36.0
Roosevelt Field	Voice Road	0.6	2.0	18.9
Voice Road	East 2nd Street	0.6	1.9	19.1
East 2nd Street	Front Street	0.7	3.7	11.4
Subtotals (without dwell)		**6.5**	**25.1**	**15.9**
Dwell Time			**3.0**	
Totals (with dwell)		**6.5**	**28.1**	**14.0**

Source: Jacobs, 2012.

8.1.4 Fleet Size Requirements

Based on the operating plans and the estimated ridership, it is anticipated that a single-vehicle train will accommodate the operations for both Alternatives 2 and 3. Using this projected demand, Alternative 2 would need a total of 12 vehicles. This includes 10 vehicles required for peak-period service at 10-minute headways and 2 spare vehicles (using a 15 percent spare ratio). For Alternative 3, a total of 10 vehicles would be needed. This includes 8 vehicles required for peak-period service at 10-minute headways and 2 spare vehicles (using a 15 percent spare ratio.)

8.1.5 Operating Statistics

Operating statistics were calculated based on the proposed operating plans for each alternative. The operating parameters and their corresponding operating statistics for Alternatives 2 and 3 are presented in Tables 8-5 and 8-6, respectively.

Table 8-5: Operating Statistics – Alternative 2

Operating Parameter	Operating Statistic	
Alignment Length (one-way)	7.1	route miles
Track Miles	14.2	track miles
End-to-End One-Way Run Time	32.8	minutes
Roundtrip Cycle Time during Peak Periods (Weekdays)	100	minutes
Roundtrip Cycle Time[1] during Off-Peak Periods (Weekdays)	120	minutes
Roundtrip Cycle Time during Weekends/Holidays	105	minutes
Peak-Period Headways (Weekdays)	10	minutes
Off-Peak-Period Headways (Weekdays)	15	minutes
Weekend Headways	15	minutes
Number of Days Per Year Service is Operated	365	days per year
Span of Service Weekdays (5:30 AM to 12 AM)	18.5	hours
Span of Service Weekends/Holidays (5:30 AM to 12 AM)	18.5	hours
Number of Peak Vehicles Required	10	vehicles
Spare Ratio (15% of Peak Vehicle Requirement)	2	spare vehicles
Total Fleet Size	12	vehicles
Number of Vehicles per Train for Peak-Period Service	1	vehicle
Number of Vehicles per Train for Off-Peak-Period Service	1	vehicle
Number of Vehicles per Train for Weekend/Holiday Service	1	vehicle
Total Number of Stations	18	stations
Total Revenue Train/ Vehicle Hours (Annual)	53,893	annual revenue train/vehicle hours
Total Revenue Train/ Vehicle Miles (Annual)	411,942	annual revenue train/vehicle miles
Number of Operators Required	29	operators
Spare Operator Ratio (10%)	3	operators
Total Number of Operators Required	32	operators

Source: Jacobs, 2012.

Note 1: Cycle time represents the time required for a transit vehicle to complete one round trip, including recovery time at both ends of the trip in each direction. Round-trip cycle time varies for peak, off-peak and weekend periods due to a variety of factors, including roadway congestion and the number of vehicles in revenue service.

Table 8-6: Operating Statistics – Alternative 3

Operating Parameter	Operating Statistic	
Alignment Length (one-way)	6.5	route miles
Track Miles	13.0	track miles
End-to-End One-Way Run Time	28.1	minutes
Roundtrip Cycle Time[1] during Peak Periods (Weekdays)	80	minutes
Roundtrip Cycle Time during Off-Peak Periods (Weekdays)	90	minutes
Roundtrip Cycle Time during Weekends/Holidays	90	minutes
Peak-Period Headways (Weekdays)	10	minutes
Off-Peak-Period Headways (Weekdays)	15	minutes
Weekend Headways	15	minutes
Number of Days Per Year Service is Operated	365	days per year
Span of Service Weekdays (5:30 AM to 12 AM)	18.5	hours
Span of Service Weekends/Holidays (5:30 AM to 12 AM)	18.5	hours
Number of Weekday Peak-Period Trains Required	8	
Number of Weekday Off-Peak-Period Trains Required	6	
Number of Weekend Trains Required	6	
Number of Peak Vehicles Required	8	vehicles
Spare Ratio (15% of Peak Vehicle Requirement)	2	spare vehicles
Total Fleet Size	10	vehicle
Number of Vehicles per Train for Peak-Period Service	1	vehicle
Number of Vehicles per Train for Off-Peak-Period Service	1	vehicle
Number of Vehicles per Train for Weekend/Holiday Service	1	vehicle
Total Number of Stations	14	stations
Total Revenue Train/ Vehicle Hours (Annual)	42,515	annual revenue train/ vehicle hours
Total Revenue Train/ Vehicle Miles (Annual)	377,130	annual revenue train/ vehicle miles
Number of Operators Required	23	operators
Spare Operator Ratio (10%)	2	operators
Total Number of Operators Required	25	operators

Source: Jacobs, 2012.

Note 1: Cycle time represents the time required for a transit vehicle to complete one round trip, including recovery time at both ends of the trip in each direction. Round-trip cycle time varies for peak, off-peak and weekend periods due to a variety of factors, including roadway congestion and the number of vehicles in revenue service.

8.2 BRT/Premium Bus – Alternatives 2A and 3A

8.2.1 Hours of Service and Service Frequency

The proposed hours of service and service frequency for Alternatives 2A and 3A would be the same as presented for Alternatives 2 and 3 in Section 8.1.1.

8.2.2 Operating Policies

Vehicle loading standards for Alternatives 2A and 3A were assumed to be the same as for Alternatives 2 and 3 (see Section 8.1.2). As for Alternatives 2 and 3, it was assumed for planning purposes that Alternative 2A's and Alternative 3A's passenger loads would not exceed LOS D and a load factor of 1.25 during the peak period. Table 8-7 summarizes the BRT/premium bus' vehicle capacity.

Table 8-7: BRT/Premium Bus Vehicle Capacity

Number of Seats in a Standard Articulated Bus	62
Level of Service for Passenger Load Level (not-to-exceed for planning purposes)	D
Peak Load Factor	1.25
Additional Standing Passengers	50
Total Passengers per Vehicle (seated and standing)	112

Source: Jacobs, 2012.

8.2.3 Running Time Estimates

The following assumptions were utilized to develop station-to-station running times for Alternatives 2A and 3A.

- Running times were developed by conducting speed runs along the proposed routing on multiple weekdays and Saturdays to determine the average travel time for general traffic. During the speed runs, an effort was made to drive at the speed of prevailing traffic. The average speed-run times, by time of day, were used as the basis for the listed running times. Dwell times were added and travel-time discounts were applied where priority bus treatments are proposed.
- Dwell times at stations were assumed to be 30 seconds.[5] Dwell time represents the time the BRT/premium bus spends stopped at a station while passengers board and alight from the vehicle.
- Where the BRT/premium bus service is proposed to travel through parking lots on the existing roadway adjacent to Michel Field and on the proposed transitway through Nassau Community College, the average travel speed was assumed to be 15 mph. On the proposed transitway adjacent to Transverse Drive, the speed-run time was used and a travel-time discount was applied.
- Proposed running times were verified against those on existing NICE Bus schedules for routes traveling along similar alignments.
- While it was assumed that all signalized intersections would have TSP, the running times did not include estimated discounts for the application of TSP because the detailed analysis of time savings for traffic signals necessary to do so was not performed during this phase of study; this analysis will be performed for the Locally Preferred Alternative (LPA) when it advances into engineering.

[5] The typical dwell time for bus vehicles is longer than for rail vehicles due to access configuration, the number of doors for boarding and alighting the vehicle, the height of vehicle boarding and, in some instances, on-board fare payment.

Because the BRT/premium bus service would travel mostly in general traffic, running times vary by time of day, weekday or weekend, and by direction. Station-to-station running times in the AM peak period from the Village of Hempstead to the Village of Mineola for Alternatives 2A and 3A, along with average operating speeds, are shown in Tables 8-8 and 8-9. Based on the results of the running-time estimation, the one-way running time for Alternative 2A would be 43 minutes. For Alternative 3A, the one-way running time would be 35 minutes.

Table 8-8: Running Time Estimates – Alternative 2A

From Passenger Station	To Passenger Station	Distance (Miles)	Run Time Without Dwell Time (Min)	Average Operating Speed (mph)
Rosa Parks–Hempstead Transit Center	Clinton Street	0.4	2.5	9.5
Clinton Street	Warner Avenue	0.5	2.6	11.4
Warner Avenue	Oak Street/Hofstra University	0.5	2.5	11.9
Oak Street/Hofstra University	Uniondale Avenue	0.5	1.6	19.2
Uniondale Avenue	Nassau Veterans Memorial Coliseum	0.5	1.7	17.9
Nassau Veterans Memorial Coliseum	Mitchel Field	0.2	0.9	13.6
Mitchel Field	Nassau Community College - Museum Row	0.4	1.2	19.8
Nassau Community College - Museum Row	Nassau Community College North	0.5	1.7	18.2
Nassau Community College North	Stewart Avenue	0.4	1.5	15.6
Stewart Avenue	Merchants Concourse	0.4	2.3	10.5
Merchants Concourse	Source Mall	0.3	1.2	14.9
Source Mall	Zeckendorf Boulevard	0.3	0.8	23.4
Zeckendorf Boulevard	East Gate Boulevard	0.4	1.7	14.1
East Gate Boulevard	Roosevelt Field - South	0.3	1.7	10.7
Roosevelt Field - South	Roosevelt Field - North	0.4	0.8	28.6
Roosevelt Field - North	Old Country Road	0.4	2.4	10.0
Old Country Road	Voice Road	0.5	1.3	22.7
Voice Road	East 2nd Street	0.5	2.1	14.3
East 2nd Street	Willis Avenue	0.5	1.5	19.8
Willis Avenue	Mineola Intermodal Center	0.6	1.9	17.4
Subtotals (without dwell)		**8.5**	**33.9**	**15.0**
Dwell Time			**9.5**	
Totals (with dwell)		**8.5**	**43.4**	**11.7**

Source: Jacobs, 2012.

Table 8-9: Running Time Estimates – Alternative 3A

From Passenger Station	To Passenger Station	Distance (Miles)	Run Time Without Dwell Time (Min)	Average Operating Speed (mph)
Rosa Parks–Hempstead Transit Center	Clinton Street	0.4	2.5	9.5
Clinton Street	Warner Avenue	0.5	2.6	11.4
Warner Avenue	Oak Street/Hofstra University	0.5	2.5	11.9
Oak Street/Hofstra University	Uniondale Avenue	0.5	1.6	19.2
Uniondale Avenue	Nassau Veterans Memorial Coliseum	0.5	1.7	17.9
Nassau Veterans Memorial Coliseum	Mitchel Field	0.2	0.9	13.6
Mitchel Field	Nassau Community College – Museum Row	0.4	1.2	19.8
Nassau Community College - Museum Row	Railroad Avenue	0.4	1.4	16.8
Railroad Avenue	South Street	0.6	2.0	17.6
South Street	Roosevelt Field - South	0.4	2.0	11.8
Roosevelt Field – South	Roosevelt Field - North	0.4	0.8	28.6
Roosevelt Field – North	Voice Road	0.4	2.4	10.0
Voice Road	East 2nd Street	0.5	2.1	14.3
East 2nd Street	Willis Avenue	0.5	1.5	19.8
Willis Avenue	Mineola Intermodal Center	0.6	1.9	17.4
Subtotals (without dwell)		**6.8**	**27.3**	**15.0**
Dwell Time			**7.5**	
Totals (with dwell)		**6.8**	**34.8**	**11.7**

Source: Jacobs, 2012.

8.2.4 Fleet Size Requirements

Based on the operating plans defined for Alternatives 2A and 3A, the number of buses required was calculated. For Alternative 2A, a fleet size of 12 buses would be needed. This includes 10 buses required for peak-period service at 10-minute headways and 2 spare buses (using a 15 percent spare ratio). For Alternative 3A, a fleet size of 10 buses would be needed. This includes 8 buses required for peak-period service at 10-minute headways and 2 spare buses (using a 15 percent spare ratio).

8.2.5 Operating Statistics

Operating statistics have been calculated based on the proposed operating plan for each alternative. The operating parameters and their corresponding operating statistics for Alternatives 2A and 3A are presented in Tables 8-10 and 8-11, respectively.

Table 8-10: Operating Statistics – Alternative 2A

Operating Parameter	Operating Statistic
Alignment Length (one-way)	8.5 route miles
End-to-End One-Way Run Time	43.4 minutes
Roundtrip Cycle Time[1] during Peak Periods (Weekdays)	113 minutes
Roundtrip Cycle Time during Off-Peak Periods (Weekdays, Saturday and Sunday)	123 minutes
Peak-Period Headways (Weekdays and Saturday)	10 minutes
Off-Peak-Period Headways (Weekdays, Saturday and Sunday)	15 minutes
Number of Days Per Year Service is Operated	365 days per year
Span of Service Weekdays (5:30 AM to 12 AM)	18.5 hours
Span of Service Weekends/Holidays (5:30 AM to 12 AM)	18.5 hours
Number of Peak-Period Buses Required	10 buses
Number of Off-Peak-Period Buses Required	7 buses
Number of Weekend Buses Required	7 buses
Spare Ratio (15% of Peak Bus Requirement)	2 spare buses
Total Fleet Size	12 buses
Total Number of Stations	21 stations
Total Revenue Vehicle Hours (Annual)	50,268 annual revenue hours
Total Revenue Vehicle Miles (Annual)	493,170 annual revenue miles
Number of Operators Required	27 operators
Spare Operator Ratio (10%)	3 operators
Total Number of Operators Required	30 operators

Source: Jacobs, 2012

Note 1: Cycle time represents the time required for a transit vehicle to complete one round trip, including recovery time at both ends of the trip in each direction. Round-trip cycle time varies for peak, off-peak and weekend periods due to a variety of factors, including roadway congestion and the number of vehicles in revenue service.

Table 8-11: Operating Statistics – Alternative 3A

Operating Parameter	Operating Statistic
Alignment Length (one-way)	6.8 route miles
End-to-End One-Way Run Time	34.8 minutes
Roundtrip Cycle Time during Peak Periods (Weekdays)	90 minutes
Roundtrip Cycle Time during Off-Peak Periods (Weekdays, Saturday and Sunday	110 minutes
Peak-Period Headways (Weekdays and Saturday)	10 minutes
Off-Peak Period Headways (Weekdays, Saturday and Sunday)	15 minutes
Number of Days Per Year Service is Operated	365 days per year
Span of Service Weekdays (5:30 AM to 12 AM)	18.5 hours
Span of Service Weekends/Holidays (5:30 AM to 12 AM)	18.5 hours
Number of Peak-Period Buses Required	8 buses
Number of Off-Peak-Period Buses Required	6 buses
Number of Weekend Buses Required	6 buses
Spare Ratio (15% of Peak Bus Requirement)	2 spare buses
Total Fleet Size	10 buses
Total Number of Stations	16 stations
Total Revenue Vehicle Hours (Annual)	42,515 annual revenue hours
Total Revenue Vehicle Miles (Annual)	394,536 annual revenue miles
Number of Operators Required	23 operators
Spare Operator Ratio (10%)	2 operators
Total Number of Operators Required	25 operators

Source: Jacobs, 2012.

9. Ridership

This section provides a summary of the methodology used to forecast potential future ridership for each of the Short-List Alternatives, a description of the alternatives' key characteristics pertaining to potential ridership, and the resulting key ridership statistics, including those that are pertinent to specific, key evaluation measures used in the Federal Transit Administration (FTA) project evaluation process.

9.1 Overview

When appropriate to satisfy program requirements for federal funding programs, the FTA encourages project sponsors to employ simplified, data-driven approaches to prepare a proposed project's ridership forecasts. A data-driven methodology was employed to estimate forecasted ridership for the Short-List Alternatives, using the 2010 Nassau Hub On-Board Origin-Destination (O/D) Survey and transit network procedures from the Metropolitan Transportation Authority (MTA) Regional Transit Forecasting Model (RTFM).

The change in transit level-of-service attributes (travel times and costs) was used with the 2010 (i.e., the most current) O/D survey data to estimate results for each alternative relative to specific FTA project-justification measures, including the number of project boardings and project boardings by transit-dependents, changes in automobile person trips and vehicle miles of travel, and the number of net new transit riders.

9.2 Forecasting Methodology

This section summarizes development of the RTFM transit network, processing of the on-board survey, development of the transit trip table and validation of the forecasting process by comparing results generated by the RTFM to the measured (i.e., observed) travel behaviors.

The following aspects of the forecasting methodology are described below:

- Transit network development
- Transit network/travel speed validation
- Refined zone system in Nassau Hub Study Area
- Nassau Hub on-board survey processing
- Preparation of trip tables for survey-based assignments
- Transit path-building/assignment parameters
- Survey assignment validation

9.2.1 Transit Network Development

The existing MTA RTFM 2010 bus networks within the Nassau Hub Study Area were updated for consistency with the 2010 Long Island Bus (LI Bus) schedules. This work included:

- The alignment for each bus route was checked and modified to match the fall 2010 schedules.
- Separate lines were coded to ensure representation of all the branches of a route shown in the schedule.
- The service frequencies were updated to reflect the scheduled headways. Two different service frequencies were coded in the MTA RTFM, for the peak period (6:00 AM – 10:00 AM) and the off-peak period (10:00 AM – 4:00 PM).

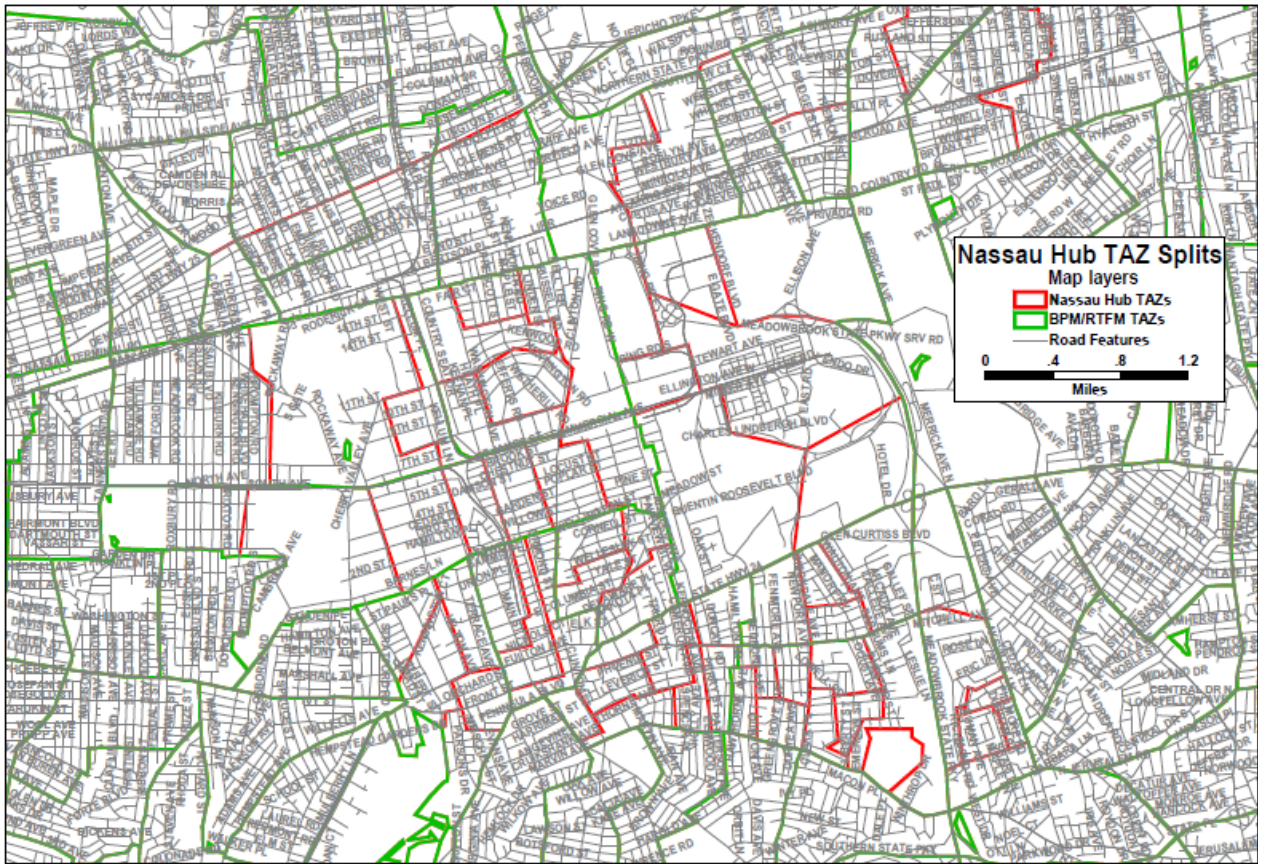
9.2.2 Transit Network/Travel Speed Validation

The MTA RTFM existing year (2010) bus travel times were updated for all routes that operate through the Study Area. The standard MTA RTFM uses generic speed relationships, which relate geographic area to stop-to-stop bus speeds. This approach was further enhanced by using fall 2010 MTA LI Bus schedules to match the time-check to time-check location. Effectively, this ensures that the model properly replicates stop-to-stop bus travel time for each route segment.

9.2.3 Refined Zone System in Nassau Hub Area

A traffic analysis zone (TAZ) is a discrete geographic area used to represent an activity center within the Study Area. For the purpose of providing a greater degree of resolution and geographic specificity for locating activity centers and for the forecasting process, TAZs were split, based on U.S. Census Block Groups and aggregations of Block Groups. The survey-derived trip tables (see Section 9.2.5) were then geo-coded to this revised TAZ system (Figure 9-1).

Figure 9-1: Map Illustrating Nassau Hub Traffic Analysis Zone Splits



Source: AECOM, 2012

Note: BPM refers to the New York Metropolitan Transportation Council (NYMTC) Best Practice Model. The BPM and the RTFM have identical TAZs.

9.2.4 Nassau Hub On-Board Survey Processing

The on-board survey conducted of Nassau County's bus system in fall 2010 was processed to develop a 2010 trip table representing existing demand for bus service. The survey was geo-coded to the enhanced

Study Area TAZs at the origin and destination trip ends using the latitude and longitude information coded in the survey. The resulting trip table was converted to production/attraction formation where the production was located based on the home end of the trip. Based on the availability of information, each record in the survey was tabulated by the following fields:

- Nassau Hub production TAZ
- Nassau Hub attraction TAZ
- Mode of access at production end:
    1. Walk
    2. Auto access (park-and-ride and kiss-and-ride)
- Time of day, selected to match the peak and off-peak period levels of service in order to align service frequency and travel times with customer experience:
    1. Peak period
        a. AM peak (6:00 AM – 10:00 AM)
        b. PM peak (3:00 PM – 7:00 PM)
    2. Off-peak period
        a. Midday (10:00 AM – 3:00 PM)
        b. Evening (7:00 PM – 6:00 AM)
- Linked-trip weight

The small number of survey records that could not be geo-coded was excluded and the survey was re-weighted to match the control totals by bus route. Linked-trip (i.e., number of trips from origin to destination, excluding transfers) weights were calculated by dividing the total unlinked-trip (i.e., boarding-based) weights by the number of transfers involved in the trip. Table 9-1 presents the resulting linked trips by period, purpose and access mode.

Table 9-1: Average Weekday Linked Trips by Time Period, Purpose and Mode of Access

Linked Trips by Time-of-Day and by Mode-of-Access (Linked Trips = Unlinked Trips/(Transfers+1))

Mode of	Peak (6-10am, 3-7pm)				Off-peak (10am-3pm, 7pm-6am)				Total			
Access	HBW	HBO	NHB	Total	HBW	HBO	NHB	Total	HBW	HBO	NHB	Total
Walk	17,362	5,041	6,302	28,705	15,545	10,065	7,586	33,195	32,907	15,106	13,888	61,901
PNR	681	60	277	1,018	686	251	378	1,316	1,367	311	655	2,333
KNR	235	48	52	335	81	320	134	535	316	368	186	870
Total	18,278	5,149	6,630	30,058	16,311	10,636	8,099	35,046	34,590	15,786	14,729	65,104

Source: AECOM, 2012
Notes:
KNR – Kiss-and-Ride/Drop off
PNR – Park-and-Ride
HBW – Home-Based Work
HBO – Home-Based Other
NHB – Non-Home Based

9.2.5 Preparation of Trip Tables for Survey-Based Assignments

The survey linked trips were consolidated into a trip matrix of production-to-attraction flows in TAZ-to-TAZ format with the following tables, stratified by time of day and mode of access:

- Peak period – walk to bus
- Peak period – PNR to bus
- Off-peak period – walk to bus
- Off-peak period – PNR to bus

These survey-based trip tables were then used as input to the assignment process.

9.2.6 Transit Path-Building/Assignment Parameters

A Study Area variant of the MTA RTFM was created for the purpose of representing the local Nassau Hub travel market. This was done by updating the RTFM path-building parameters using the results of the Nassau Hub Stated Preference (SP) survey. A SP survey asks system users and non-users how they would make mode choices given differing levels of travel time and costs. Through statistical analysis of the collected data, relationships among the various components of travel time (e.g., in-vehicle, waiting and walking time; transfers; etc.) and costs can be established.

The SP survey was conducted to ensure that the MTA RTFM model parameters, developed originally to simulate travel behavior to/from New York City, are applicable for travel to and from the Nassau Hub. This survey confirmed that many of the relationships in the existing RTFM are applicable to travelers in the Nassau Hub.

The one material adjustment made to the RTFM, due to findings of the SP survey, was the use of a larger transfer penalty (5 minutes for the first and 10 minutes for the second transfer) for local Nassau Hub transit travel. This is both logical and intuitive, as the transfer penalties in the original RTFM were set based on MTA-New York City Transit transferring activity (i.e., where cross-platform transfers exist). The resulting transfer penalty obtained from the SP research is very consistent with transfer penalties used nationally for suburban bus operators. The transit-network and path-building parameters of the RTFM were adjusted to match the observed ridership patterns. During this process, minor adjustments were made to the MTA RTFM transit path-building and -assignment procedures.

The transit path-building and -assignment routines were calibrated in the RTFM by calibrating the variable weights to best reflect the observed boardings. This process started with the existing RTFM transit weights on variables, implemented the findings from the SP survey (penalty for transfers) and confirmed that the resulting assignments matched observed travel patterns. The path-building parameters and weight factors included in-vehicle travel time, out-of-vehicle time, waiting time and transfer penalties; the weight factors convert the parameters to equivalent minutes of in-vehicle travel time. The following key parameters were applied during the path-building process:

- Walk speed – 3 miles per hour (mph)
- Transfer penalty – 6 minutes per transfer
- In-vehicle-time weight factor – 1.0
- Waiting-time weight factor– 1.5
- Transfer-wait weight factor – 1.5
- Walk-time weight factor – 1.5
- Drive-time weight factor– 2.0

When the transit path-building and -assignment parameters listed above were implemented, the transit trip tables (Section 9.2.5) were found to mimic the observed travel patterns with a fairly high degree of accuracy.

9.2.7 Survey Assignment Validation

An important element of the validation of the transit path-building and -assignment weights is to ensure that selected path-weights mimic the observed travel patterns. Table 9-2 shows a comparison of AM peak-period (6:00-10:00 AM) survey boardings and the survey assignment.

Table 9-2: AM Peak-Period (6-10 AM) Nassau County Bus Boardings by Route (Survey Boardings versus Validated Model Boardings)

Bus Route	Survey AM Peak Period Boardings	Modeled AM Peak Period Boardings
6	2,843	2,833
15	1,552	1,275
16	760	502
22	2,400	3,236
23	714	514
24	1,557	1,088
27	493	631
32/31	1,814	1,555
40/41	2,176	2,042
43	374	925
45	230	449
46/47	161	252
49/48	782	367
50	70	74
51	23	1
54/55	299	442
72/71/70	1,699	2,107
79/78	1,468	840
Total	**19,415**	**19,133**

Source: AECOM 2012

The existing Nassau County bus system in the vicinity of the Nassau Hub Study Area makes it nearly impossible to match route-level assignments within the RTFM because many routes operate in the Study Area in an overlapping fashion, that is, multiple routes and route groups operate within a given corridor. The approach for validating the route-level assignments is important to ensure that the heavily utilized bus routes (i.e., with thousands of AM peak-period boardings) and bus routes with moderate ridership (i.e., several hundred AM peak-period boardings) and the overall number of boardings in the model closely match the survey results.

9.3 Evaluation of Nassau Hub Alternatives

Forecast-year (2035) estimates of ridership were developed for the four Short-List Alternatives. These forecasts were produced during the period between the release of the Notice of Proposed Rule Making (NPRM) (January 2012) and the final rule under the Moving Ahead for Progress in the 21st Century Act (MAP-21) (August 2013). During this period, there were several changes to the project evaluation criteria for New Starts/Small Starts projects. With this transition period in mind, the Short-List Alternatives were evaluated using the following approach:

Step 1 – Grow the 2010 Survey to Represent Year 2035 Conditions

In Step 1, the 2010 on-board survey data were grown to represent opening- and forecast-year conditions. This was done by scaling the base-year (2010) transit on-board survey trip table to represent year 2035 conditions. This was done by applying estimates of forecasted growth in TAZ-level population and employment in the Study Area, as adopted by the New York Metropolitan Transportation Council (NYMTC).

Step 2 – Code Service Plans and Travel Times for Each Alternative

In Step 2, the alternatives' characteristics were coded into the refined RTFM forecasting tool including the service plans and travel times for each of the alternatives, as follows:

- **Year 2035 No-Build Alternative –** This alternative represents transit service within the Study Area without a Nassau Hub transit-improvement investment. It starts with the 2010 base-year representation of the transit network and includes programmed and committed changes (e.g., the Long Island Rail Road's East Side Access project) that would occur between 2010 and the opening and forecast year (2035).
- **Year 2035 Build Alternatives –** These alternatives represent the Nassau Hub build options. In addition to the programmed/committed projects included in the No-Build Alternative, each of these alternatives (i.e., Short-List Alternatives) includes the transit-improvement project elements described in Section 6.1.

The key issue in the development of the ridership estimates was the transit travel times within the Study Area. The FTA will consider travel-time savings for the Nassau Hub investment from two different sources. The first source is the physical improvements with the proposed project (guideway, dedicated running ways and off-board fare collection), which yield *measured improvements* to transit travel times. The second source of travel-time savings, which FTA categorizes as "Alternative Specific Effects" (ASE), assigns travel-time improvements to the *perceived improvements* (enhanced vehicles, station amenities, ride quality, branding and visibility that increase transit utilization). The purpose of ASEs is to capture the equivalent travel-time benefits associated with the perceived improvements. The ASEs were embedded in this analysis consistent with FTA guidance.

Step 3 – Estimate the Transit Impedance for Each Alternative

In Step 3, the resulting measured transit travel times and costs, often referred to as impedances, were derived for each coded alternative by running the enhanced RTFM transit path-building process (described in Section 9.2.6). Following that, a transit-impedance score was developed for all origin-destination TAZ pairs in the region for each of the alternatives. A TransCAD GISDK script was written to

write out the transit impedance (consistent with the path-weights described above) using the calibrated impedances:

Transit Impedance =

- 1.0 * Measured Transit In-Vehicle Travel Time (IVTT) (minutes)+
- 1.5 * Measured Transit Waiting Time (minutes) +
- 1.5 * Measured Walking Time (minutes) +
- 2.0 * Measured Drive Time (minutes, if a drive path) +
- 6.0 minutes * Number of Transfers

Step 4 – Estimate the Ridership for the Year 2035 No-Build Alternative

In this step, the "grown" opening- and forecast-year trip tables were assigned to the No-Build networks in the enhanced RTFM Nassau Hub forecasting tool. The resulting boardings by route were summarized and presented as the No-Build volumes.

Step 5 – Estimate Ridership for the Short-List Alternatives

In Step 5, the ridership for the four Short-List Alternatives were estimated. Because these alternatives represent another incremental improvement to transit service within the Study Area, an arc midpoint elasticity of -0.7 on transit impedance was applied to estimate the new riders generated by the given alternative. For the purposes of estimating the alternatives' ridership, the 2035 baseline trip table and the new trips estimated via elasticity were added together to create a 2035 build-alternative trip table. The resulting build-alternative trip table was assigned to the 2035 build-alternative network.

In addition to the "measured" impacts to travel time, non-measured impacts (i.e., ASEs) were represented. These ASEs include the impacts of "non-measured" effects of premium transit service, including:

- Dedicated running lanes/reliability of vehicle arrival
- Improved transit vehicles
- Branding/visibility
- Schedule-free service
- High-quality station stops with dynamic schedule information

FTA generally allows for a two-tiered benefit for trips using premium transit in the build alternative. These benefits include:

- An in-vehicle travel time discount (5 to 20 percent depending on mode) for improved vehicles and associated ride quality
- A constant travel-time benefit, which represents the unmeasured attributes of premium transit service

For the purpose of evaluating the Short-List Alternatives, application of the following ASEs was discussed with FTA in late 2012:

- Modern streetcar alternatives:
  - 10 percent IVTT travel discount
  - 7 minutes of constant effect (i.e., 7 minutes of travel-time savings) for modern streetcar-only trips

  - 2 minutes of constant effect (i.e., 2 minutes of travel-time savings) for modern streetcar trips also using local bus

- BRT/premium bus alternatives:
  - 5 percent IVTT travel discount
  - 5 minutes of constant effect (i.e., 5 minutes of travel-time savings) for BRT/premium bus only trips
  - 2 minutes of constant effect (i.e., 2 minutes of travel-time savings) for BRT/premium bus trips also using local bus

9.4 Year 2035 Alternative Definitions

The following alternatives, as described in Section 9.3, were evaluated using the forecasting methodology described above.

Year 2035 No-Build – This alternative includes a representation of transit service within the Study Area without a Nassau Hub investment. It starts with the 2010 base year representation of the transit network and includes committed changes programmed to occur between 2010 and the opening and forecast years. This alternative also includes the service changes that were made as part of the conversion of service from MTA LI Bus to Veolia-operated Nassau Inter County Express (NICE) Bus, effective January 1, 2012. This alternative serves as the basis of comparison to evaluate the performance of the build alternatives.

Year 2035 Build Alternative 2 – This alternative is identical to the 2035 No-Build alternative with the exception that the modern streetcar is constructed and operated between the Mineola Intermodal Center, Carle Place, Roosevelt Field, Source Mall and the Rosa Parks–Hempstead Transit Center. With Alternative 2, the existing local bus service was modified to eliminate duplicative service along the modern streetcar alignment. These changes include:

- N15 – truncated in Village of Mineola
- N16 – truncated in Village of Hempstead
- N22/N22A/N24 – eliminated the section through Roosevelt Field, focused service on Old Country Road
- N23 – truncated in Village of Mineola

The modeled station-to-station travel times are summarized in Table 8-3.

Year 2035 Build Alternative 3 – This alternative is identical to the 2035 No-Build alternative with the exception that the modern streetcar is constructed and operated between the Mineola Intermodal Center, Carle Place, Roosevelt Field, and the Rosa Parks–Hempstead Transit Center. With Alternative 3, the existing local bus service represented in the refined RTFM was modified to eliminate duplicative transit service along the modern streetcar alignment. These changes include:

- N15 – truncated in Village of Mineola
- N16 – truncated in Village of Hempstead
- N22/N22A/N24 – eliminated the section through Roosevelt Field, focused service on Old Country Road
- N23 – truncated in Village of Mineola

The modeled station-to-station travel times are summarized in Table 8-4.

Year 2035 Build Alternative 2A – This alternative is identical to the year 2035 Build Alternative 2 with the exception that the modern streetcar is replaced with a BRT/premium bus service. As with the year 2035 Build Alternative 2, the existing local bus service represented in the refined RTFM was modified to eliminate duplicative transit service along the BRT/premium bus alignment. The station-to-station travel times are summarized in Table 8-8.

Year 2035 Build Alternative 3A – This alternative is identical to the year 2035 Build Alternative 3 with the exception that the modern streetcar is replaced with a BRT/premium bus service. As with the year 2035 Build Alternative 3, the existing local bus service represented in the refined RTFM was modified to eliminate duplicative transit service along the BRT/premium bus alignment. The station-to-station travel times are summarized in Table 8-9.

9.5 Ridership Results

The key ridership statistics are summarized in Table 9-3.

Table 9-3: Year 2035 Summary of Key Ridership Forecasting Statistics by Alternative

	Alternative 2	Alternative 3	Alternative 2A	Alternative 3A
	Modern Streetcar	Modern Streetcar	BRT/Premium Bus	BRT/Premium Bus
	Mineola to Hempstead via Source Mall	Mineola to Hempstead via South Street	Mineola to Hempstead via Source Mall	Mineola to Hempstead via South Street
Annual non-transit dependent trips	1,220,000	1,281,000	793,000	878,400
Annual transit dependent trips	780,000	819,000	507,000	561,600
FTA mobility measure (trips on the Project: + [transit dependent trips * 2]), Annual	2,780,000	2,919,000	1,807,000	2,002,000
Number of trips accessing by walking, bicycling, carpool and other travel demand management methods	2,000,000	2,100,000	1,310,200	1,440,000
Daily project boardings	6,700	7,000	4,400	4,800
Daily diversions in automobile person trips	600	600	400	400
Annual project boardings	2,000,000	2,100,000	1,300,000	1,440,000
Annual passenger miles	4,878,179	5,030,000	3,750,000	3,460,000
Annual revenues (for farebox recovery calc.)	$3,080,000	$3,234,000	$2,002,000	$2,218,000
Annual reduction in vehicle miles traveled (VMT)	442,000	432,000	347,000	289,000

Source: AECOM, 2012

The summary results provided in Table 9-3 reveal that Alternative 3 has the highest predicted number of riders, which is a key factor in the overall alternatives screening evaluation process for selection of the Locally Preferred Alternative (LPA).

10. Capital Cost

This Section presents the capital cost estimates for the Short-List Alternatives. It summarizes the capital cost estimate structure and development, cost categories, quantities of materials, unit-cost data sources, contingencies and finance charges. The capital cost estimates for Alternatives 2, 3, 2A and 3A are order-of-magnitude in nature, developed for the purpose of comparing the alternatives. The estimates are based on the preliminary, concept-level design plans developed for the alternatives, appropriate for the Alternatives Analysis (AA) phase of project planning. Detailed cost analysis will be required during subsequent phases of project planning for the Locally Preferred Alternative (LPA).

10.1 Cost Estimate Structure and Development

Capital cost estimates for the four Short-List Alternatives were based on the concept-level designs developed for each alternative. Consistent with Federal Transit Administration (FTA) guidance and Standard Cost Category (SCC) structure,[1] a three-step process was employed to develop the capital cost estimates: 1) the quantities of materials needed to support each alternative were estimated, 2) unit costs were applied to arrive at a total estimated subtotal cost, and 3) contingencies were allocated across each category's subtotal cost.

Contingencies are intended to account for unforeseen items of work, quantity fluctuations, and variances in unit costs that develop as the project progresses through the various stages of development. The level of contingency applied to each cost category reflects the relative potential variability of those costs. Capital costs were developed in present-year (2012) dollars. As a specific build year has not been determined, mid-point of construction capital cost estimates has not yet been developed.

Therefore, the calculation of the total concept-level capital cost estimate for each alternative is as follows:

Capital Cost = Quantity of Materials x Unit Cost + Contingency

10.2 Cost Categories

10.2.1 Standard Cost Categories

Accurate capital costs are vital to the financial planning of the proposed project and allow the project to be seamlessly integrated into the FTA's New Starts/Small Starts program. Costs were determined based on each alternative's physical characteristics and required quantities of structures, equipment and other materials. Costs were organized according to the set of 10 SCCs described by the FTA. Due to the concept level of design of the Short-List Alternatives, project contingencies and allowances were also applied to capture the costs of unknown or unquantifiable items at this stage of project development so that the estimates reflect complete project costs. As the proposed project advances to future stages of design and the level of detail becomes more refined, the estimates of capital costs will also be refined.

10.2.2 Category Detail

Table 10-1 identifies the 10 capital cost categories, organized according to the FTA's SCC structure. Applicable cost categories from Table 10-1 were used for the capital cost estimates.

[1] *FTA Standard Cost Categories for Capital Projects Workbook*, Rev. 14, August 5, 2011.

Table 10-1: FTA Standard Cost Category Estimate Structure

Mode	Description
10: GUIDEWAY & TRACK ELEMENTS	
General (Modern Streetcar & BRT/Premium Bus)	Guideway grading and drainage; retaining walls; bridges and tunnels
Modern Streetcar	Trackwork
Bus Rapid Transit (BRT)/ Premium Bus	Roadway construction
20: STATIONS, STOPS, TERMINALS, INTERMODAL	
General (Modern Streetcar & BRT/Premium Bus)	Enclosures, canopies and fixtures; elevators, escalators and stairs; multi-story auto parking structures and passenger transfer facilities
Modern Streetcar	Modern Streetcar stations
BRT/ Premium Bus	BRT/Premium Bus stations
30: SUPPORT FACILITIES: YARDS, SHOPS, ADMIN. BLDGS	
General (Modern Streetcar & BRT/Premium Bus)	Maintenance facility; midday layover facility; administration and/or operations buildings
Modern Streetcar	Overnight layover facility; yard track
40: SITEWORK & SPECIAL CONDITIONS	
General (Modern Streetcar & BRT/Premium Bus)	Demolition, clearing, and earthwork; utilities and utility relocation; site remediation; environmental mitigation; noise mitigation; site structures; access roadways; temporary facilities required during construction phase; surface parking lots at stations; pedestrian and bicycle accommodations; landscaping, fencing and lighting
50: SYSTEMS	
General (Modern Streetcar & BRT/Premium Bus)	Roadway protection; communication systems; dispatching system and software; fare collection
Modern Streetcar	Train control signal systems; grade crossing signals; overhead catenary
BRT/ Premium Bus	Signal priority system
60: RIGHT-OF-WAY, LAND, EXISTING IMPROVEMENTS	
General (Modern Streetcar & BRT/Premium Bus)	Acquisition of right-of-way or easements for guideway, stations; relocation of existing households and businesses
70: VEHICLES	
General (Modern Streetcar & BRT/Premium Bus)	Non-revenue vehicles; spare parts
Modern Streetcar	Modern streetcar vehicles
BRT/ Premium Bus	BRT/premium buses
80: PROFESSIONAL SERVICES (applies to Cats. 10-50)	
General (Modern Streetcar & BRT/Premium Bus)	Preliminary engineering; final design; project management for design and construction; construction administration and management; professional liability and other non-construction insurance; legal; permits; review fees by other agencies, cities, etc.; surveys; testing; investigation; inspection; startup
90: UNALLOCATED CONTINGENCY	
Overall Project contingency and reserves	
100: FINANCE CHARGES	
General (Modern Streetcar & BRT/Premium Bus)	This category includes the finance charges to pay the interest on the bonds used to finance the project, where necessary.

Source: *FTA Standard Cost Categories for Capital Projects Workbook*, Rev. 14, August 5, 2011.
Note: For purposes of this Study and capital cost estimate, modern street car stations are assumed to have the identical characteristics as BRT/premium bus stations.

10.3 Quantity of Materials

10.3.1 Modern Streetcar Alternatives 2 and 3

Guideway and Track Elements

The capital cost for the guideway for the modern streetcar Alternatives 2 and 3 consists of the cost for right-of-way and track construction. The alignment for Alternative 2 is 7.1 miles in length, extends from the Village of Mineola to the Village of Hempstead and serves the Source Mall area. The alignment is primarily two tracks except in the vicinity of the Village of Mineola terminal, where a primarily one-way loop is assumed, as well as a short one-track section in the vicinity of East Gate Boulevard to Zeckendorf Boulevard and in a section of Hempstead Turnpike.

The modern streetcar would operate generally in mixed traffic with its alignment sharing the travel lanes on roadways in the Village of Mineola, Carle Place, and the Village of Hempstead. Exclusive right-of-way is assumed for Alternative 2's guideway in the following locations:

- Adjacent to the Meadowbrook State Parkway in Carle Place
- Under the Long Island Rail Road (LIRR) Main Line embankment
- Elevated over Old Country Road through the Roosevelt Field property, stopping at an elevated station in Roosevelt Field and crossing over the Meadowbrook State Parkway
- Through the majority of the Source Mall area on former rail right-of-way (including the one-track segment between East Gate and Zeckendorf Boulevards) and available land on either side of roadways using landscaped roadway medians to provide a semi-exclusive right-of-way
- Through Nassau Community College and the Nassau Veterans Memorial Coliseum property
- Along Hempstead Turnpike, along the north side of the curb lane, to Oak Street
- Along Fulton Avenue in the Village of Hempstead using curb lanes
- In a center median lane of Hempstead Turnpike/Fulton Avenue between Oak Street and Hendrickson Avenue
- In a center median lane of Hempstead Turnpike/Fulton Avenue between California Avenue and Clinton Street

The alignment for Alternative 3 is 6.5 miles in length and extends from the Village of Mineola to the Village of Hempstead. It follows the same routing as described, above, for Alternative 2 from the Village of Mineola to Roosevelt Field, except that the Source Mall area would not be served. The modern streetcar would operate generally in mixed traffic with its alignment sharing the travel lanes on roadways in the Village of Mineola, Carle Place, and the Village of Hempstead. Exclusive right-of-way is assumed for Alternative 3's guideway in the following locations:

- Adjacent to the Meadowbrook State Parkway in Carle Place
- Under the LIRR Main Line embankment
- Elevated over Old Country Road through the Roosevelt Field property, stopping at an elevated station in Roosevelt Field, continuing elevated south from within the western edge of the Meadowbrook

State Parkway right-of-way, crossing over Zeckendorf Boulevard, and along the western edge of the retention basin at Ring Road East and South Street

- At-grade in exclusive right-of-way eastbound on the north side of South Street and continuing southbound on the west side of Quentin Roosevelt Boulevard.
- At-grade in exclusive right-of-way eastbound onto the south side of Charles Lindbergh Boulevard continuing to Museum Row and the Nassau Community College West Campus using the campus parking lots
- At-grade in exclusive right-of-way south past the Nassau Community College Physical Education Complex, using the parking lots and vacant land, crossing Charles Lindbergh Boulevard to access the Nassau Veterans Memorial Coliseum
- Along Hempstead Turnpike, along the north side of the curb lane, to Oak Street
- Along Fulton Avenue in the Village of Hempstead using curb lanes
- In a center median lane of Hempstead Turnpike/Fulton Avenue between Oak Street and Hendrickson Avenue
- In a center median lane of Hempstead Turnpike/Fulton Avenue between California Avenue and Clinton Street

Stations

Alternative 2 assumes 18 modern streetcar stations at the following locations (all stops have 1 station serving both directions of travel unless otherwise noted):

- Front Street
- East 2nd Street (2 stations)
- Voice Road
- Roosevelt Field
- East Gate Boulevard
- Zeckendorf Boulevard
- Source Mall
- Merchants Concourse
- Stewart Avenue (2 stations/stops)
- Nassau Community College North
- Nassau Community College-Museum Row (2 stations)
- Mitchel Field
- Nassau Veterans Memorial Coliseum
- Hofstra University
- Oak Street (2 stations)
- Warner Avenue (2 stations)
- Clinton Street
- Rosa Parks–Hempstead Transit Center

Alternative 3 assumes 14 modern streetcar stations at the following locations (all stops have 1 station for both directions unless otherwise noted):

- Front Street
- East 2nd Street (2 stations)
- Voice Road
- Roosevelt Field
- Roosevelt Field - South
- South Street
- Railroad Avenue
- Nassau Community College-Museum Row (2 stations)
- Nassau Veterans Memorial Coliseum
- Hofstra University
- Oak Street (2 stations)
- Warner Avenue (2 stations)
- Clinton Street
- Rosa Parks–Hempstead Transit Center

Support Facilities

Capital costs for a vehicle base facility to accommodate 12 modern streetcars for Alternative 2 and 10 modern streetcars for Alternative 3 were assumed. A candidate vehicle base facility location at Axinn Avenue was assumed for Alternative 2 and a candidate location at South Street was assumed for Alternative 3.

Sitework and Special Conditions

Capital costs for demolition, clearing, earthwork, utility relocation, hazardous materials removal/mitigation, ground water treatments and environmental mitigation[2] were included for both modern streetcar Alternatives 2 and 3. The cost for shifting or relocating the jogging/bike paths along Charles Lindbergh Boulevard to accommodate an exclusive transit right-of-way for the modern streetcar alternatives was also included.

Systems

Costs for modification to existing traffic signals, installing new traffic signals and implementing traffic signal prioritization for Alternative 2 included:

- Existing signal modification:
  1. Roslyn Road at East 2nd Street
  2. Corporate Drive at Merchants Concourse
  3. Stewart Avenue at Merchants Concourse
  4. Endo Boulevard at Miller Avenue

[2] Detailed environmental analysis, on the basis of which environmental mitigation costs can be estimated, has not yet been performed. An order-of-magnitude budget for this item has been included in the capital cost estimates for all alternatives.

5. Earl Ovington Boulevard at Quentin Roosevelt Boulevard
6. Hempstead Turnpike at Oak Street

- New signals:
  1. Front Street East
  2. Front Street West
  3. 3rd Street at Main Street
  4. Willis Avenue at 3rd Street North
  5. Willis Avenue at 3rd Street South
  6. Roslyn Road at 3rd Street
  7. Voice Road
  8. Glen Cove Road
  9. East Gate Boulevard
  10. Charles Lindbergh Boulevard at Nassau Community College
  11. Hempstead Turnpike at Uniondale Avenue
  12. Hempstead Turnpike at Hofstra Boulevard
  13. Hempstead Turnpike at Peninsula Boulevard
  14. Jackson Street at Station Plaza
- Signal prioritization: Jackson Street at Washington Street

Costs for traffic signal improvements and modifications for Alternative 3 included:

- Existing signal modification:
  1. Roslyn Road at East 2nd Street
  2. Corporate Drive at Merchants Concourse
  3. Stewart Avenue at Merchants Concourse
  4. Endo Boulevard at Miller Avenue
  5. Earl Ovington Boulevard at Quentin Roosevelt Boulevard
  6. Hempstead Turnpike at Oak Street
- New signals:
  1. Front Street East
  2. Front Street West
  3. 3rd Street at Main Street
  4. Willis Avenue at 3rd Street North
  5. Willis Avenue at 3rd Street South
  6. Roslyn Road at 3rd Street
  7. Voice Road
  8. Glen Cove Road
  9. East Gate Boulevard

10. Charles Lindbergh Boulevard at Nassau Community College
11. Hempstead Turnpike at Uniondale Avenue
12. Hempstead Turnpike at Hofstra Boulevard
13. Hempstead Turnpike at Peninsula Boulevard
14. Jackson Street at Station Plaza

- Signal prioritization: Jackson Street at Washington Street

Costs for eight electric substations for Alternative 2 and seven substations for Alternative 3 were included, as were catenary costs along the length of both alignments.

Costs for communications were included for both modern streetcar alternatives for the length of each alignment, at all stations and on vehicles. Fare-collection equipment was assumed at all stations. Cost for a central control center was assumed for both alternatives.

Right-of-Way

The cost for the purchase of real estate for Alternatives 2 and 3 comprises any privately owned or municipally owned right-of-way, including lands belonging to the state, and any and all buildings that would need to be demolished to clear way for the track.

Vehicles

The purchase of 12 modern streetcars vehicles was assumed for Alternative 2 and 10 modern streetcars was assumed for Alternative 3 (see Section 8.1.4).

10.3.2 BRT/Premium Bus Alternatives 2A and 3A

Guideway and Track Elements

The capital costs for the guideway elements for BRT/premium bus Alternatives 2A and 3A consist of the costs for roadway construction. The guideway for Alternative 2A from the Village of Mineola to the Village of Hempstead has an outbound alignment that is 8.5 miles in length, an inbound alignment that is 8.1 miles in length, and serves the Source Mall area. The majority of the alignment, approximately 6.5 miles of the guideway, would be at-grade in mixed traffic. Approximately 2.0 miles of the guideway would be at-grade, dedicated BRT/premium bus right-of-way at the following locations:

- Connecting the dead ends of East 2nd Street and Voice Road in the Village of Mineola[3]
- At Roosevelt Field for inbound buses across Ring Road North
- In the Source Mall area on the south side of Transverse Drive
- Through Nassau Community College and the Nassau Veterans Memorial Coliseum property
- In a center median lane of Hempstead Turnpike/Fulton Avenue between Oak Street and Hendrickson Avenue
- In a center median lane of Hempstead Turnpike/Fulton Avenue between California Avenue and Clinton Street

[3] This concept will require additional coordination with the Village of Mineola.

The guideway for Alternative 3A from the Village of Mineola to the Village of Hempstead has an alignment that is 6.8 miles in length. The majority of the alignment, approximately 5.0 miles of the guideway, would be at-grade in mixed traffic. Approximately 1.8 miles of the guideway would be at-grade, dedicated BRT/premium bus right-of-way at the following locations:

- Connecting the dead ends of East 2nd Street and Voice Road in the Village of Mineola[4]
- At Roosevelt Field for inbound buses across Ring Road North
- From South Street on the south side of Charles Lindbergh Boulevard to the entrance of Museum Row for the outbound alignment
- Through Nassau Community College and the Nassau Veterans Memorial Coliseum property
- In a center median lane of Hempstead Turnpike/Fulton Avenue between Oak Street and Hendrickson Avenue
- In a center median lane of Hempstead Turnpike/Fulton Avenue between California Avenue and Clinton Street

Stations

Alternative 2A assumes 21 BRT/premium bus station/stops at the following locations (all would have two separate stations/stops, one for each direction of travel, unless otherwise noted):

- Mineola Intermodal Center (1 station/stop only)
- Willis Avenue
- East 2nd Street
- Voice Road
- Old Country Road
- Roosevelt Field – North (1 station/stop only)
- Roosevelt Field – South
- East Gate Boulevard
- Zeckendorf Boulevard
- Source Mall
- Merchants Concourse
- Stewart Avenue
- Nassau Community College North
- Nassau Community College-Museum Row
- Mitchel Field (1 station/stop only)
- Nassau Veterans Memorial Coliseum

[4] This concept will require additional coordination with the Village of Mineola.

- Uniondale Avenue
- Oak Street/Hofstra University
- Warner Avenue
- Clinton Street
- Rosa Parks–Hempstead Transit Center (1 station/stop only)

Alternative 3A assumes 16 BRT/premium bus stations/stops at the following locations (all would have two separate stations/stops, one for each direction of travel, unless otherwise noted):

- Mineola Intermodal Center (1 station/stop only)
- Willis Avenue
- East 2nd Street
- Voice Road
- Roosevelt Field – North (1 station/stop only)
- Roosevelt Field – South
- South Street
- Railroad Avenue
- Nassau Community College-Museum Row
- Mitchel Field
- Nassau Veterans Memorial Coliseum (1 station/stop only)
- Uniondale Avenue
- Oak Street/Hofstra University
- Warner Avenue
- Clinton Street
- Rosa Parks–Hempstead Transit Center (1 station/stop only)

Support Facilities

Based on conversations with the operator of Nassau Inter County Express (NICE) Bus, the existing maintenance facilities in the Study Area have sufficient capacity to accommodate 12 BRT/premium buses with Alternative 2A and 10 BRT/premium buses with Alternative 3A. Therefore, costs for additional facilities were not assumed at this time.

Site Work and Special Conditions

Capital costs for demolition, clearing, earthwork, utility relocation, hazardous materials removal/mitigation, ground water treatments and environmental mitigation were included for both BRT/premium bus alternatives for locations requiring construction, such as along segments of new guideway.

Systems

Costs for modification to existing traffic signals, installing new traffic signals and implementing traffic signal prioritization for Alternative 2A include:

- Existing signal modification: Old Country Road at Glen Cove Road
- New signals:
  1. 3rd Street at Station Road
  2. Roslyn Road at 3rd Street
  3. Zeckendorf Boulevard at Transverse Drive
  4. Transverse Drive at Fortunoff Way
- Signal prioritization:
  1. Roslyn Road at East 2nd Street
  2. Voice Road at Glen Cove Road
  3. Glen Cove Road at A.C. Moore site driveway
  4. Zeckendorf Boulevard at Ring Road East
  5. Zeckendorf Boulevard at Corporate Drive
  6. Transverse Drive at Merchants Concourse
  7. Merchants Concourse at Corporate Drive
  8. Stewart Avenue at Merchants Concourse
  9. Endo Boulevard at Miller Avenue
  10. Charles Lindbergh Boulevard at Nassau Community College
  11. Hempstead Turnpike at Nassau Veterans Memorial Coliseum
  12. Fulton Avenue at Fairview Boulevard
- Pedestrian signal: Voice Road at Glen Cove Road

Costs for traffic signal improvements and modifications for Alternative 3A include:

- Existing signal modification: Old Country Road at Glen Cove Road.
- New signals:
  1. 3rd Street at Station Road
  2. Roslyn Road at 3rd Street
  3. Zeckendorf Boulevard at Transverse Drive
  4. Transverse Drive at Fortunoff Way

- Signal prioritization:
  1. Roslyn Road at East 2nd Street
  2. Voice Road at Glen Cove Road
  3. Glen Cove Road at A.C. Moore site driveway
  4. Hempstead Turnpike at Nassau Veterans Memorial Coliseum
  5. Fulton Avenue at Fairview Boulevard
- Pedestrian signal: Voice Road at Glen Cove Road

Costs for bus communications were included for both BRT/premium bus alternatives for the length of each alignment, at stations and on vehicles. Fare-collection equipment was assumed at all stations. Cost for a central control center was assumed for both alternatives.

Right-of-Way

The cost for the purchase of real estate for Alternatives 2A and 3A comprises any privately owned or municipally owned right-of-way, including lands belonging to the state, and any and all buildings that would need to be demolished to clear way for the right-of-way.

Vehicles

The purchase of 12 BRT/premium buses was assumed for Alternative 2A and 10 BRT/premium buses for Alternative 3A (see Section 8.2.4).

10.4 Unit Cost Data Sources

Unit costs for typical cross-sections and elements for each alternative were developed from costs of the various subcomponents of the typical section, or from parametric cost information from similar projects, refined with adjustments for location and escalation costs.

Unit costs were developed using various local and national sources. Local source data from recent projects that are similar to the Short-List Alternatives in terms of scope and materials were utilized as the primary source for unit costs. Unit cost data for the modern streetcar Alternatives 2 and 3 were obtained from the Charlotte Area Transit System (CATS) *Charlotte Streetcar Project* (2011), the *Central Broward East-West Transit Analysis* (2012) and NJ TRANSIT's *Northern Branch Hudson-Bergen Light Rail Extension DEIS* (2012). Unit cost data for the BRT/premium bus Alternatives 2A and 3A were obtained from *Transit Cooperative Research Program (TCRP) Report 118 Bus Rapid Transit Practitioner's Guide* (2007) and the Florida Department of Transportation's *Central Broward East-West Transit Analysis* (2012). Roadway, site and real estate costs for all alternatives were estimated based on typical construction bids for projects in Nassau County municipalities and for the Nassau County Department of Public Works.

10.5 Contingencies and Finance Charges

10.5.1 Allocated Contingencies

All capital cost estimates include two types of contingencies: allocated contingencies and unallocated contingencies. Allocated contingencies are associated with individual cost estimate categories. These contingencies are intended to account for unforeseen items of work, quantity fluctuations, and variances in unit costs that develop as the proposed project progresses through the various stages of development. The level of contingency applied to each cost category was estimated, reflecting the relative potential variability of those costs. Table 10-2 lists the allocated contingencies by SCC that were applied for the four alternatives.

Table 10-2: Allocated Standard Cost Category Contingencies

SCC	Allocated Contingency
10: Guideway and Track Elements	25%
20: Stations	20%
30: Support Facilities	25%
40: Site work and Special Conditions	30%
50: Systems	15%
60: Right-of-Way	50%
70: Vehicles	5%

Source: Jacobs, 2012.

10.5.2 Unallocated Contingencies

Unallocated contingencies (SCC 90) were applied to the overall total capital cost estimate for each alternative. Unallocated contingencies account for potential changes to the project scope (e.g., design changes that may be required) and other unforeseeable project cost increases that are not directly associated with any particular cost category. Based on the conceptual level of design completed during this AA phase of the Study, 15 percent of construction costs were included in the cost estimate for each alternative in the unallocated contingency cost category.

10.5.3 Professional Services

In addition to the unallocated contingencies, allowances were included in the estimate for "soft costs" or professional services (SCC 80). These are project management and engineering costs, which were added to the total cost of each alternative. These soft costs include typical project management and engineering costs and are determined based on a percentage of the projected capital cost. The soft-cost contingency percentages were based on guidance in *TCRP Report 138: Estimating Soft Costs for Major Public Transportation Fixed Guideway Projects* (2010). This estimating process begins with default averages for each category of professional services and adjusts them based on the specific attributes of the alternative. The soft costs for each component of the alternatives are listed in Table 10-3.

Table 10-3: Professional Services Contingencies

Service	Percentage
Preliminary engineering and final design	14%
Project management for design and construction	7.5%
Construction administration and management	5%
Professional liability and other non-construction insurance	2%
Legal; permits; review fees by other agencies, cities, etc.	0.3%
Surveys, testing, investigation, inspection	0.3%
Start-up	0.3%

Source: Jacobs, 2012.

10.5.4 Finance Charges

A value for FTA Category 100: Finance Charges has not been included in the capital cost estimates, to date, pending development of a proposed financing plan and a design and construction schedule for the LPA. Once a financing plan and construction schedule are prepared during the project's Preliminary Engineering stage for the LPA and, if the financial plan's components include issuance of bonds or otherwise accrue financing charges, a cost value for Category 100: Finance Charges will be developed and incorporated in a refined capital cost estimate.

10.6 Capital Costs (2012 Dollars)

Adding the seven direct cost categories, with the allocated contingencies applied, and the two indirect cost categories (unallocated contingencies and professional services) provides an overall estimate of the capital cost for each alternative. Estimated capital costs for the four Short-List Alternatives are presented in Table 10-4.

Table 10-4: Capital Costs (2012 dollars)

	Alternative 2: Modern Streetcar	Alternative 3: Modern Streetcar	Alternative 2A: BRT/ Premium Bus	Alternative 3A: BRT/ Premium Bus
Guideway & Track	$103,913,000	$99,106,000	$15,874,000	$13,157,000
Stations, Stops, Terminals, Intermodal Centers	$8,688,000	$7,188,000	$11,988,000	$8,850,000
Yards, Shops, Administration Buildings	$26,670,000	$20,839,000	$0	$0
Sitework & Special Conditions	$45,675,000	$42,565,000	$27,781,000	$24,487,000
Systems	$50,821,000	$45,241,000	$17,068,000	$14,927,000
Right-of-Way & Land	$4,350,000	$4,350,000	$11,250,000	$11,250,000
Vehicles	$53,028,000	$37,877,000	$13,860,000	$11,550,000
Professional Services	$76,247,000	$69,511,000	$23,514,000	$19,864,000
SUBTOTAL	**$369,392,000**	**$326,676,000**	**$121,334,000**	**$104,086,000**
Contingency	$55,409,000	$49,001,000	$18,200,000	$15,613,000
Finance Charges	TBD	TBD	TBD	TBD
TOTAL PROJECT COST	**$424,801,000**	**$375,678,000**	**$139,534,000**	**$119,699,000**

Source: Jacobs, 2012.

Of the modern streetcar alternatives, Alternative 2 is more expensive with a capital cost of $424,801,000; Alternative 3 is less expensive with a capital cost of $375,678,000. Of the BRT/premium bus alternatives, Alternative 2A is more expensive with a capital cost of $139,534,000, compared to Alternative 3A with a capital cost of $119,699,000.

11. Operating and Maintenance Costs

This section provides an overview of the development and structure of operating and maintenance (O&M) cost-estimating models created for the modern streetcar and bus rapid transit (BRT)/premium bus transit modes proposed with, respectively, Alternatives 2 and 3 and Alternatives 2A and 3A and the resultant order-of-magnitude O&M cost estimates, by alternative.

11.1 Operating and Maintenance Cost Estimating Approach

The O&M cost methodology was structured in accordance with Federal Transit Administration (FTA) guidelines for estimating O&M costs in a "resource build-up" manner as part of the New Starts process, as follows:

- Costs are computed by estimating labor and materials needed to provide a given level of service, and then unit costs are applied to the estimated future labor and materials cost items.
- Costs are calculated based on operating statistics by mode (rather than system-wide for all modes combined).
- Each labor and non-labor expense item is calculated separately, which ensures that equations are mutually exclusive and cover all operating costs.
- Cost items are variable, meaning that cost estimates will change with projected changes in service.

System characteristics and operating statistics serve as driving variables in an O&M cost model. Current expenses are paired with relevant driving variables to derive unit costs that represent current rates of consumption and labor productivity. An O&M cost model uses current unit costs as the basis for estimating future costs of transit alternatives under consideration.

The basic structure of a resource build-up model is a series of line items representing specific labor or non-labor costs. Each item is linked, either directly or indirectly, to an input variable that reflects levels of service or some other system attribute. Examples of level-of-service variables include annual revenue vehicle miles, and the number of vehicles in peak-period service.

Two O&M cost models were developed, one for modern streetcar alternatives and one for BRT/premium bus alternatives, comprising the following functional areas:

- Vehicle Operations: Annual costs associated with vehicle operations such as rail/bus operator and rail/bus operation supervisor wages and fringe benefits, and costs associated with traction power (e.g., electricity or fuel);
- Vehicle Maintenance: Annual costs associated with vehicle maintenance such as mechanic and supervisor wages and fringe benefits, and vehicle maintenance materials (e.g., spare parts, lubricants, tools and uniforms/protective clothing, etc.);
- Non-Vehicle Maintenance: Annual costs associated with right-of-way maintenance, such as technician and supervisor wages and fringe benefits, right-of-way maintainers, vehicle control and communications equipment, maintenance of fare collection and counting equipment, maintenance of passenger facilities, and maintenance materials; and
- Stations: Annual costs associated with station maintenance, such as transit facility maintainers wages and fringe benefits.

Annual costs associated with general administration (i.e., supervision and clerical support associated with finance, purchasing, payroll, human relations, etc.) were not included in the O&M cost models because it was assumed that the modern streetcar or BRT/premium bus alternative would be operated under contract to Nassau County, and these administrative costs would be included in any contract between the County and the transit operator.

The unit costs include an adjustment factor for the differences in regional labor costs, as well as an inflation factor derived from the U.S. Department of Labor, Bureau of Labor Statistics Consumer Price Index, to account for general rise in costs of services and goods to enable costs to be represented in 2012 dollars.

11.1.1 Modern Streetcar O&M Cost Model Development

The cost model is based on the major O&M expense object classes (i.e., cost categories) in the National Transit Database (NTD).[1] Expense line items (i.e., salary and wages, fringe benefits, services, etc.) were assigned to the appropriate functional areas or O&M cost categories. A unit of service (or key supply variable) was assigned to the expense line items. A unit of service may be represented as annual revenue vehicle hours or the total number of the vehicles in peak service. Unit costs representing labor wages and fringe benefits, as well as costs of materials, were developed based on recent operations and service statistics, which are, in turn, based on data obtained from the Fiscal Year (FY) 2010 NTD database. To provide a reasonable average of O&M expenses for the modern streetcar alternatives, five peer fixed-guideway rail systems that are similar to Alternatives 2 and 3 were reviewed.

The basis for the O&M cost model used to estimate the O&M costs of the modern streetcar Alternatives 2 and 3 is a "calibration system," which can be defined as the combination of actual O&M expenses with system and service statistics for a recent 12-month period. Once structured into a series of expense items and unit costs, a model can estimate costs for any set of statistics representing a future transit alternative for that mode. It is implicitly assumed that the calibration-year rates of consumption and labor productivity will continue into the future.

The five peer fixed-guideway rail systems that were reviewed were identified based on their similarity to Alternatives 2 and 3 in terms of their operating statistics such as fleet size, number of vehicles in daily operation, annual revenue train hours and train miles, route length, one-way travel times, average operating speed, number of stations, and number of lines in the system (see Section 8.1.5). In addition, peer systems were selected considering their physical and operational characteristics relative to those proposed for Alternatives 2 and 3. The peer systems are new, primarily at-grade systems. Rights-of-way types for the peer systems range from operating in roadways, in semi-exclusive alignment and/or with mixed traffic, to exclusive alignments such as former rail rights-of-way. The peer systems serve similar types of major activity centers (i.e., universities, intermodal centers, large malls, etc.), and have average operating speeds and service plans comparable to Alternatives 2 and 3. It is recognized that no one peer system matches the Nassau Hub Study's modern streetcar alternatives' operating parameters exactly; the range of selected peer systems provided a diversity that allowed the cost model's averaging ability to mitigate any specific cost anomalies attributable to one of the peer systems.

[1] The National Transit Database is the FTA's primary national database for statistics on the transit industry.

The peer systems used as the basis for unit costs and productivity ratios are the Tacoma Link (Tacoma, WA), the South Lake Union Streetcar (Seattle, WA), Newark Light Rail (Newark, NJ), METRORail (Houston, TX), and the Hiawatha Line (Minneapolis, MN).

11.1.2 BRT/Premium Bus O&M Cost Model Development

In 2011, Nassau County entered into a contract for the operation and maintenance of its bus services with Veolia Transportation, a private transportation provider. The new system is the Nassau Inter County Express (NICE) Bus. Unlike the modern streetcar Alternatives 2 and 3, detailed NTD data regarding NICE Bus operations are not available (NICE Bus began operations in January 2012). However, Veolia Transportation provided the Study Team with the hourly cost for its fixed-route operations. The cost per vehicle hour under the current contract between Nassau County and Veolia Transportation is $112.32.[2] Using this unit cost and applying the same unit cost as was used for modern streetcar stations since the stations would contain the same features and elements,[3] a two-variable O&M cost model was developed to calculate the annual O&M cost for the BRT/premium bus alternatives.

11.2 O&M Cost Methodology

11.2.1 Key Supply Variables

The modeling effort began with the selection of key driving supply variables. The key supply variables that were used to drive related expense items (i.e., cost items) are described below. The key variables focus primarily on the modern streetcar alternatives as there are more variables in the modern streetcar model; variables used for the BRT/premium bus are noted, as applicable.

- Annual Revenue Vehicle Hours represent the total number of hours during 1 year in which vehicles operate with revenue service (i.e., the time in which the vehicles are available for travel by the general public). Vehicle operating costs are closely related to the amount of time transit vehicles spend in revenue operation, as these costs are largely driven by the labor costs of operators. Per NTD reporting instructions, revenue service includes layover time at terminals since an operator is on duty during rest periods. For the BRT/premium bus alternatives, the equivalent operating statistic, annual revenue vehicle hours, was used to estimate annual O&M costs.
- Annual Revenue Vehicle Miles represents the mileage that vehicles (i.e., modern streetcars) travel during 1 year in revenue service. Propulsion power costs are largely driven by the distance traveled by vehicles, which has a nearly direct relationship to the power consumed for locomotion and is a good surrogate for other constant power requirements (e.g., vehicle heating, ventilation and air conditioning [HVAC], lighting of vehicle, etc.). Vehicle maintenance costs are closely related to the total revenue mileage traveled by vehicles in the fleet, as the cost of maintaining vehicles is largely driven by the wear and tear on the vehicle fleet.

[2] Veolia Transportation's cost per vehicle hour was compared to FY2010 NTD data for similar systems in the Northeast, i.e., MBTA (Boston, MA), Bee-Line Bus (Westchester County, NY), NFTA (Niagara Falls, NY), and the former MTA LI Bus (Nassau County, NY). The review found that the NICE Bus system's aggregate cost is comparable to these systems (MBTA: $142.96 per vehicle hour, NFTA: $114.23 per vehicle hour, Westchester Bee Line: $159.17 per vehicle hour, and MTA LI Bus: $128.05 per vehicle hour).

[3] The station O&M unit cost is based on the average station O&M costs for Salt Lake City, St. Louis, Denver, San Jose, Portland, Sacramento, Los Angeles, and Baltimore in 2012 dollars.

- Track Miles are the best indicator of the physical size of the system. A track mile is equal to 1 mile of single track.[4] Non-vehicle maintenance cost is focused on the maintenance of the system's infrastructure (i.e., track, signals, and communications). This operating statistic is used as an input in calculating the costs of track maintenance labor, materials and supplies because the numbers of staff and materials needed to maintain trackage are directly related to the number of tracks and the length of the alignment.
- Number of Stations represent the total number of stations along the alignment. Costs associated with station maintenance include labor costs, maintenance materials and supplies, and contracted services. This variable applies to both the modern streetcar and BRT/premium bus alternatives.

The following sections outline the steps that were followed to develop the O&M cost models.

11.2.2 Data Assembled

Following the selection of key driving supply variables, recent operations and expense data for the five peer systems were obtained from the FY 2010 NTD. These data were used in the development of the functional areas (i.e., O&M cost categories) including expense line items, unit costs, and productivity ratios, and were used as inputs to the O&M cost model.

11.2.3 Expense Line Items and Unit Costs

Following the identification of the functional areas, the next step was to record peer system expenses in a series of line items. Once line items were established, each one was assigned a key supply variable as its most relevant cost driver, as shown in Table 11-1.

Table 11-1: Modern Streetcar O&M Cost Categories, Associated Cost Items, and Key Supply Variables

Cost Category and Cost Item	Key Supply Variable
Vehicle Operations	
Operations Salaries & Wages	• Annual Revenue Vehicle Hours
Fringe Benefits	• Annual Revenue Vehicle Hours
Utilities (Propulsion Power)	• Annual Revenue Vehicle Miles
Services	• Annual Revenue Vehicle Hours
Other Expenses	• Annual Revenue Vehicle Hours
Vehicle Maintenance	
Salaries & Wages	• Annual Revenue Vehicle Miles
Fringe Benefits	• Annual Revenue Vehicle Miles
Services	• Annual Revenue Vehicle Miles
Maintenance Materials and Supplies	• Annual Revenue Vehicle Miles
Other Expenses	• Annual Revenue Vehicle Miles
Non-Vehicle Maintenance-of-Way	
Salaries & Wages	• Track Mileage
Fringe Benefits	• Track Mileage
Services	• Track Mileage
Other Materials and Supplies	• Track Mileage
Other Expenses	• Track Mileage
Stations	
Transit Facility Maintainers	• Number of Stations
Maintenance Materials and Supplies	• Number of Stations
Contracted Services	• Number of Stations

Source: Jacobs, 2012.

[4] A two-track section that is 1 mile in length would be calculated as 2 track miles.

The next step in the O&M cost model development was to obtain base-year (FY 2010) cost data for the development of unit costs, including NTD cost and service data from peer fixed-guideway rail systems for the modern streetcar Alternatives 2 and 3.

Base-year costs for each expense line item were assigned to the associated service variables and unit costs, and productivity ratios were calculated.

The basic formula used for calculating O&M costs is as follows:

O&M Expense = Unit Cost [$/quantity] x Service Quantity

Once each system's unit costs were developed, averages were calculated for use in the O&M cost model. For the modern streetcar O&M cost model, unit costs were averaged with a simple average among all five peer systems. However, labor unit costs were weighted before averaging to account for regional differences in labor costs. Regional cost-of-labor factors were developed using average hourly wages for each metropolitan area, as reported in the Occupational Employment Statistics database compiled by the Bureau of Labor Statistics.[5] These factors are shown in Table 11-2.

Table 11-2: Cost of Labor Adjustments by Metropolitan Area

Metropolitan Area	Cost of Labor Factor
Nassau County, NY	**1.00**
Tacoma, WA	0.90
Seattle, WA	1.07
Newark, NJ	1.05
Houston, TX	0.91
Minneapolis, MN	0.98

Source: U.S. Bureau of Labor Statistics, 2012.

Using these data, unit costs and the model's base-year costs were calculated. All unit costs use a 5 percent inflation factor, derived from the U.S. Bureau of Labor Statistics Consumer Price Index to represent 2012 dollars. Table 11-3 shows the O&M cost model used to estimate O&M costs for the modern streetcar Alternatives 2 and 3.

[5] Metropolitan Area Wage Estimates, Occupational Employment Statistics, Bureau of Labor Statistics. May 2011. http://www.bls.gov/oes/current/oessrcma.htm

Table 11-3: Modern Streetcar O&M Cost Model - FY2012 Unit Costs

Cost Item	Resource Variable	Average Unit Cost (FY 2010)		Average Unit Cost (FY 2012)	
Operating Expenses					
Vehicle Operations					
Operations Salaries & Wages	Annual Revenue Vehicle Hours	$63.69	*per Revenue Vehicle Hour*	$66.88	*per Revenue Vehicle Hour*
Fringe Benefits	Annual Revenue Vehicle Hours	$41.25	*per Revenue Vehicle Hour*	$43.31	*per Revenue Vehicle Hour*
Utilities (Propulsion Power)	Annual Revenue Vehicle Miles	$0.73	*per Revenue Vehicle Mile*	$0.77	*per Revenue Vehicle Mile*
Services	Annual Revenue Vehicle Hours	$4.08	*per Revenue Vehicle Hour*	$4.29	*per Revenue Vehicle Hour*
Other Expenses	Annual Revenue Vehicle Hours	$0.37	*per Revenue Vehicle Hour*	$0.39	*per Revenue Vehicle Hour*
Vehicle Maintenance					
Salaries & Wages	Annual Revenue Vehicle Miles	$2.05	*per Revenue Vehicle Mile*	$2.16	*per Revenue Vehicle Mile*
Fringe Benefits	Annual Revenue Vehicle Miles	$1.33	*per Revenue Vehicle Mile*	$1.40	*per Revenue Vehicle Mile*
Services	Annual Revenue Vehicle Miles	$0.34	*per Revenue Vehicle Mile*	$0.35	*per Revenue Vehicle Mile*
Maintenance Materials and Supplies	Annual Revenue Vehicle Miles	$0.90	*per Revenue Vehicle Mile*	$0.94	*per Revenue Vehicle Mile*
Other Expenses	Annual Revenue Vehicle Miles	$0.24	*per Revenue Vehicle Mile*	$0.25	*per Revenue Vehicle Mile*
Non-Vehicle Maintenance					
Salaries & Wages	Track Mileage	$7,612.38	*per Track Mile*	$60,493.00	*per Track Mile*
Fringe Benefits	Track Mileage	$37,806.65	*per Track Mile*	$39,696.98	*per Track Mile*
Services	Track Mileage	$14,476.67	*per Track Mile*	$15,200.50	*per Track Mile*
Other Materials and Supplies	Track Mileage	$3,897.41	*per Track Mile*	$4,092.28	*per Track Mile*
Other Expenses	Track Mileage	$44.63	*per Track Mile*	$46.86	*per Track Mile*
Station Maintenance					
Transit Facility Maintainers	Stations	$57,238.00	*per Station Maintainer*	$60,100.00	*per Station Maintainer*
Materials and Supplies	Stations	$5,932.00	*per Station*	$6,229.00	*per Station*
Contract Services	Stations	$4,675.00	*per Station*	$4,909.00	*per Station*

Source: Jacobs, 2012.

11.2.4 Variable Quantities for Modern Streetcar Alternatives 2 and 3

A service plan defining the operation of the modern streetcar Alternatives 2 and 3 was created and used in the calculation of units of service, which were used as input to the O&M cost models. Table 11-4 presents a summary of the basic operating parameters for Alternatives 2 and 3.

Table 11-4: Operating Parameters of Modern Streetcar Alternatives 2 and 3

Operating Parameter	Alternative 2 Mineola and Hempstead, via Source Mall area	Alternative 3 Mineola and Hempstead, via South Street
Alignment Length (route miles)	7.1	6.5
Average Operating Speed (mph)	13.0	14.0
End-to-End One-Way Run Time (minutes)	32.8	28.1
Minimum Layover Time at Terminals (each end)	17	15/16
Round Trip Cycle Time During Peak Periods (Weekdays) (minutes)	100	80
Weekday Peak Headways (minutes)	10	10
Peak Vehicles in Service	10	8
Peak Consist Size (# of vehicles)	1	1
Spare Ratio (15% of peak vehicle requirement)	2	2
Total Fleet Size	12	10
Total Number of Stations	18	14
Total Revenue Train/Vehicle Hours (Annual)	53,893	42,515
Total Revenue Train/Vehicle Miles (Annual)	411,942	377,130

Source: Jacobs, 2012.

11.2.5 Variable Quantities for BRT/Premium Bus Alternatives 2A and 3A

A service plan defining the operation of the BRT/premium bus alternatives was created and used in the calculation of units of service, which were used as input to the O&M cost models. Table 11-5 presents a summary of the basic operating parameters for the BRT/premium bus alternatives.

Table 11-5: Operating Parameters of BRT/Premium Bus Alternatives 2A and 3A

Operating Parameter	Alternative 2A Mineola and Hempstead, via Source Mall area	Alternative 3A Mineola and Hempstead, via South Street
Alignment Length (route miles)	8.5	6.8
Average Operating Speed (mph)	11.7	11.7
End-to-End One-Way Run Time (minutes)	43.4	34.8
Recovery Time at Each End for Peak Period (minutes)	6.5	5
Recovery Time at Each End on Off-peak Period (minutes)	9	10
Weekday Peak Headways (minutes)	10	10
Peak Buses in Service	10	8
Spare Ratio (15% of peak vehicle requirement)	2	2
Total Fleet Size	12	10
Total Number of Stations	21	16
Total Revenue Vehicle Hours (Annual)	50,268	42,515
Total Revenue Vehicle Miles (Annual)	493,170	394,536

Source: Jacobs, 2012.

11.3 O&M Cost Results

Based on the service plans defined for the modern streetcar Alternatives 2 and 3, the annual O&M costs were estimated to be $10.6 million and $8.9 million, respectively. The annual O&M costs for BRT/premium bus Alternatives 2A and 3A were estimated to be $5.9 million and $5.0 million, respectively. All costs were estimated in 2012 dollars. A summary of the annual O&M cost by alternative is presented in Table 11-6.

Table 11-6: Annual O&M Cost Summary by Alternative
(millions of dollars [2012])

	Alternative 2 Modern Streetcar Mineola to Hempstead via Source Mall	**Alternative 3 Modern Streetcar Mineola to Hempstead via South Street**
Vehicle Operations	$6.5	$5.2
Vehicle Maintenance	$2.1	$1.9
Non-Vehicle Maintenance	$1.7	$1.6
Station Maintenance	$0.3	$0.2
Total	**$10.6**	**$8.9**
Operation, Maintenance and Administration (fixed rate)	$5.6	$4.7
Station Maintenance	$0.3	$0.3
Total	**$5.9**	**$5.0**

Source: Jacobs, 2012.

12. Environmental Screening

An environmental screening of the four Short-List Alternatives was performed to identify significant environmental issues that would preclude or complicate the implementation of one or more of the project alternatives, and to compare the alternatives' relative environmental impacts and benefits. A summary of the findings of this environmental screening is presented in Table 12-1. Potential environmental impacts will be evaluated in greater detail during the environmental review phase of the Study. This section summarizes the findings of the environmental screening by environmental impact category.

Table 12-1: Summary of Environmental Screening Findings

Category	Summary of Findings
Land Use & Neighborhood Character	• All Alternatives: 1 property acquisition (transportation/parking use) in the Village of Mineola and partial right-of-way easements, such as at Roosevelt Field, Nassau Community College; minor changes affecting neighborhood character • Alternatives 2 and 3: 1 additional property acquisition (warehouse use) in Uniondale and right-of-way easements at 2nd Street and Voice Road and within the Meadowbrook State Parkway (MSP) right-of-way
Consistency with Public Policy and Plans	• All Alternatives would be consistent with local plans and policies
Socioeconomics/ Environmental Justice (EJ)	• All Alternatives: No disproportionately high and adverse impacts to environmental justice (EJ) populations; may offer mobility benefits to EJ populations
Transportation	• All Alternatives: Improved mobility • Alternatives 2A and 3A: Potential for traffic impacts in areas of mixed traffic where congestion already exists, such as at the intersection of Old Country Road and Glen Cove Road
Air Quality	• All Alternatives: May help slow the growth in total vehicle miles traveled (VMT), reducing mobile-source pollutant emissions • Alternatives 2 and 3: Modern streetcar vehicles do not generate emissions • Alternatives 2A and 3A: Bus rapid transit (BRT)/Premium bus vehicles generate emissions
Noise and Vibration	• All Alternatives: No vibration impacts • Alternatives 2 and 3: The bell on the modern streetcar would be a new source of noise • Alternatives 2A and 3A: New bus noise would not change the noise environment but may result in more frequent noise events
Hazardous Materials	• All Alternatives: No disturbance to known hazardous materials sites; the maintenance facility would handle any hazardous materials in accordance with all applicable local, state, and federal requirements
Open Space and Recreational Resources	• Alternatives 2 and 3: Easement within the MSP right-of-way required • Alternative 2: Additional easement over the MSP required • Alternatives 2A and 3A: No impacts to open space and recreational resources
Cultural Resources	• All Alternatives: Village of Mineola station stop located near two individually eligible resources (Nassau Tower/Long Island Rail Road (LIRR) Mineola Station; LIRR Electrical Substation); not anticipated to create an adverse effect • Alternatives 2 and 3: Alignment would traverse one historic district (MSP); determination of whether this creates an adverse effect required
Section 4(f)	• Alternatives 2A and 3A: Would not affect Section 4(f) resources • Alternatives 2: Would result in use of 2 Section 4(f) resources (Mitchel Field; MSP) • Alternative 3: Would result in use of 1 Section 4(f) resource (MSP)

Table 12-1: Summary of Environmental Screening Findings (Continued)

Floodplains	• All Alternatives: No impacts
Water Quality	• All Alternatives: Would not cross or approach any New York State Division of Water water body; no impacts to the Nassau-Suffolk Aquifer System anticipated; the access road to the Carle Place Water District's well field must be maintained; new impervious areas would incorporate Nassau County's stormwater best management practices (BMP)
Ecology/Endangered Species	• All Alternatives: Road widening, construction of separate right-of-way, and construction of stations and the vehicle base facility (VBF) may potentially affect threatened and endangered species, such as plant species and the peregrine falcon
Visual Resources	• Alternatives 2 and 3: Potential visual changes as a result of catenary wires, catenary support poles, and the elevated alignment section within the MSP right-of-way; no significant impacts anticipated • Alternatives 2A and 3A: No significant impacts anticipated

Source: Jacobs, 2012.

12.1 Land Use and Neighborhood Character

The majority of the land use in the Study Area comprises commercial businesses (36 percent) and a variety of residential neighborhoods (26 percent). The 11.7 square-mile Study Area contains the largest concentration of commercial uses within Nassau County, including two regional malls, numerous office complexes, and a wide variety of shops, restaurants, and service establishments. Significant areas of residential development are located in neighborhoods in the Village of Mineola, Carle Place, the Village of Garden City, the Town of Hempstead and the Village of Hempstead. The neighborhood character of this residential development generally takes the form of single-family housing; however, a number of garden apartments, townhomes and medium-density, multi-family dwellings can be found throughout the Study Area along major transportation corridors and near existing LIRR stations in the Village of Mineola and the Village of Hempstead. Parks and other recreational uses account for about 15 percent of the land use, much of it in Eisenhower Park. An extensive supply of off-street parking represents approximately 9 percent of the total land cover of the Study Area.

None of the four Short-List Alternatives would require property acquisition that would result in residential displacement. Property acquisition of one multi-parcel location, a transportation/parking use, may be required for a station in downtown Village of Mineola for all four alternatives. Modern streetcar Alternatives 2 and 3 would require property acquisition of one multi-parcel location, a warehouse use, for the VBF in Uniondale. In addition, for all four alternatives, partial easements would be required through existing parking areas and internal roadways at Roosevelt Field, the Nassau Veterans Memorial Coliseum property and Nassau Community College. Alternatives 2 and 3 would require right-of-way easements across undeveloped properties at the proposed connection between the eastern terminus of 2nd Street and Voice Road[1]. A right-of-way easement for Alternatives 2 and 3 within the MSP right-of-way may also be required; the extent of the easement will be determined during further engineering studies and the environmental review process. Alternative 2 would require more right-of-way easement within the MSP right-of-way than would Alternative 3 because it crosses over the MSP. Consequently, Alternative 2 would result in more impacts to land use than would the other alternatives as it would require acquisition of two properties and the most right-of-way from the MSP.

[1] This concept will require additional coordination with the Village of Mineola.

All of the alternatives would add a new transportation service with facilities and infrastructure that would change the character of the neighborhoods to some degree. However, these changes would be minor and in targeted locations. Neighborhood character will be a consideration during design of the proposed modern streetcar or BRT/premium bus stations/stops for the Locally Preferred Alternative (LPA); their design will be coordinated with each community through an outreach effort to facilitate context-sensitive design in keeping with neighborhood character. The potential VBF is proposed for locations that can accommodate this type of facility and be integrated into the existing mixed industrial/commercial development of the surrounding neighborhoods. The modern streetcar or BRT/premium bus would travel on tracks or street bed within a dedicated right-of-way for the majority of its route. In most locations, the new right-of-way would be located adjacent to or within existing arterials. An elevated structure would be required within the MSP right-of-way for modern streetcar Alternatives 2 and 3, over Old Country Road and past Roosevelt Field. This structure is not anticipated to present a physical barrier dividing any community, affect access to existing uses, or result in noise or shadow impacts affecting surrounding residential areas or natural recreational areas. The structure would be located in an intensely developed part of the Study Area containing commercial and retail uses and existing arterials. While it would be visible, particularly to drivers on the MSP and visitors to Roosevelt Field, the elevated structure would not be out of place given the scale of development in its vicinity and adjacent areas.

The potential changes resulting with the alternatives would occur almost exclusively within areas of the Study Area that are currently developed with existing commercial/retail and community services. The changes would not be particularly notable in any given community, would not adversely affect access to existing uses, or introduce a change or obstacle that would functionally or culturally divide an existing community. The development of a new transit service that would provide access to existing uses is supportive of existing land use and neighborhood character in the Study Area. Consequently, there would be no significant adverse effects on land use or neighborhood character anticipated with any of the four Short-List Alternatives.

12.2 Consistency with Public Policy and Plans

Recent pertinent studies and analyses identified problems of growing roadway congestion, a limited transit system, slowed population growth and an overall stagnation of economic growth. Additionally, these studies suggested strategies for directing growth to existing downtowns and targeted development areas, including the Study Area, as well as encouraged the use of public transit as a means of supporting growth without further exacerbating traffic congestion.

Recent and current public policies and plans are setting the foundation for a transition of the Study Area's future land use pattern from single-use, automobile-dependent developments to mixed-use, higher-density and transit- and pedestrian-friendly developments that provide linkages to existing and proposed developments and multimodal transit centers. Several municipalities within the Study Area have initiated planning and zoning initiatives to promote this type of development. As noted in Section 3.1, the Village of Hempstead is advancing – through an approved redevelopment plan – a 26-acre, mixed-use, transit-oriented development in its downtown, and the Village of Westbury has redeveloped its downtown. Redevelopment of the Nassau Veterans Memorial Coliseum and the former Mitchel Field are planned in the Town of Hempstead where the Town has adopted a mixed-use zoning district. The County has selected developers for both projects and redevelopment plans are being advanced.

In 2012, the New York State Department of Transportation (NYSDOT) initiated a pedestrian safety program along Hempstead Turnpike consisting of restriping the 235 crosswalks located along the length of the road, widening some crosswalks, installing No Turn On Red restrictions, and increasing pedestrian crossing times at 86 traffic signals. This was initiated in response to 326 pedestrian-vehicle accidents over a 3-year period, including 20 fatalities. The improved pedestrian environment along Hempstead Turnpike is conducive to transit service. Nassau County has initiated similar programs for the portions of Hempstead Turnpike that are owned by the County (called Fulton Street).

All alternatives are supportive of the long-range vision for Nassau County's land use and economic development described in the County's Draft Master Plan, and all would serve major new redevelopment initiatives in the Village of Hempstead and the Town of Hempstead.

While Alternatives 3 and 3A would not serve the Source Mall area, Alternatives 2 and 2A would. Conversely, Alternatives 3 and 3A would provide service to peripheral office parks, but Alternatives 2 and 2A would not.

All Short-List Alternatives can be considered consistent with the mobility goals of locally adopted plans.

12.3 Socioeconomics/Environmental Justice

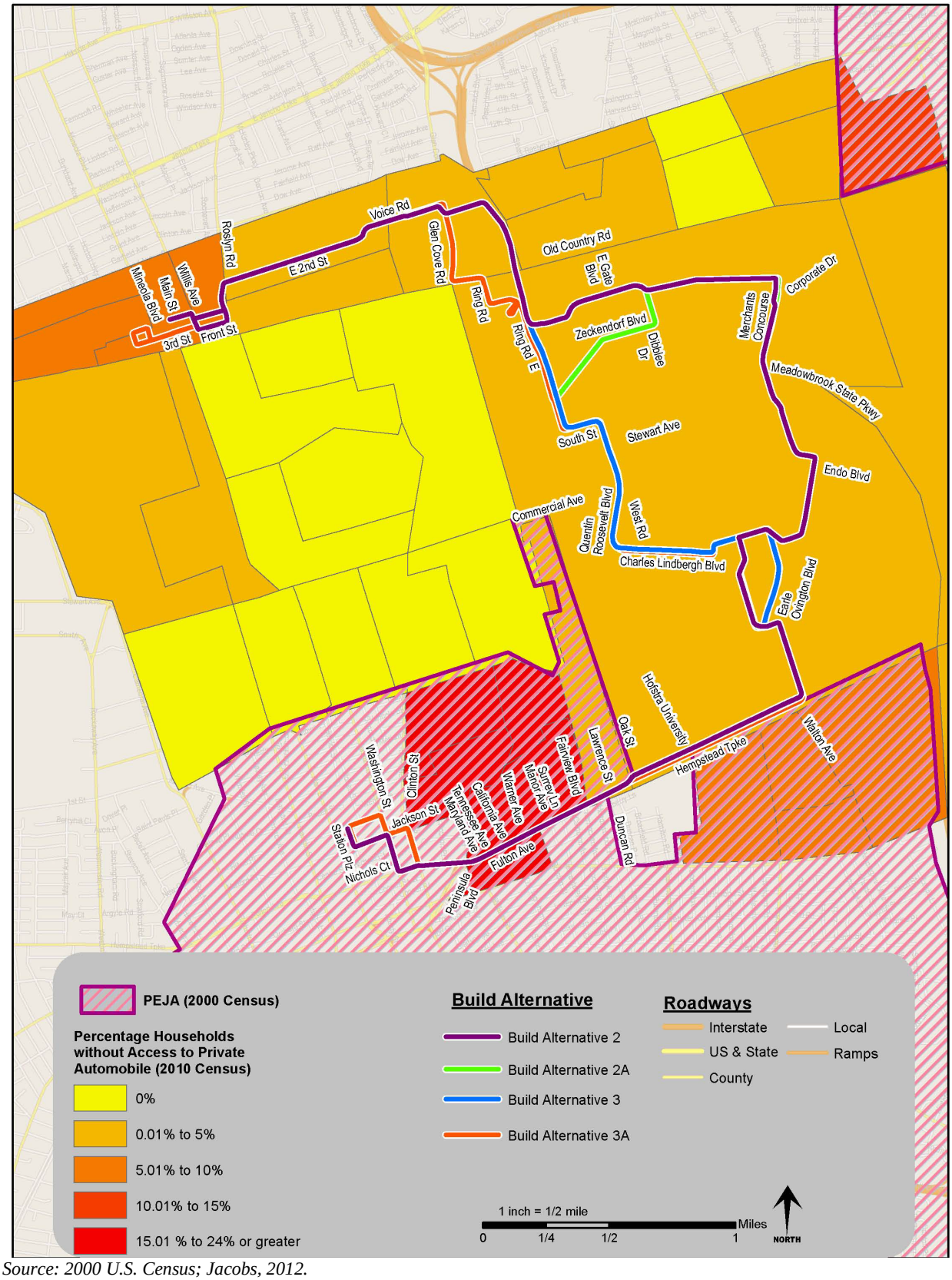
An analysis of New York State Department of Environmental Conservation (NYSDEC) Potential Environmental Justice Areas (PEJAs) and auto-ownership data was performed to map areas of potential Environmental Justice (EJ) concern.[2] PEJAs consist of U.S. Census block groups of 250 to 500 households each that have populations that meet or exceed statistical thresholds related to minority population and household income. While auto availability is not universally identified as a measure of potential lower-income status, in suburban areas that are typically more auto-dependent than are areas such as Manhattan, lack of access to an automobile is also considered a reliable indicator of economic status, particularly when viewed in terms of other demographic data.

Throughout the Study Area, the percentage of residences without access to an automobile ("zero-auto households") ranges from a low of zero to a high of 25 percent of residences per Census tract. Portions of the Study Area within the Village of Garden City, portions of the Village of Mineola, and portions of the Town of North Hempstead were found to have low percentages of zero-auto households, ranging from 0 percent to 2 percent. Conversely, between 16 percent and 25 percent of households within the tracts constituting the PEJA area in the Village of Hempstead were zero-auto households. Approximately 7 percent of households within the Uniondale portion of the PEJA were also zero-auto households (Figure 12-1).

None of the Short-List Alternatives would result in disproportionately high and adverse impacts to EJ populations. All of the alternatives may offer benefits to EJ populations as they would serve the retail areas and office parks, providing direct access to entry-level and flexible employment opportunities.

[2] Executive Order 12898, *Federal Action to Address Environmental Justice in Minority Populations and Low-Income Populations*, dated February 11, 1994, directs all federal agencies to ensure that their actions do not have a "disproportionately high and adverse human health or environmental effect on minority populations or low-income populations." Existing socio-economic data were collected and analyzed to inform the Environmental Justice (EJ) impact analysis, in compliance with Executive Order 12898.

Figure 12-1: Potential Environmental Justice Areas and Zero-Auto Households



Source: 2000 U.S. Census; Jacobs, 2012.

12.4 Transportation

The private automobile is the dominant mode of transportation into and around the Study Area, comprising about 90 percent of all Study Area trips. Although there is scheduled bus service within the Study Area, buses account for only 6 to 7 percent of Study Area trips, while other modes, including carpool and taxi, make up the remaining 3 to 4 percent of total trips. There is no direct LIRR service to many parts of the Study Area. The reliance on automobiles is further reinforced by current land use patterns: residential neighborhoods, commercial stores, and other land uses are typically separated by major roads, vast surface parking areas, or areas with little or no transit access.

According to the year 2008 analyses published in the *DGEIS for the Lighthouse at Long Island*, seven of 27 intersections analyzed in the Nassau Hub Study Area and along key feeder routes leading to it operate at overall level of service (LOS) E or F conditions in the weekday AM peak hour and another eight intersections operate at overall LOS D. In the weekday PM peak hour, 11 of the 27 intersections operate at overall LOS E or F and another 10 operate at overall LOS D. In the Saturday midday peak hour, four operate at overall LOS E or F and another eight operate at overall LOS D. Congestion delays at many of these intersections are already severe. Even at overall marginally acceptable LOS D, one or more traffic movements may be operating under congested conditions.

The NYSDEC, which publishes geographic information systems (GIS) data used by Nassau County, identifies several combined bicycle and pedestrian routes through the Study Area. The western route uses Washington Avenue from the southern border of the Study Area, continuing north through the Village of Hempstead, the Village of Garden City, and the Village of Mineola to the northern boundary of the Study Area. Two east-west branches intersect Washington Avenue: Stewart Road connects to Washington Avenue from the west in the Village of Garden City, and Old Country Road connects to Washington Avenue from the west in the Village of Mineola. On the east side of the Study Area, the combined bicycle/pedestrian route travels north-south from the southern border of the Study Area via Earl Ovington Boulevard. In the central part of the Study Area, the route turns west, connecting to Charles Lindbergh Boulevard where the route branches. One branch continues west to Merrick Avenue, which runs north-south along the western edge of Eisenhower Park, providing access to the park. The other branch turns north and uses Perimeter Road and Lifetime Brands Boulevard through the Source Mall to Ellison Avenue to the northern boundary of the Study Area. In addition, NYSDOT recently constructed a bicycle path along Salisbury Park Drive.

The BRT/premium bus Alternatives 2A and 3A would route bus service through the intersection of Old Country Road and Glen Cove Road, the Study Area's most congested intersection. Signal prioritization may improve the efficiency of the BRT/premium bus service but at the expense of additional delays borne by private vehicles. Both modern streetcar Alternatives 2 and 3 would use new dedicated right-of-way to bypass this intersection. All alternatives would experience congestion issues along Hempstead Turnpike as both modes would travel in mixed traffic. Consequently, the BRT/premium-bus mode (Alternatives 2A and 3A) are somewhat less desirable in terms of the potential to exacerbate traffic delay. The modern streetcar mode (Alternatives 2 and 3) would involve fewer interactions between the modern-streetcar vehicle and background traffic, resulting in fewer instances where the modern streetcar could contribute to additional delay.

Alternatives 2 and 2A would provide access to the central concentrated commercial/retail and entertainment portions of the Study Area and to Eisenhower Park. These two alternatives would also

better coordinate with established bicycle and pedestrian trails in this area. Alternatives 3 and 3A would not interact as directly with established bike/pedestrian routes due to their routing.

In terms of transportation, all alternatives would improve mobility and reduce or slow the growth of congestion by providing service to major trip generators. All four alternatives could potentially create minor increases in traffic volumes accessing the proposed new stations; however, the introduction of new transit in the area would increase the number of people moving in, out and through the area at a faster rate than under current conditions, which would be a benefit.

12.5 Air Quality

Nassau County, like much of the New York/New Jersey metropolitan region, has been designated as a non-attainment area for ozone and a maintenance area for particulate matter ($PM_{2.5}$) and carbon monoxide (CO).[3] All four alternatives may help slow the growth in total vehicle miles traveled (VMT) and, consequently, mobile-source pollutant emissions. However, all would also result in some increases in traffic delays associated with signal priority for the transit service. The extent of the effectiveness of each alternative in slowing the growth in VMT, or even reducing VMT, depends on the alternative's vehicle mode and route. The modern streetcar mode (Alternatives 2 and 3) is better in terms of air quality because the vehicles themselves do not generate emissions. The BRT/premium bus vehicles used by Alternatives 2A and 3A generate emissions. Although all four alternatives could potentially create minor increases in traffic volume accessing the proposed stations, leading to some potential air quality degradation, this impact would likely be negated by the benefits of the decrease in traffic from auto users being diverted to the modern streetcar or BRT/premium bus service.

12.6 Noise and Vibration

Noise-sensitive receptors in the Study Area that would be affected by the Short-List Alternatives are located primarily in the Village of Mineola and the Village of Hempstead. All alternatives have the same number of receptors that would be potentially affected, as residential receptors are concentrated within the route segments in the Village of Mineola and the Village of Hempstead that are common to all four alternatives.

The distinction among the alternatives in terms of noise comes from the difference between the sound of the bell associated with the modern streetcar (Alternatives 2 and 3) and engine noise associated with BRT/premium bus (Alternatives 2A and 3A). Neither noise is excessively loud; the consideration related to noise is the frequency of the noise, or how "annoying" the noise is, and whether the alignments would bring the noise close, or in the case of BRT/premium bus, closer to sensitive receptors. In terms of the latter, the alignments for all four alternatives travel within or adjacent to existing roads for the majority of their routes. New right-of-way locations are confined to urbanized areas, non-residential areas, or parking areas associated with existing uses, such as Roosevelt Field and Nassau Community College. None of the alternatives would bring a source of noise closer to a sensitive receptor than existing sources of noise (e.g., traffic on existing streets). The distinction between the vehicle modes results in different types of noise, but the effect is comparable. Bus engine noise is currently audible at receptors on all roads that are proposed to be traversed by Alternatives 2A and 3A. The addition of new bus noise would not change the noise environment of the Study Area, but it may result in more frequent noise events. The bell on the

[3] USEPA Green Book Nonattainment Areas for Criteria Pollutants, http://epa.gov/airquality/greenbook/, 2014.

modern streetcar would be a new source of noise added to the existing noise environment, which includes engine noise from existing NICE Bus service and other vehicles. The bell is not loud, but it would be frequent, adding to the occurrences of audible noise but not the loudness of the noise environment. Therefore, the BRT/premium bus alternatives (2A and 3A) are potentially less likely to garner community opposition because of the familiarity of the noise generated by the vehicles.

No vibration impacts are anticipated with any of the alternatives because the vehicles proposed are not generators of noticeable vibration and the elevated portions of the alignment for Alternatives 2 and 3 are not located near sensitive receptors.

12.7 Hazardous Materials

The hazardous materials screening analysis used readily available GIS data documenting known contaminated sites and information obtained from regulatory agency databases, including the United States Environmental Protection Agency (USEPA)'s Toxic Release Inventory (TRI); the National Priority List (NPL) of Comprehensive Environmental Response, Compensation, and Liability Information System (CERCLIS) of hazardous waste sites, also known as Superfund sites; and NYSDEC's Environmental Remediation Sites.

Through the database search, 14 known hazardous materials sites were identified in the Nassau Hub Study Area.

Of the 14 identified hazardous materials sites, four are located near Alternatives 2 and 2A and six near Alternatives 3 and 3A. None of these sites is proposed to be disturbed for construction of any of the alternatives. The modern streetcar VBF locations considered for Alternatives 2 and 3 would manage hazardous materials associated with light maintenance and cleaning of the modern streetcar vehicles—detergents and perhaps motor oil and other lubricants. The BRT/premium bus Alternatives 2A and 3A would utilize the existing NICE Bus maintenance facility, which operates under similar provisions. As none of the four alternatives would disturb hazardous materials and all four would require a maintenance facility, which would handle any hazardous materials in accordance with all applicable local, state, and federal requirements, no hazardous materials impacts are anticipated as a result of any of the alternatives.

12.8 Open Space and Recreational Resources

Nassau County's Department of Parks, Recreation, and Museums (DPRM) identifies parks by category: Active Parks, Passive Parks, Recreation, Preserves, and Campgrounds. The DPRM also has jurisdiction over museum properties. Museums are included in this screening assessment because they are open to the public, funded in part by public money, and serve as recreational resources.

One privately managed preserve, the Hempstead Plains Preserve (Francis Purcell Preserve), is located within the boundaries of Nassau Community College within the Study Area. This preserve is owned and managed by the College through the non-profit organization, *Friends of Hempstead Plains Preserve.* The DPRM supports the activities of the Friends of Hempstead Plains Preserve but does not have jurisdiction over the preserve.

Although parkways are not actively used for recreation, the New York State Office of Parks, Recreation and Historic Preservation (OPRHP) has designated all parkways as "parks;" consequently, the MSP must be considered a public open space resource. The MSP's landscaped right-of-way is parkland under the jurisdiction of OPRHP, while the cartway (paved surface) is maintained by NYSDOT. As the right-of-

way and cartway function together, any use of the MSP for an alternative would require approval from both NYSDOT and OPRHP. Modern streetcar Alternatives 2 and 3 would require an easement within the MSP right-of-way for construction of an elevated structure and operation of modern streetcar service on that structure. Additionally, Alternative 2 would require an easement over the MSP. BRT/premium bus Alternatives 2A and 3A would result in no impacts to open space and recreational resources.

12.9 Cultural Resources

The cultural resource screening used readily available data obtained through a review of State and National Registers of Historic Places (NRHP) resource records; the New York State Historic Preservation Office (NYSHPO) Sphinx database; and consultation with NYSHPO personnel.

All four alternatives have the potential to affect two individually eligible resources, and the modern streetcar Alternatives 2 and 3 would potentially affect one historic district. The two individually eligible resources, the Nassau Tower/LIRR Mineola Station and the LIRR Electrical Substation located on Main Street in the Village of Mineola, are located in the vicinity of the Village of Mineola station stop that is common to all alternatives. The proposed improvements associated with the new Village of Mineola station – bus shelter-style waiting areas – would not alter the two historic structures or change their setting; therefore, it is likely that the proposed Village of Mineola station common to all of the alternatives would not have an adverse effect on either historic resource.

Alternatives 2 and 3 propose to construct new right-of-way, including right-of-way on structure, in the undeveloped parkway primarily on the west side of the MSP, which is an historic district. Placement of project elements within the parkway would require review per Section 106[4] for impacts to historic resources and Section 4(f)[5] requirements for impacts to both historic resources and parkland. Acquisition of the right-of-way would require New York State legislative approval, per requirements related to parkland alienation, due to the MSP's parkland designation. Alternative 2 may result in a more visible effect on the MSP because the route crosses above the MSP from east to west, perpendicular to the travel lanes of the cartway. As a character-defining feature of the MSP's historic significance is directly related to its viewshed, depending on the historic integrity of the portion of the MSP crossed by Alternative 2, this effect may be considered adverse. Alternative 3 would result in a greater linear distance of effect as the alignment runs within the western boundary of the MSP from Roosevelt Field to South Street.

Consequently, the modern streetcar alternatives (Alternatives 2 and 3) may result in the greatest effects on historic resources as a result of the need for right-of-way within the MSP. The BRT/premium bus alternatives (Alternatives 2A and 3A) may affect the same individually eligible resources but would not affect the MSP.

[4] Historic resources are protected under federal law through Section 106 of the National Historic Preservation Act of 1966, as amended.

[5] Section 4(f) of the U.S. Department of Transportation Act of 1966 prohibits the use of publicly owned parks, recreation areas and wildlife and waterfowl refuges, as well as historic sites, whether publicly or privately owned unless 1) there is no feasible and prudent alternative that avoids the use of Section 4(f) properties and 2) the proposed project that would use the Section 4(f) property(ies) incorporates all possible planning to minimize the harm that would result from the use of the property(ies). Section 4(f) applies to all agencies of the US Department of Transportation in their decision-making (e.g., approval, funding) processes for proposed projects.

12.10 Section 4(f)

Section 4(f) requirements were considered in the screening assessment because two public open space resources (the MSP and Mitchel Field) and one historic resource (the MSP) may be affected, the MSP by both Alternatives 2 and 3 and Mitchel Field by Alternative 2. The BRT/premium bus Alternatives 2A and 3A would not affect Section 4(f) resources.

For purposes of the alternatives screening, the assessment of potential Section 4(f) impacts focused on permanent, physical use of Section 4(f) resources, which can be determined at this phase of project planning with more certainty than can constructive use.[6] The use of the landscaped parkway of the MSP would likely be a more significant Section 4(f) use than would the use of an unused portion of Mitchel Field, as the landscaped right-of-way of the MSP is the actual historic element and park, characteristic of Robert Moses' vision. The Mitchel Field impacts associated with Alternative 2 may comprise a *de minimis* impact, which would permit a minor use of the resource without having to make a finding that there are no feasible and prudent alternatives that would avoid use of the resource. Alternative 2 would affect less linear distance of the MSP compared to Alternative 3, but Alternative 2's crossing of the MSP perpendicular to the cartway may be considered an effect on the visual character or historic integrity of the parkway and may be a constructive use impact. The effect of the crossing (i.e., whether an adverse effect) will be determined through detailed Section 4(f) evaluation and Section 106 consultation during the Nassau Hub Study's environmental review phase.

Section 4(f) requires consideration of any prudent and feasible alternatives to the use of the Section 4(f) resources and prohibits the use of public funds for a project alternative that would result in the use of a Section 4(f) resource if other prudent and feasible alternatives exist. Therefore, the modern streetcar Alternatives 2 and 3 in their current alignments are less viable alternatives than are the BRT/premium bus Alternatives 2A and 3A. A full Section 4(f) evaluation will need to be completed during the Study's environmental review phase to ensure that the proposed transit improvement selected for implementation conforms fully to Section 4(f) requirements.

12.11 Floodplains

One floodplain area has been identified in the Study Area; it is associated with the Hempstead Plains Preserve near the MSP. This area is designated Federal Emergency Management Agency (FEMA) Flood Zone A, which means it is subject to a 1 percent annual chance of inundation (100-year flood zone). The four alternatives' alignments would not pass through or near the flood zone. As no improvements are proposed within the flood zone area, no adverse effect to the floodplain itself and no change to the flood risk for adjacent areas would occur as a result of implementation of any of the four Short-List Alternatives.

12.12 Water Quality

The New York State Division of Water (DOW) maps and monitors water quality in most identified lakes, streams, rivers, estuaries, and coastlines of the Great Lakes and Atlantic Ocean. DOW mapping indicated that identified water resources occur near but not within the Study Area.

[6] Section 4(f) "use" occurs when a project would permanently incorporate land from a Section 4(f) property; temporarily occupy land from a Section 4(f) property, if certain conditions apply; or have proximity effects (e.g., noise, visual, etc.) that substantially impair the protected features of the property. The latter condition is known as a constructive use.

The Study Area is located over a USEPA-designated Sole Source Aquifer known as the Nassau-Suffolk Aquifer System. The aquifer underlies all of Long Island, providing drinking water within the Study Area, as well as all of Nassau and Suffolk Counties. In addition, the Carle Place Water District operates a well field north of Old County Road adjacent to the east side of the MSP. The well field supplies much of the potable drinking water for the Study Area.

All four Short-List Alternatives are alike in their potential to affect water quality. None of the alternatives would cross or approach any DOW water body. While the routes would cross over the Nassau-Suffolk Aquifer System, construction activities proposed in conjunction with the development of any of the alternatives' infrastructure would not require excavation or dewatering to the extent that the aquifer would be affected. All four alternatives' alignments travel along the eastern boundary of the Carle Place Water District's well field. The access road to the well field must be maintained.

A new right-of-way, whether at-grade or elevated, would constitute new impervious area. Construction design would incorporate Nassau County's stormwater best management practices to ensure that water quality in the Study Area is preserved.

12.13 Ecology/Endangered Species

The U.S. Fish and Wildlife Service (USFWS) identified five threatened and endangered species known to occur within Nassau County; however, most of these species are associated with shoreline habitats and are found in and around the northern and southern shorelines of Long Island. The habitat areas supporting these species do not extend into the Study Area. The exception to this is the Sandplain gerardia, the only plant on the USFWS Threatened and Endangered Species list for the whole of New York State. The Sandplain gerardia is found only at Sayville, the Hempstead Plains Preserve, and Montauk. Hempstead Plains Preserve, the preserved area within the boundary of Nassau Community College, is within the Study Area.

The NYSDEC maps the location of habitat communities of concern, areas known to support a diversity of plants and animals, many of which may be threatened or endangered. The Hempstead Plains Preserve grassland is the only such area identified within the Study Area.

Additionally, the NY State Natural Heritage Program (NHP) provides data on state-listed species of concern. A spring 2012 search for threatened, endangered, or state-concern species identified 20 animal and 94 plant species that may be found within Nassau County. The habitats identified for the listed species were compared to the land cover, land forms, and known geology of the Study Area to determine the likelihood that the species occur in the Study Area.

Most of these species are most likely to be found in the Hempstead Plains Preserve or Eisenhower Park, neither of which would be affected by any alternative. However, some listed species may occur in other locations within the Study Area that may be affected by all of the alternatives, such as several plant species that have been found to inhabit roadway right-of-way and ballasted areas of active and abandoned railroads. The peregrine falcon is the only animal species that may occur in the portions of the Study Area directly affected by all of the alternatives. Peregrine falcons have been known to nest on the facades of high-rise buildings near hunting grounds. Tall structures near open areas, such as near RXR Plaza and Mineola near the Government Center, may be habitat for peregrine falcons.

All four alternatives are alike in that they may require road widening or construction of separate right-of-way and may affect threatened and endangered species that have been found along road and railroad

right-of-way. The development of station sites on presently undeveloped land (including mowed lawn areas) may affect threatened and endangered species that are found in disturbed areas. A detailed habitat and threatened and endangered species survey may need to be completed during the Nassau Hub Study's environmental review phase.

12.14 Visual Resources

The Study Area is generally characterized as densely developed with a mix of historic and modern residential, commercial, and government structures with a roughly gridded street network throughout. The Study Area also includes former military bases, such as Mitchel Air Field, which include open spaces and more recent development. Single-family residential development along with classic downtown landscapes predominate areas on the western side of the Study Area, particularly the Village of Garden City, but these areas are not within the influence area of the four alternatives and would not be affected by them. While the Study Area includes important historic landmarks, such as the Nassau County Courthouse, many of the notable visual features are more modern structures, such as Roosevelt Field, the Source Mall, the museum buildings on Museum Row, Nassau Veterans Memorial Coliseum, and RXR Plaza.

Visual resources for which intrusion in the form of new transit infrastructure may result in notable changes to their viewshed include portions of Nassau Community College, the historic district that previously served as Mitchel Air Field, Eisenhower Park, Hempstead Plains Preserve, and the MSP.

Modern streetcar Alternatives 2 and 3 would be more likely to result in visual impacts in the Study Area than would Alternatives 2A and 3A. This potential effect would be the result of catenary wires, catenary support poles, and the elevated alignment section within the MSP right-of-way, which would be new visual elements in the Study Area. BRT/premium bus Alternatives 2A and 3A would require no new infrastructure that does not already exist in association with other transit service within the Study Area. None of the visual changes with any of the Short-List Alternatives are anticipated to result in significant impact.

13. Public and Agency Involvement

A *Public Involvement Plan* was prepared for The Nassau Hub Study Alternatives Analysis (AA)/Environmental Impact Statement (EIS) to document the procedures to be used to engage pertinent agencies, municipalities, stakeholder representatives and the general public throughout the Study process. It also describes mechanisms used for disseminating information and receiving feedback for the Study's technical decision-making, as well as for improving the public outreach process.

To accomplish the Study's public involvement goal to *"establish and continue thorough, responsive, open and transparent communication with the public during the AA/EIS process,"* the following objectives were defined for the public involvement program:

- Establish means to reach out to and facilitate information-sharing with the public, as well as interested and involved agencies, throughout the Study period.
- Educate the public and elicit public comments and suggestions regarding existing and potential issues within the Study Area, potential alternatives for addressing them, and other Study aspects.
- Employ outreach techniques that will allow for collection and coordination of public communication and comments.
- Reach out to groups that might normally be underrepresented in a study, such as minorities, non-English-speaking residents, low-income residents, seniors, youth and the disabled.

13.1 Technical Advisory Committee Meetings

The committees formed during the *Nassau Hub Major Investment Study (MIS) (2006)* were transitioned into a Technical Advisory Committee (TAC) and a Stakeholder Committee, with updated and enhanced membership lists, for the Nassau Hub Study AA/EIS. The purpose of the TAC was to provide regulatory, policy, operating, and design guidance and feedback from implementing or resource agencies to the Study Team. The membership of the TAC is provided in Table 13-1. Each of the five TAC meetings held during the AA phase of the Study is summarized below.

Table 13-1: Technical Advisory Committee Membership

Federal Highway Administration (FHWA)	Nassau County Office of Economic Development
Federal Transit Administration (FTA)	Nassau County Office of Emergency Management
United States Environmental Protection Agency (USEPA)	Nassau County Planning Commission
New York State Department of Transportation (NYSDOT)	Nassau Inter-County Express (NICE) Bus[1]
New York Metropolitan Transportation Council (NYMTC)	Nassau County Open Space and Parks Advisory Committee (OSPAC)
Metropolitan Transportation Authority (MTA)	Nassau County Police Department
MTA Long Island Bus (LI Bus)	Town of Hempstead
MTA Long Island Rail Road (LIRR)	Town of North Hempstead
Nassau County Comptroller's Office	Town of Oyster Bay
Nassau County Department of Assessment	Village of Garden City
Nassau County Department of Health	Village of Hempstead
Nassau County Department of Parks, Recreation and Museums	Village of Mineola
Nassau County Department of Public Works	Village of Westbury
Nassau County Executive's Office	Carle Place Civic Association
Nassau County Industrial Development Agency	

Note 1: NICE Bus assumed operation of the County's bus system on January 1, 2012, replacing LI Bus on the TAC.

13.1.1 TAC Meeting 1

The first TAC meeting was held Wednesday, June 22, 2010, at the Long Island Marriott in Uniondale, NY. The purpose of this initial meeting was to welcome the TAC members to the Study, provide them with an overview of the Study's history and the work plan, and discuss the role the TAC would play in the Study's process. The role of the TAC included serving as a liaison between the Study Team and the TAC members' organizations, reviewing Study materials, and providing ongoing technical guidance to the Study Team. Key points raised by TAC members at the first meeting included:

- Whether each alternative would be subject to review in an EIS; what the outcome would be if the Locally Preferred Alternative (LPA) would result in significant environmental impacts;
- How the development of the Nassau Veterans Memorial Coliseum will be factored into the Study;
- Whether funding is guaranteed for project implementation or just for the Study; and
- How the transit-improvement options defined in the Study would facilitate multi-modal circulation in the Study Area.

The responses to these questions were that all of the issues would be addressed as part of the Study. In addition, the environmental review process was described. It was noted that possible future land use scenarios, including the development of the Nassau Veterans Memorial Coliseum property, will be determined through consultation with local communities. It was explained that funding is currently available for the Study phase only; however, the Study includes development of an implementation strategy that recognizes economic conditions and the availability of federal and local funding. It was noted that a multi-modal approach, including both pedestrian and bicycle circulation, is key to the AA Study.

13.1.2 TAC Meeting 2

The second TAC meeting was held jointly with the first Participating Agencies Coordination meeting Thursday, November 18, 2010, at the Nassau County Ceremonial Chambers, 1550 Franklin Avenue, Mineola, NY. The list of Participating Agencies is included in Appendix A.

The purpose of this meeting was to update the TAC on Study progress and to formally assemble the additional federal and non-federal agencies that accepted the invitation to become a Participating Agency during the AA process. Key topics discussed at the meeting included:

- The Study's Problem Statement
- The Purpose and Need and Goals and Objectives for the Study;
- Public involvement activities;
- The Preliminary Long-List Alternatives.

Questions posed by TAC and Participating Agency attendees were principally about potential ridership and details of the alignments presented at the meeting. Specific questions and issues included:

- Would a lack of pedestrian connections be considered a fatal flaw?
- A new LIRR station has been proposed with many of the alternatives but the LIRR is not considering a new station in the proposed area. It is always a possibility but would require in-depth, separate analysis.
- Will the full system from the MIS be evaluated, as well, or just the core system?

The fatal-flaw phase of the alternatives screening process was explained. It was noted that the potential usefulness of a new LIRR station would be tested through the Study's travel demand modeling process; that discussions with MTA/LIRR and other stakeholders would be necessary to advance the concept of a new LIRR station; and that both the full and core systems would be evaluated.

13.1.3 TAC Meeting 3

The third TAC meeting was held Thursday, June 2, 2011, at the Nassau County Legislative Chamber, Mineola, NY. The purpose of the meeting was to provide a Study update; review the results of the initial phase of the alternatives screening process and preliminary results of the second screening phase; obtain TAC comments and feedback; and provide an overview of the next steps of the screening process. Prior to the meeting, technical memoranda documenting the Study's Problem Statement, Purpose and Need, and Goals and Objectives were made available on the Study website for TAC review.

Prior to the formal portion of the meeting, TAC attendees were invited to view display boards with maps of alignment alternatives and the results of the first phase of the alternatives screening process and discuss them with Study Team members. The Study Team discussed at the meeting that, after further review and consideration, these segments were refined and linked to create 14 conceptual travel corridors, each one representing a potential Study Area transit alignment alternative. The 14 alignment alternatives comprising the Preliminary Long-List of Alternatives were presented.

The three phases of the alternative screening process were also presented, consisting of:

1. An initial, qualitative fatal-flaw screening of the Preliminary Long-List Alternatives to eliminate infeasible alternatives;
2. An additional screening to qualitatively and quantitatively evaluate the Refined Long-List Alternatives advanced from the fatal-flaw screening against the Study goals and objectives;
3. Detailed, quantitative analyses to evaluate the Short-List Alternatives advanced from the Refined Long-List Alternatives screening, and further detailed in terms of mode and alignment, against multiple criteria and evaluation measures.

It was noted that the screening process concludes with the selection of the LPA.

Questions posed by TAC attendees were as follows:

- Will the alternatives require new construction?
- Will sidewalks be constructed to assist pedestrians at certain areas?
- Was travel demand potential developed using only the results of the Origin/Destination (O/D) Survey?
- Does the travel demand forecasting model use daily and one-way trips?
- How will the remaining alternatives be screened?

It was explained that the alternatives, as presented at the meeting, generally use existing rights-of-way (i.e., existing roads and rail corridors), although each alternative would involve some new construction, and that issues related to pedestrian and bicycle access would be considered at a later stage of the alternatives screening process. It was noted that the travel demand model used in the Study is a planning model developed by the FTA and called the Aggregate Regional Rail Forecasting (ARRF) model. The model is GIS-based, uses census data such as population, employment, and journey-to-work, as well as

the results of the Study's O/D survey, and daily and one-way trips. It was noted that the screening criteria were still being defined, at that point, and that each screening phase is progressively more quantitative.

13.1.4 TAC Meeting 4

The fourth TAC meeting was held Tuesday, January 17, 2012, at the Nassau County Legislative Chamber, Mineola, NY. The purpose of the meeting was to provide a Study update; review the results of the second phase of the alternatives screening process; obtain TAC comments and feedback; and provide an overview of the next steps of the screening process. Prior to the formal portion of the meeting, TAC attendees were invited to view display boards with maps of alignment alternatives and the results of the second phase of the alternatives screening process and discuss them with Study Team members.

The 14 Preliminary Long-List Alternatives evaluated during the fatal-flaw screening were presented. It was noted that Alternatives 9 through 14 were fatally flawed, leaving Alternatives 1 through 8 to be advanced for the Refined Long-List Alternatives screening. For this next level of screening, the remaining alternatives were further defined and developed with more detail, including activity center connections; land use compatibility; stakeholder and public input; infrastructure and operational characteristics; and ridership potential.

The Study Team discussed the assessment of mode options. The recommended modes for further evaluation were bus rapid transit (BRT)/premium bus and modern streetcar. The Study Team recommended that Alternatives 2 and 3 be advanced, each as BRT/premium bus and/or modern streetcar.

Key questions asked by TAC members and addressed in responses at the meeting or through subsequent analyses included:

- Are there issues regarding fundability of light rail transit (LRT) versus modern streetcar? Is one more fundable than the other?
- On the revenue side, is the Study Team discussing obtaining financial assistance and buy-in from the major employers and other large property owners along the alternatives' alignments?

It was noted that there is a resurgence in streetcars being used throughout the United States so it is possible there could more funding available for that mode. However, in general, funding opportunities are not influenced by the mode of transit. In terms of private funding, the Study Team will investigate that possibility when assessing potential funding options.

13.1.5 TAC Meeting 5

The fifth TAC meeting was held May 7, 2013, at the Nassau County Legislative Chamber, Mineola, NY. The purpose of the meeting was to provide a Study update; review and solicit feedback regarding the Study Team's proposed LPA, based on the studies and outreach conducted to date; obtain TAC comments and feedback; and provide an overview of the next steps of the AA process. Prior to the formal portion of the meeting, TAC attendees were invited to view a display board with a map of the proposed LPA and discuss the LPA with Study Team members. Key areas of discussion included:

- Funding potential of the LPA;
- Upcoming environmental review: and
- Potential phasing of LPA implementation.

There were no specific questions raised.

13.2 Stakeholder Committee Meetings

The purpose of the Stakeholder Committee is to share information with and receive feedback from designated representatives and their constituents about the Study. Stakeholder Committee membership includes almost 300 representatives of government, business organizations, institutions, community and environmental groups, and other civic entities. A complete list of Stakeholder Committee members is provided in Appendix B. Each of the four stakeholder committee meetings held during the AA phase of the Study is summarized below.

13.2.1 Stakeholder Committee Meeting 1

The first Stakeholder Committee meeting was held Wednesday, July 14, 2010, at the Nassau County Legislative Chamber, Mineola, NY. The purpose of this initial meeting was to welcome the Stakeholder Committee members to the Study, provide them with an overview of the Study's history and the work plan; and discuss the role the Committee would play in the Nassau Hub Study AA/EIS process. The Committee was tasked with reviewing Study information, providing feedback and serving as a liaison between the Study Team and the Stakeholder Committee members' organizations. Key points raised by the Stakeholder Committee included:

- How the LPA would be selected;
- Whether transit-mode options other than rail and bus would be considered in the Study;
- How the Study Team would engage people living outside the Study Area but using mass transit in/around the Study Area; and
- How the Study would affect changes already planned in the Study Area (e.g., Nassau University Medical Center [NuHealth] expansion, Hofstra University's new medical school).

Meeting attendees were advised that the LPA would be selected through a formal alternatives evaluation process, which incorporates the public's feedback, and is based on the technical evaluations and input. It was noted that because a multi-modal approach is key to the AA, the Study includes consideration of both pedestrian and bicycle travel modes. In terms of outreach, it was stressed that elected officials and community representatives beyond the immediate Hub area are invited to the Study's public meetings and that suggestions on how else to approach communities outside the Study Area would be welcomed. Possible future land use scenarios, including the expansions at NuHealth and Hofstra, will be incorporated through consultation with these facilities and local communities.

13.2.2 Stakeholder Committee Meeting 2

The second Stakeholder Committee meeting was held Thursday, June 2, 2011, at the Nassau County Legislative Chamber, Mineola, NY. The purpose of this meeting was to provide a Study update; review alternatives screening activities and results, to date; obtain Committee comments and feedback; and provide an overview of the next steps of the screening process. Prior to the meeting, the technical memoranda documenting the Study's Problem Statement, Purpose and Need, and Goals and Objectives were made available on the Study website for Stakeholder Committee review.

Prior to the formal portion of the meeting, Stakeholder Committee attendees were invited to view display boards with maps of alignment alternatives and the results of the first phase of the alternatives screening process and discuss them with Study Team members. The Study Team discussed at the meeting that, after further review and consideration, these segments were refined and linked to create 14 conceptual travel corridors, each one representing a potential Study transit alignment alternative. The 14 alignment alternatives comprising the Preliminary Long-List of Alternatives were presented.

The components of the alternative screening process were presented, consisting of:

1. An initial, qualitative fatal-flaw screening of the Preliminary Long-List Alternatives to eliminate infeasible alternatives.
2. An additional screening to qualitatively and quantitatively evaluate Refined Long-List Alternatives advanced from the fatal-flaw screening against the Study goals and objectives.
3. Detailed, quantitative analyses to evaluate Short-List Alternatives advanced from the Long-List screening, and further detailed in terms of mode and alignment, against multiple criteria and evaluation measures.

It was noted that the screening process concludes with the selection of a LPA. Key points raised by the Stakeholder Committee included:

- What methods there are to convince people to use transit instead of their cars; and
- Whether there would be extensive connections outside the study area including north-south connections.

Various comments and responses on the issue of how to attract ridership to a proposed transit system considered reducing available parking, making the transit service frequent, dependable and inexpensive, and creating connections outside of the Study Area. These issues were considered in the development of the LPA.

13.2.3 Stakeholder Committee Meeting 3

The third Stakeholder Committee meeting was held Tuesday, January 17, 2012, at the Nassau County Legislative Chamber, Mineola, NY. The purpose of the meeting was to provide a Study update; review the results of the second phase of the alternatives screening process; obtain committee comments and feedback; and provide an overview of the next steps of the screening process. Prior to the formal portion of the meeting, Stakeholder Committee attendees were invited to view display boards with maps of alignment alternatives and the results of the second phase of the alternatives screening process and discuss them with Study Team members.

The 14 Preliminary Long-List Alternatives evaluated during the fatal-flaw screening were presented. It was noted that Alternatives 9 through 14 were fatally flawed, leaving Alternatives 1 through 8 to be advanced for the Refined Long-List Alternatives screening. For this next level of screening, the remaining alternatives were further defined and developed with more detail, including activity center connections; land use compatibility; stakeholder and public input; infrastructure and operational characteristics; and ridership potential.

The Study Team discussed the assessment of mode options. The recommended modes for further evaluation were BRT/premium bus and modern streetcar. The Study Team recommended that Alternatives 2 and 3 should be advanced, each as BRT/premium bus and/or modern streetcar.

Key points raised by Stakeholder Committee members included:

- Whether light rail transit (LRT) or modern streetcar is more fundable than the other;
- Whether there are suburban areas that have implemented LRT subsequent to suburban development; and
- How NICE Bus and LIRR are providing input to the Study.

The Study Team responded that project funding is more about the specifics of the system proposed than about the mode; funding potential is related to project cost and benefits. Examples of other systems were mentioned, including the Hudson-Bergen LRT in Bayonne, NJ, and LRTs in Seattle, Portland, Denver and St. Louis. It was noted that representatives of NICE Bus and the LIRR have participated in the TAC meetings, as well as one-on-one meetings to provide their input.

13.2.4 Stakeholder Committee Meeting 4

The fourth Stakeholder Committee meeting was held May 7, 2013, at the Nassau County Legislative Chamber, Mineola, NY. The purpose of the meeting was to provide a Study update; review and solicit feedback regarding the proposed LPA; obtain committee comments and feedback; and provide an overview of the next steps of the process. Prior to the formal portion of the meeting, Stakeholder Committee attendees were invited to view a display board with a map of the proposed LPA and discuss the LPA with Study Team members. Key areas of discussion included:

- Funding potential of the LPA,
- Upcoming environmental review, and
- Potential phasing of LPA implementation.

There were no specific questions raised.

13.3 Public Engagement

While the Stakeholder Committee represents the interests of many people and organizations, multiple opportunities were also provided for the general public to participate in the Study. Each of the four public meetings held during the AA phase of the study is summarized below.

13.3.1 Public Meeting 1

The first public meeting was held Wednesday, August 11, 2010, from 6:00 to 8:30 PM at the Long Island Marriott Hotel and Conference Center. The meeting was broadly advertised with ads in over 60 weekly papers including *Newsday*, *Long Island Business News* and *Noticia;* and on Patch.com. Notices in English and Spanish were also sent for distribution/posting to the e-newsletters published regularly by the New York Metropolitan Transportation Council (NYMTC Notes), Tri-State Transportation Campaign, Vision Long Island, and Sustainable Long Island; the Nassau County Coordinating Agency for Spanish Americans (CASA); and were provided to all members of the TAC and Stakeholder Committee and all Nassau County villages, towns, cities and libraries. Flyers in English and Spanish were posted at railroad kiosks and post offices and variable message signs announcing the meeting were located at two locations on Hempstead Turnpike for a week before the meeting (Figure 13-1).

Figure 13-1: Publicity for Public Meeting 1

Source: Jacobs, 2012.

Following an introductory presentation about the Study, participants were invited to visit five information stations on the following topics: study background, history and process; transportation problems; transit options; ideas and opportunities; and staying involved in the Nassau Hub Study AA/EIS. Each station had a series of boards on easels and was manned by one or two Study Team members to have dialogue with meeting attendees, answer questions and take notes regarding attendees' comments, issues or concerns. Comment cards were also available at each station.

13.3.2 Public Meeting 2

The second public meeting was held Wednesday, September 21, 2011, from 6:30 to 9:00 PM at the Nassau County Legislative Chamber, Mineola, NY. The meeting was broadly advertised with the same program of ads, flyers and variable message signs as was used for the first public meeting.

The purpose of this meeting was to provide a Study update; review alternatives screening activities and results, to date; obtain comments and feedback from the public; and provide an overview of the next steps of the screening process. Prior to the formal portion of the meeting, the public was invited to view display boards with maps of alignment alternatives and the results of the first phase of the alternatives screening process (Refined Long-List Alternatives) and discuss them with Study Team members.

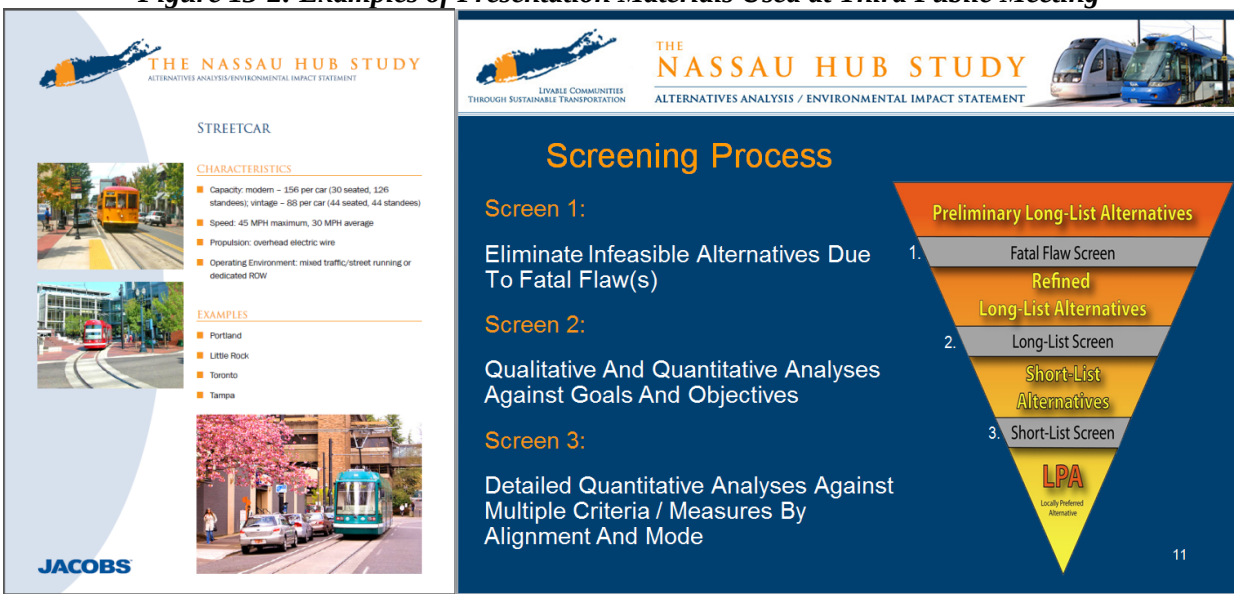
13.3.3 Public Meeting 3

The third public meeting was held Tuesday, January 31, 2012, from 6:30 to 9:00 PM at the Nassau County Legislative Chamber, Mineola, NY. The meeting was broadly advertised with the same program of ads, flyers and variable message signs as was used for the first and second public meetings.

The purpose of this meeting was to provide a Study update to the public; review alternatives screening activities and results, to date; obtain comments and feedback from the public; and provide an overview of the next steps of the screening process. This meeting focused on the selection of Alternatives 2 and 3 to advance for more detailed study, each with two modes (modern streetcar or BRT/premium bus). Prior to the formal portion of the meeting, the public was invited to view display boards with maps of alignment alternatives and the results of the second phase of the alternatives screening process and discuss them

with Study Team members. Figure 13-2 provides examples of presentation materials used at this public meeting.

Figure 13-2: Examples of Presentation Materials Used at Third Public Meeting



Source: Jacobs, 2012.

13.3.4 Public Meeting 4

The fourth public meeting was held May 7, 2013, at the Nassau County Legislative Chamber, Mineola, NY in conjunction with the fourth Stakeholder Committee meeting. Everyone on the Study's email list was invited. The purpose of the meeting was to provide a Study update to the public; review and solicit feedback regarding the proposed LPA; obtain comments and feedback from the public; and provide an overview of the next steps of the process. Prior to the formal portion of the meeting, the public was invited to view a display board with a map of the proposed LPA and discuss the LPA with Study Team members.

Most of the questions received over the course of the four public outreach meetings were answered with explanations and clarifications. There was support expressed for the LPA at this final public meeting. Key comments and questions raised at the public meetings, which helped shape the refinement of the LPA, include:

- Due to concerns raised by the public and the LIRR about a new or a relocated Carle Place Station, this station was not included in the LPA.
- Concerns about involving the public and private entities in the Hub, such as Roosevelt Field, NuHealth, Hofstra University, Nassau Community College, Renaissance Downtowns, etc., were addressed by the Study Team with expanded outreach through one-on-one meetings with those entities.
- Concerns about economic viability, potential tax increases, and reasonable fares were factored not the consideration of potential funding for project implementation and subsequent operations and maintenance.

- Concerns about having the proposed project's hours of operation span weekend trips, Nassau Veterans Memorial Coliseum events and later hours for retail shopping during the holiday season were considered in the Study's operations planning.
- Concerns about connection of the proposed system to the Village of Freeport, Roosevelt Field, Uniondale, as well as north-south connections, were considered for a phased approach to the system.
- Concerns from the Village of Mineola about potential parking demand and from Carle Place Water District about its well field and pumping facility will need to be addressed during the Study's environmental review phase.

All comments received at the public meetings were documented in the Study database, became part of the Study record and were used to enhance and improve the AA Study.

13.4 One-on-One Meetings

The Study's technical activities required additional coordination with specific agencies and organizations in the Study Area beyond that achieved through the TAC, Stakeholder Committee, and public meetings. More than 40 one-on-one meetings were held to explain specific geographic or technical details of the Study to particular audiences and receive and discuss their input, concerns and issues. The following meetings were held with representatives of local municipalities, institutions, businesses, landowners, homeowner associations, and other civic and stakeholder groups:

Date	Representing
05/18/11	Hofstra, Nassau Community College, Hebrew Academy of Nassau County (HANC), Nassau Boards of Cooperative Educational Services (BOCES)
05/18/11	Nassau County Offices for Physically Challenged, Real Estate, Police
05/18/11	Nassau County Offices of Minority Affairs, Coordinated Agency for Spanish Americans (CASA) and Mental Health Chemical Dependency & Developmental Disabilities Services (OMHCDD)
05/19/11	Simon Property Group, Inc. (Roosevelt Field), Renaissance Property Group, Beechwood Homes
05/19/11	Uniondale Chamber of Commerce, Long Island Business Council
07/22/11	Long Island Association, Nassau Council of Chambers of Commerce
08/01/11	RXR Realty, LLC
08/02/11	Nassau Community College
08/18/11	LI Progressive Coalition, Regional Plan Association, Vision Long Island, Sustainability Institute, Tri-State Transportation Campaign, Sustainable Long Island
08/18/11	Carle Place Civic Association, Uniondale Community Council, Greater Uniondale Civic Action Coalition, West Hempstead Community Support Association
09/22/11	Simon Property Group, Inc. (Roosevelt Field)
11/15/11	Long Island Regional Planning Council (LIRPC)
11/16/11	Hempstead Chamber of Commerce
11/16/11	Nassau County Department of Human Services
11/18/11	Vincent Polimeni
11/29/11	Nassau County Parks Department
11/29/11	Town of North Hempstead
11/29/11	Village of Hempstead Community Development Agency (CDA)
12/02/11	Village of Freeport
12/02/11	Village of Westbury
12/02/11	Office of Community Development & Housing & Homeless Services
12/05/11	Village of Mineola
12/15/11	LIRR
02/02/12	Town of Hempstead
02/07/12	Long Island Regional Planning Council (LIRPC) (presentation)

Date	Representing
02/07/12	NICE Bus
02/15/12	Carle Place Civic Association
02/21/12	Hofstra University
02/23/12	Renaissance Downtowns
04/19/12	New York State Department of Transportation
04/23/12	Hofstra University Student Affairs
05/18/12	Carle Place Water District
05/31/12	Nassau Industrial Development Agency (IDA)
05/31/12	LIRR Commuter Council
06/01/12	Village of Hempstead
06/05/12	Nassau Community College
06/05/12	Town of North Hempstead
08/13/12	Renaissance Downtowns, LLC
09/11/12	Hofstra University
12/12/12	Renaissance Downtowns, LLC
12/19/12	Renaissance Downtowns, LLC
06/06/14	Forest City Ratner
07/23/14	Simon Property Group, Inc. (Roosevelt Field)

The one-on-one meetings yielded substantive information on ridership, routing, potential synergy with planned developments, and mode preference. Below are some examples of the feedback and information gleaned from one-on-one meetings with respect to alignment routing and station locations.

13.4.1 Meeting with Nassau Community College (6/5/12)

Representatives from Nassau Community College expressed concern that the alignment would cause additional congestion at the College's Endo Boulevard exit. The Study Team related that the future detailed environmental review to be performed would evaluate future traffic flow with and without the Study improvements compared to what currently occurs. The College representatives were also interested in improving LIRR access for students who commute from eastern Queens and from Suffolk County. This will be a future consideration as potential longer-term alignment expansions may branch out from the main LPA route. This could involve a future connection to the LIRR's Freeport Station, which would then connect to points east and west via train and via frequent bus service to the Rosa Parks–Hempstead Transit Center.

13.4.2 Meeting with Renaissance Downtowns, LLC (8/13/12)

Renaissance Downtowns, LLC representatives expressed a desire for the alignment to run through the center median along Hempstead Turnpike. The LPA (see Section 15) would run along the length of Hempstead Turnpike from the Village of Hempstead (near Renaissance Downtowns' multi-billion dollar redevelopment project) to Nassau Community College. The Study Team explained that the LPA would use the center median where this is possible and, where the median is too narrow, the LPA would use the outer lanes or a new alignment outside the travel way to maximize dedicated mileage. Where sufficient room and right-of-way do not exist, the LPA's Hempstead Turnpike alignment would run in mixed traffic.

At this meeting, the Study Team noted that the alignment along the north side of Hempstead Turnpike would require some property taking in the vicinity of Hofstra University, which would need to be coordinated with the University, whose representatives are supportive of the Study.

Renaissance Downtowns, LLC representatives asked about a connection to NuHealth's Nassau University Medical Center, as many nurses and employees use public transportation. The Study Team subsequently examined this option, and determined that the connection would not be cost-effective as it would serve only the hospital. In addition, three NICE Bus routes (N70/71/72) already serve the hospital. Therefore, while the Study Team evaluated a connection to NuHealth hospital, it was not incorporated in the LPA.

13.4.3 Meeting with Hofstra University (9/11/12)

This meeting included the Hofstra University President, head of security, and several Deans. The attendees informed the Study Team of their preferred locations for stations and of locations where they would not want local stations. Their preferred station locations were along Hempstead Turnpike, near the existing pedestrian overpasses, which would eliminate the need for Hofstra University to provide private bus service to the LIRR Hempstead Station, thus freeing up resources to be used elsewhere on campus. The LPA incorporates these ideas and locates the two Hofstra University stations in the exact locations requested at this meeting.

In addition, Hofstra University personnel preferred that the alignment avoid using Oak Street because of the labored return route around the fenced backyards of the University dorms. The LPA incorporates this request and avoids Oak Street.

13.4.4 Multiple One-on-One Meetings

Many attendees at different one-on-one meetings gave similar or overlapping advice about positive features to include, making the future transit system successful. Examples of this input include the following:

- Ensure short enough headways so riders have a comfort level with the new service – this has been incorporated into the LPA's operating plan;
- Minimize the number of transfers required to access major generators and make sure that transfer points are not vast, expansive areas – this will be considered in future project phases as the LPA undergoes formal design;
- Avoid residential streets and stick to main arterials – this has been incorporated in the LPA; and
- Consider phased implementation to reduce initial costs – this is incorporated in the LPA.

13.5 Website

The Nassau Hub Study AA/EIS website (www.nassauhub.com) (Figure 13-3) is linked to the Nassau County website and serves as a repository to provide the public with notification of all Study meetings and events, and downloadable versions of materials developed for public distribution. Materials posted on the website, to date, include an overview of the Study, alternatives under consideration, Study reports, maps and documents, meeting presentations, notices of public meetings, and contact information. The website includes an area to accept public comment, as well as a section with Frequently Asked Questions (FAQs). All materials and information on the website have been kept up to date during the Study. The website includes a translation tool for several languages, including Spanish, and has received 8,207 hits since its inception.

Figure 13-3: Website

Source: Jacobs, 2010.

14. Evaluation of Short-List Alternatives

Based on the alternatives development and screening evaluation results summarized in Sections 6 through 12 and reflecting stakeholder and public input summarized in Section 13, the Short-List Alternatives were evaluated in the final phase of the alternatives screening process. In this screening, the four remaining alternatives were comparatively evaluated against a set of criteria and evaluation measures directly related to the Study's goals and objectives, which, in turn, relate to the purpose and need for transit improvement in the Study Area and the underlying transportation- and economic development-related problems identified in the Study Area. This section summarizes the Short-List Alternatives screening and rating process; identifies the criteria and evaluation measures used; and reports the alternatives' comparative performance against the evaluation measures and, on that basis, their relative summary ratings.

14.1 Short-List Alternatives Screening Process

The Short-List Alternatives screening criteria and evaluation measures are presented in Table 14-1 organized by the specific Study goal and associated objective to which the criteria and measures relate. Criteria in the FTA's New Starts evaluation process (highlighted in brown type in Table 14-1) were aligned with specific Study goals. Additional criteria not in the New Starts evaluation process but relevant to address certain of the Study's goals and objectives were defined.

Following the screening evaluation against these criteria and measures, the Short-List Alternatives were ranked (as described below) based on a summary rating for the evaluations associated with each of the four project goals. That is, for each goal, the individual ratings specific to each evaluation measure were averaged to determine the alternative's summary rating for the given goal.

In keeping with the Federal Transit Administration's (FTA) project rating process, a rating system of high, medium-high, medium, medium-low, and low was used. In FTA's Policy Guidance,[1] its rating process recognizes that small amounts of benefits are simply small, but not bad, as an indicator of a proposed project's performance. Therefore, FTA rates a small amount of positive benefits on a particular measure as "medium" rather than "low" or "medium-low." FTA rates projects with greater than small benefits on a particular measure as "high" or "medium-high." Only projects with adverse impacts or disbenefits on a particular measure receive a "medium-low" or "low" rating. The same series of ratings and a similar approach to assignment of ratings were used in the Short-List Alternatives screening evaluation.

Ranking breakpoints (i.e., thresholds) defined by the FTA in its Policy Guidance were used in this screening's rating system, where applicable to the criteria; the applicable FTA breakpoints are identified in Table 14-1.

A point system was assigned to the ratings: High=4; Medium-High=3; Medium=2; Medium-Low=1; Low=0. Points were then summed for each alternative. The alternative with the highest points for the Short-List Alternatives screening is being recommended as the Locally Preferred Alternative (LPA).

[1] Federal Transit Administration, Major Capital Investment Projects New and Small Starts: Final Rule (PDF) (49 CFR Part 611; effective April 9, 2013)

Table 14-1: Short-List Alternatives Screening Criteria

Objective	Screening Criterion	Evaluation Measure
GOAL: Develop transit improvements that will provide additional realistic and practical travel options to, from and within the Study Area and help to mitigate congestion on roadways.		
Increase public transportation options and use as a means of access to, from and within the Study Area.	Total transit trips to, from and within the Study Area should be maximized.	Number of Transit Trips using the Project: Non-transit-dependent Trips + (Transit-dependent trips * 2) (*new FTA mobility measure*) Ranked using FTA breakpoints: High: >25.0 million; Medium-High: 15-24.9 million; Medium: 9-14.9 million; Medium-Low: 4.5-8.9 million; Low: < 4.49 million
Develop a transit alternative that encourages use of alternate transportation modes (walking, bicycling, carpooling and other travel demand management methods) to travel by auto.	The number of trips that access transit by walking, bicycling, carpooling and other travel demand management methods should be maximized.	Number of trips accessing transit alternative by walking, bicycling, carpooling and other travel demand management methods. Ranked as High: > 2.0 million; Medium-High: 1.5-2.0 million; Medium: 1-1.5 million; Medium-Low: 0.5-1.0 million; Low: <0.5 million
Identify a transit alternative that is capable of growing and adapting to changes in the demand for service.	Flexibility to respond to future changes in demand should be maximized.	Qualitative evaluation of the degree of system flexibility. Ranked as High, Medium, Low, relative to other alternatives under evaluation.
GOAL: Develop transit improvements that will enhance mobility to, from and within the Study Area in a cost-effective manner.		
Develop an alternative that will have a capital cost that is consistent with anticipated financial resources and operating and maintenance (O&M) costs that can feasibly be funded with state and local resources.	Annualized capital and O&M costs per trip should be minimized.	Annualized capital and O&M cost per trip (*new FTA Cost-effectiveness measure*). Ranked using FTA breakpoints: High: <$4.00; Medium-High: $4.00 - $5.99; Medium: $6.00 - $9.99; Medium-Low: $10.00 - $14.99; Low: >$15.00
Develop a transit alternative that provides travel time savings compared to existing options.	The alternative should shorten travel time between a standard set of activity centers.	Travel time from Village of Hempstead to Roosevelt Field Ranked as High: <20 minutes; Medium-High: 20-21.9 minutes; Medium 22-23.9 minutes; Medium-Low: 24-25.9 minutes Low: > 26 minutes
		Travel time from Village of Mineola to Nassau Veterans Memorial Coliseum Ranked as High: <15 minutes; Medium-High: 15-16.9 minutes; Medium: 17-18.9 minutes; Medium-Low: 19-20.9 minutes Low: > 21 minutes

Table 14-1: Short-List Alternatives Screening Criteria (continued)

Reduce travel time and costs associated with congestion.	Capital cost per passenger mile should be minimized.	Annualized capital cost per passenger mile Ranked as High: <$4; Medium-High: $4-$5.9; Medium: $6-$7.9; Medium-Low: $8-$9.9; Low: >$10
Develop an alternative that is capable of being funded for construction through traditional or alternative/innovative funding mechanisms.	The federal funding component of total funding should be maximized.	Local capital funding required of total capital cost: (Non-Section 5309 Federal Funds) Ranked as High: <$50 million; Medium-High: $50-$100 million; Medium: $100-$150 million; Medium-Low: $150-$200 million; Low: >$200 million
Develop an alternative that is capable of being funded for operation through traditional or alternative/innovative funding mechanisms.	Projected ratio of farebox recovery & operating subsidy should be maximized relative to projected operating costs.	Farebox recovery ratio. High: > 60%; Medium-High: 50-60%; Medium: 40-50%; Medium-Low: 30-40%; Low: <30%
Explore alternatives that can be phased incrementally, consistent with available funding.	Ability to phase the project based on viability to implement initial or minimum operating segments should be maximized.	Qualitative evaluation of ability to phase project. Ranked as High, Medium-High, Medium, Medium-Low, Low, relative to other alternatives under evaluation.
GOAL: Develop transit improvements that encourage the development of sustainable, transit-friendly land use patterns and support economic development activities.		
Use transit to enable more compact land uses that could better support a transit-oriented development scenario.	Density of development within ¼-mile radius of transit stations or stops should be maximized.	Average population density (persons/square mile) within ¼-mile radius of transit stations/stops (*FTA land use measure*). Ranked using FTA breakpoints: High (> 15,000); Medium-High (10,000-15,000); Medium (6,667-10,000); Medium-Low (3,333-6,667); Low (< 3,333)
Locate transit to enhance the economic competitiveness of the Study Area, creating new job opportunities, and support existing businesses.	The number of jobs within ¼ mile of proposed alignment should be maximized.	Employment/jobs served by system (*FTA land use measure*) Ranked using FTA breakpoints: High (> 250,000); Medium-High (175,000-250,000); Medium (125,000-175,000); Medium-Low (75,000-125,000); Low (< 75,000)
Develop transportation alternatives that attract transit-dependent and non-transit-dependent riders.	The number of transit-dependent users (elderly, youths, and/or below median income levels) should be maximized.	Number of units of publicly supported housing in the corridor (*FTA land use measure*). Breakpoints not yet established by the FTA; medium rating to be applied to all alternatives.

Table 14-1: Short-List Alternatives Screening Criteria (continued)

Develop a transit alternative that can be supported by local land use plans and development policies.	Extent to which an alternative is supportive of existing and planned local land use policies should be maximized.	Qualitative evaluation of transit-supportive plans and policies in place, including plans to support or increase affordable housing (*FTA economic development measure*). Ranked as High, Medium-High, Medium, Medium-Low, or Low, relative to other alternatives under evaluation.
GOAL: Develop transit improvements that enhance quality of life and minimize adverse environmental impact.		
Use transit as part of a regional approach to address congestion-related air quality concerns and regional air quality conformity; mitigate greenhouse gas (GHG) emissions; and mitigate overall energy consumption for trip making.	Reduction in air pollutants, GHG emissions and annual energy consumption based on reduction in vehicle miles traveled (VMT) should be maximized.	Reduction in VMT (*new FTA environmental benefits measures are a function of reduced VMT*). Ranked using FTA breakpoints: High: >10 million; Medium-High: 8-10 million; Medium: 6-8 million; Medium-Low: 4-6 million; Low: < 4 million
Encourage uses at street level that will support a lively streetscape on a pedestrian scale with diverse activity in the vicinity of station areas.	Ability to integrate into a streetscape with a pedestrian-scale environment should be maximized.	Qualitative evaluation of ability to integrate into pedestrian-scale streetscape. Ranked as High, Medium-High, Medium, Medium-Low or Low, relative to other alternatives under evaluation.
Incorporate alternative fuels and energy sources into the transit alternative, as appropriate.	Incorporation of alternative fuels and energy sources should be maximized.	Fuel or energy source incorporated: High: electric; Medium: hybrid; Low: diesel

Note: Evaluation criteria used by the FTA in the New Starts rating process are indicated in brown.

Source: Jacobs, 2013.

14.2 Evaluation Results

The comparative performance of the four Short-List Alternatives against each of the evaluation measures is presented in Table 14-2 and discussed in the following section, organized by Study goals and associated evaluation measures.

Table 14-2: Short-List Alternatives Screening Results

Evaluation Measures	Thresholds/Breakpoints	Alternative 2 Modern Streetcar Mineola to Hempstead via Source Mall			Alternative 2A BRT/Premium Bus Mineola to Hempstead via Source Mall			Alternative 3 Modern Streetcar Mineola to Hempstead via South Street			Alternative 3A BRT/Premium Bus Mineola to Hempstead via South Street		
		Measure	Rating	Points	Measure	Rating	Points	Measure	Rating	Points	Measure	Rating	Points
Trips on the Project: Non-transit dependent Trips + (Transit dependent trips * 2) (new FTA mobility measure)	High: >25.0 million; Medium-High: 15-24.9 million; Medium: 9-14.9 million; Medium-Low: 4.5-8.9 million; Low: < 4.49 million	2,799,857	Low	0	1,838,712	Low	0	2,925,224	Low	0	2,005,868	Low	0
Number of trips accessing transit by walking, bicycling, carpool and other travel demand management methods	High: > 2.0 million; Medium-High: 1.5-2.0 million; Medium: 1-1.5 million; Medium-Low: 0.5-1.0 million; Low: <0.5 million	2,014,286	High	4	1,310,188	Medium	2	2,104,478	High	4	1,443,070	Medium	2
Degree of system flexibility to grow and change	Qualitative evaluation of degree of system flexibility to grow and change & ranking of as High, Medium-High, Medium, Medium-Low, Low, relative to other alternatives under evaluation	Qualitative	Medium	2	Qualitative	Medium	2	Qualitative	Medium	2	Qualitative	Medium	2
Annualized capital and O&M cost per trip (new FTA Cost-effectiveness measure)	High: <$4.00; Medium-High: $4.00 - $5.99; Medium: $6.00 - $9.99; Medium-Low: $10.00 - $14.99; Low: >$15.00	$21.41	Low	0	$12.27	Medium-Low	1	$17.79	Low	0	$10.11	Medium-Low	1
Travel time from Hempstead to Roosevelt Field	High: <20 minutes; Medium-High: 20-21.9 minutes; Medium 22-23.9 minutes; Medium-Low: 24-25.9 minutes Low: > 26 minutes	24.8	Medium-Low	1	30.9	Low	0	19.1	High	4	23.5	Medium	2
Travel time from Mineola to Coliseum	High: <15 minutes; Medium-High: 15-16.9 minutes; Medium 17-18.9 minutes; Medium-Low: 19-20.9 minutes Low: > 21 minutes	20.3	Medium-Low	1	28.6	Low	0	14.5	High	4	20.0	Medium-Low	1
Annualized capital cost per passenger mile	High: <$4; Medium-High: $4-$5.9; Medium: $6-$7.9; Medium-Low: $8-$9.9; Low: >$10	$6.7	Medium	2	$2.9	High	4	$5.7	Medium-High	3	$2.7	High	4
Local capital funding required (Non-Section 5309 Federal Funds)	High: <$50 million; Medium-High: $50-$100 million; Medium: $100-$150 million; Medium-Low: $150-$200 million; Low: >$200 million	$203,778,000	Low	0	$66,733,500	Medium-High	3	$180,054,000	Medium-Low	1	$57,614,000	Medium-High	3
Farebox recovery ratio	High: > 60%; Medium-High: 50-60%; Medium: 40-50%; Medium-Low: 30-40%; Low: <30%	29%	Low	0	38%	Medium-Low	1	36%	Medium-Low	1	44%	Medium	2
Ability to phase project	Qualitative evaluation of ability to phase project & ranking of as High, Medium-High, Medium, Medium-Low, Low, relative to other alternatives under evaluation	Qualitative	Medium	2	Qualitative	Medium	2	Qualitative	Medium	2	Qualitative	Medium	2
Average population density (persons/square mile) within ¼-mile radius of transit stations/stops (FTA land use measure)	High (> 15,000); Medium-High (10,000-15,000); Medium (6,667-10,000); Medium-Low (3,333-6,667); Low (< 3,333)	8,350	Medium	2	7,820	Medium	2	9,070	Medium	2	8,470	Medium	2
Employment/jobs served by system (FTA land use measure)	High (> 250,000); Medium-High (175,000-250,000); Medium (125,000-175,000); Medium-Low (75,000-125,000); Low (< 75,000)	34,975	Low	0	36,710	Low	0	32,030	Low	0	32,730	Low	0
Units of publically supported housing in the corridor (FTA land use measure)	Ranges not yet established; medium rating applied to all alternatives.	1,330	Medium	2	1,330	Medium	2	1,330	Medium	2	1,330	Medium	2
Transit-Supportive Plans and Policies in place, including plans to support or increase affordable housing (FTA economic development measure)	Qualitative evaluation of transit-supportive plans and policies & ranking of as High, Medium-High, Medium, Medium-Low, Low, relative to other alternatives under evaluation	Qualitative	Medium	2	Qualitative	Medium	2	Qualitative	High	4	Qualitative	Medium	2
Reduction in vehicle miles traveled (VMT) (new FTA environmental benefits measures are a function of reduced VMT)	High: >10 million; Medium-High: 8-10 million; Medium: 6-8 million; Medium-Low: 4-6 million; Low < 4 million	436,852	Low	0	340,759	Low	0	431,298	Low	0	288,639	Low	0
Ability to integrate into a streetscape with a pedestrian-scale environment	Qualitative evaluation and of ability to integrate into pedestrian-scale streetscape & ranking of as High, Medium-High, Medium, Medium-Low or Low, as relative to other alternatives under evaluation.	Qualitative	High	4	Qualitative	Medium	2	Qualitative	High	4	Qualitative	Medium	2
Incorporation of alternative fuels and energy sources	High: electric; Medium: hybrid; Low: Diesel	Electric	High	4	Diesel	Low	0	Electric	High	4	Diesel	Low	0
SUMMARY RATING FOR ALTERNATIVE				**26**			**23**			**37**			**27**

Methodology for Evaluation Rating Points: High = 4; Medium-High = 3; Medium = 2; Medium-Low = 1; Low = 0;

Source: Jacobs, 2013.

GOAL: Develop transit improvements that will provide additional realistic and practical travel options to, from and within the Study Area and help to mitigate congestion on roadways.

For the three evaluation measures used to evaluate the alternatives' relative ability to satisfy this Study goal, the alternatives' performance was as follows:

- Alternative 3 would have the highest number of trips using the proposed transit improvement, which is the new FTA measure for mobility, although all four alternatives rated low against the current[2] FTA breakpoints for this evaluation measure.
- Alternative 3 would have the highest number of trips accessing the proposed transit improvement by walking, bicycling, carpool and other travel demand methods and was given a high rating, as was Alternative 2, while Alternatives 2A and 3A received medium ratings.
- All of the alternatives were evaluated as having a medium degree of system flexibility to grow and change, based on the nature of the modern streetcar and BRT/premium bus modes.

GOAL: Develop transit improvements that will enhance mobility to, from and within the Study Area in a cost-effective manner.

For the seven measures used to evaluate the alternatives' relative ability to satisfy this Study goal, the alternatives' performance was as follows:

- Alternatives 2A and 3A were rated medium-low for annualized capital and O&M cost per trip, while Alternatives 2 and 3 were rated low.
- For travel time from the Village of Hempstead to Roosevelt Field, Alternative 3 had the best time at 19.1 minutes and was rated high, while Alternative 3A was rated medium, Alternative 2 was rated medium-low and Alternative 2A was rated low.
- For travel time from the Village of Mineola to the Nassau Veterans Memorial Coliseum, Alternative 3 had the best time at 14.5 minutes and was rated high, while Alternative 3A was rated medium, Alternative 2 was rated medium-low and Alternative 2A was rated low.
- For annualized capital cost per passenger mile, Alternatives 2A and 3A were rated high, Alternative 3 was rated medium-high, and Alternative 2 was rated medium.
- Alternatives 2A and 3A were rated medium-high for the local capital funding required while Alternative 3 was rated medium-low and Alternative 2 was rated low.
- For farebox recovery ratio, Alternative 3A was rated medium, Alternatives 2A and 3 were rated medium-low and Alternative 2 was rated low.
- All of the alternatives were evaluated to have a medium ability to be implemented in phases.

GOAL: Develop transit improvements that encourage the development of sustainable, transit-friendly land use patterns and support economic development activities.

For the four measures used to evaluate the alternatives' relative ability to satisfy this Study goal, the alternatives' performance was as follows:

- All of the alternatives received a medium rating for population density.

[2] FTA Breakpoint used as of June 2013 on http://www.fta.dot.gov/.

- All of the alternatives received a low rating for employment/jobs served by the proposed system, based on the FTA employment thresholds.
- Because the exact details of the FTA methodology to evaluate the units of publicly supported housing in the corridor had not been determined at the time of the Short-List Alternatives evaluation, and since all of the alternatives were found to have the same amount of publicly supported housing in the corridor, all of the alternatives were given a medium rating for this measure.
- Alternative 3 was rated high for transit-supportive plans and policies being in place. Alternatives 2, 2A and 3A were rated medium, based on qualitative review of the plans and policies in place.

GOAL: Develop transit improvements that enhance quality of life and minimize adverse environmental impact.

For the three evaluation measures used to evaluate the alternatives' relative ability to satisfy this Study goal, the alternatives' performance was as follows:

- All of the alternatives received a low rating for reduction in VMT.
- Alternatives 2 and 3 were rated high for their ability to be integrated into a streetscape with a pedestrian-scale environment because they would use modern streetcar technology which, because it is a fixed guideway, directly supports creation and enhancement of pedestrian environments. Alternatives 2A and 3A, which would use BRT/premium buses, were rated medium because they would also contribute to enhancing the pedestrian environment but on a lesser scale.
- For incorporation of alternative fuels and energy sources, Alternatives 2 and 3 were rated high because they use electric propulsion, while Alternatives 2A and 3A were rated low because they use some form of fuel propulsion.

14.3 Evaluation Recommendation

Based on the results of the Short-List Alternatives screening and the summary ratings of each alternative's performance against the full set of evaluation measures, Alternative 3 Modern Streetcar is recommended for advancement for further, more detailed study. Alternative 3's summary rating (37 points) was 10 points higher than the next best-performing alternative, Alternative 3A BRT/Premium Bus (27 points). Key differentiators of Alternative 3, compared to the other three alternatives, are its relatively better travel-time performance, a critical consideration for any transit-improvement project, and, to a lesser extent, the degree to which local transit-supportive plans and policies are in place and would help advance its implementation.

15. Locally Preferred Alternative

The modern streetcar Locally Preferred Alternative (LPA) recommended in Section 14 is proposed to be implemented in phases. This section describes the LPA, the proposed phased implementation strategy, and the Initial Operating Segment (IOS) that has been identified for first-phase implementation.

15.1 Phased LPA Implementation Strategy

The alignment and modern streetcar technology comprising the LPA are recommended as the *long-term vision* for transit improvement in the Nassau Hub. The LPA's full alignment between the Village of Hempstead and downtown Village of Mineola is shown on Figure 15-1, with its key characteristics summarized in Table 15-1.

The LPA was selected because it would best satisfy the Study's goals and objectives, address the purpose and need for transit improvement, and alleviate the underlying transportation- and economic development-related issues identified in the Study Area. However, recognizing existing financial constraints to construction of the full LPA and reflecting the desire to generate ridership growth over time, an IOS has been defined as a financially feasible *first phase of the LPA for near-term implementation*. The IOS is also proposed as an early phase to provide a reasonable timeframe for some large-scale development proposals, which are currently in flux along segments of the LPA corridor, to become better defined. These developments are anticipated to generate additional demand for travel in the Hub area that could be accommodated with later implementation of the LPA's second phase. Therefore, the IOS would initially be advanced with the intent to build ridership and brand the system, with the remainder of the LPA occurring at some point in the future as planned development comes on line and funding becomes available.

The IOS is proposed to operate initially using premium bus technology, similar to bus rapid transit (BRT) vehicles. When proposed developments are completed and funding is identified and available, the balance of the LPA alignment would be constructed and BRT/premium bus vehicles would be replaced with modern streetcars. The design of the physical features of the IOS would permit conversion to modern streetcar in the future. The IOS would incorporate various physical elements of the overall LPA so that the infrastructure developed for the IOS would remain functional and be integral to the full LPA.

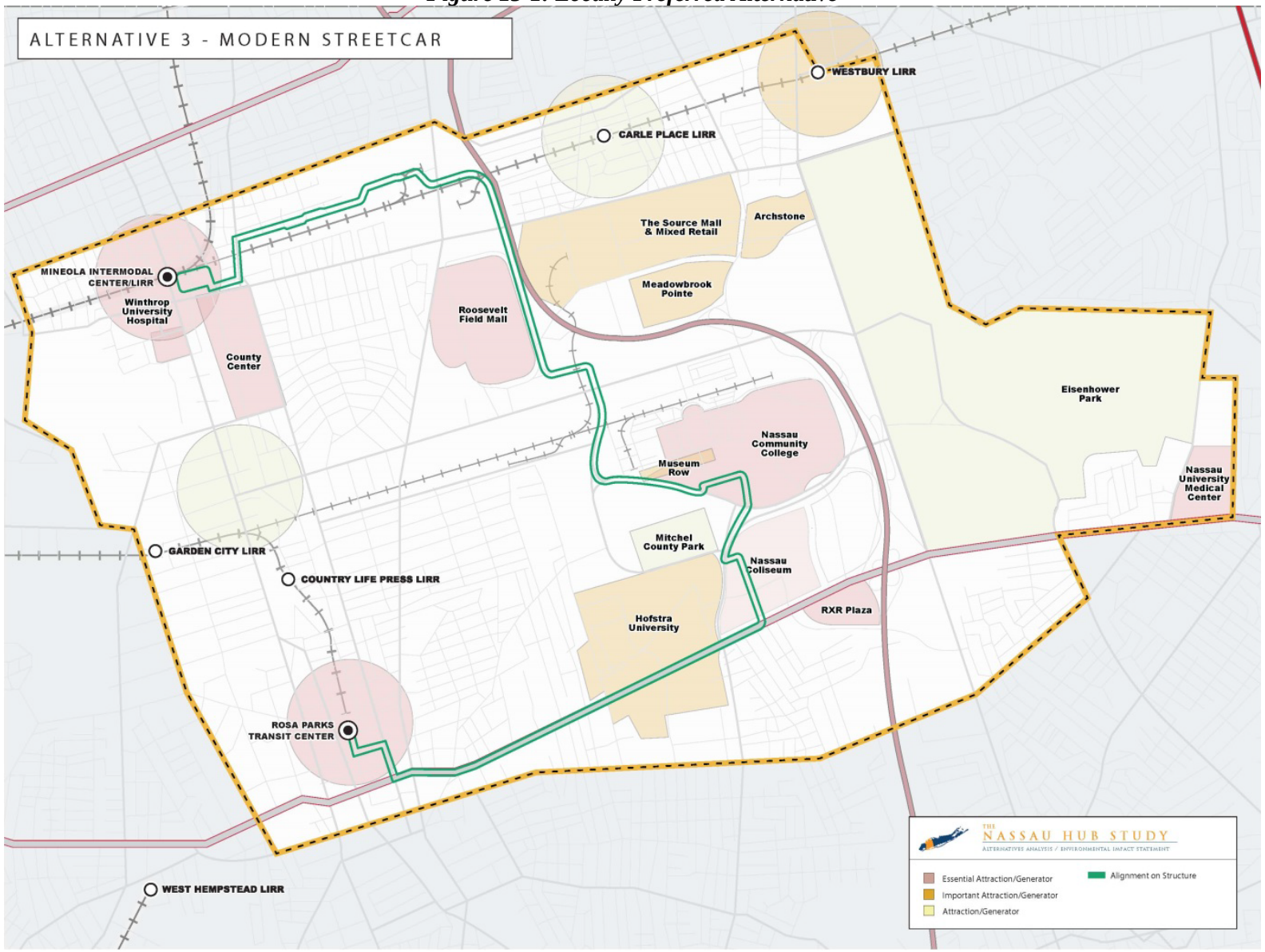
Table 15-1: Summary of LPA's Key Characteristics

Route Miles	6.5 miles
Stations	14 stations
Vehicles	10 trains
Travel Time – Mineola to Hempstead	28.1 minutes
Headway (peak & off-peak)[1]	10 minutes (peak); 15 (off-peak)
Ridership (daily boardings)	7,000
Annual Ridership	2,100,000
Order-of-magnitude Capital Cost (2012 dollars)	$376 M
Order-of-magnitude Annual Operating and Maintenance Cost (2012 dollars)	$8.9 M

Source: Jacobs, 2013.

Note 1: Peak periods for providing the proposed transit service would be on weekdays from 7:00 AM to 8:59 AM and 4:00 PM to 5:59 PM. Off-peak periods of service would be on weekdays from 5:30 AM to 6:59 AM, 9:00 AM to 3:59 PM and 6:00 PM to 12:00 AM and all day on Saturdays, Sundays, and holidays.

Figure 15-1: Locally Preferred Alternative

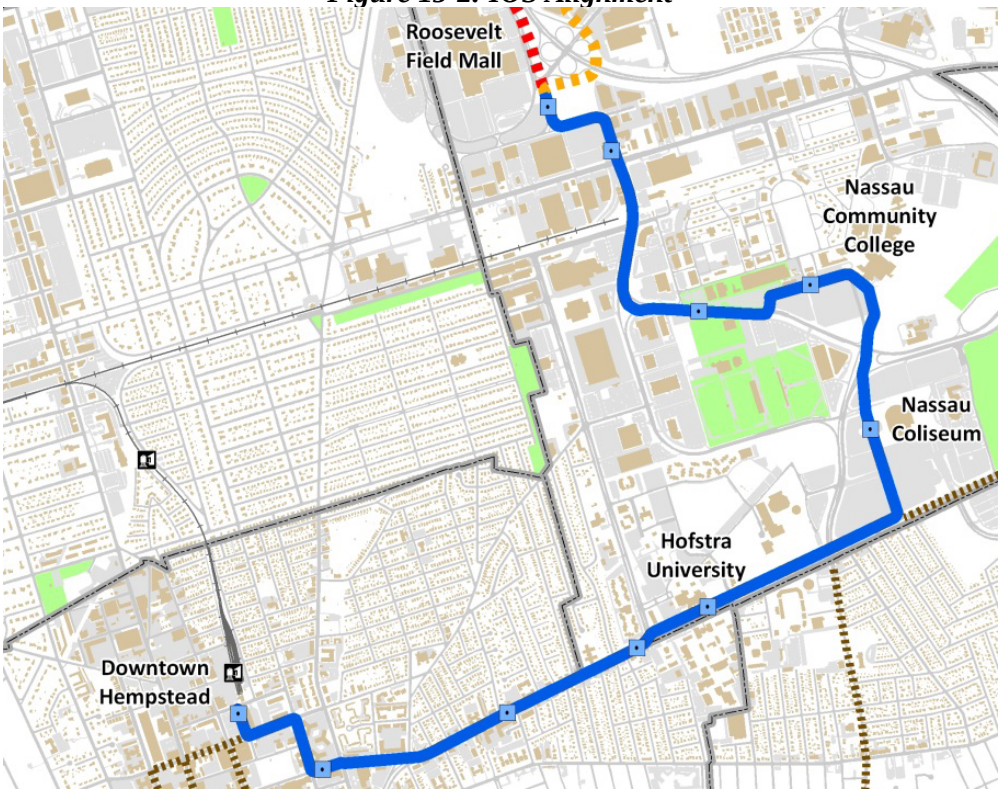


Source: Jacobs, 2013.

15.2 Initial Operating Segment Implementation

Table 15-2 summarizes the main characteristics of the IOS, which would connect the Village of Hempstead and the southern edge of Roosevelt Field (Figure 15-2).

Figure 15-2: IOS Alignment



Source: Jacobs, 2013.

The IOS design would seek to maximize elements that would continue to function with later implementation of subsequent phase(s) of the LPA and minimize elements that would need to be modified as the full LPA is designed and constructed. Elements of the IOS that would be anticipated to continue to function with implementation of the full LPA include:

- **Right-of-Way –** All right-of-way proposed for use with the IOS would be designed to readily accommodate implementation of the full LPA at a later date. This would include the horizontal and vertical geometry, vehicle envelope/clearances and utility relocation.
- **Stations –** Stations would be designed and constructed to accommodate the near-term need with the IOS while being easily adaptable to accommodate the modern streetcar application in the future with the full LPA.
- **Guideway –** Elements of the guideway would be designed and constructed so as not to require significant modification for conversion to modern streetcar technology. Adequate provisions would be made for future power and signal needs, as well as utility protection.
- **Systems –** Traffic control infrastructure, including transit signal priority, would be an integral component of the IOS and retained for the subsequent full LPA.

Table 15-2: Summary of IOS' Key Characteristics

Route Miles	4 miles
Stations	10 stations
Vehicles	6 buses
Travel Time	18 minutes
Headway (peak & off-peak)	10 minutes (peak); 15 (off-peak)
Ridership (daily boardings)	3,100-5,200
Annual Ridership	868,000-1,456,000
Order-of-magnitude Capital Cost (2012 dollars)	$94.5 M
Order-of-magnitude Annual Operating and Maintenance Cost (2012 dollars)	$3.4 M

Source: Jacobs, 2013.
Note: The higher end of the ranges presented for ridership (daily boardings) and annual ridership represents the ridership potential if pending and proposed land use and development possibilities occur in the IOS corridor that would generate additional demand.

15.2.1 IOS Alignment and Stations

The entire alignment of the IOS would be at-grade. After departing the Roosevelt Field Bus Facility, the IOS would comprise street-running in mixed traffic and potentially dedicated right-of-way through the Roosevelt Field parking lot, and then follow exclusive right-of-way using the edge of the retention basin along Ring Road East and the north and south sides of South Street, where another station is proposed. The alignment would continue in dedicated right-of-way on the east and west sides of Quentin Roosevelt Boulevard.

The alignment would turn onto Charles Lindbergh Boulevard on exclusive right-of-way and continue to Museum Row and the Nassau Community College West Campus, using the campus parking lots. Stations are proposed at locations that would serve Museum Row and Nassau Community College. The alignment would continue south past the college's Physical Education Complex, using dedicated right-of-way through the parking lots and vacant land, crossing Charles Lindbergh Boulevard to access the Nassau Veterans Memorial Coliseum. New traffic signals would be placed on Quentin Roosevelt Boulevard and Charles Lindbergh Boulevard. In sections of Charles Lindbergh Boulevard where an exclusive right-of-way is proposed, existing jogging/bike paths would be shifted or relocated to accommodate an exclusive transit right-of-way.

The alignment would continue southbound, traveling in dedicated right-of-way through the Nassau Veterans Memorial Coliseum property to Hempstead Turnpike. A station is proposed for the Nassau Veterans Memorial Coliseum property.

On Hempstead Turnpike, the exclusive right-of-way would run along the north side of the roadway in the landscaped strip between the shoulder lane and the jogging/bicycle path. Proposed stations would be located east of Hofstra Boulevard and east of Oak Street.

At Oak Street, the alignment would transition from operating on the north side of Hempstead Turnpike to operating in a dedicated median lane.[1] The dedicated median bus lane would be controlled with transit signal priority. The dedicated center lane would transition to the eastbound and westbound mixed-traffic curb lanes to serve stations at Warner Avenue and Clinton Street.

At Washington Street, the alignment would turn north, operating in mixed traffic to Jackson Street. The alignment would turn west on Jackson Street and terminate at the Rosa Parks–Hempstead Transit Center.

[1] The proposed dedicated median lane on Hempstead Turnpike is the subject of ongoing coordination meetings with the New York State Department of Transportation's (NYSDOT) Region 2 Office.

The IOS would have 10 stations (Table 15-3), with an average station spacing of 0.5 mile.

Table 15-3: IOS Stations

Station	Location/Cross Streets	Attractors/Generators Served
Roosevelt Field	Existing bus facility south of Roosevelt Field	Roosevelt Field
South Street	South Street and Stewart Avenue	Neighborhood stop
Railroad Avenue	Railroad Avenue and Charles Lindbergh Boulevard	Neighborhood stop
Nassau Community College-Museum Row	Earle Ovington Boulevard (North-South Road) and Student Union Service Road	Nassau Community College campus, Museum Row
Nassau Veterans Memorial Coliseum	West of Earle Ovington Boulevard	Nassau Veterans Memorial Coliseum and/or other development on the property
Hofstra University	Hempstead Turnpike and Hofstra Boulevard	Hofstra University campus
Oak Street	Hempstead Turnpike and Oak Street	Hofstra University campus
Warner Avenue	Fulton Avenue and Warner Avenue	Neighborhood stop
Clinton Street	Fulton Avenue and Clinton Street	Neighborhood stop
Rosa Parks–Hempstead Transit Center	Jackson Street and Station Plaza	Downtown Village of Hempstead, NICE Bus, LIRR Hempstead Station

Source: Jacobs, 2013.

15.2.2 IOS Operating Plan

The IOS would operate vehicles in revenue service from 5:30 AM to midnight, 7 days per week. The proposed service frequencies are every 10 minutes during the weekday peak periods and every 15 minutes during weekday off-peak periods and on weekends. Table 15-4 presents the proposed service frequencies by day-of-week and time-of-day.

Table 15-4: IOS Service Frequencies

Day of Week	Time of Day	Time Period	Frequency (minutes)
Monday to Friday	Early AM	5:30 AM to 6:59 AM	15
	AM Peak	7:00 AM to 8:59 AM	10
	Midday	9:00 AM to 3:59 PM	15
	PM Peak	4:00 PM to 5:59 PM	10
	Evening	6:00 PM to 12:00 AM	15
Saturday, Sunday, Holidays	All Day	5:30 AM to 12:00 AM	15

Source: Jacobs, 2013.

The IOS route's end-to-end run time, including a 20-second dwell time at stations and traffic signal priority, would be 17.8 minutes (Table 15-5).

A fleet size of six buses would be needed to meet the vehicle requirements for peak-period service with 10-minute headways between buses and a 15 percent spare-vehicle ratio.

Table 15-5: IOS Run Times

From Passenger Station	To Passenger Station	Distance (Miles)	Station-to-Station Run Time Without Dwell Time (Minutes)	End-to-End Run Time With Dwell Time (Minutes)
Rosa Parks–Hempstead Transit Center	Clinton Street	0.4	2.1	—
Clinton Street	Warner Avenue	0.5	2.0	—
Warner Avenue	Oak Street	0.4	1.9	—
Oak Street	Hofstra University	0.3	1.1	—
Hofstra University	Nassau Veterans Memorial Coliseum	0.7	1.9	—
Nassau Veterans Memorial Coliseum	Nassau Community College-Museum Row	0.5	1.5	—
Nassau Community College - Museum Row	Railroad Avenue	0.4	1.3	—
Railroad Avenue	South Street	0.6	1.9	—
South Street	Roosevelt Field	0.2	1.5	—
Subtotals		**4.0**	**15.1**	—
Dwell Time		—	—	**2.7**
Totals		**4.0**	—	**17.8**

Source: Jacobs, 2013.

15.2.3 IOS Capital Costs

The order-of-magnitude capital cost estimate for the IOS is $94.7 million. The details of the capital costs for the IOS are presented in Table 15-6.

Table 15-6: IOS Order-of-Magnitude Capital Costs (2012 dollars)

Cost Category	IOS Cost
Guideway	$16,631,000
Stations, Stops, Terminals, Intermodal Centers	$4,200,000
Yards, Shops, Administration Buildings	$0
Sitework & Special Conditions	$15,651,000
Systems	$12,105,000
Right-of-Way & Land	$11,250,000
Vehicles	$6,600,000
Professional Services	$15,713,000
SUBTOTAL	**$82,151,000**
Contingency	$12,353,000
Finance Charges	TBD
TOTAL PROJECT COST	**$94,474,000**

Source: Jacobs, 2013.

15.2.4 IOS Operating and Maintenance Costs

Based on the proposed operating plan, operating parameters (Table 15-7) and order-of-magnitude operating and maintenance (O&M) costs were estimated.

Table 15-7: IOS Operating Parameters

Operating Parameter	IOS
Alignment Length (route miles)	4
Average Operating Speed (miles per hour)	11.2
End-to-End One-Way Run Time (minutes)	17.8
Recovery Time at Each End for Peak Period (minutes)	5
Recovery Time at Each End for Off-peak Period (minutes)	10
Weekday Peak Headways (minutes)	10
Peak Buses in Service	5
Spare Ratio (15% of peak vehicle requirement)	1
Total Fleet Size	6
Total Number of Stations	10
Total Revenue Vehicle Hours (annual)	28,107
Total Revenue Vehicle Miles (annual)	232,080

Source: Jacobs, 2013.

Based on the IOS service plan and operating parameters, order-of-magnitude annual O&M costs are estimated to be $3.3 million (2012 dollars).

15.3 Financial Plan

The following section describes a preliminary financial plan that creates a framework to meet the objectives of the Study to achieve regional transportation investments with supportive land use strategies. The financial plan supports the Nassau Hub IOS capital and operating costs by aligning funding sources and uses to implement the proposed project. While Nassau County is committed to funding and implementing the transportation improvements recommended through the Study, this report recognizes that funding and financing considerations are preliminary and dynamic at this stage of the Study. The IOS costs are as follows:

- **Capital** – Total capital cost to construct the IOS is estimated to be approximately $94.7 million (2012 dollars). The project sponsor, Nassau County, is planning for approximately one-half, or 50 percent, of the capital costs to be funded via grants from the Federal Transit Administration (FTA) and/or other granting agencies. Therefore, about $48 million of the total capital funding would need to be funded through local and non-federal sources.
- **Operation and Maintenance** – Annual costs to operate and maintain the IOS are estimated to total about $3.3 million (2012 dollars). Potential funding sources for consideration are Nassau County Statewide Mass Transportation Operating Assistance (STOA), NYSDOT STOA, FTA operating assistance (5307 funding), parking revenue, fare revenue and, in a few locations, developer contribution.

There are several federal, state, and local public funding sources that could support the design and construction of the IOS. The estimate of percentage shares provided in Table 15-8 exceeds 100 percent, reflecting different arrangements and alternative funding packages that may be used; this allows for flexibility in funding scenarios, which will continue to be refined and updated as the Study moves through the environmental review phase.

Financing mechanisms are leveraging techniques that can be used to generate upfront capital for a BRT/premium bus investment, but are predicated upon a stable revenue stream being identified to pay a return on invested capital. As described below, the Transportation Infrastructure Finance and Innovation

Act (TIFIA) can be a valuable financing mechanism because of its low interest rates, lengthy terms, no local match requirement, and a front-end grace period allowing time for revenues to "ramp up."

Table 15-8: Potential Funding and Financing Sources and Uses

Source of Potential Funds	Use of Funds by Cost Element	Estimate of Percentage Share of Total Costs
U.S. Department of Transportation (USDOT), Transportation Investment Generating Economic Recovery (TIGER) Grants *A very competitive and discretionary grant source of funding, which requires upwards of a 40% local match and project sponsor's readiness to move forward. In 2013, nearly $500 million in TIGER grants were awarded for 52 projects encompassing public transportation, roadway and intermodal facilities. The TIGER Grant Program is not currently funded past September 2014, but is contained in MAP-21 reauthorization and the federal Administration's Grow America Act.* *TIGER works for large, multi-modal projects that are not suitable for other federal funding sources.*	Design and construction of: ▪ Guideway ▪ Stations, stops, terminals, intermodal centers ▪ Systems/traffic signal prioritization (TSP) ▪ Vehicles ▪ Limited property acquisition	20%
Federal Transit Administration (FTA) - Section 5309, Small Starts Grants *This program funds capacity-improvement projects such as corridor-based BRT projects that are less than $75 million in grant request to the FTA and the total net capital cost is less than $250 million.*	Design, construction or purchase of: ▪ Guideway ▪ Stations, stops, terminals, intermodal centers ▪ Systems/TSP ▪ Vehicles	50% (less than $75 million of total capital cost is mandated)
Federal Transit Administration (FTA) - Section 5307, Formula Grants *This program provides formula funding for use to support transit capital expenses, although up to 10% of the allocation may be used to assist with the operating costs of ADA-mandated complementary para-transit services.1% of funding allocations to be spent on safety and security measures, and 1% spent on transit enhancements. Funding for this program is approximately $3.6 billion annually. Statutory provisions: 49 U.S.C.A. § 5307*	▪ Operations ▪ Vehicles ▪ Station enhancements	10% (applied after IOS achieves revenue service)
Federal Highway Administration (FHWA) – Highway Program Investments	▪ Guideway/roadway rehabilitation	5%

Table 15-8: Potential Funding and Financing Sources and Uses (continued)

Source of Potential Funds	Use of Funds by Cost Element	Estimate of Percentage Share of Total Costs
FHWA Flexible Funds (Congestion Mitigation/Air Quality [CMAQ]) *Provides funding for projects and programs in air quality nonattainment and maintenance areas for ozone, carbon monoxide, and particulate matter), which reduce transportation-related emissions.* **FHWA Flexible Funds (Surface Transportation Program [STP])** *Provides flexible funding that may be used by states and localities for projects to preserve and improve the conditions and performance on any Federal-aid highway, bridge and tunnel projects on any public road, pedestrian and bicycle infrastructure, and transit capital projects, including intercity bus terminals.* **FHWA Flexible Funds (Transportation Alternatives)** *Provides funding for programs and projects defined as transportation alternatives, including on- and off-road pedestrian and bicycle facilities, infrastructure projects for improving non-driver access to public transportation and enhanced mobility.*	▪ Multi-modal elements of project ▪ Bicycle and pedestrian elements ▪ Station/stop and appurtenances	5%
New York State/Long Island Regional Economic Development Council (LIREDC) ▪ *Provides grants via the Consolidated Funding Application (CFA)*	▪ Guideway ▪ Stations, stops, terminals, intermodal centers.	20%
New York State Department of Transportation (NYSDOT) ▪ *Program funds that could be used to support reconstruction of Hempstead Turnpike for use by BRT/premium bus system.*	▪ Guideway and road rehabilitation ▪ Limited right-of-way acquisition	10%
Nassau County General Fund and Capital Program ▪ *Funding and finance from general fund revenue program and/or issuance of revenue bonds and/or capital construction bonds.*	▪ Guideway ▪ Stations, stops, terminals, intermodal centers ▪ Vehicles ▪ Right-of-way acquisition ▪ O&M	20% 50% of O&M cost
Joint Development/Private Developer Contribution *Developer's monetary contribution or project-specific design/construction integration of station/stop, plaza, landscape, or other parts of the project that have direct transit nexus and mutual benefit to proposed development building or public/private physical infrastructure. These arrangements could reduce public-sector costs that would be otherwise expended.*	▪ Stations/stops ▪ Landscaping ▪ Plaza ▪ O&M	5% of capital cost 5% of O&M cost
Advertising and Naming Rights *Kiosk advertising; bus vehicle advertising; and naming rights of notable station/stops at entertainment or institutional complexes.*	▪ Stations/stops ▪ Intermodal centers ▪ Plazas	1%

Table 15-8: Potential Funding and Financing Sources and Uses (continued)

Source of Potential Funds	Use of Funds by Cost Element	Estimate of Percentage Share of Total Costs
New York State Energy Research and Development Authority (NYSERDA) *NYSERDA has a regular cycle of grant programs for clean fuel under its Cleaner Greener Communities Program (CNG; hybrid; or battery) for bus vehicles and any other component reducing greenhouse gases. NYSERDA awarded (2013) Suffolk County a $1.5-million grant under its Cleaner Greener program to establish a BRT demonstration corridor.*	▪ Vehicles (hybrid; energy saving) ▪ Design and planning	< 1%
Rockefeller Foundation *The Rockefeller Foundation provides funding for transformative projects that meet the foundation's core goals, one of which is to transform cities and regions. The Foundation has funded dozens of projects in the United States to improve public transportation. Of note, the Foundation recently awarded $1.2 million to support BRT systems in Boston, Chicago, Nashville and Pittsburgh. The grants support research/planning studies, communications and community outreach to engage stakeholders on the benefits of BRT.*	▪ Planning and stakeholder outreach/communication	< 1%
Value Capture – Special Assessment District (SAD) *Special levy on parcels within ¼ mile of BRT or streetcar route. Apportionment of costs and assessment fee on annual basis is used to offset capital costs and pay for ongoing operation and maintenance.*	▪ Guideway ▪ Stations ▪ O&M	5% of capital cost 25% of O&M cost
Value Capture – Tax Increment Financing (TIF) *TIF is a public financing tool that allows local government to borrow to invest in public infrastructure and other public improvements by capturing the future incremental real property taxes generated by new development, transit-oriented development, or entertainment venues, etc.* *TIF has not been used for BRT or light rail project funding in New York.* *Note: Most likely either TIF or SAD – not both – can be implemented. These are very new financing mechanisms that have received support at state, regional and local level but have yet to be implemented for a transportation investment in the region.*	▪ Guideway ▪ Stations ▪ O&M	5% of capital cost 25% of O&M cost

Table 15-8: Potential Funding and Financing Sources and Uses (continued)

Source of Potential Funds	Use of Funds by Cost Element	Estimate of Percentage Share of Total Costs
Transportation Infrastructure Finance and Innovation Act (TIFIA) *TIFIA loans are negotiated between the USDOT and the borrower and are based on the project's economics and characteristics. Interest rates are at the rate that the U.S. Treasury borrows funds. Amount of the loan cannot exceed 50% of total eligible project costs, and is limited to projects with total costs of at least $50 million. TIFIA offers credit assistance in the form of lower financing costs and flexible payment terms.*	▪ Guideway ▪ Stations, stops, terminals, intermodal centers. ▪ Systems/TSP ▪ Vehicles	50% credit assistance
Payment in Lieu of Taxes (PILOTS) *A PILOT Increment Financing (PIF) structure allows for diversion of monies which are otherwise payable to a taxing jurisdiction into a fund that is used either to offset the developer's project costs, repay project financing, or hold in a fund to pay for infrastructure improvements. The arrangement requires the cooperation of the taxing jurisdictions, and an entity which can provide a real property tax exemption such as an Industrial Development Authority (IDA) and the lender. The developer must participate in tax credit program such as NY Empire Zone Program.*	▪ Guideway ▪ Stations ▪ O&M	5% of capital cost 25% of O&M cost

Source: AECOM, 2014.

As the Study advances, Nassau County will undertake steps to advance and refine the preliminary financial plan, including:

- Pre-application sessions with FTA, the USDOT, NYSDOT and other potential funding partners;
- Potential partnerships with other agencies and stakeholder operators to gain better access and improve competitive position to funding sources;
- Identification of potential joint development partner(s) to bring private capital for construction of station/stops and other infrastructure;
- Evaluation of the utilization of the Nassau County capital program; public grants; value-capture techniques and associated enabling authority; and
- Development of an approach with organizational and stakeholder partners to implement the financial plan.

15.4 Next Steps

The Nassau Hub Study AA was completed to identify the most appropriate transportation improvement for advancement in the Study Area and thereby select the LPA, and to satisfy FTA requirements for a project to be eligible for federal funds. Nassau County intends to pursue Federal Small Starts funds, among other sources, for IOS implementation. Given that, the next steps in the financial planning component of the Study include:

- Refining the project costs as the LPA moves through the environmental-review phase of project planning;
- Developing a detailed cash flow analysis;
- Working with pertinent federal, state and local entities to refine funding avenues; and
- Refining the overall financial plans as the IOS advances through design.

Appendix A: List of Participating Agencies

Acting Division Administrator	Federal Highway Administration	Leo W. O'Brien Federal Building, Room 719 Clinton Ave & N. Pearl St	Albany, NY 12207
Regional Administrator, Region 1	Federal Railroad Administration	55 Broadway, Room 1077	Cambridge, MA 02142
Regional Administrator	Federal Transit Administration, Region 2	1 Bowling Green, Room 719	New York, NY 10004-1415
Executive Director	Long Island Regional Planning Council	1864 Muttontown Road	Syosset, NY 11791
Chairman & CEO	Metropolitan Transportation Authority (MTA)	347 Madison Avenue	New York, NY 10017-3739
President	MTA Long Island Bus (LI Bus)	700 Commercial Avenue	Garden City, NY 11530-6410
President	MTA Long Island Rail Road (LIRR)	Jamaica Station	Jamaica, NY 11435-4380
County Comptroller	Nassau County Comptroller's Office	240 Old Country Road	Mineola, NY 11501
County Assessor	Nassau County Department of Assessment	240 Old Country Road	Mineola, NY 11501
Commissioner of Health	Nassau County Department of Health	106 Charles Lindbergh Blvd	Uniondale, NY 11553
Commissioner	Nassau County Department of Parks, Recreation and Museums	Administrative Building, Eisenhower Park	East Meadow, NY 11554
Commissioner	Nassau County Department of Public Works	1194 Prospect Avenue	Westbury, NY 11590-2723
County Executive	Nassau County Executive's Office	1550 Franklin Avenue	Mineola, NY 11501
Executive Director	Nassau County Industrial Development Agency	1100 Franklin Avenue, Suite 300	Garden City, NY 11530
Senior Policy Advisor and Communications Director	Nassau County	1550 Franklin Avenue	Mineola, NY 11501
Commissioner of Emergency Management	Nassau County Office of Emergency Management	100 Carmen Avenue	East Meadow, NY 11554
Chairman	Nassau County Open Space and Parks Advisory Committee	59 Woodland Drive	Oyster Bay Cove, NY 11771
Chair	Nassau County Planning Commission	100 County Seat Drive	Mineola, NY 11501
Commissioner of Police	Nassau County Police Department	1490 Franklin Avenue	Mineola, NY 11501
Executive Director	New York Metropolitan Transportation Council (NYMTC)	199 Water Street, 22nd Floor	New York, NY 10038-3534

Regional Director	New York State Department of Environmental Conservation	50 Circle Road	Stony Brook, NY 11790-3409
First Deputy Secretary of State	New York State Department of State	1 Commerce Plaza, 99 Washington Ave	Albany, NY 12231-0001
Director	New York State Department of Transportation (Region 10)	250 Veterans Memorial Highway	Hauppauge, NY 11788
	New York State Department of Transportation, Transit Bureau	50 Wolf Road, POD 54	Albany, NY 12232
President & CEO	New York State Energy Research and Development Authority	17 Columbia Circle	Albany, NY 12203-6399
Director	New York State Historic Preservation Office	Peebles Island Resource Center P.O. Box 189	Waterford, NY 12188-0189
Supervisor	Town of Hempstead	1 Washington Street	Hempstead, NY 11550
Supervisor	Town of North Hempstead	220 Plandome Road	Manhasset, NY 11030
Supervisor	Town of Oyster Bay	54 Audrey Avenue	Oyster Bay, NY 11771
Engineering Division Leader	United States Army Corps of Engineers	26 Federal Plaza, Room 2109	New York, NY 10278-0090
Regional Administrator	United States Environmental Protection Agency (Region 2)	290 Broadway	New York, NY 10007-1866
Acting Director	United States Fish and Wildlife Service, Long Island Field Office	3 Old Barto Road	Brookhaven, NY 11719
Mayor	Village of Garden City	351 Stewart Avenue	Garden City, NY 11530
Mayor	Village of Hempstead	99 Nichols Court	Hempstead, NY 11550
Mayor	Village of Mineola	155 Washington Avenue	Mineola, NY 11501
Mayor	Village of Westbury	235 Lincoln Place	Westbury, NY 11568

Appendix B: List of Stakeholder Committee Members[1]

Mr. Ms. Dr.	First	Last	Replaced By/No Longer Holds Position:	Elected Office, Corporate Position, Job Title	Group or Organization Represented	Classification
Mr.	Domenic	Abbatiello		Director of Economic Development	National Grid Economic Development	Major business owners in the Hub study area
Hon.	Kevan	Abrahams		Legislator	Nassau County Legislature	Nassau County Agencies
Ms.	Carolyn	Acerra		Administrative Executive	Nassau County Department of Senior Citizen Affairs	Nassau County Agencies
Hon.	Gary	Ackerman		Representative	U.S. House of Representatives	Government representatives
Mr.	Michael	Adler		Development Director	The Beechwood Organization-Meadowbrook Pointe	Residential Complexes
Hon.	Rebecca	Alesia		Councilwoman	Town of Oyster Bay	Government representatives
Mr.	Eric	Alexander		Executive Director	Vision Long Island	Environmental-concern groups
Hon.	Edward	Ambrosino		Councilman	Town of Hempstead	Government representatives
Ms.	Judith	Ammerman		Co-President	American Association of University Women	Underserved Populations
Mr.	Phil	Andrews	Replaced Henry Holley	President	100 Black Men of Long Island	Underserved Populations
Mr.	Tony	Arcuri			Nassau County Department of Assessment	TAC
Dr.	Donald P.	Astrab		President	Nassau Community College	Colleges
Mr.	George	Bakish			Town of Hempstead Department of Planning and Economic Development	
Mr.	Priscilla	Bauerschmidt		Secretary	Carle Place Civic Association	Community organizations, civic associations, and individuals
Mr.	Leone	Baum		Vice President	Village of Hempstead Chamber of Commerce	Local Chambers of Commerce and Business Improvement Districts
Hon.	Francis	Becker, Jr.		Legislator	Nassau County Legislature	Nassau County Agencies
Ms.	Yvette	Beckett-Tuggle	Replaced Dr. Phillip Elliott	Executive Director	Minority Affairs for Nassau County	
Hon.	Joseph	Belesi		Legislator	Nassau County Legislature	Nassau County Agencies
Mr.	Richard	Bell		Director of Business, Facilities and Public Affairs	Family and Children's Association	
Mr.	Dean	Bennett		President/CEO	J.K. Bennett & Associates	
Mr.	Robert	Benrubi		Chief Council	NuHealth	Hospitals
Mr.	Michael	Berfield		Vice President of Development	Equity One, Inc.	
Mr.	Gil	Bernardino		Executive Director	Ciculo de la Hispanidad Administrative Office	Underserved Populations
Ms.	Linda	Bianculli		Deputy Commissioner	Town of Oyster Bay DEA	
Hon.	Timothy	Bishop		Representative	U.S. House of Representatives	Government representatives
Mr.	Richard	Bivone		Nassau Chairman	Long Island Business Council	
Mr.	Edward	Blumenfeld		President/CEO	Association for a Better Long Island	Associations
Hon.	Judi	Bosworth		Legislator	Nassau County Legislature	Nassau County Agencies
Mr.	Marc	Boucher			New York State Department of Transportation (Transit Bureau)	TAC
Ms.	Donna	Boyce		Director of Programs	Sustainable Long Island	
Mr.	Thomas	Brennan			Long Island Freight Users Organization	Freight service providers
Mr.	John	Broder		Vice President of External Affairs	Winthrop Hospital	Hospitals
Hon.	Donald	Brudie	Bob Rothschild	Mayor	Village of Garden City	TAC
Mr.	Frank	Camerlengo		Deputy Commissioner	Nassau County Department of Parks, Recreation and Museums	TAC
Ms.	Marianne	Carillo		President/CEO	Long Island Transportation Management	Commuter and alternative transportation advocacy groups
Ms.	Francesca	Carlow		2nd Vice President	Nassau Council of Chambers of Commerce	
Ms.	Laura	Cassell		Chief Executive Officer	Catholic Charities	Charities
Ms.	Maria	Catanese			UNITE	
Mr.	Bob	Cavalieri		Senior Vice President of Sales & Development	SMG	
Mr.	Raj K.	Chopra		Chairman/CEO	Tishcon Corp.	Minority business owners in the Hub study area
Hon.	John	Ciotti		Deputy Presiding Officer	Nassau County Legislature	Nassau County Agencies
Mr.	Peter	Cipriano, Jr.	Replaced Rose Fuger	President	East Meadow Chamber of Commerce	
Mr.	Andrew	Cohen		Administrator	The Rehabilitation Institute	Underserved Populations

[1] Some of the individuals named in this list were replaced over the course of the AA process.

Mr. Ms. Dr.	First	Last	Replaced By/No Longer Holds Position:	Elected Office, Corporate Position, Job Title	Group or Organization Represented	Classification
Ms.	Diana	Coleman		Community Activist	The Equal Opportunity Commission of Nassau County Inc.	Underserved Populations
Mr.	Bruce	Collins		Director of Development	OTO Development	Major business owners in the Hub study area
Mr.	John	Collins		President	Winthrop Hospital	
Hon.	Chris	Coschignano		Councilman	Town of Oyster Bay	Government representatives
Mr.	Craig	Craft		Acting Commissioner	Nassau County Office of Emergency Management-Morrelly Homeland Security Center	
Hon.	Angie	Cullin		Councilwoman	Town of Hempstead	Government representatives
Hon.	Andrew	Cuomo	Replaced David A. Paterson	Governor	Governor's Office	Government representatives
Hon.	Brian	Curran		Assemblyman	New York State Assembly, District 14	Government representatives
Mr.	Vincent	D'Antone		Assistant Mall Manager	Simon Property Group	
Hon.	James	Darcy		Councilman	Town of Hempstead	Government representatives
Mr.	Michael	Davies		Division Administrator	Federal Highway Administration	TAC
Ms.	Viki	DeJong		President	Citizens Committee for Civic Action	Environmental-concern groups
Ms.	Terry	DeLoney	Replaced Carol O'Neil	Director	Hempstead Senior Community Service Center	Underserved Populations
Mr.	Richard F.	DeMatteis		President	The DeMatteis Organization	Major business owners in the Hub study area
Hon.	David	Denenberg		Legislator	Nassau County Legislature	Nassau County Agencies
Mr.	James	Dolan, Jr.		Director	Office of Mental Health, Chemical Dependency, and Developmental Disabilities Services	
Ms.	Nancy R.	Douzinas		President	Rauch Foundation	Associations
Ms.	Maureen	Droge		Executive Director	Westbury Senior Center	Underserved Populations
Ms.	Lori	Duggan Gold		Vice President for Communications	Adelphi University	
Hon.	Dennis	Dunne, Sr.		Legislator	Nassau County Legislature	Nassau County Agencies
Ms.	Karen	Durkin		Chief Executive Officer	Women's Sports Foundation	Associations
Mr.	Matthew	Dwyer	Replaced Don Dreyer	Director	Nassau County Office of the Physically Challenged	Nassau County Agencies
Mr.	Matt	Dwyer		Director	Nassau County Office of the Physically Challenged	
Hon.	Thomas	Dwyer		Councilman	Town of North Hempstead	Government representatives
Fr.	Philip	Eichner		President	Kellenberg Memorial High School	
Mr.	Roger	Eltringham		President	Garden City Chamber of Commerce	Local Chambers of Commerce and Business Improvement Districts
Mr.	Roland	Ericsson		Board Member	Action Long Island	
Ms.	Adrienne	Esposito		Executive Director	Citizens Campaign for the Environment	Environmental-concern groups
Hon.	Elizabeth	Faughnan		Councilwoman	Town of Oyster Bay	Government representatives
Mr.	Leo	Fernandez		President	Village of Hempstead Chamber of Commerce	
Hon.	Angelo	Ferrara		Councilman	Town of North Hempstead	Government representatives
Ms.	Jennifer	Ferrara-Poupis		President	Rotary Club of Garden City-Mineola	Associations
Mr.	Herb	Flores		Deputy Director	Nassau County Office of Minority Affairs	
Mr.	Anthony	Florez		CEO	Sirina Fire Protection	Minority business owners in the Hub study area
Mr.	Ronald	Foley		Regional Director	New York State Parks, Long Island Region	State Agencies
Hon.	Denise	Ford		Legislator	Nassau County Legislature	Nassau County Agencies
Mr.	Carnell	Foskey		Commissioner	Nassau County Parks, Recreation and Museums	
Hon.	Charles J.	Fuschillo, Jr.		Senator	New York State Senate, District 8	Government representatives
Mr.	Wayne	Galante		President	Uniondale Chamber of Commerce	
Ms.	Barbara	Gervase	Replaced Patricia Latzman	President	Women's Bar Association of Nassau County	Underserved Populations
Ms.	Kathleen	Giamo		President	The Giamo Group	Major business owners in the Hub study area
Hon.	Kirsten	Gillibrand		Senator	U.S. Senate	Government representatives
Mr.	Alan	Goldstein		Vice President Architecture	RXR Realty	
Hon.	Norma	Gonsalves		Legislator	Nassau County Legislature , Chair, Planning Development and Environment Committee	Nassau County Agencies
Ms.	Eldia	Gonzalez		Executive Director	Coordinating Agency for Spanish Americans of Nassau County	Nassau County Agencies
Mr.	Claude	Gooding		Commissioner	Village of Hempstead CDA	Local government representatives
Ms.	Phoebe	Goodman			Nassau Citizens Budget Committee	Nassau County Agencies
Hon.	Dorothy	Goosby		Councilwoman	Town of Hempstead	Government representatives

Mr. Ms. Dr.	First	Last	Replaced By/No Longer Holds Position:	Elected Office, Corporate Position, Job Title	Group or Organization Represented	Classification
Mr.	Richard	Guardino, Jr.		Vice President for Business Development	Hofstra University	
Prof.	Betsy	Gulotta		Conservation Study Manager	Friends of Hempstead Plains at Nassau Community College, Inc.	Environmental-concern groups
Hon.	Wayne	Hall, Sr.		Mayor	Village of Hempstead	
Hon.	Kemp	Hannon		Senator	New York State Senate, District 6	Government representatives
Hon.	Andrew	Hardwick		Mayor	Incorporated Village of Freeport	Local government representatives
Ms.	Amy	Hariton		President	Women's Coalition of the Millennium	Underserved Populations
Mr.	Marc	Herbst		Executive Director	Long Island Contractors' Association, Inc.	
Mr.	Michael	Hervey	Replaced Kevin Law	President/Chief Operating Officer	Long Island Power Authority	Major business owners in the Hub study area
Mr.	Douglas	Holland		District Plant Engineering Manager	United Parcel Service - North Atlantic District	
Hon.	Earlene	Hooper		Assemblywoman	New York State Assembly, District 18	Government representatives
Mr.	Scott	Howell		Director of Parking & Stations	MTA Long Island Rail Road	TAC
Hon.	Gary	Hudes		Councilman	Town of Hempstead	Government representatives
Dr.	John	Imhof		Commissioner	Nassau County Dept. Social Services	Nassau County Agencies
Hon.	Steve	Israel		Representative	U.S. House of Representatives	Government representatives
Hon.	Judith	Jacobs		Legislator	Nassau County Legislature	Nassau County Agencies
Mr.	Justin	Johnson		Senior Vice President, Corporate Partnerships	NY Islanders	Nassau Coliseum
Ms.	Iris	Johnson		Executive Director	Hempstead Community Action program	Underserved Populations
Hon.	Jon	Kaiman		Supervisor	Town of North Hempstead	TAC
Mr.	Arthur M.	Katz		President	Uniondale Chamber of Commerce	Local Chambers of Commerce and Business Improvement Districts
Mr.	Joseph	Kearney		Executive Director	Nassau County Industrial Development Agency	TAC
Dr.	Janine D.	Kelly		President	East Meadow Chamber of Commerce	Local Chambers of Commerce and Business Improvement Districts
Mr.	Mike	Kelly		Deputy Director	Nassau County Department of Real Estate, Planning and Development	
Mr.	Mike	Kelly	Replaced Ira Tane	President	Long Island Builders Institute	Associations
Ms.	Dawn	Kenny		Executive Assistant	RXR Realty, LLC	
Hon.	Peter	King		Representative	U.S. House of Representatives	Government representatives
Mr.	Randy	King		Chairman	Shinnecock Indian Nation	Indian Tribe
Mr.	Frank	Kirby		Deputy Chief	Nassau County Police Department	TAC
Mr.	Lingard	Knutson		Environmental Scientist	USEPA	
Hon.	Howard J.	Kopel		Legislator	Nassau County Legislature	Nassau County Agencies
Mr.	Jay	Korth		Director of Housing and Legal Affairs	Catholic Charities	
Ms.	Sarah	Lansdale	No longer holds position	Executive Director	Sustainable Long Island	Associations
Hon.	Charles D.	Lavine		Assemblyman	New York State Assembly, District 13	Government representatives
Mr.	Kevin	Law		President/Chief Exec Officer	Long Island Association	Associations
Ms.	Margaret	Lawrence			Nassau Community College Office of VP Administration/Planning	
Ms.	Suzanne	LeBlanc		Executive Director	Long Island Children’s Museum	Museums
Mr.	Patrick	Lespinasse		Director External Affairs	Verizon Communications	Major business owners in the Hub study area
Mr.	Steven	Levy		President	Westbury -Carle Place Chamber of Commerce	Local Chambers of Commerce and Business Improvement Districts
Ms.	Andrea	Lohneiss		Regional Director	Empire State Development Corp.	State Agencies
Ms.	Cara	Longworth		Deputy Executive Director	Long Island Regional Planning Council	
Mr.	Luis	Lopez		Board President	LI Hispanic Chamber of Commerce	
Ms.	Beatrice	Lozada			Coordinating Agency for Spanish Americans of Nassau County	
Mr.	Ryan	Lynch		Senior Planner	Tri-State Transportation Campaign	
Hon.	Anthony	Macagnone		Councilman	Town of Oyster Bay	Government representatives
Mr.	Robert	Mangan		Director of Public Works	Village of Garden City	
Hon.	Edward P.	Mangano		County Executive	Nassau County Executive's Office	TAC
Mr.	Howard	Mann	Nancy O'Connell	Nassau/Suffolk TCC Staff Director	New York Metropolitan Transportation Council (NYMTC)	TAC
Hon.	George	Maragos		County Comptroller	Nassau County Comptroller's Office	TAC
Mr.	Demosthenes	Maratos		Program Director	Long Island Neighborhood Network	Associations
Hon.	Carl	Marcellino		Senator	New York State Senate, District 5	Government representatives

Mr. Ms. Dr.	First	Last	Replaced By/No Longer Holds Position:	Elected Office, Corporate Position, Job Title	Group or Organization Represented	Classification
Ms.	Julie	Marchesilla		1st Vice President	Nassau Council of Chambers of Commerce	
Hon.	Jack	Martins		Senator	New York State Senate, District 7	Government representatives
Ms,	Kristen	Matejka			Long Island Convention & Visitors Bureau & Sports Commission	
Mr.	Joseph	Mattone, Sr.		Chairman, CEO	Mattone Group, LLC	
Mr.	Christopher	McBride		Community Transportation Specialist	Automobile Club of New York, Inc.	Associations
Mr.	Jim	McCaffrey		Deputy Commissioner	Town of Oyster Bay, Department of Economic Development	
Ms.	Bonnie	McCarthy		Administrator	Simon Property Group	Major business owners in the Hub study area
Hon.	Carolyn	McCarthy		Representative	U.S. House of Representatives	Government representatives
Hon.	David	McDonough		Assemblyman	New York State Assembly, District 19	Government representatives
Mr.	R. Moke	McGowan		President	Long Island Convention and Visitors Bureau	Recreation and tourism bureaus
Mr.	Walter	McKenna		President	Eastern Property Owners Association of Garden City	Community organizations, civic associations, and individuals
Hon.	Tom	McKevitt		Assemblyman	New York State Assembly, District 17	Government representatives
Ms.	Deloris	McQueen			Village of Hempstead	TAC
Mr.	Phil	Mickulas		Executive Director	Family Service Association	Underserved Populations
Mr.	Mike	Miller			Long Island Housing Partnership	Underserved Populations
Hon.	Michael	Montesano		Assemblyman	New York State Assembly, District 15	Government representatives
Ms.	Jessica	Montgomery		District Office	Congresswoman Carolyn McCarthy	
Mr.	Jamie	Morrison	Replaced Dan Hester	Executive Director	Hempstead Housing Authority	Underserved Populations/Town Agency
Mr.	Michael	Mule			Suffolk Department of Planning	
Mr.	Scott	Mullen		General Manager	Nassau Coliseum	Nassau Coliseum
Ms.	Wendy	Murbach		President	South Shore Audubon Society	
Ms.	Lisa	Murphy		Deputy Commissioner	Nassau County Department of Senior Citizen Affairs	
Mr.	E. Christopher	Murray		President	Nassau Council of Chambers of Commerce	Local Chambers of Commerce and Business Improvement Districts
Hon.	Kate	Murray		Supervisor	Town of Hempstead	
Ms.	Jill	Murtha		Secretary to the Commissioner	Nassau County Department of Public Works	
Hon.	Vincent	Muscarella		Legislator	Nassau County Legislature	Nassau County Agencies
Hon.	Joseph	Muscarella		Councilman	Town of Oyster Bay	Government representatives
Dr	Joseph	Muscarella		Vice President of Administration and Planning	Nassau Community College	
Ms.	Nadine	Nakamura		General Manager Roosevelt Field	Simon Property Group	
Mr.	Arthur	Nastre				
Ms.	Angela	Neal		Secretary to Commissioner Carnell Foskey	Nassau County Parks, Recreation & Museums	
Ms.	Cathy	Nelkin Miller		President	The Garden City Hotel	Major business owners in the Hub study area
Hon.	Richard	Nicolello		Legislator	Nassau County Legislature	Nassau County Agencies
Mr.	Robert	Nouryan		Vice President	Central Garden City Property Owners' Association	
Mr.	Frederick	Parola		Executive Director/CEO	Town of Hempstead Industrial Development Agency	Government representatives
Ms.	Martha	Parra		General Manager	Holiday Inn of Westbury	Major business owners in the Hub study area
Mr.	Andrew	Parton		Executive Director	Cradle of Aviation	Museums
Mr.	Daniel	Perkins		V.P., Government Affairs	Long Island Association	Associations
Hon.	Gregory	Peterson		Principal	Berkman, Henoch, Peterson & Peddy, P.C.	Major business owners in the Hub study area
Ms.	Alana	Petrocelli		Executive Director	Firefighters Museum	Museums
Mr.	Rickie	Piazza		Community Property Manager	The Archstone Group	
Mr.	Michael	Picker			Renaissance Property Associates	
Mr.	Brian	Pinnola		President	Garden City Historical Society	Community organizations, civic associations, and individuals
Hon.	Joseph	Pinto		Councilman	Town of Oyster Bay	Government representatives
Mr.	Vincent	Polimeni		Chairman/CEO	Polimeni Enterprises, LLC	Major business owners in the Hub study area
Hon.	Fred	Pollack		Councilman	Town of North Hempstead	Government representatives
Hon.	Maria-Christina	Poons		Councilwoman	Town of North Hempstead	Government representatives
Hon.	Edward	Ra		Assemblyman	New York State Assembly, District 21	Government representatives

Mr. Ms. Dr.	First	Last	Replaced By/No Longer Holds Position:	Elected Office, Corporate Position, Job Title	Group or Organization Represented	Classification
Mr.	Scott	Rechler		Chairman/Chief Exec Officer	RXR Realty, LLC	Major business owners in the Hub study area
Mr.	Ken	Recke		Plant Engineering Department	United Parcel Service	Major business owners in the Hub study area
Rev.	Milton	Rochford			Pentecostal Church of God	Underserved Populations
Ms.	Agnes	Rodriguez		Executive Director	Hempstead Hispanic Civic Association	Underserved Populations
Dr	Thomas	Rogers		District Superintendant	Nassau BOCES	
Ms.	Karen	Rosenberger		NY Division	Federal Highway Administration	
Ms.	Diana	Roy			MTA Long Island Rail Road	
Hon.	Viviana	Russell		Councilwoman	Town of North Hempstead	Government representatives
Mr.	Donald	Ryan	Replaced Joseph Pirinea	President	Rotary Club of Hempstead-Uniondale	
Mr.	Sheldon	Sackstein		Chairman	Action Long Island	Associations
Hon.	Joseph S.	Saladino		Assemblyman	New York State Assembly, District 12	Government representatives
Hon.	Anthony	Santino		Councilman	Town of Hempstead	Government representatives
Mr.	John	Saraceno		Vice President	Paumonok Bicycling Advocacy	Commuter and alternative transportation advocacy groups
Mr.	John	Sarcone		Director	Housing & Office of Community Development	
Ms.	Janet	Sarro		Director	Helen Keller Service for the Blind / Nassau Disabled Senior Center	Underserved Populations
Mr.	Frank	Scalera		Commissioner	Town of Oyster Bay, Department of Economic Development	TAC
Hon.	Joseph	Scannell		Legislator	Nassau County Legislature	Nassau County Agencies
Ms.	Paula	Scappatura		CEO	Scappatura Real Estate	
Mr.	Richard	Schary		Board Member	L.I. Greenbelt Trail Conference	Environmental-concern groups
Hon.	Michelle	Schimel		Assemblywoman	New York State Assembly, District 16	Government representatives
Hon.	Peter	Schmitt		Presiding Officer	Nassau County Legislature	Nassau County Agencies
Mr.	Thomas	Schneider			Simon Property Group	Major business owners in the Hub study area
Mr.	Robert L.	Schoelle, Jr.		Village Administrator	Village of Garden City	TAC
Ms.	Frances	Schor		President	Treeline Companies	
Mr.	Carl	Schroeter		Director	Nassau County Department of Real Estate Planning and Development	Nassau County Agencies
Hon.	Charles	Schumer		Senator	U.S. Senate	Government representatives
Ms.	Marion	Schurade			League of Women Voters East Nassau	
Mr.	Adam	Seelig		Residential Manager	Fairhaven Apartments	Major business owners in the Hub study area
Hon.	Lee	Seeman		Councilwoman	Town of North Hempstead	Government representatives
Mr.	R. Scot	Sellers		Chief Executive Officer	Archstone	Major business owners in the Hub study area
Ms.	Heather	Senti		Administrative Assistant to the Commissioner & OEM Safety Officer	Nassau County Office of Emergency Management-Morrelly Homeland Security Center	
Mr.	Daniel	Shapiro		First Deputy Secretary of State	New York State Department of State	TAC
Dr.	Barbara	Shaw	Replaced Johnnie Walker	Chair	National Council of Negro Women	Underserved Populations
Mr.	Robert	Shelly		Executive Director	Hebrew Academy of Nassau County	
Mr.	Ray	Sikorski		President	Mineola Chamber of Commerce	
Mr.	Donald	Sioss		Vice President of the H2M Group	Action Long Island	
Ms.	Nancy	Skeete		First Vice President	Uniondale Chamber of Commerce	
Hon.	Dean G.	Skelos		Senator	New York State Senate, District 9	Government representatives
Ms.	Gina	Slater-Parker		President/CEO	Black Women Enterprises	Underserved Populations
Ms.	Kate	Slevin, AICP		Executive Director	Tri-State Transportation Campaign	Commuter and alternative transportation advocacy groups
Ms.	Elaine	Smith			Uniondale Community Council	Community organizations, civic associations, and individuals
Mr.	Louis	Soloway		Partner	Certilman Balin Adler & Hyman, LLP	Major business owners in the Hub study area
Mr.	Todd	Stebbins		Director of Environmental Affairs	Long Island Power Authority	
Hon.	David	Tanner	Nancy Zollezzi	Mayor	Village of East Williston	Government representatives
Ms.	Sheila	Tate		Program Director	Unified New Cassel Community Revitalization Corporation	Community organizations, civic associations, and individuals
Ms.	Johanna	Teelahti		Human Resources Manager	Marriott Hotel (Long Island)	
Ms.	Ray	Thomas	Replaced Jennifer Rimmer	Director	Nassau County Office of Economic Development	TAC

Mr. Ms. Dr.	First	Last	Replaced By/No Longer Holds Position:	Elected Office, Corporate Position, Job Title	Group or Organization Represented	Classification
Ms.	Edward	Tolver		Branch president	Hempstead NAACP	Underserved Populations
Hon.	Robert	Troiano		Legislator	Nassau County Legislature	Nassau County Agencies
Mr.	Mike	Tumbarello			Town of North Hempstead Department of Planning & Economic Development	
Ms.	Lisa	Tyson		Director	Long Island Progressive Coalition	Environmental-concern groups
Dr.	Marsha J.	Tyson Darling		Professor and Director	Center for African American and Ethnic Studies Program	Nassau County Agencies
Mr.	Bill	Urianek		President	Mineola Civic Association	Community organizations, civic associations, and individuals
Mr.	John	Vahey		Caseworker & Community Liaison	Office of Congressman Gary L. Ackerman	
Mr.	Rob	Walker	Replaced Patrick J. Foye	Deputy County Executive	Nassau County Office of Economic Development	TAC
Hon.	Rose Marie	Walker		Legislator	Nassau County Legislature	Nassau County Agencies
Mr.	Charles	Wang		Founder	Lighthouse Development Group, LLC	Major business owners in the Hub study area
Hon.	Harvey	Weisenberg		Assemblyman	New York State Assembly, District 20	Government representatives
Mr.	William	Weitzman		Commissioner of Labor	Nassau County Office of the Commissioner of Labor	
Mr.	Wes	Westley		President/CEO	SMG	Nassau Coliseum
Mr.	Michael	White, Esq.		Executive Director	Long Island Regional Planning Council	TAC
Mr.	Jason	Wilensky		Senior Vice-President of Business Development	Treeline Realty	Major business owners in the Hub study area
Mr.	Christopher	Williams		Associate Vice President for Government Relations & Public Policy	Long Island University	
Hon.	Wayne	Wink, Jr.		Legislator	Nassau County Legislature	Nassau County Agencies
Mr.	Robert D.	Yaro		President	Regional Plan Association	Associations
Hon.	Diane	Yatauro		Minority Leader	Nassau County Legislature	Nassau County Agencies
Mr.	Michael	Zapson			Davidoff & Malito	Major business owners in the Hub study area

Appendix C: List of Technical Memoranda

- Problem Statement Technical Memorandum
- Purpose and Need Technical Memorandum
- Goals and Objectives Technical Memorandum
- Preliminary Long-List Alternatives Technical Memorandum
- Refined Long-List Alternatives Technical Memorandum
- Public Involvement Plan
- Detailed Definition of Alternatives Technical Memorandum
- Operations Planning Technical Memorandum
- Technology Assessment Technical Memorandum
- Conceptual Engineering Technical Memorandum
- Capital Cost Estimating Technical Memorandum
- Operations and Maintenance Cost Estimating Technical Memorandum
- Financial Feasibility Technical Memorandum
- Environmental Screening Technical Memorandum
- Land Use Technical Memorandum

This AA Report has been prepared following conclusion of a number of technical studies documented through various Technical Memoranda, listed above. All technical findings documented in this report are based on the aforementioned Technical Memoranda.