BEFORE THE FEDERAL ENERGY REGULATORY COMMISSION
APPLICATION FOR LICENSE FOR MAJOR PROJECT – EXISTING DAM

Cannonsville Hydroelectric Project

FERC Project No. 13287

VOLUME 9

Appendix E-7: Socioeconomic Study Report

City of New York

Environmental Protection

February 2012

City of New York
West of Hudson Hydroelectric Project

Project No. 13287

Socioeconomic Study Report

Cannonsville, Pepacton, and Neversink Developments

Study Conducted By:

Hugh O'Neill Ltd d/b/a Appleseed

and

Bates White, LLC

August 2011

TABLE OF CONTENTS

EXECUTIVE SUMMARY **2**

1.0 INTRODUCTION **6**

2.0 SOCIOECONOMIC IMPACTS **7**

3.0 ASSESSMENT OF TRADITIONAL SOCIOECONOMIC FACTORS **8**

3.1 Introduction **8**

3.2 Areas of Analysis and Sources of Data **8**

3.3 Socioeconomic Conditions and Trends **9**

3.3.1 Cannonsville Development 9
3.3.2 Pepacton Development 27
3.3.3 Neversink Development 38
3.3.4 Socioeconomic Conclusions 53

3.4 Economic Impact of Project Construction **53**

3.4.1 Economic Impact of Construction of the Cannonsville Development 55
3.4.2 Economic Impact of Construction of the Pepacton Development 55
3.4.3 Economic Impact of Construction of the Neversink Development 56

3.5 Economic Impact of Project Operations **57**

3.5.1 Economic Impact of Cannonsville, Pepacton, and Neversink Operations 57
3.5.2 Tax Impacts of Operations 58
3.5.3 Impact on Local Government Services and Local Government Expenditures 59

3.6 Project Impact on Community Character and Recreation **59**

3.6.1 Conclusion: Overall Impact on Socioeconomic Conditions and Community Character 62

4.0 ASSESSMENT OF ENVIRONMENTAL BENEFITS, RELIABILITY BENEFITS AND WHOLESALE PRICE IMPACTS **64**

4.1 Impacts of Project Generation on Wholesale Energy Prices **64**

4.2 Modeling Issues and Sensitivities **67**

4.2.1 Model Sensitivity Case 68
4.2.2 Decline in NYISO Demand During the Model Period 69

4.3 Interpretation of Benefits from Wholesale Energy Price Reduction **70**

4.3.1 Interpretation of Economic Benefits 71

4.4 Environmental Externality Benefits **72**

4.5 System Reliability Benefits **73**

4.5.1 Ancillary Service Benefits 73

5.0 CONCLUSION **77**

APPENDIX A

APPENDIX B

EXECUTIVE SUMMARY

The City of New York ("City"), acting through the New York City Department of Environmental Protection ("DEP") has filed with the Federal Energy Regulatory Commission ("FERC") a Notice of Intent ("NOI") to develop hydroelectric generation at the West of Hudson Hydroelectric Project, FERC Project No. 13287 ("Project"). As part of the licensing process for the Project, the City commissioned the conduct of a socioeconomic study with respect to the three developments (i.e., Cannonsville, Neversink and Pepacton) associated the Project. This report presents the results of such study and is being submitted to FERC in support of the license application for the proposed Project.

The objective of the socioeconomic study was to identify and quantify the impacts of constructing and operating the three Project developments on factors such as employment, local government services, local tax revenues, and other relevant factors with respect to the municipalities and counties in the vicinity of the Project ("Impact Area"). In addition, other factors such as Project-related impacts on wholesale electricity prices and pollutant emissions were analyzed.

The City engaged the services of Hugh O'Neill Ltd d/b/a Appleseed ("Appleseed") and Bates White, LLC ("Bates White") to conduct the socioeconomic study of the Project. Appleseed conducted an analysis of Project impacts of traditional socioeconomic factors considered by FERC (e.g., employment, population, local tax revenues and local government services). The analysis conducted by Bates White primarily focused on the potential Project-related impacts on wholesale electricity prices and pollutant emissions associated with electricity production in New York.

Economic Impact of Project Construction and Operation

Using the IMPLAN input-output modeling system – an econometric modeling system commonly used in the analyses of economic impacts – the direct, indirect and induced (or "multiplier") effects of Project construction and ongoing operation were estimated.

Cannonsville Development

Of a total estimated construction cost of approximately $42.5 million, it is projected that nearly $3.1 million would be paid either to Delaware County subcontractors or to Delaware County residents employed by non-local contractors and subcontractors, generating 49 person-years of employment for Delaware County residents in construction and related industries during the anticipated 36 month construction period associated with the Cannonsville development. Through the multiplier effect, construction of the Cannonsville development is estimated to generate approximately $1.2 million in additional economic output in Delaware County and ten person-years of employment.

Once fully operational, ongoing operation of the Cannonsville development is estimated to increase Delaware County's annual economic by more than $2.7 million.

Pepacton Development

Of a total estimated construction cost of approximately $8.1 million, it is projected that approximately $491,000 would be paid either to Delaware County subcontractors or to Delaware County residents employed by non-local contractors and subcontractors, generating 8 person-years of employment for Delaware County residents in construction and related industries during the anticipated 21 month construction period associated with the Pepacton development. Through the multiplier effect, construction of the Pepacton development is estimated to generate approximately $192,000 in additional economic output in Delaware County and two person-years of employment.

Once fully operational, ongoing operation of the Pepacton development is estimated to increase Delaware County's annual economic by approximately $454,000.

Neversink Development

Of a total estimated construction cost of approximately $4.4 million, it is projected that approximately $274,000 would be paid either to Sullivan County subcontractors or to Sullivan County residents employed by non-local contractors and subcontractors, generating 5 person-years of employment for Sullivan County residents in construction and related industries during the anticipated 21 month construction period associated with the Neversink development. Through the multiplier effect, construction of the Neversink development is estimated to generate approximately $120,000 in additional economic output in Sullivan County and one person-years of employment.

Once fully operational, ongoing operation of the Neversink development is estimated to increase Delaware County's annual economic by slightly less than $273,000.

Impact on Local Tax Revenues and Local Governmental Services

Assuming that: (a) the market value of each Project development is roughly equal to the respective construction costs of each development; and (b) equalization rates and tax rates for each of the three respective towns in which each development is located are the same as they were in 2010, an estimate of the applicable town, county and school property taxes to be paid with respect to each development was calculated. Utilizing these assumptions, the estimated town, county and school property taxes to be paid with respect to each development during its respective first year of operation are as follows: (a) approximately $1.7 million for the Cannonsville development; (b) approximately $158,000 for the Pepacton development; and (c) approximately $112,000 for the Neversink development.

Due primarily to the relatively small number of new jobs associated with ongoing operations at each Project development, the respective impact of each development on local government services is expected to be minimal.

Impact on Recreation and the Character of the Affected Communities

Because: (a) the City is merely seeking to generate power from the discharges it is already obligated to provide and will continue to provide such discharges in accordance with the requirements of the operating protocol applicable to the operation of the reservoirs associated with each Project development; and (b) the Project developments are being constructed at existing facilities, the Project developments are expected to neither create new recreational opportunities nor impair existing recreational activities undertaken on the reservoir or downstream environs associated with each Project development.

Furthermore, the impact of each Project development on the character of the affected communities is expected to be minimal for several reasons, including: (a) the small increase in labor demands associated with the developments is unlikely to affect wages in either the directly affected industries or the labor force more broadly; (b) because the resident labor force in the two affected counties (i.e., Delaware and Sullivan counties) and surrounding areas would easily absorb the small increase in labor demands generated by the Project developments, the developments are not anticipated to affect demand for housing or housing costs in such areas; and (c) due to their small impact on labor demands, the developments are not expected to affect other aspects of community character such as the predominantly low-density, rural character of the affected communities, existing patterns of land use and development, or the overall mix of local economic activity.

Impacts on Wholesale Energy Prices, Pollutant Emissions and System Reliability

In addition to the traditional socioeconomic impact assessment, three additional analyses were performed to assess the effects of the Project developments on reducing wholesale energy prices, reducing pollutant emissions and supporting reliability of the electric system.

Wholesale Energy Market Impacts

Electricity generated from the Project developments would lower wholesale market energy prices by displacing higher cost marginal generation in some hours. The estimated annual dollar benefit of such price reductions for the western region of the control area administered by the New York Independent System Operator, Inc. ("NYISO") is approximately $13.6 million annually.

Environmental Externality Benefits

Generation from the Project developments, estimated to be approximately 57,000 megawatt-hours ("MWh") per year of emissions-free electricity, would provide environmental benefits by displacing generation of electricity from fossil fuels. Electricity generated from the Project developments will result in reductions in emissions by fossil-fueled generation sources by as much as 64,000 tons of carbon dioxide ("CO_2"), 170 tons of nitrogen oxides ("NOx"), and 370 tons of sulfur dioxide ("SO_2") annually, depending on the type of fossil-fuel generation displaced by the electricity produced from the Project developments. The estimated CO_2 emissions reductions are equivalent to removing between 5,600 and 11,100 vehicles from the road, depending on the type of fossil-fuel generation displaced.

Electric System Reliability Benefits

Interconnection of the Project developments may provide additional reliability and power quality benefits at both the local and the Statewide level, including the provision of certain ancillary services. These ancillary services are typically used by the transmission system operator to balance supply and demand and maintain the reliability and security of the system within acceptable standards. The ancillary services that the Project developments may be suited to provide include regulation service and frequency control, and reactive power supply and voltage support. Additionally, the proposed Project developments may have the effect of delaying the need for New York State Electric & Gas Corporation ("NYSEG") to invest in upstream capacity needed to meet future load growth along the feeders to which they are connected.

1.0 INTRODUCTION

On September 15, 2008, the City, acting through DEP, filed an application for a preliminary permit with FERC to develop hydroelectric generation at four sites (i.e., Project developments) that together comprise the Project.[1] Through the Project, the City is considering developing hydroelectric facilities at the Project developments, while simultaneously maintaining its crucial water supply operations in accordance with long-term sustainable drinking water needs, conservation releases, directed releases, water quality standards, and various other conditions affecting the City's water supply system, including determinations by and/or agreements with the U.S. Environmental Protection Agency, the New York State Department of Health, the New York State Department of Environmental Conservation, and the Delaware River Basin Commission. The delivery of high quality drinking water to approximately one-half of New York State's total population will remain the primary purpose and function of DEP's operations at the reservoirs and dams associated with the Project. All of the existing dams and reservoirs associated with the Project are owned by the City and operated by DEP to provide water for New York City and four nearby counties. The water supply system provides approximately 1.1 billion gallons of unfiltered high quality drinking water daily to approximately nine million New York State residents (approximately half of the State's total population), as well as the millions of tourists and commuters who visit New York City each year.[2]

By order issued March 20, 2009, FERC issued a Preliminary Permit to the City, facilitating its ability to proceed with its data collection, studies, and evaluation of the Project. On August 13, 2009, the City commenced the pre-filing process for the Project with the filing of its Notification of Intent and Pre-Application Document ("PAD"). In accordance with the Preliminary Permit, DEP is evaluating the technical and economic merit and feasibility for each proposed hydroelectric development. Based on the analysis completed to date, the City has not yet identified an economically viable project for the Schoharie Development. Accordingly, there are no additional studies proposed for the Schoharie Development at this time. However, the City will continue to investigate whether there is a technically and economically feasible option for this Project development, and will proceed with appropriate FERC licensing studies in the event such an alternative is identified.

Based on the foregoing, this socioeconomic study analyzes only the following three proposed Project developments: (1) Cannonsville Development; (2) Neversink Development; and (3) Pepacton Development.[3]

---

[1] The Project, as initially proposed by the City, consisted of the following four developments: (1) the Cannonsville Dam and Reservoir in Delaware County, New York ("Cannonsville Development"); (2) the Neversink Dam and Reservoir in Sullivan County, New York ("Neversink Development"); (3) the Downsville Dam and Pepacton Reservoir in Delaware County, New York ("Pepacton Development"); and (4) the Gilboa Dam and Schoharie Reservoir in Schoharie and Greene Counties, New York ("Schoharie Development").

[2] The City's water supply is comprised of three watersheds – Catskill, Croton, and Delaware – which are operated as an integrated system. The Cannonsville, Neversink and Pepacton Developments are part of the Delaware system. The Schoharie Development is part of the Catskill system.

[3] For the purposes of this socioeconomic study, references to the "Project" herein are references to the Project inclusive of the three proposed Project developments assessed as part of this study.

2.0 SOCIOECONOMIC IMPACTS

In connection with the licensing process, the City elected to conduct a socioeconomic study regarding the Project. The overall objective of the socioeconomic study was to identify and quantify the impacts of constructing and operating the Project developments on employment, population, housing, personal income, local government services, local tax revenues and other relevant factors with respect to the Impact Area.

In order to accomplish this objective, the following activities were included in the socioeconomic study of the Project:

- Identify the appropriate Impact Area for conducting the socio-economic study, based on the Project location, existing demographic and economic linkages;

- Identify demographic and economic trends for the Impact Area, including:
  - Population;
  - Employment;
  - Personal income;
  - General economic condition;
  - Real estate characteristics;
  - Government Services and Facilities (e.g., police, fire, health, roads, education);

- Identify the economic impacts (direct, indirect, and induced) of Project construction and on-going Project operation on the demographic and economic trends for the Impact Area, including:
  - Evaluating whether the existing supply of housing (temporary and permanent) is sufficient to meet the needs of any additional population resulting from Project construction and operation;
  - Identifying any additional revenues (e.g., taxes) provided to the Impact Area resulting from Project construction and operation;

- Evaluate the incremental local government expenditures in the Impact Area (including school operating costs, road maintenance and repair, public safety costs and public utility costs) compared to the local government revenues in the Impact Area that would result from Project construction and operation;

- Evaluate the impact of the Project on recreational activities and character of the communities within the Impact Area;

- Identify and quantify, to the extent practicable, environmental externality benefits to the public, generally, associated with Project construction and operation (e.g., air pollution reduction resulting from the offset of fossil-fuel generation by the power generated by the Project); and

- Evaluate the potential impacts of the Project on wholesale electricity prices and system reliability in the Impact Area.

To conduct the socioeconomic study of the Project, the City engaged the services of two consultants: (1) Appleseed; and (2) Bates White. Appleseed conducted an assessment of the traditional socioeconomic impacts required by FERC regulations,[4] while Bates White conducted an assessment relating to potential environmental externality benefits, reliability benefits and wholesale electricity price impacts associated with the Project. Accordingly, Appleseed is responsible for the content of Section 3.0 of this report, and Bates White is responsible for the content of Section 4.0.

3.0 ASSESSMENT OF TRADITIONAL SOCIOECONOMIC FACTORS

3.1 Introduction

Section 3 of this report assesses the economic impact of the proposed Cannonsville, Pepacton and Neversink Developments. In order to understand the socioeconomic context within which the Project developments would be constructed, an analysis of current demographic and economic conditions and recent trends in the towns most likely to be affected by the Projects are presented below.

3.2 Areas of Analysis and Sources of Data

Two of the proposed Project developments – Cannonsville and Pepacton – would be located in Delaware County. The Neversink Development would be located in Sullivan County. For purposes of this analysis, the towns in which socioeconomic conditions are most likely to be affected by the developments are as follows:

- The towns in which the proposed facilities would be located (i.e., Deposit, Colchester and Neversink);

- Other towns that, when added to the three cited above, account for more than half of all of the workforce of the towns in which the proposed facilities would be located. For example, about 54 percent of all those whose place of work is in the Town of Deposit live either in the town itself or in the Towns of Walton or Sanford; and

- Any other towns that directly border Deposit, Colchester or Neversink.

Figure 3.1 shows the fifteen towns that are included in the review of demographic and economic conditions and trends.

Data used in preparing profiles of each of these fifteen towns were taken primarily from several sources:

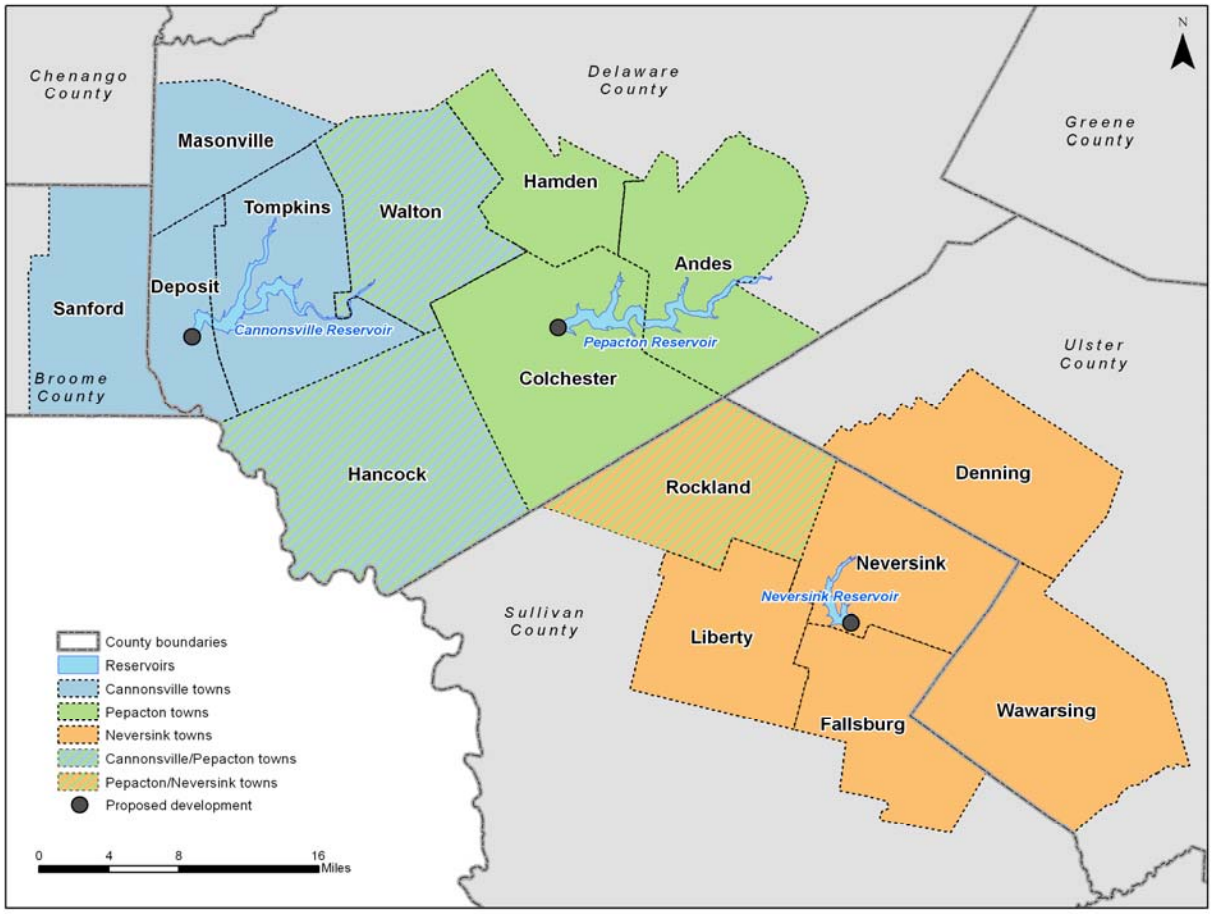
[4] *See* 18 C.F.R. § 4.41(f)(5).

- U.S. Census data for 2000 and 2010 was used to show population, median age, and housing trends.

- The Census Bureau's American Community Survey for 2005-2009 provides the most recent available data on educational attainment, employment and unemployment, industry employment characteristics, and educational attainment rates.

- The Census Bureau's journey-to-work data for 2000 provides the most recent available data showing on a small-area basis where people live and work.

Figure 3.1: Map of Reservoirs Project Developments in Relation to Towns and Counties Assessed



3.3 Socioeconomic Conditions and Trends

This section describes the town-level socioeconomic conditions and trends during the past decade, organized by Project development.

3.3.1 Cannonsville Development

The following sections describe socioeconomic conditions and trends in six towns (five in Delaware County and one in Broome County that could potentially be affected by the Cannonsville facility: (1) Deposit, (2) Hancock, (3) Masonville, (4) Tompkins, and (5) Walton in Delaware County; and (6) Sanford in Broome County.

3.3.1.1Town of Deposit

According to the 2010 Census, the population of the Town of Deposit was 1,712 – an increase of 1.5 percent since 2000. This represents a slightly slower rate of growth than for New York State as a whole, but is more positive than the overall trend in Delaware County, which experienced a slight decline in population during the same period (Table 3.1). The Town had a population density of 39.8 persons per square mile, which reflects the Town's rural character.

Table 3.1: Town of Deposit Population, 2000 and 2010

Geography	2000	2010	% Change
Deposit	1,687	1,712	1.5%
Delaware County	48,040	47,980	-0.1%
New York	18,976,457	19,378,102	2.1%

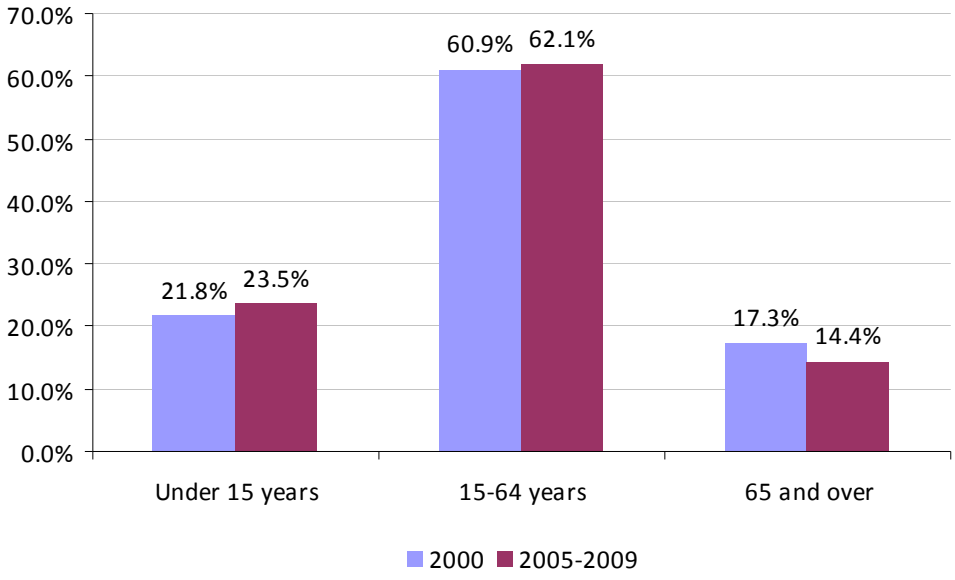
As shown by Table 3.2, the number of housing units in the Town of Deposit increased by 11.8 percent between 2000 and 2010 – an increase of 119 units. Housing for seasonal or recreational use accounted for 31.2 percent of all housing units in 2010; and such units accounted for almost all housing growth in the Town between 2000 and 2010.

Table 3.2: Town of Deposit Housing Units, 2000 and 2010

Geography	2000	2010	% Change
Deposit	1,048	1,131	7.9%
Delaware County	28,943	31,222	7.9%
New York	7,679,307	8,108,103	5.6%

According to the Census Bureau's American Community Survey ("ACS"), the median age in Deposit during the years 2005-2009 was 37.6 – a slight decrease from the 38.3 reported in the 2000 Census. As depicted by Figure 3.2, the age distribution of the Town of Deposit changed significantly between 2000 and 2009. The population age 15-and-under and aged 15-64 increased by about 10 percent and 15 percent, respectively. More dramatically, the population 65-and-over decreased by about 30 percent.

Figure 3.2: Town of Deposit Age Distribution, 2000 and 2005-2009



Resident employment, as shown in Table 3.3, decreased by slightly more than 13 percent in the Town of Deposit between 2000 and 2005-2009. The reduction in employment is significant considering that employment in the State actually increased during the same time period by 8.6 percent.

Table 3.3: Town of Deposit Resident Employment, 2000 and 2005-2009

Geography	2000	2005-2009	% Change
Deposit	709	615	-13.3%
Delaware County	20,840	21,111	1.3%
New York	8,382,988	9,102,596	8.6%

As Figure 3.3 shows, the largest number of employed residents of the Town of Deposit – about 29 percent – worked in education, health care and social assistance. The manufacturing sector accounted for 15 percent of all resident employment, reflecting a strong concentration of manufacturing firms in western Delaware County. Another 12 percent of the Town's employed residents worked in construction; 11 percent in retail trade; and 61 percent in the arts, entertainment and hospitality sector.

Figure 3.3: Town of Deposit Resident Employment - Top Employment Sectors, 2005-2009

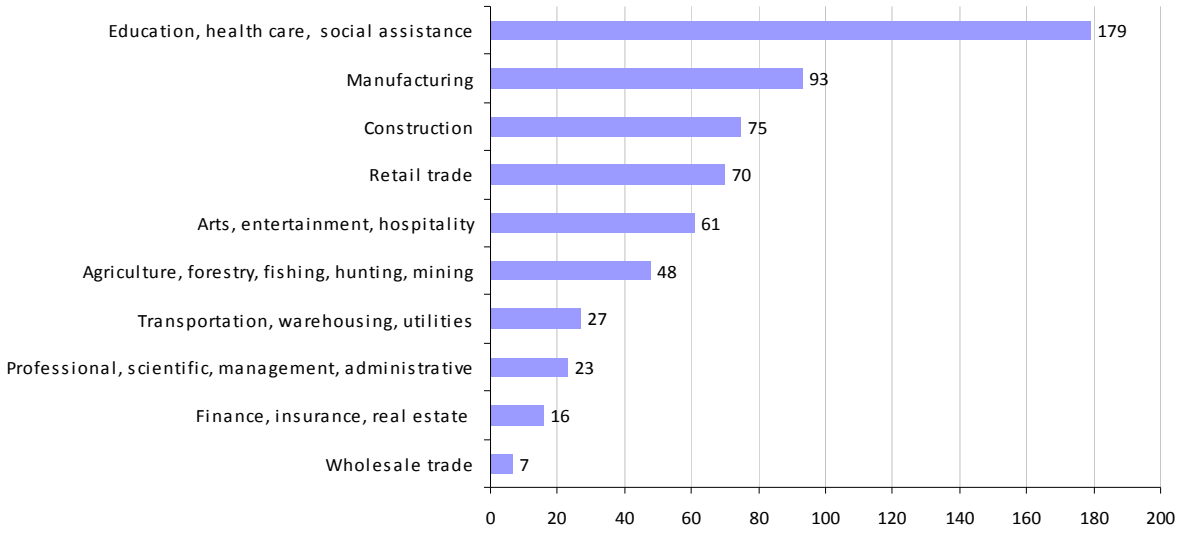


Table 3.4 shows that the unemployment rate for the Town of Deposit during the years 2005-2009 averaged 8.1 percent – higher than the overall rate for Delaware County or for New York State.[5]

Table 3.4: Town of Deposit Unemployment Rate, 2000 and 2005-2009

Geography	2000	2005-2009
Deposit	7.2%	8.1%
Delaware County	6.2%	7.1%
New York	7.1%	7.0%

As shown in Table 3.5, the median household income ("MHI") for the Town of Deposit for the years 2005-2009 was $34,621 – 83 percent of the median household income for Delaware County, and just 63 percent of the statewide median household income for the same period. Moreover, after adjusting for inflation, the Town's MHI fell by 6.5 percent between 2000 and 2005-2009, indicating that the Town fell further behind the rest of the County and the State during this period.

Table 3.5: Town of Deposit Median Household Income (2009 dollars), 2000 and 2005-2009

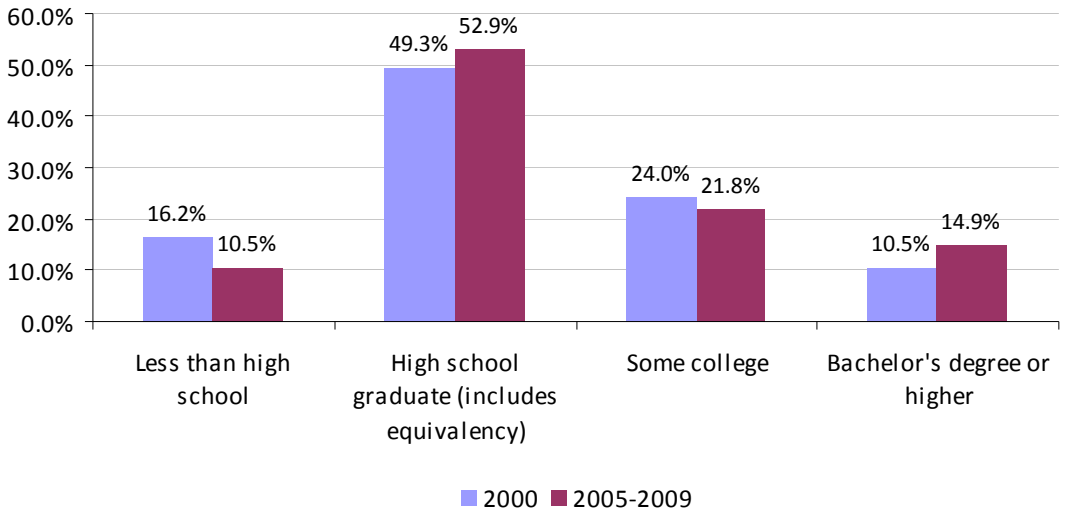
Geography	2000	2005-2009	% Change
Deposit	$37,022	$34,621	-6.5%
Delaware County	$41,801	$41,656	-0.3%
New York	$55,879	$55,233	-1.2%

As Figure 3.4 shows, the Town of Deposit has experienced some positive changes in the areas of secondary and post-secondary educational attainment. The percentage of residents age 25 and over who lack a high school diploma fell between 2000 and 2005-2009, while the percentage of

[5] It should be noted that with respect to all of the unemployment data presented in this report, the percentage unemployment rate for 2005-2009 does not fully reflect the impact of the economic recession that commenced in 2008 and the continuing economic downturn that has followed thereafter.

residents who held at least a bachelor's degree rose. Nevertheless, in the area of college and advanced degree attainment, the Town still trails both Delaware County (18.2 percent) and New York State (31.8 percent).

Figure 3.4: Town of Deposit Educational Attainment (population 25 years and over), 2000 and 2005-2009



3.3.1.2 Town of Hancock

As shown in Table 3.6, in 2010 the population of the Town of Hancock was 3,224 (with a population density of 20.3 persons per square mile), a decline of 6.5 percent since 2000. The Town's population loss was, thus, significantly larger in percentage terms than the 0.1 percent decline in Delaware County's population.

Table 3.6: Town of Hancock Population, 2000 and 2010

Geography	2000	2010	% Change
Hancock	3,449	3,224	-6.5%
Delaware County	48,040	47,980	-0.1%
New York	18,976,457	19,378,102	2.1%

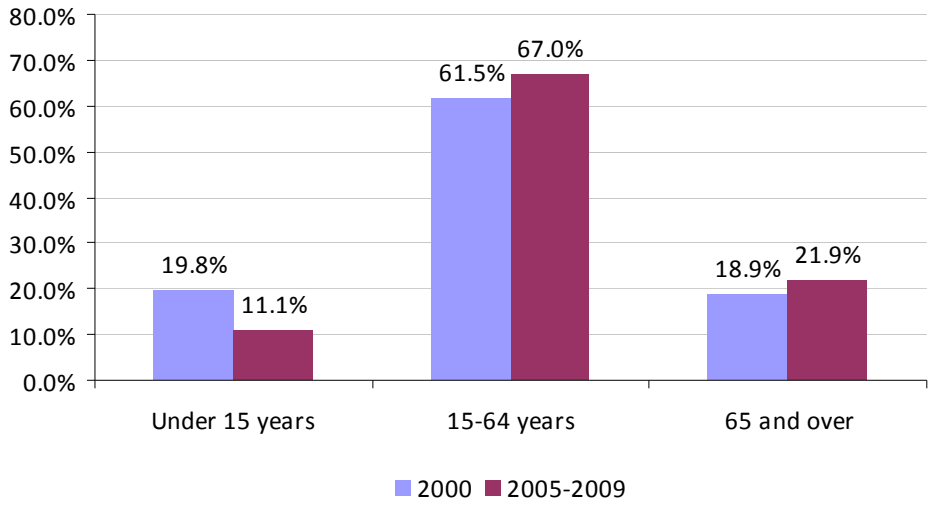
While its resident population declined between 2000 and 2010, Hancock's housing stock grew by 9.2 percent, as shown in Table 3.7. As of 2010, seasonal and recreational housing accounted for 45 percent of all units in Hancock, an increase of about 23 percent since 2000.

Table 3.7: Town of Hancock Housing Units, 2000 and 2010

Geography	2,000	2010	% Change
Hancock	2,512	2,743	9.2%
Delaware County	28,943	31,222	7.9%
New York	7,679,307	7,950,035	3.5%

As demonstrated by Figure 3.5, the population of the Town of Hancock aged between 2000 and 2005-2009. During this period, the median age increased to 48.2 years. The share of the population under the age of 15 fell by 8.7 percentage points. while the share of the population between 15 and 64 rose by 5.5 percentage points, and the population older than 65 increased by 3 percentage points.

Figure 3.5: Town of Hancock Age Distribution



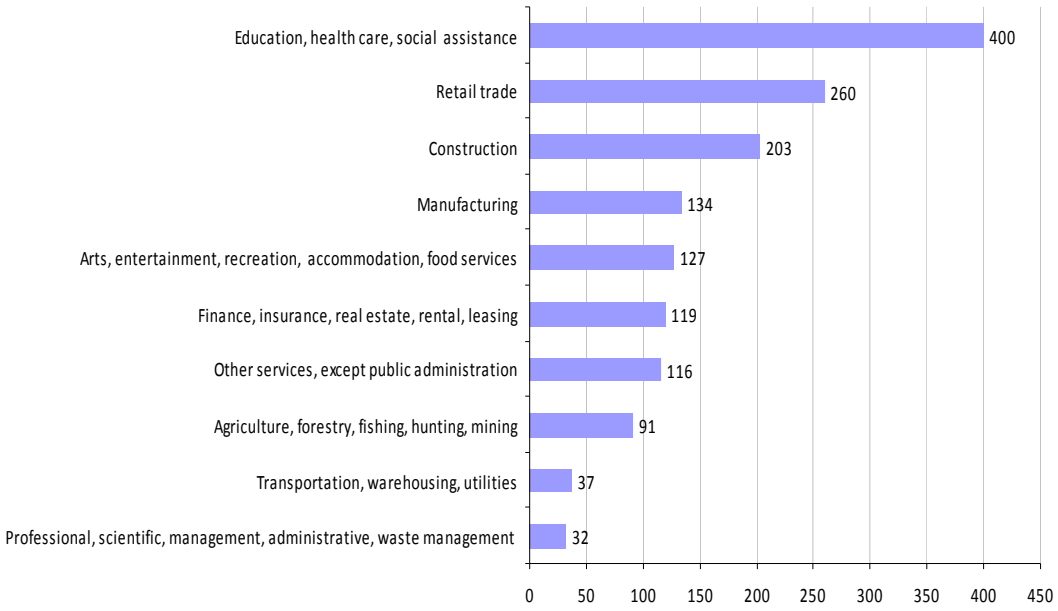
Resident employment in the Town of Hancock increased by nearly 19 percent between 2000 and 2005-2009. This growth rate was more than double the growth in the State during this period, as depicted in Table 3.8.

Table 3.8: Town of Hancock Resident Employment, 2000 and 2005-2009

Geography	2000	2005-2009	% Change
Hancock	1,338	1,593	19.1%
Delaware County	208	21,111	1.3%
New York	8,382,988	9,102,596	8.6%

As depicted by Figure 3.6, approximately 25 percent of employed residents of the Town of Hancock worked in education, health care and social assistance in 2005-2009, 16 percent in retail trade; nearly 13 percent in construction; and 8 percent in manufacturing.

Figure 3.6: Town of Hancock Resident Employment - Top Employment Sectors, 2005-2009



As Table 3.9 shows, the Town of Hancock's unemployment rate declined by 3 percentage points between 2000 and 2005-2009, and was below the unemployment rates of both Delaware County and the State for 2005-2009.

Table 3.9: Town of Hancock Unemployment Rate, 2000 and 2005-2009

Geography	2000	2005-2009
Hancock	8.9	5.9%
Delaware County	6.2%	7.1%
New York	7.1%	7.0%

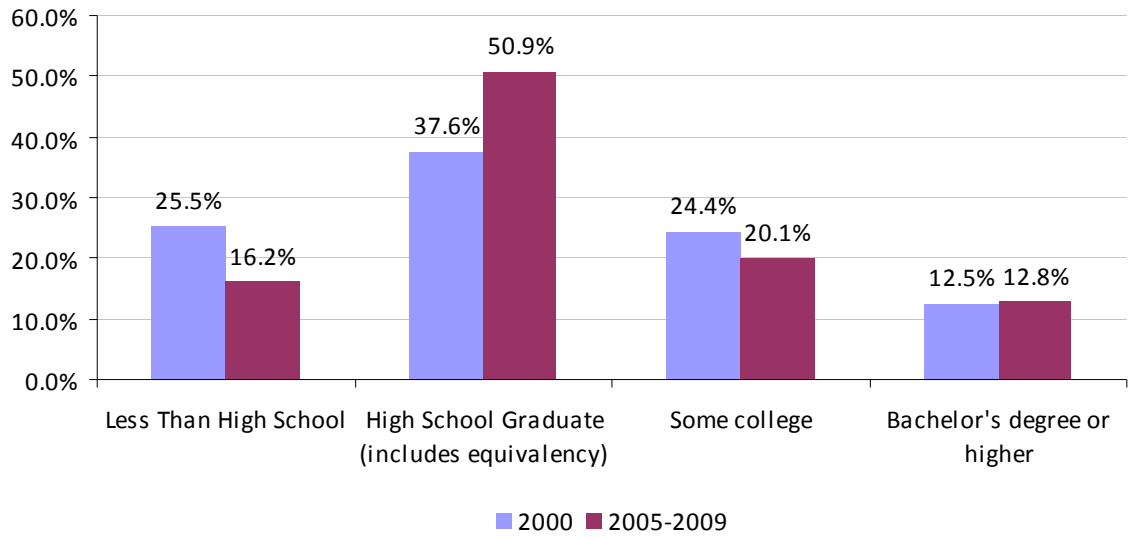
The MHI in the Town of Hancock decreased by slightly less than one percent between 2000 and 2005-2009, as shown in Table 3.10. While a decrease in MHI during this period is consistent with trend in Delaware County and the State, the Town's MHI remained slightly below the level in Delaware County and well below the level in the State.

Table 3.10: Town of Hancock Median Household Income (2009 dollars), 2000 and 2005-2009

Geography	2000	2005-2009	% Change
Hancock	$39,853	$39,583	-0.7%
Delaware County	$41,801	$41,656	-0.3%
New York	$55,879	$55,233	-1.2%

As depicted in Figure 3.7, educational attainment increased in the Town of Hancock between 2000 and 2005-2009 as the number of high school graduates increased, while the number with less than a high school degree or some college experience decreased considerably. The percentage of people age 25-and-older who held a bachelor's degree or higher remained flat (and relatively low) between 2000 and 2005-2009.

Figure 3.7: Town of Hancock Educational Attainment (population 25 years and over), 2000 and 2005-2009



3.3.1.3 Town of Masonville

As shown by Table 3.11, the population of the Town of Masonville declined by 6 percent between 2000 and 2010 – a sharper decline than the nominal change that Delaware County experienced during the same period. The town had a primarily rural character with a population density of 24.3 persons per square mile.

Table 3.11: Town of Masonville Population, 2000 and 2010

Geography	2000	2010	% Change
Masonville	1,407	1,320	-6.2%
Delaware County	48,040	47,980	-0.1%
New York	18,976,457	19,378,102	2.1%

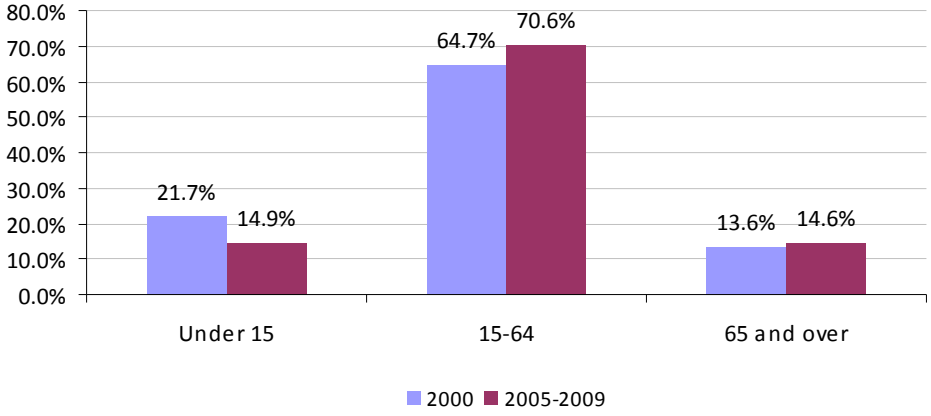
While the population of the Town of Masonville decreased between 2000 and 2010, the town experienced strong growth (15.5 percent) in its housing stock. Seasonal and recreational housing accounted for more than half the growth in the Town's housing stock during this period; and as of 2010, such units made up 28.9 percent of all housing in Masonville (Table 3.12)

Table 3.12: Town of Masonville Housing Units, 2000 and 2010

Geography	2000	2010	% Change
Masonville	716	850	18.8%
Delaware County	28,943	31,222	7.9%
New York	7,679,307	8,108,103	5.6%

As demonstrated by Figure 3.8, between 2000 and 2005-2009 Masonville's population aged 15-64 increased slightly (by about 3 percent), while the population aged 15 and under decreased more significantly (by about 35 percent). The share of the population 65 and over remained virtually unchanged during the same time period

Figure 3.8: Town of Masonville Age Distribution, 2000 and 2005-2009



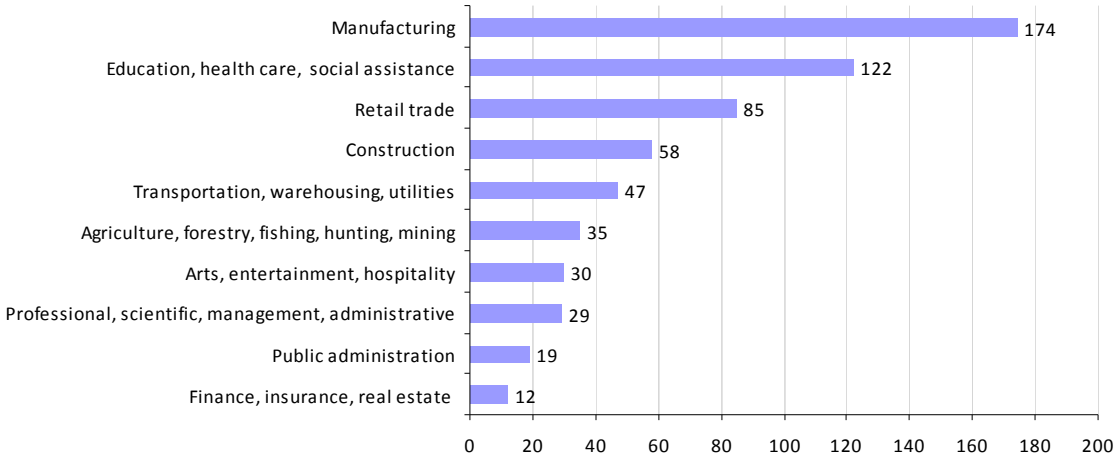
Resident employment in Masonville by nearly 1.5 percent between 2000 and 2005-2009, which was in contrast to the slight growth that Delaware County and the more significant growth that the State experienced in 2005-2009, as demonstrated by Table 3.13.

Table 3.13: Town of Masonville Resident Employment, 2000 and 2005-2009

Geography	2000	2005-2009	% Change
Masonville	633	624	-1.4%
Delaware County	20,840	21,111	1.3%
New York	8,382,988	9,102,596	8.6%

As Figure 3.9 shows, the Census Bureau's ACS data indicate that between 2005 and 2009, an average of 174 Masonville residents worked in manufacturing – about 28 percent of the town's employed residents. The relatively high percentage of all employees working in manufacturing reflects this sector's continued importance in the economy of Delaware County. Other major employers of Masonville residents include the education, health and social assistance sector (nearly 20 percent of the town's employed residents), retail trade (14 percent) and construction (more than 9 percent).

Figure 3.9: Town of Masonville Resident Employment - Top Employment Sectors, 2005-2009



As Table 3.14 shows, between 2005 and 2009 the Town's unemployment rate averaged 8.5 percent – significantly higher than the rates for Delaware County as a whole, or for New York State. Moreover, the average rate for 2005-2009 (as reported by ACS) does not reflect the full impact of the recession.

Table 3.14: Town of Masonville Unemployment Rate, 2000 and 2005-2009

Geography	2000	2005-2009
Masonville	5.1%	8.5%
Delaware County	6.2%	7.1%
New York	7.1%	7.0%

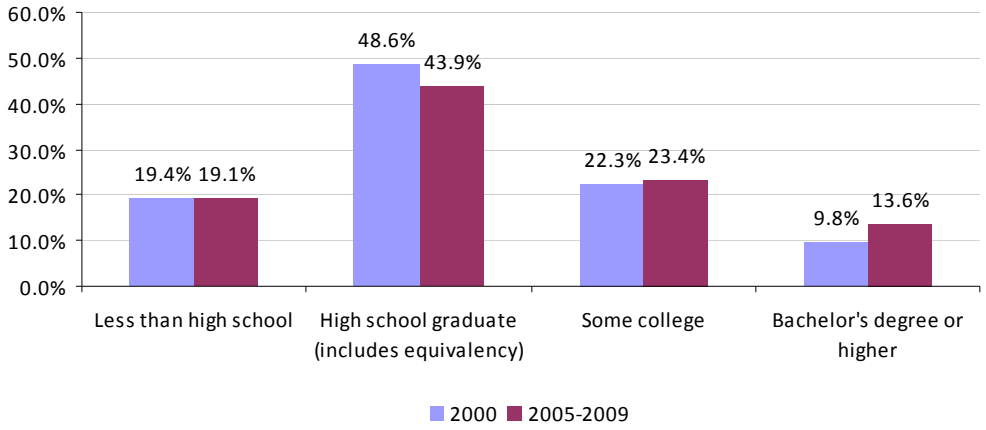
As depicted in Table 3.15, the Town of Masonville's MHI grew by 17 percent between 2000 and 2005-2009, while MHI declined at both County and State levels during the same period. As a result of this growth, the Town's MHI is 19 percent higher than the County's – and lags the statewide MHI by 10 percent.

Table 3.15: Town of Masonville Median Household Income (2009 dollars), 2000 and 2005-2009

Geography	2000	2005-2009	% Change
Masonville	$42,495	$49,702	17.0%
Delaware County	$41,801	$41,656	-0.3%
New York	$55,879	$55,233	-1.2%

The percentage of all Masonville residents age 25-and-older who have at least a bachelor's degree rose between 2000 and 2005-2009, but at 13.6 percent is still relatively low. At the same time, the percentage of those 25-and-older who have not completed high school is still relatively high (Table 3.10).

Figure 3.10: Town of Masonvile Educational Attainment (population 25 years and over), 2000 and 2005-2009



3.3.1.4 Town of Tompkins

In 2010, the population of the Town of Tompkins was 1,247 – as shown in Table 3.16, an increase of 12.9 percent since 2000. The Town's population density (12.7 persons per square mile) had increased from its 2000 level, at a rate that mirrors the rate of population growth that the Town of Tompkins experienced.

Table 3.16: Town of Tompkins Population, 2000 and 2010

Geography	2000	2010	% Change
Tompkins	1,105	1,247	12.9%
Delaware County	48,040	47,980	-0.1%
New York	18,976,457	19,378,102	2.1%

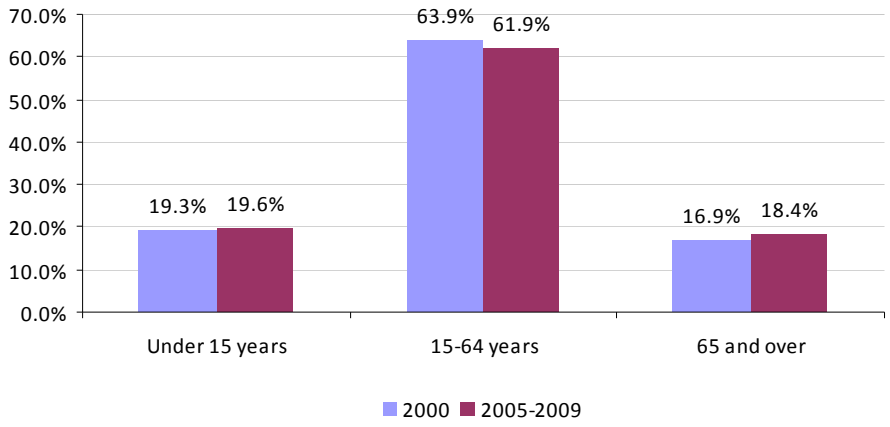
As shown in Table 3.17, the number of housing units in the Town of Tompkins grew by 13 percent between 2000 and 2010. Seasonal and recreational housing accounted for about 38 percent of all units in 2010.

Table 3.17: Town of Tompkins Housing Units, 2000 and 2010

Geography	2000	2010	% Change
Tompkins	768	884	15.1%
Delaware County	28,943	31,222	7.9%
New York	7,679,307	8,108,103	5.6%

For 2005-2009, the median age in Tompkins was 37.2. As shown in Figure 3.11, the overall age distribution in the Town was relatively unchanged between 2000 and 2005-2009.

Figure 3.11: Town of Tompkins Age Distribution, 2000 and 2005-2009



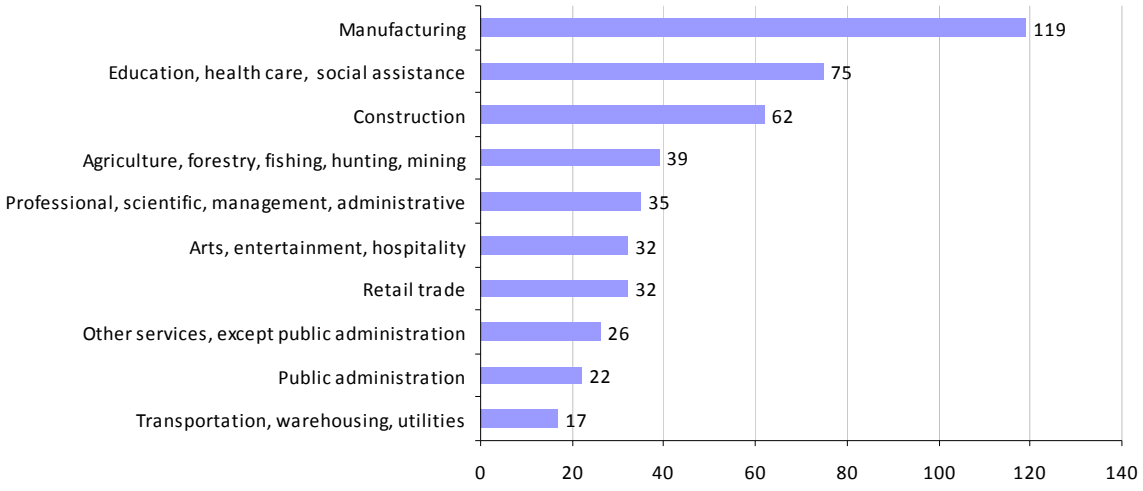
As shown by Table 3.18, resident employment in the Town of Tompkins decreased by more than 3 percent between 2000 and 2005-2009, whereas resident employment increased in both Delaware County and the State during the same period.

Table 3.18: Town of Tompkins Resident Employment, 2000 and 2005-2009

Geography	2,000	2005-2009	% Change
Tompkins	506	489	-3.4%
Delaware County	20,840	21,111	1.3%
New York	8,382,988	9,102,596	8.6%

As Figure 3.12 shows, the manufacturing sector was the leading employer of Tompkins residents during 2005-2009, accounting for 24 percent of the Town's employed residents. Other leading sectors include education, health and social assistance (15 percent), construction (13 percent), and agriculture and natural resources (8 percent).

Figure 3.12: Town of Tompkins Resident Employment - Top Employment Sectors, 2005-2009



As Table 3.19 shows, the Town of Tompkins's unemployment rate for 2005-2009 was 5.2 percent – considerably lower than the County-wide and State-wide rates for the same period.

Table 3.19: Town of Tompkins Unemployment Rate, 2000 and 2005-2009

Geography	2000	2005-2009
Tompkins	6.8%	5.2%
Delaware County	6.2%	7.1%
New York	7.1%	7.0%

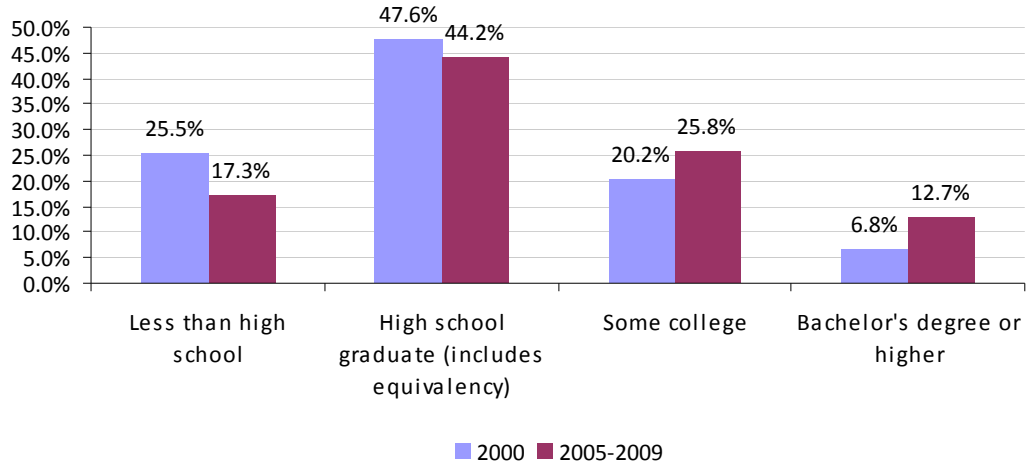
The Census Bureau's ACS data indicates that in real terms, the Town's median household income declined by 11 percent between 2000 and 2005-2009, as depicted in Table 3.20. In 2000 the Town's MHI had been 8.5 percent higher than that for Delaware County; for 2005-2009, it was 3 percent lower.

Table 3.20: Town of Tompkins Median Household Income (2009 dollars), 2000 and 2005-2009

Geography	2000	2005-2009	% Change
Tompkins	$45,363	$40,378	-11.0%
Delaware County	$41,801	$41,656	-0.3%
New York	$55,879	$55,233	-1.2%

As in other towns in the region, the level of educational attainment in Tompkins rose between 2000 and 2005-2009, with 38.5 percent of all residents age 25-and-older having had at least some college experience. Nevertheless, even with this increase the percentage of all 25-and-older residents who have earned at least a bachelor's degree (12.7 percent) is still relatively low (Figure 3.13)

Figure 3.13: Town of Tompkins Educational Attainment (population 25 years and over), 2000 and 2005-2009



3.3.1.5Town of Sanford

As shown in Table 3.21, the Town of Sanford's population declined slightly between 2000 and 2010, while the population in Broome County and the State increased slightly during that same period. In 2010, the Town's population density was 26.7 persons per square mile reflecting the

Town's primarily rural nature, which was much lower than the County's population density (284.2 persons per square mile).

Table 3.21: Town of Sanford Population, 2000 and 2010

Geography	2000	2010	% Change
Sanford	2,477	2,407	-2.8%
Broome County	200,534	200,600	0.03%
New York	18,976,457	19,378,102	2.1%

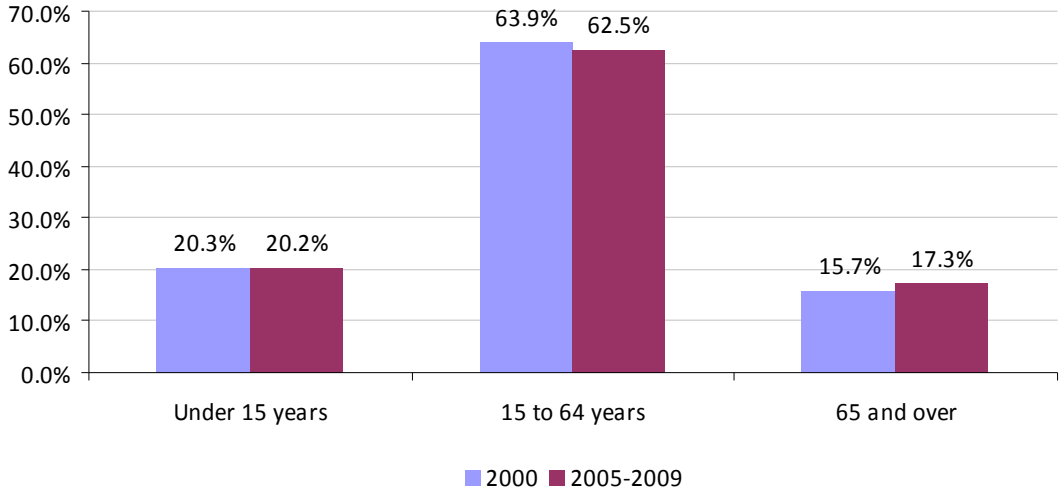
Despite the decline in its resident population, Sanford experienced growth in the number of housing units. This growth rate exceeded the rate that Broome County and the State experienced, as shown in Table 3.22. Seasonal and recreational housing accounted for 44 percent of housing units.

Table 3.22: Town of Sanford Housing Units, 2000 and 2010

Geography	2000	2010	% Change
Sanford	1,545	1,739	12.6%
Broome County	88,816	90,563	2.0%
New York	7,679,307	8,108,103	5.6%

The median age was 40.9 in 2005-2009. As depicted in Figure 3.14, the Town of Sanford is aging slightly. Between 2000 and 2005-2009, the share of the Town's population over age 64 increased, while the percentage age 15 through 64 decreased.

Figure 3.14: Town of Sanford Age Distribution, 2000 and 2005-2009



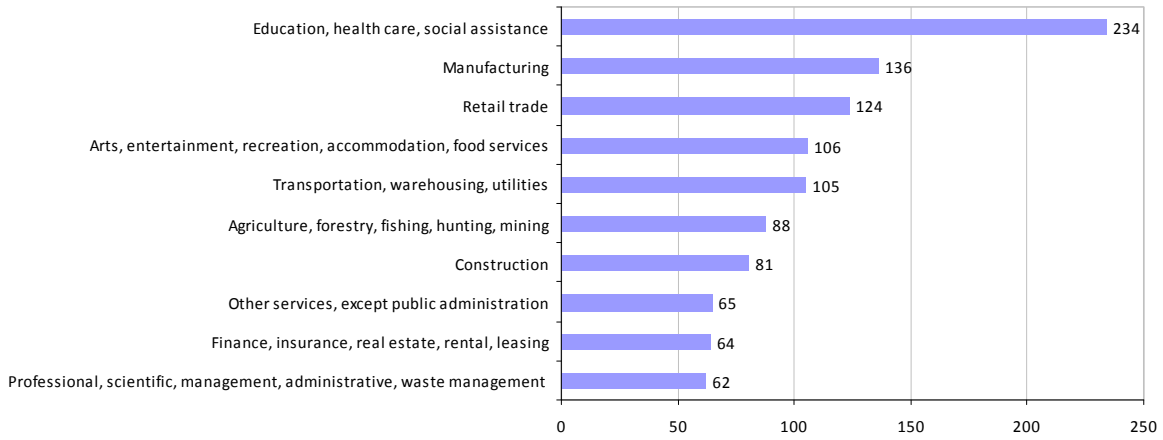
As shown in Table 3.23, resident employment in the Town of Sanford increased about 11 percent between 2000 and 2005-2009, which was a level that was greater than the State and Broome County.

Table 3.23: Town of Sanford Resident Employment, 2000 and 2005-2009

Geography	2000	2005-2009	% Change
Sanford	1,052	1,168	11.0%
Broome County	91,340	91,237	-0.1%
New York	8,382,988	9,102,596	8.6%

As demonstrated in Figure 3.15, in 2005-2009 about 20 percent of the Town of Sanford's employed residents worked in education, health care and social assistance. Manufacturing accounted for 12 percent, retail trade for 11 percent, and arts, recreation and hospitality for 9 percent.

Figure 3.15: Town of Sanford Resident Employment - Top Employment Sectors, 2005-2009



As shown in Table 3.24, unemployment in the Town of Sanford increased to more than 10 percent in 2005-2009 – higher than the unemployment rates in Broome County and the State during the same period, whereas in 2000 Sanford's unemployment rate was lower than the rates for the County and the State.

Table 3.24: Town of Sanford Unemployment Rate, 2000 and 2005-2009

Geography	2000	2005-2009
Sanford	3.7%	10.6%
Broome County	5.4%	6.1%
New York	7.1%	7.0%

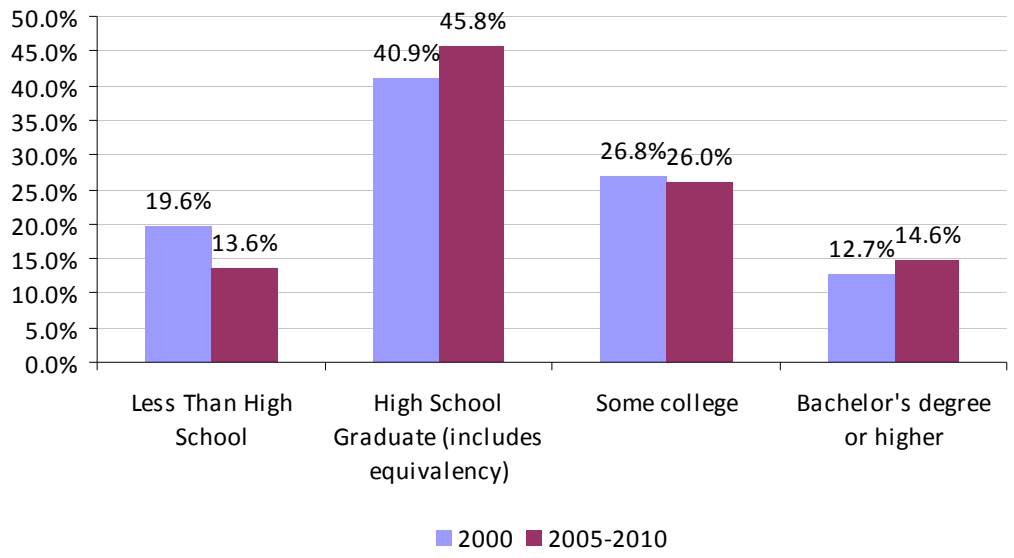
As Table 3.25 shows, the Town of Sanford experienced a drop in MHI greater than that which Broome County and State experienced during the same period. Sanford's MHI for 2005-2009 was 12 percent lower than Broome County's MHI and more than 30 percent below the State's.

Table 3.25: Town of Sanford Median Household Income (2009 dollars), 2000 and 2005-2009

Geography	2000	2005-2009	% Change
Sanford	$42,893	$38,365	-10.6%
Broome County	$45,517	$43,467	-4.5%
New York	$55,879	$55,233	-1.2%

Figure 3.16 shows that the Town of Sanford made gains in the area of secondary and post-secondary educational attainment between 2000 and 2005-2009. The Town saw an increase in the share of residents aged 25-and-older with a high school diploma and in the percentage that had at least a bachelor's degree. Also, there were fewer people who had not completed high school.

Figure 3. 16: Town of Sanford Educational Attainment (population 25 years and over), 2000 and 2005-2009



3.3.1.6Town of Walton

In 2010, the Town of Walton had a population of 5,576, making it the second largest town in Delaware County. As shown in Table 3.26, the Town of Walton's population declined by 0.6 percent between 2000 and 2010. The Town's low population density (57.6 persons per square mile) reflects its primarily rural character.

Table 3.26: Town of Walton Population, 2000 and 2010

Geography	2000	2010	% Change
Walton	5,607	5,576	-0.6%
Delaware County	48,040	47,980	-0.1%
New York	18,976,457	19,378,102	2.1%

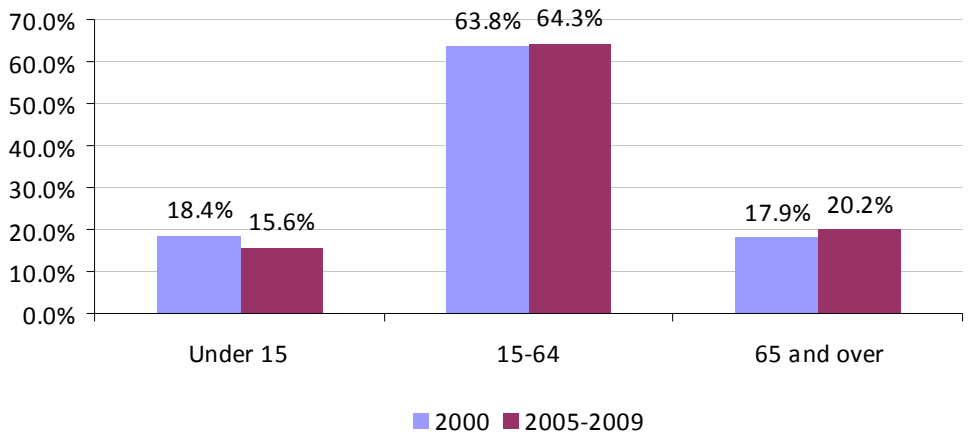
Between 2000 and 2010, as shown in Table 3.27, the Town's housing stock grew by 5 percent, to 3,106 units. In 2010, 14.5 percent of all units in the Town were for seasonal or recreational use – lower than the percentage of such units in many other towns in the region.

Table 3.27: Town of Walton Housing Units, 2000 and 2010

Geography	2000	2010	% Change
Walton	2,958	3,106	5.0%
Delaware County	28,943	31,222	7.9%
New York	7,679,307	8,108,103	5.6%

The median age of Walton residents during 2005-2009 was 44.7 – slightly higher than the median age in 2000 which was 41.6. Between 2000 and 2009, the share of the Town of Walton's population under the age of 15 declined, while, during the same period, the share of the Town's population aged 65 and over increased, as shown in Figure 3.17.

Figure 3.17: Town of Walton Age Distribution, 2000 and 2005-2009



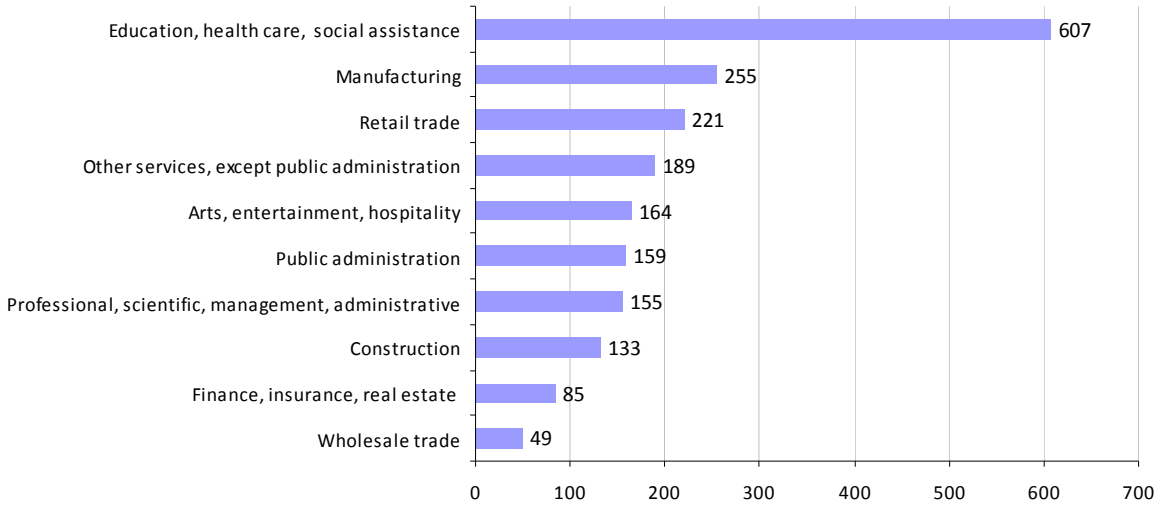
According to ACS data, as shown in Table 3.28, the number of employed Walton residents during the years 2005 through 2009 averaged 2,106 – a decline of 18.9 percent from the level reported in the 2000 census. This unusually steep decline may in part reflect the effects of severe flooding that occurred in Walton in 2006.

Table 3.28: Town of Walton Resident Employment, 2000 and 2005-2009

Geography	2000	2005-2009	% Change
Walton	2,596	2,106	-18.9%
Delaware County	20,840	21,111	1.3%
New York	8,382,988	9,102,596	8.6%

As shown in Figure 3.18, the education, health and social assistance sector accounted for about 29 percent of all jobs held by Walton residents in 2005-2009; manufacturing accounted for 12 percent; and retail trade accounted for nearly 11 percent.

Figure 3.18: Town of Walton Resident Employment - Top Employment Sectors, 2005-2009



As shown in Table 3.29, the unemployment rate among Walton residents averaged 10.2 percent between 2005 and 2009 – a sharp increase from the 5.4 percent rate reported in 2000, it is clear from data on resident employment and unemployment that that the employment prospects of Walton residents had deteriorated significantly even before the full effect recession had been felt.

Table 3.29: Town of Walton Unemployment Rate, 2000 and 2005-2009

Geography	2000	2005-2009
Walton	5.4%	10.2%
Delaware County	6.2%	7.1%
New York	7.1%	7.0%

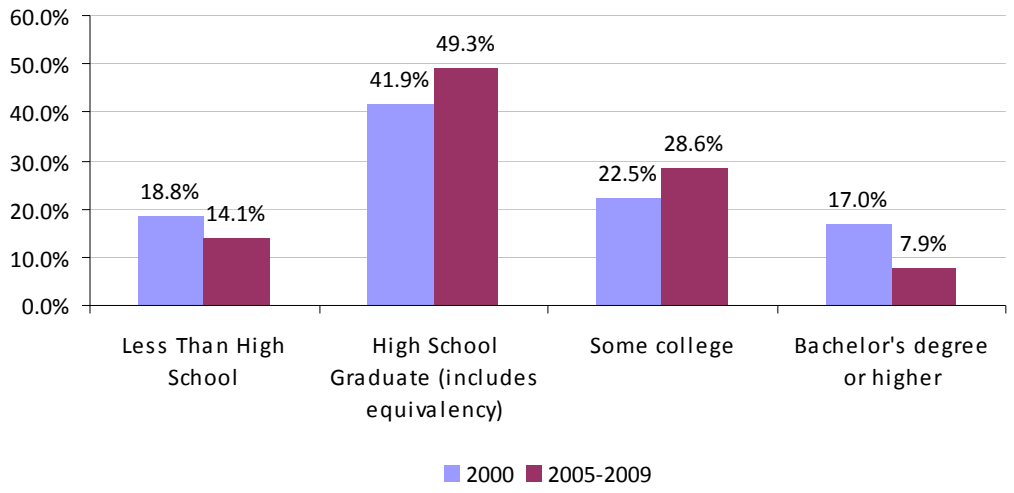
Consistent with the deterioration of the job market for Walton residents, the Town's MHI – already well below the County-wide and State-wide MHI as of 2000 – fell even further. Walton's MHI for 2005-2009 was 84 percent of the MHI for Delaware County and only 63 percent of the State MHI (Table 3.30).

Table 3.30: Town of Walton Median Household Income (2009 dollars), 2000 and 2005-2009

Geography	2000	2005-2009	% Change
Walton	$39,340	$35,000	-11.0%
Delaware County	$41,801	$41,656	-0.3%
New York	$55,879	$55,233	-1.2%

With respect to educational attainment, ACS data for 2005-2009 (Figure 3.19) indicates that Walton is characterized by an unusual mix of strengths and weaknesses. Only 14.1 percent of all residents age 25-and-older lack a high school diploma; and about 78 percent have either a high school diploma or some education beyond high school. But only 7.9 percent of all 25-and-older Walton residents have at least a bachelor's degree.

Figure 3. 19: Town of Walton Educational Attainment (population 25 years and over), 2000 and 2005-2009



3.3.2 Pepacton Development

This section focuses on socioeconomic trends of four towns in the vicinity of the Pepacton Development: (1) Andes, (2) Colchester, and (3) Hamden in Delaware County; and (4) Rockland in Sullivan County.

3.3.2.1Town of Andes

As Table 3.31 shows, the population of the Town of Andes in 2010 was 1,301 – a decline of 4.1 percent from 2000. Population density was 12.0 persons per square mile, which reflects the Town's extremely rural character.

Table 3.31: Town of Andes Population, 2000 and 2010

Geography	2000	2010	% Change
Andes	1,357	1,301	-4.1%
Delaware County	48,040	47,980	-0.1%
New York	18,976,457	19,378,102	2.1%

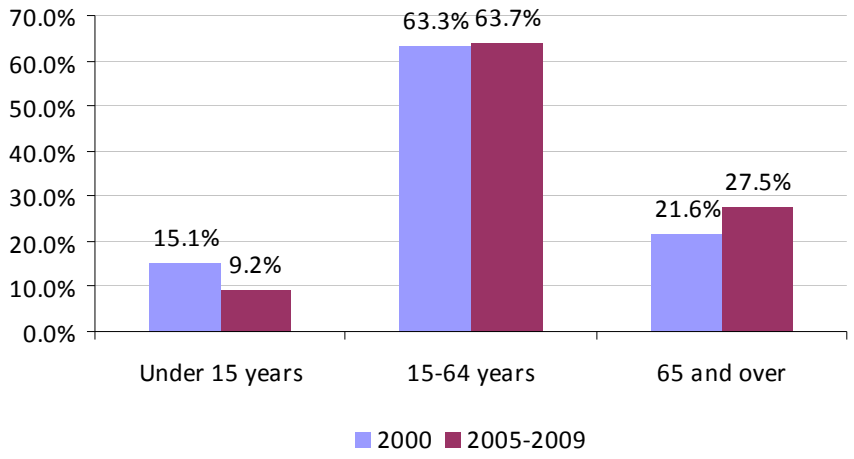
Despite the decline in the Town's resident population noted above, the number of housing units in Andes (as shown in Table 3.32) increased by about 10 percent between 2000 and 2010. This may be due in part to the large number of seasonal and recreational units in Andes. In 2010, such units accounted for 52.4 percent of the Town's housing stock; and between 2000 and 2010 they accounted for 88 percent of the total increase in housing units during that period.

Table 3.32: Town of Andes Housing Units, 2000 and 2010

Geography	2000	2010	% Change
Andes	1,327	1,459	9.9%
Delaware County	28,943	31,222	7.9%
New York	7,679,307	8,108,103	5.6%

For 2005-2009, the median age of Andes residents was 52.3 – significantly older than the median age of 47.8 reported in the 2000 census, and among the oldest in the State. The share of the population below age 15 fell to just 9.2 percent, while those 65-and-older rose to 27.5 percent (Figure 3.20).

Figure 3.20: Town of Andes Age Distribution, 2000 and 2005-2009



ACS data indicates that between 2000 and 2005-2009, the number of employed Andes residents declined by more than 10 percent (Table 3.33). This trend may, in part, reflect the overall decline in the Town's population, as well as the relatively large share of the Town's population that is over 65.

Table 3.33: Town of Andes Resident Employment, 2000 and 2005-2009

Geography	2000	2005-2009	% Change
Andes	565	507	-10.3%
Delaware County	20,840	21,111	1.3%
New York	8,382,988	9,102,596	8.6%

As Figure 3.21 shows, nearly 26 percent of the Town's employed residents work in education, health and social assistance. The arts, entertainment and hospitality account for 15 percent – a figure that in part reflects the Town's large second-home sector, construction accounted for 12 percent and manufacturing accounted for 11 percent.

Figure 3.21: Town of Andes Resident Employment - Top Employment Sectors, 2005-2009

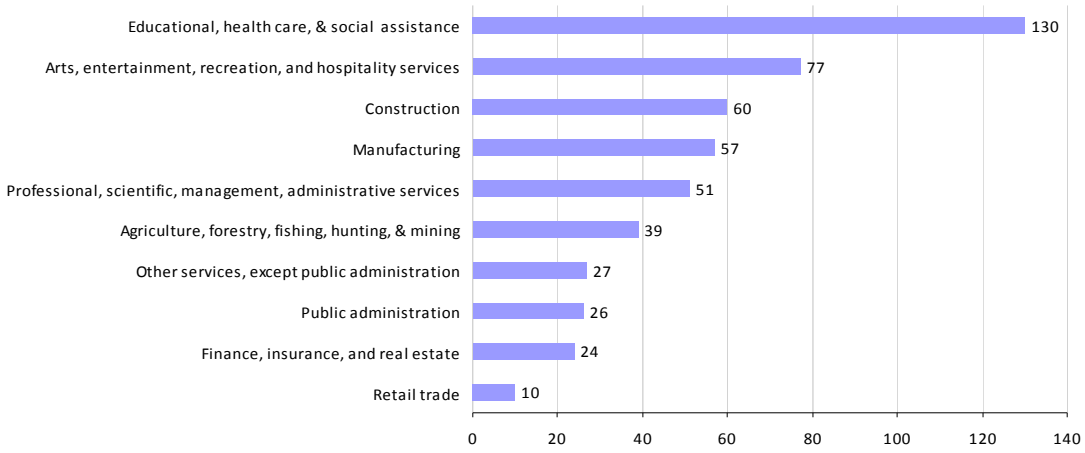


Table 3.34 shows that the unemployment rate for the Town of Andes – which had been very low in 2000 – rose sharply in the latter part of the decade; but for 2005-2009, was still only slightly higher than the unemployment rates for Delaware County and New York State.

Table 3.34: Town of Andes Unemployment Rate, 2000 and 2005-2009

Geography	2000	2005-2009
Andes	3.1%	7.3%
Delaware County	6.2%	7.1%
New York	7.1%	7.0%

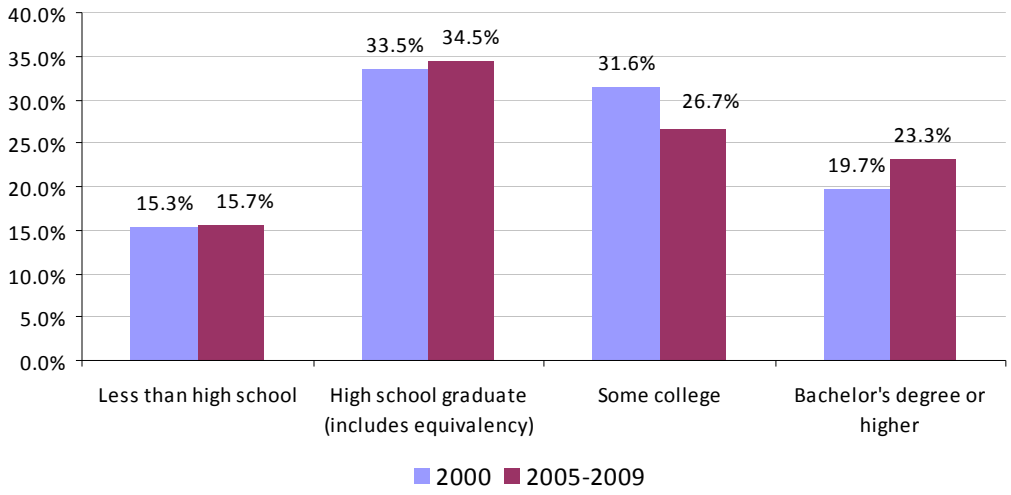
As shown in Table 3.35, the MHI for the Town of Andes was 8 percent higher than the MHI for Delaware County for 2005-2009, but still only 81 percent of the State-wide MHI. The Town's MHI declined by about 0.5 percent in real terms between 2000 and 2005-2009.

Table 3.35: Town of Andes Median Household Income (2009 dollars), 2000 and 2005-2009

Geography	2000	2005-2009	% Change
Andes	$45,224	$45,000	-0.5%
Delaware County	$41,801	$41,656	-0.3%
New York	$55,879	$55,233	-1.2%

As demonstrated by Figure 3.22, the educational attainment rate for the Town of Andes' population increased for the post-secondary education categories of bachelor's and advanced degrees between 2000 and 2009. Additionally there were a higher percentage of people who were high school graduates.

Figure 3.22: Town of Andes Educational Attainment (population aged 25 and over), 2000 and 2005-2009



3.3.2.2 Town of Colchester

As Table 3.36 shows, the population of the Town of Colchester in 2010 was 2,077, an increase of 1.7 percent since 2000. Population density was 15.19 persons per square mile, making Colchester one of the lower density towns in Delaware County.

Table 3.36: Town of Colchester, 2000 and 2010

Geography	2000	2010	% Change
Colchester	2,042	2,077	1.7%
Delaware County	48,040	47,980	-0.1%
New York	18,976,457	19,378,102	2.1%

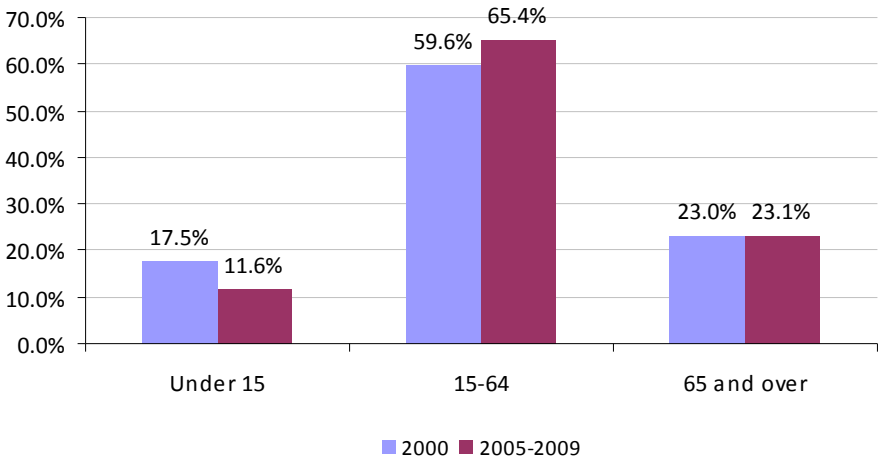
As shown in Table 3.37, the number of housing units in the Town of Colchester increased by 14.8 percent between 2000 and 2010. Seasonal and recreational units accounted for 45 percent of the Town's housing stock in 2010 – and for 79 percent of the total increase in housing units between 2000 and 2010.

Table 3.37: Town of Colchester Housing Units, 2000 and 2010

Geography	2000	2010	% Change
Andes	1,327	1,459	9.9%
Delaware County	28,943	31,222	7.9%
New York	7,679,307	8,108,103	5.6%

As shown in Figure 3.23, between 2000 and 2005-2009 the share of Colchester's population below age 15 declined by nearly 6 percentage points, while those age 15 to 64 increased by a similar amount. Colchester's median age in 2005-2009 was 48.7, which was a about a four year increase from the median age in 2000.

Figure 3.23: Town of Colchester Age Distribution, 2000 and 2005-2009



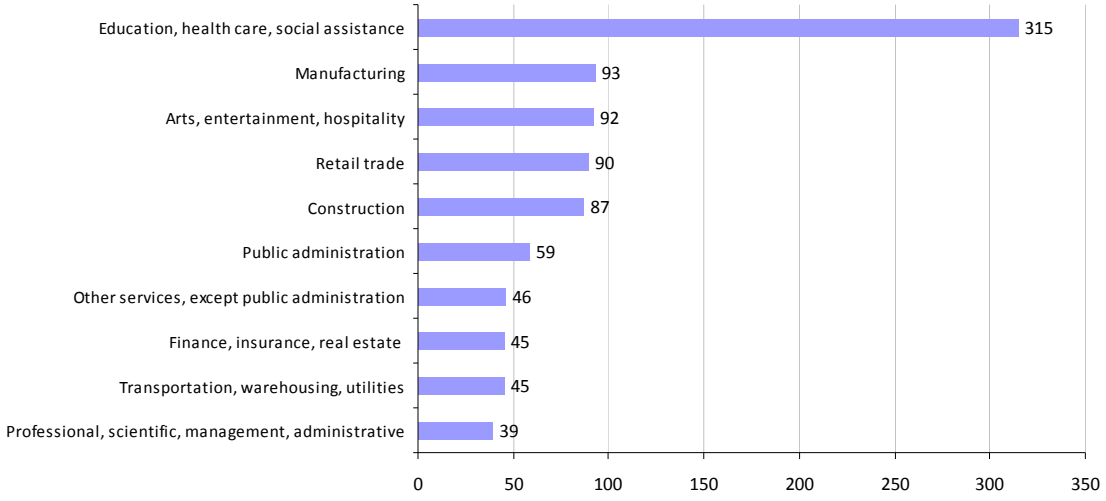
Between 2000 and 2005-2009 (according to ACS data), the number of employed residents of Colchester rose by nearly 22 percent, to 955 (Table 3.38)

Table 3.38: Town of Colchester Resident Employment, 2000 and 2005-2009

Geography	2000	2005-2009	Growth
Colchester	784	955	21.8%
Delaware County	20,840	21,111	1.3%
New York	8,382,988	9,102,596	8.6%

As Figure 3.24 shows, in 2005-2009 approximately 33 percent of the Town of Colchester's employed residents worked in education, health and social assistance; nearly 10 percent each in manufacturing and arts, entertainment and hospitality; and 9 percent in retail trade.

Figure 3.24: Town of Colchester Resident Employment - Top Employment Sectors, 2005-2009



Consistent with the increase in resident employment, the Town's unemployment rate fell from 7.4 percent in 2000 to 6.6 percent in 2005-2009, as shown in Table 3.39.

Table 3.39: Town of Colchester Unemployment Rate, 2000 and 2005-2009

Geography	2000	2005-2009
Colchester	7.4%	6.6%
Delaware County	6.2%	7.1%
New York	7.1%	7.0%

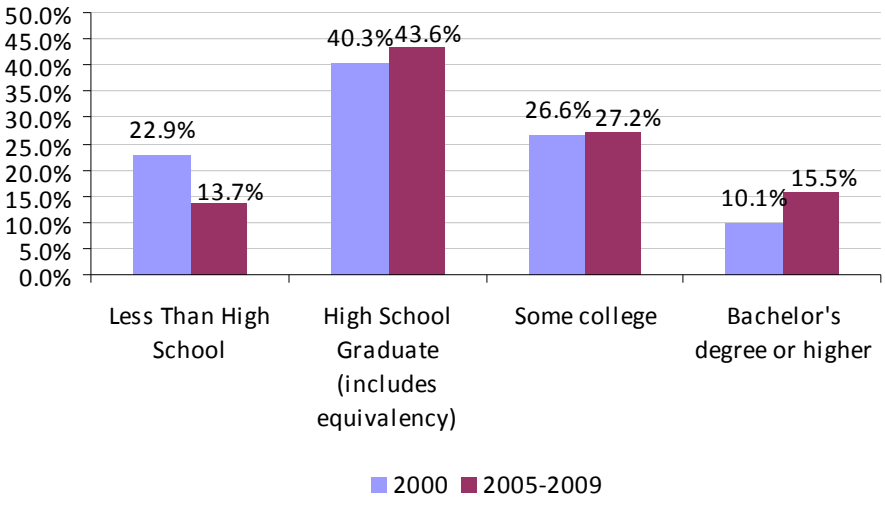
As shown in Table 3.40, the MHI for the Town of Colchester in 2005-2009 increased slightly from 2000, and virtually identical to the median income for Delaware County. The Town's MHI for 2005-2009 was about 25 percent below the MHI for New York State.

Table 3.40: Town of Colchester Median Household Income, 2000 and 2009 (2009 dollars), 2000 and 2005-2009

Geography	2000	2005-2009	% Change
Colchester	$41,397	$41,696	0.7%
Delaware County	$41,801	$41,656	-0.3%
New York	$55,879	$55,233	-1.2%

As demonstrated by Figure 3.25, the Town of Colchester made gains in the level of secondary and post-secondary educational attainment, with the number of high school graduates, bachelor's and advanced degree earners increasing between 2000 and 2009. At the same time, the number of people with less than a high school education declined moderately.

Figure 3.25: Town of Colchester Educational Attainment (population aged 25 and over), 2000 and 2005-2009



3.3.2.3 Town of Hamden

As depicted in Table 3.41, the population of the Town of Hamden increased by 3.4 percent between 2000 and 2010, which was slightly higher than the rate that the State experienced during

the same period. The Town's population density was 22.1 persons per square mile, which was in line with many of the other towns in Delaware County.

Table 3.41: Town of Hamden Population, 2000 and 2010

Geography	2000	2010	% Change
Hamden	1,280	1,323	3.4%
Delaware County	48,040	47,980	-0.1%
New York	18,976,457	19,378,102	2.1%

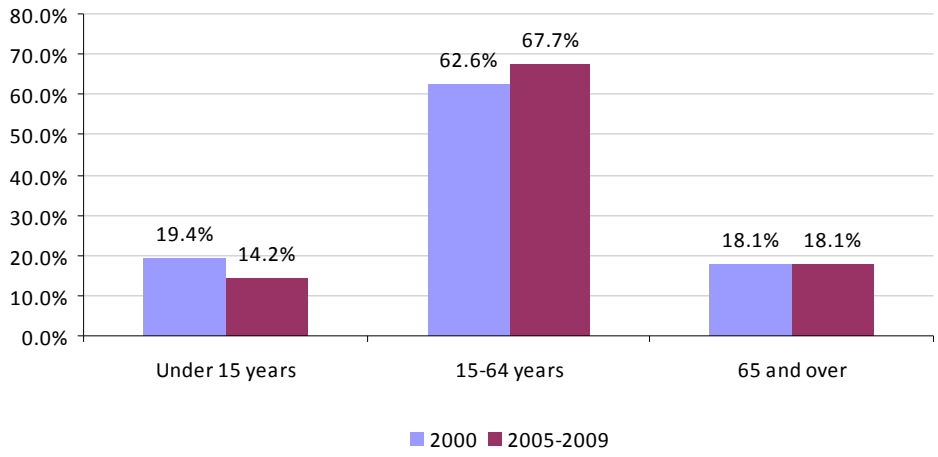
Between 2000 and 2010, the total number of housing units grew more slowly in the Town of Hamden than in Delaware County or in the State, as shown in Table 3.42.

Table 3.42: Town of Hamden Housing Units, 2000 and 2010

Geography	2000	2010	% Change
Hamden	902	946	4.9%
Delaware County	28,943	31,222	7.9%
New York	7,679,307	8,108,103	5.6%

As depicted in Figure 3.26, the under-15 population of Hamden declined between 2000 and 2005-2009 as a share of total population, while the population age 15 through 64 increased in relative terms. The Town's median age has also increased slightly from 43 in 2000 to 45.4 in 2010.

Figure 3.26: Town of Hamden Age Distribution, 2000 and 2005-2009



As shown in Table 3.43, there was a slight increase in resident employment in the Town of Hamden, which almost matched the rate of change in Delaware County between 2000 and 2005-2009, unlike for the State which experienced an 8.6 percent increase in employment.

Table 3.43: Town of Hamden Resident Employment, 2000 and 2005-2009

Geography	2000	2005-2009	% Change
Hamden	604	614	1.7%
Delaware County	20,840	21,111	1.3%
New York	8,382,988	9,102,596	8.6%

As Figure 3.27 demonstrates, in 2005-2009 approximately 24 percent of all employed residents of Hamden work in education, health care and social assistance; 14 percent in retail trade; 11 percent in manufacturing; and nearly 10 percent in construction.

Figure 3.27: Town of Hamden Resident Employment - Top Employment Sectors, 2005-2009

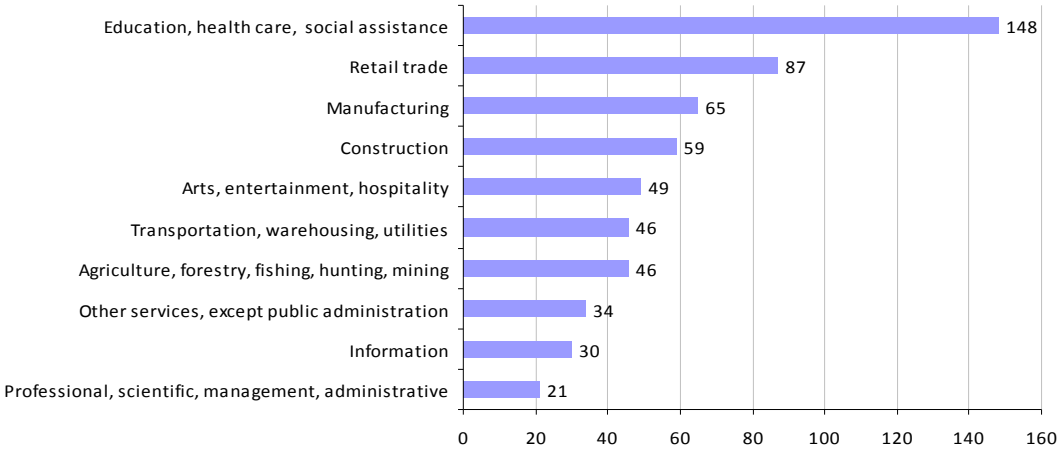


Table 3.44 shows that the unemployment rate for the Town of Hamden increased to 5.3 percent in 2005-2009 – significantly lower than the rates for the County and the State.

Table 3.44: Town of Hamden Unemployment Rate, 2000 and 2005-2009

Geography	2000	2005-2009
Hamden	3.1%	5.3%
Delaware County	6.2%	7.1%
New York	7.1%	7.0%

Table 3.45 shows that the MHI in the Town of Hamden fell by about 22 percent in real terms between 2000 and 2005-2009. The Town's MHI in 2005-2009 was 14 percent below the MHI for the County and 36 percent below the MHI for the State.

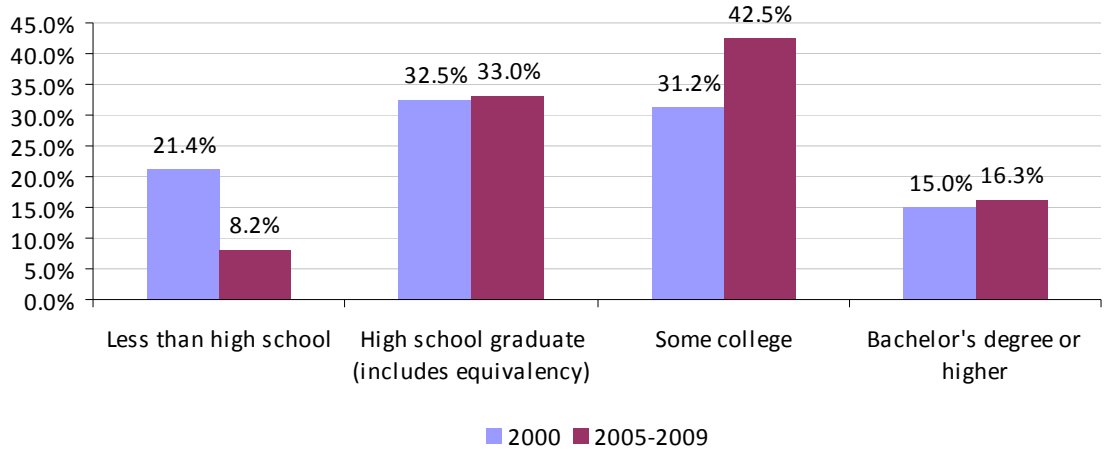
Table 3.45: Town of Hamden Median Household Income (2009 dollars), 2000 and 2005-2009

Geography	2000	2005-2009	% Change
Hamden	$45,474	$35,625	-21.7%
Delaware County	$41,801	$41,656	-0.3%
New York	$55,879	$55,233	-1.2%

As Figure 3.28 shows, between 2000 and 2005-2009, the Town of Hamden made gains in the area of educational attainment. The percentage of all residents age 25-and-older who had not

completed high school dropped sharply, while the percentage of residents in this age group who had at least some college-level education rose correspondingly. The percentage of 25-and-older residents who have bachelor's or higher degrees nevertheless remained below the average for the State.

Figure 3.28: Town of Hamden Educational Attainment (population 25 years and over), 2000 and 2005-2009



3.3.2.4 Town of Rockland

Table 3.46 shows that the population of the Town of Rockland decreased by a little fewer than 4 percent between 2000 and 2009, which was in contrast to the population growth that Sullivan County and the State experienced during the same period. Population density was 40.1 persons per square mile, which reflects its primarily rural character.

Table 3.46: Town of Rockland Population, 2000 and 2010

Geography	2000	2010	% Change
Rockland	3,915	3,775	-3.6%
Sullivan County	73,965	77,547	4.8%
New York	18,976,457	19,378,102	2.1%

As depicted in Table 3.47, the number of housing units in the Town of Rockland grew by 11.2 percent between 2000 and 2010, exceeding the rate of growth in Sullivan County and the State during the same period. There was significant growth in the number of seasonal and recreational units, which accounted for 34 percent of housing in the Town of Rockland in 2010, representing a 30 percent increase since 2000.

Table 3.47: Town of Rockland Housing Units, 2000 and 2010

Geography	2000	2010	% Change
Rockland	2,477	2,755	11.2%
Sullivan County	44,730	49,186	10.0%
New York	7,679,307	8,108,103	5.6%

As demonstrated in Figure 3.29, the population of the Town of Rockland below age 15 declined between 2000 and 2005-2009, while the working-age and older population increased their share of the total. As a result of these changes, the Town's median age increased from 40.4 in 2000 to 45.6 in 2005-2009.

Figure 3.29: Town of Rockland Age Distribution, 2000 and 2005-2009

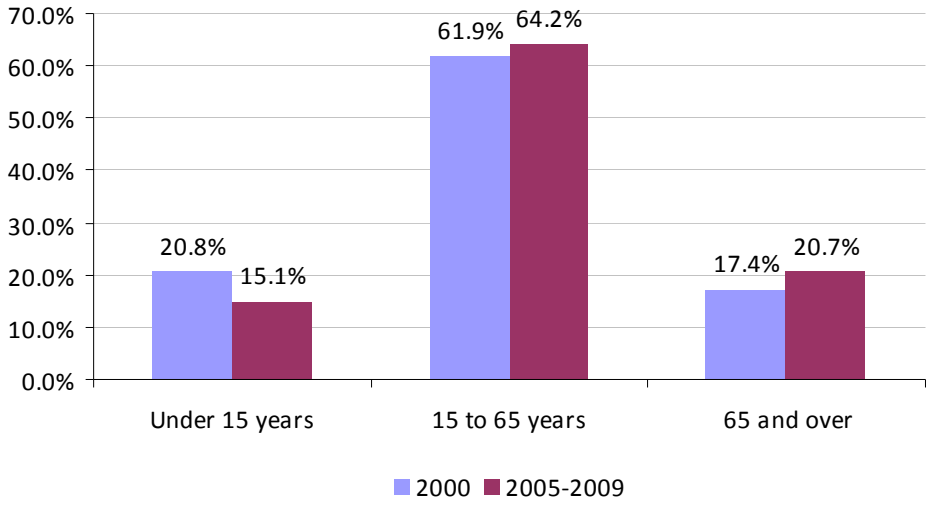


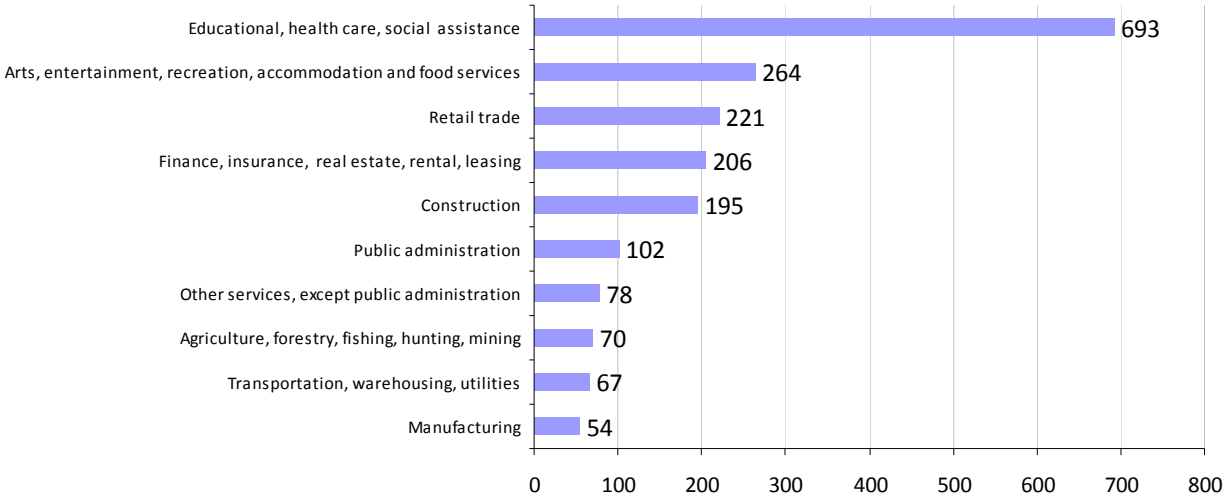
Table 3.48 shows that resident employment for the Town of Rockland increased between 2000 and 2005-2009 by almost 28 percent, which was almost double the rate of employment growth in Sullivan County and triple the growth rate experienced in the State during the same period.

Table 3.48: Town of Rockland Resident Employment, 2000 and 2005-2009

Geography	2000	2005-2009	% Change
Rockland	1,602	2,048	27.8%
Sullivan County	30,244	34,440	13.9%
New York	8,382,988	9,102,596	8.6%

Figure 3.30 shows that more than one-third of all employed Rockland residents work in education, health care and social assistance. Nearly 13 percent work in the arts, recreation and hospitality; and nearly 11 percent in retail trade. In contrast to the pattern found in much of Delaware County, the manufacturing sector accounts for less than 3 percent of resident employment in Rockland, which is located in Sullivan County.

Figure 3.30: Town of Rockland Resident Employment - Top Employment Sectors, 2005-2009



As depicted in Table 3.49, the unemployment rate for the Town of Rockland increased between 2000 and 2005-2009, growing to a rate that exceeded the rates for Sullivan County and for the State.

Table 3.49: Town of Rockland Unemployment Rate, 2000 and 2005-2009

Geography	2000	2005-2009
Rockland	5.4%	7.7%
Sullivan County	9.2%	6.5%
New York	7.1%	7.0%

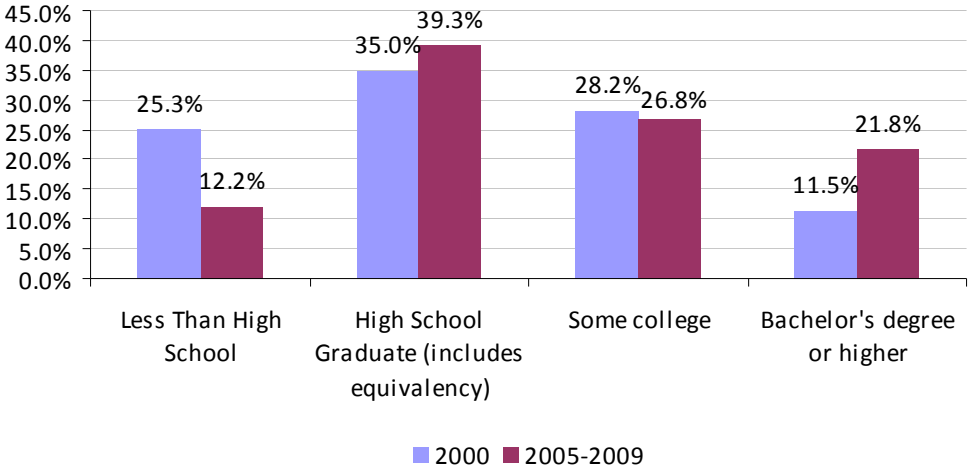
As shown in Table 3.50, the MHI for the Town of Rockland grew strongly in real terms between 2000 and 2005-2009, with growth exceeding that for both Sullivan County and the State. The Town's 2005-2009 MHI was about 91 percent of the State's.

Table 3.50: Town of Rockland Median Household Income (2009 dollars), 2000 and 2005-2009

Geography	2000	2005-2009	% Change
Rockland	$42,339	$50,184	16.4%
Sullivan County	$47,644	$48,586	2.0%
New York	$55,879	$55,233	-1.2%

As shown in Figure 3.31 the Town of Rockland experienced significant gains in the areas of secondary and post-secondary educational attainment between 2000 and 2009, as reflected by a sharp drop in the percentage of all residents age 25-and-older who have not completed high school, and a sharp increase in the percentage of all residents in this age group who have a bachelor's degree.

Figure 3.31: Town of Rockland Educational Attainment (population 25 years and over), 2000 and 2005-2009



3.3.3 Neversink Development

This section describes socioeconomic conditions and trends in five towns assessed in connection with the Neversink Development: (1) Neversink, (2) Fallsburg, and (3) Liberty in Sullivan County; and (4) Denning, and (5) Wawarsing in Ulster County.

3.3.3.1 Town of Denning

Table 3.51 shows that the population of the Town of Denning increased by 6.6 percent between 2000 and 2010 – although with just 551 residents in 2010 the Town is still very small. Population density in the Town of Denning was quite low, at a rate of 5.2 persons per square mile in 2010 – due in part to the fact that much of the Town's land area consists of State, City or privately-owned protected land.

Table 3.51: Town of Denning Population, 2000 and 2010

Geography	2000	2010	% Change
Denning	517	551	6.6%
Ulster County	177,749	182,493	2.7%
New York	18,976,457	19,378,102	2.1%

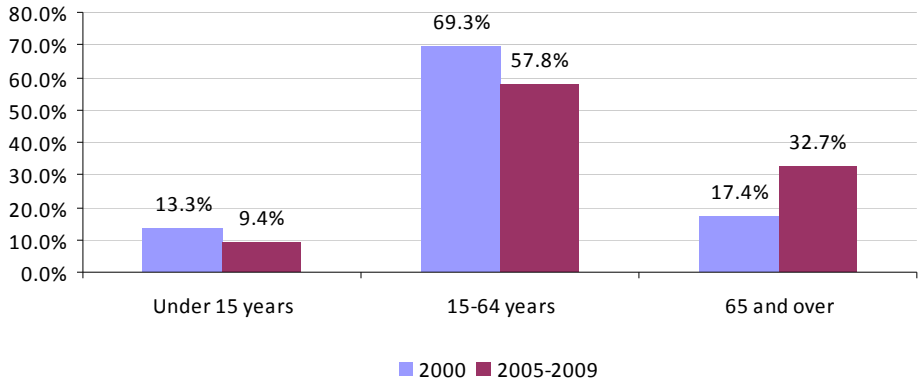
As depicted in Table 3.52, the number of total housing units in the Town of Denning rose by 2.5 percent between 2000 and 2010.

Table 3.52: Town of Denning Housing Units, 2000 and 2010

Geography	2000	2010	% Change
Denning	518	531	2.5%
Ulster County	77,656	83,638	7.7%
New York	7,679,307	8,108,103	5.6%

For 2005-2009, the median age in Denning was 57.1, a sharp increase from 42.7 in 2000, which was considerably higher than Ulster County's median age of 40.6. Figure 3.32 shows a sharp shift in the Town's age mix during this period, with the under-15 population falling to a relatively low 9.4 percent of the total, while those age 65-and-older rose to a very large 32.7 percent of the total.

Figure 3.32: Town of Denning Age Distribution, 2000 and 2010



Resident employment in the Town of Denning decreased by almost 15 percent between 2000 and 2005-2009, as shown in Table 3.53, while resident employment in both Ulster County and the State rose by more than 8 percent. The decline in the number of employed residents no doubt reflects at least, in part, the growth of the Town's 65-and-older population.

Table 3.53: Town of Denning Resident Employment, 2000 and 2005-2009

Geography	2000	2005-2009	% Change
Denning	247	211	-14.6%
Ulster County	83,748	90,507	8.1%
New York	8,382,988	9,102,596	8.6%

As Figure 3.33 shows, approximately 25 percent of all employed residents of the Town of Denning worked in the public sector in 2005-2009.

Figure 3.33: Town of Denning Resident Employment - Top Employment Sectors, 2005-2009

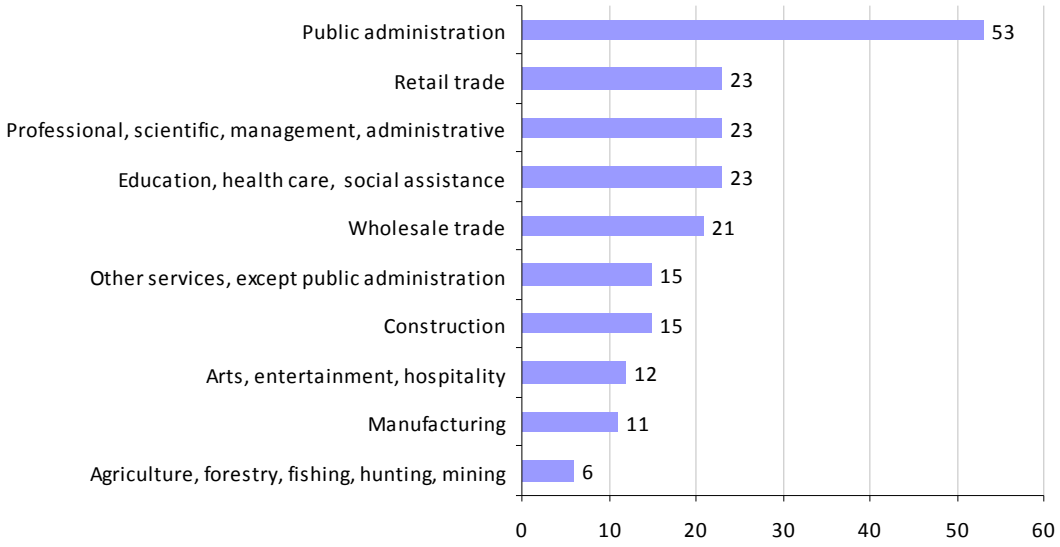


Table 3.54 shows that the unemployment rate for the Town of Denning more than doubled, to 6.6 percent, between 2000 and 2005-2009. The Town's unemployment rate in 2005-2009 was about a percentage point higher than the rate for Ulster County and slightly less than in the Statewide rate.

Table 3.54: Town of Denning Unemployment Rate, 2000 and 2010

Geography	2000	2005-2009
Denning	2.8%	6.6%
Ulster County	6.3%	5.6%
New York	7.1%	7.0%

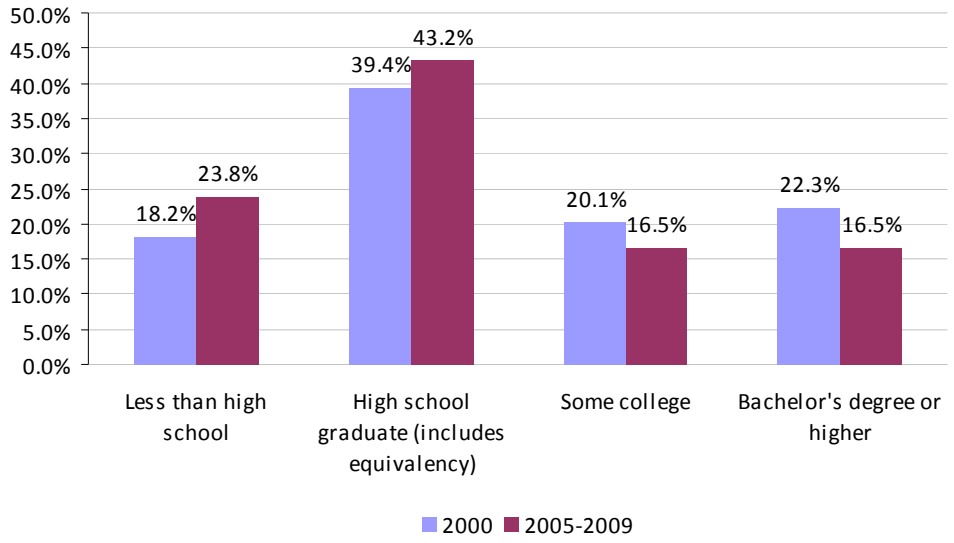
The MHI for the Town of Denning dropped by 9.2 percent between 2000 and 2005-2009, as shown in Table 3.55. This contraction was particularly notable in light of the increase recorded by Ulster County as a whole during the same period. It may reflect the decline in the number of employed residents, and the growth of the Town's older population.

Table 3.55: Town of Denning Median Household Income (2009 dollars), 2000 and 2005-2009

Geography	2000	2005-2009	% Change
Denning	$52,659	$47,833	-9.2%
Ulster County	$54,795	$57,485	4.9%
New York	$55,879	$55,233	-1.2%

In contrast to most other towns in the region, ACS data indicates (Figure 3.34) that educational attainment in the Town of Denning declined between 2000 and 2005-2009, as the percentage of those age 25-and-older who have not completed high school increased, and the percentage with at least some college-level education declined.

Figure 3.34: Town of Denning Educational Attainment (population 25 and over), 2000 and 2005-2009



3.3.3.2 Town of Fallsburg

In 2010, as shown in Table 3.56, the population of Fallsburg was 12,780 – an increase of 5.3 percent from its population in 2000. At a rate of 165.8 persons per square mile, the Town of Fallsburg had a relatively high population density compared to the other towns profiled in this report.

Table 3.56: Town of Fallsburg Population, 2000 and 2010

Geography	2000	2010	% Change
Fallsburg	12,223	12,870	5.3%
Sullivan County	73,965	77,547	4.8%
New York	18,976,457	19,378,102	2.1%

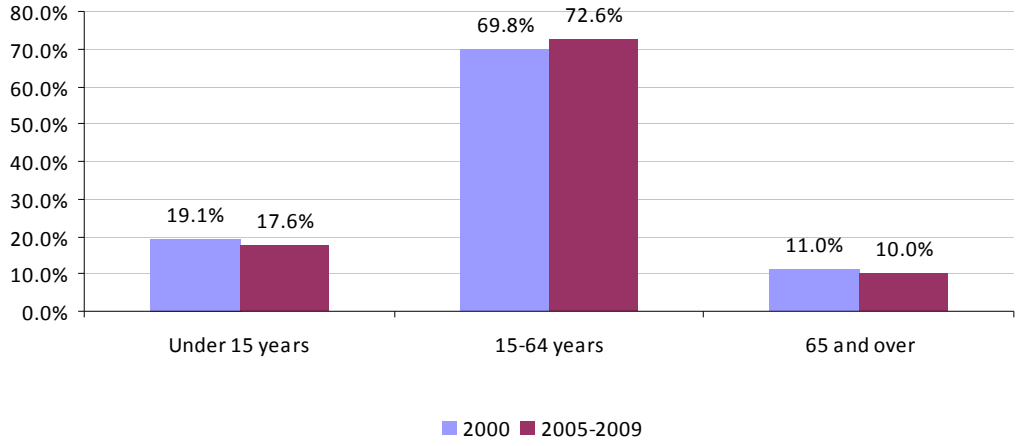
Since 2000, the Town of Fallsburg has experienced very strong growth in its housing stock, with the total number of units increasing by more than 28 percent between 2000 and 2010 (Table 3.57). This growth was driven primarily by growth in seasonal and recreational units. The number of such units in Fallsburg increased by nearly 58 percent over the course of the decade; and they accounted for more than two-thirds of the Town's total increase in housing units. As of 2010, seasonal and recreational units accounted for nearly 41 percent of the Town's housing stock.

Table 3.57: Town of Fallsburg Housing Units, 2000 and 2010

Geography	2000	2010	% Change
Fallsburg	6,621	8,497	28.3%
Sullivan County	44,730	49,186	10.0%
New York	7,679,307	8,108,103	5.6%

As Figure 3.35 shows, the Town of Fallsburg has experienced modest change in terms of its age mix. Between 2000 and 2005-2009, the share of the population in the Town of Fallsburg under the age of 15 declined slightly, while the 15-64 age group increased to an unusually high 72.6 percent of the total population. The median age increased to about 40 years old, which represented an increase of approximately 6.2 percent from its 2000 level.

Figure 3.35: Town of Fallsburg Age Distribution, 2000 and 2005-2009



As shown in Table 3.58, the number of employed Fallsburg residents grew significantly between 2000 and 2005-2009, experiencing an increase of approximately 22 percent. This employment growth rate was greater than that experienced in Sullivan County and significantly more than the State's growth rate during this period.

Table 3.58: Town of Fallsburg Resident Employment, 2000 and 2005-2009

Geography	2000	2005-2009	% Change
Fallsburg	4,318	5,256	21.7%
Sullivan County	30,244	34,440	13.9%
New York	8,382,988	9,102,596	8.6%

As Figure 3.36 shows, more than 35 percent of all employed residents of the Town of Fallsburg worked in education, health and social assistance in 2005-2009. The miscellaneous services sector accounted for about 14 percent; arts, entertainment and hospitality accounted for nearly 8 percent; and retail trade accounted for 7 percent.

Figure 3.36: Town of Fallsburg Resident Employment - Top Employment Sectors, 2005-2009

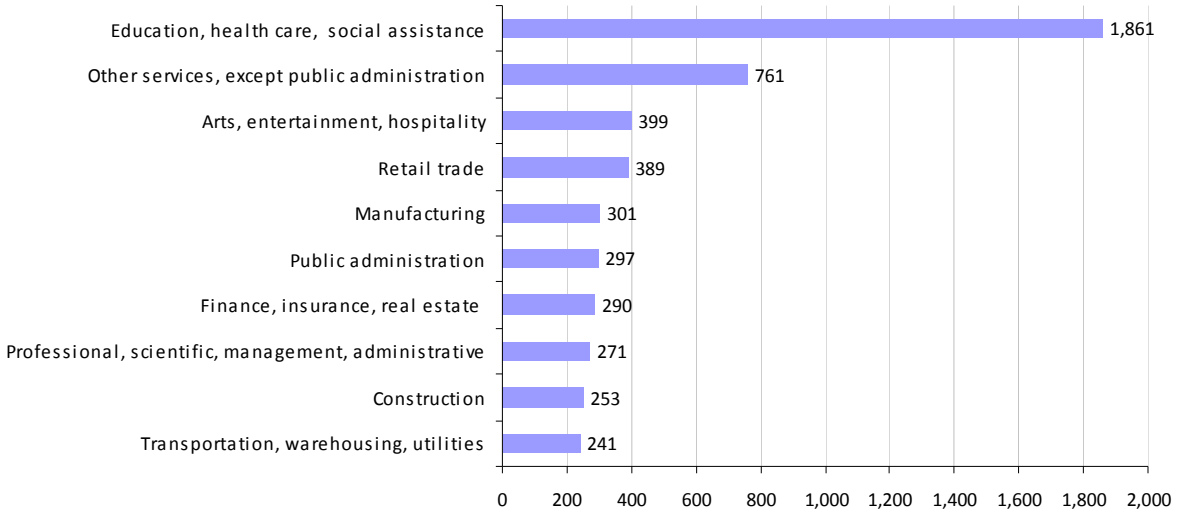


Table 3.59 shows that the unemployment rate for the Town of Fallsburg declined by 1.5 percentage points between 2000 and 2005-2009, which was slightly less than the rate for Sullivan County as a whole.

Table 3.59: Town of Fallsburg Unemployment Rate, 2000 and 2005-2009

Geography	2000	2005-2009
Fallsburg	8.8%	7.3%
Sullivan County	9.2%	6.5%
New York	7.1%	7.0%

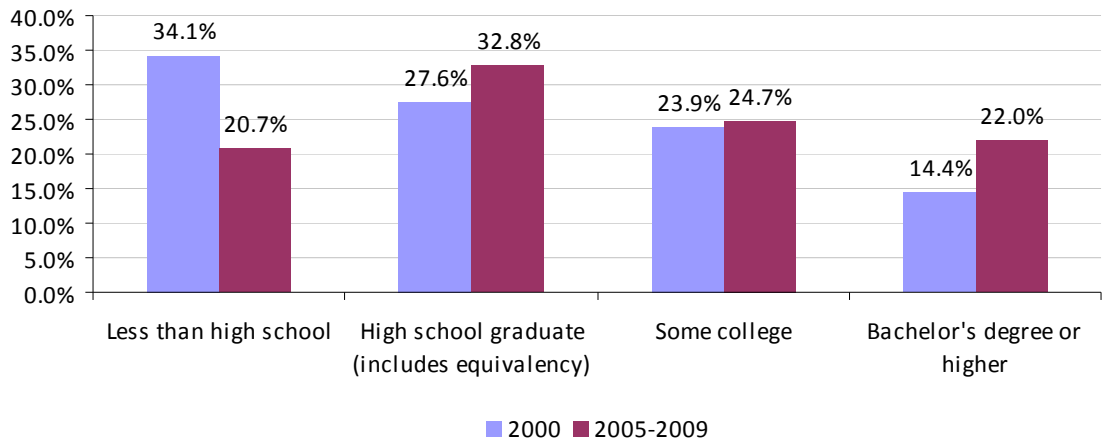
As shown in Table 3.60, the Town's MHI dropped by 3.2 percent between 2000 and 2005-2009. This slight decrease was opposite the trend experienced by Sullivan County during this period, which experienced a slight increase in MHI, but was more than the decline in MHI experienced in the State.

Table 3.60: Town of Fallsburg Median Household Income (2009 dollars), 2000 and 2005-2009

Geography	2000	2005-2009	% Change
Fallsburg	$42,542	$41,178	-3.2%
Sullivan County	$47,644	$48,586	2.0%
New York	$55,879	$55,233	-1.2%

As shown in Figure 3.37, between 2000 and 2005-2009 the Town of Fallsburg progressed significantly in the area of secondary and post-secondary educational attainment, with an increase in the percentage of those who were high school graduates, had college experience, or bachelor's degrees or higher.

Figure 3.37: Town of Fallsburg Educational Attainment (population 25 years and over), 2000 and 2005-2009



3.3.3.3 Town of Liberty

In 2010, the population of the Town of Liberty, as shown in Table 3.61, was 9,885 – an increase of 2.5 percent since 2000. The Town's population grew somewhat more slowly during this period than that of Sullivan County as a whole. In 2010, the Town had a relatively high population density of 124.2 persons per square mile.

Table 3.61: Town of Liberty Population, 2000 and 2010

Geography	2000	2010	% Change
Liberty	9,644	9,885	2.5%
Sullivan County	73,965	77,547	4.8%
New York	18,976,457	19,378,102	2.1%

Between 2000 and 2010, the Town of Liberty experienced a modest increase in its housing stock, with a growth rate of nearly 2 percent during this period (Table 3.62). Slow growth in Liberty may, in part, be related to the Town's relatively small second-home sector; in 2010 fewer than 17 percent of its housing units were used for seasonal or recreational purposes.

Table 3.62: Town of Liberty Housing Units, 2000 and 2010

Geography	2000	2010	% Change
Liberty	5,391	5,495	1.9%
Sullivan County	44,730	49,186	10.0%
New York	7,679,307	8,108,103	5.6%

As demonstrated by Figure 3.38, the Town of Liberty experienced relatively few changes in its age distribution. The population under 64 years old declined slightly and the population 65 and over increased nominally (less than a percent). Meanwhile, the median age rose slightly from 39.3 in 2000 to 41.7 in 2005-2009.

Figure 3.38: Town of Liberty Age Distribution, 2000 and 2005-2009

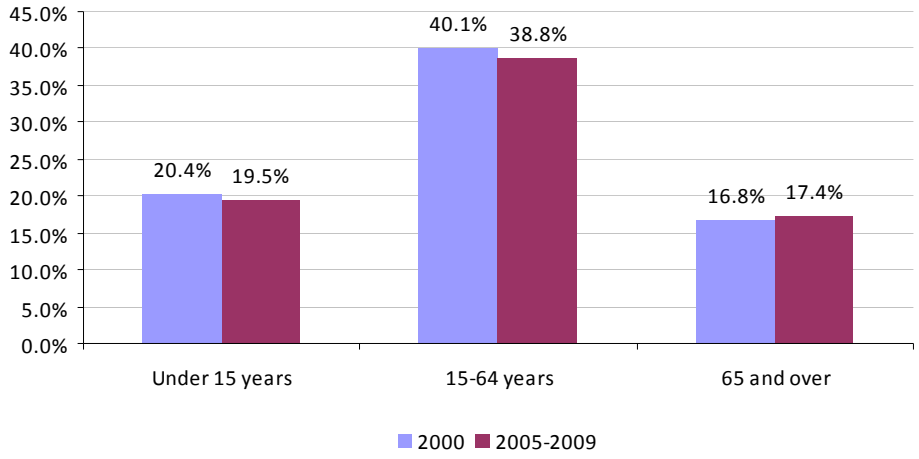


Table 3.63 shows that resident employment for the Town of Liberty increased by 9.6 percent between 2000 and 2005-2009 – not as fast as resident employment in Sullivan County as a whole, but faster than employment growth statewide.

Table 3.63: Town of Liberty Resident Employment, 2000 and 2005-2009

Geography	2000	2005-2009	% Change
Liberty	3,850	4,218	9.6%
Sullivan County	30,244	34,440	13.9%
New York	8,382,988	9,102,596	8.6%

As Figure 3.39 shows, nearly 30 percent of all employed residents of the Town of Liberty worked education, health and social assistance in 2005-2009. Nearly 11 percent were employed in retail trade; and a similar percentage in arts, entertainment and hospitality, reflecting the important role that the latter sector plays in Sullivan County's economy.

Figure 3.39: Town of Liberty Resident Employment - Top Employment Sectors, 2005-2009

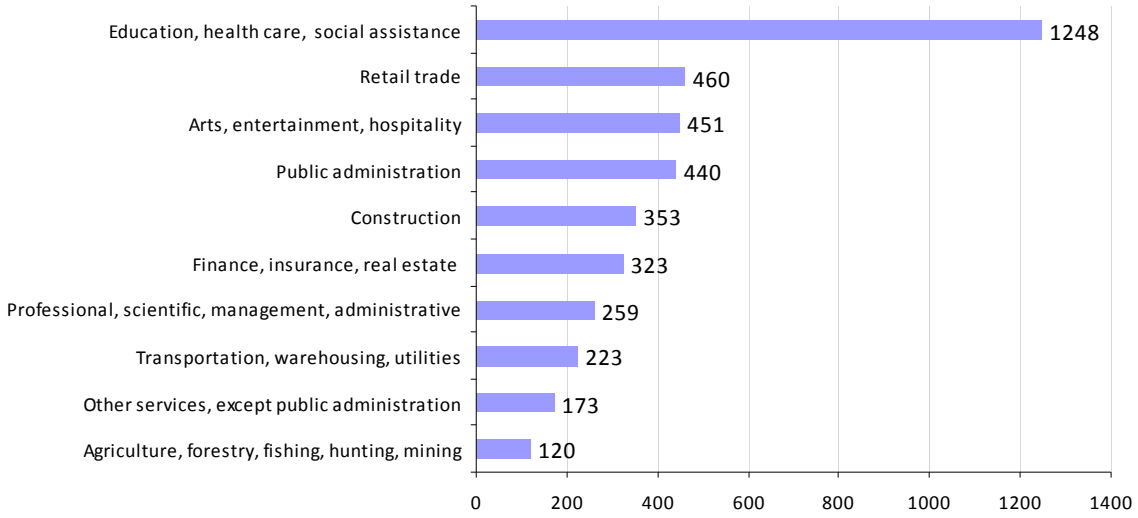


Table 3.64 shows that the unemployment rate for the Town of Liberty declined between 2000 and 2005-2009, consistent with the declining trend experienced in Sullivan County and the State during this period. However, the Town of Liberty's unemployment rate remained higher than in Sullivan County and the State.

Table 3.64: Town of Liberty Unemployment Rate, 2000 and 2005-2009

Geography	2000	2005-2009
Liberty	10.7%	8.6%
Sullivan County	9.2%	6.5%
New York	7.1%	7.0%

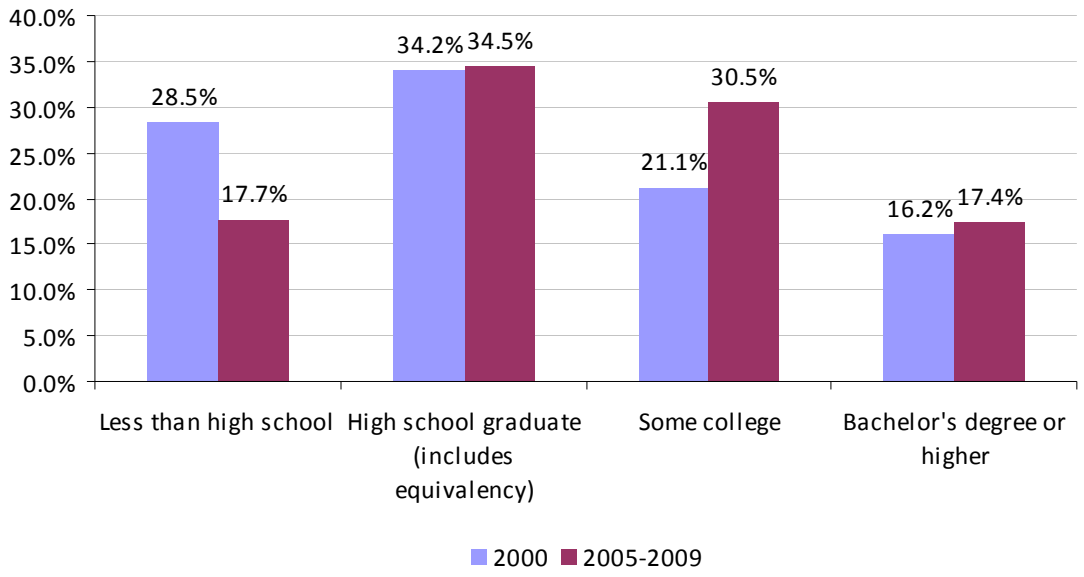
The MHI for the Town of Liberty increased by more than 18 percent in real terms between 2000 and 2005-2009 – far exceeding the increase in Sullivan County during this period, and contrasting sharply with the decline that occurred at the State level. Nevertheless, Liberty's MHI was still 12 percent below the MHI for New York State in 2005-2009 (Table 3.65).

Table 3.65: Town of Liberty Median Household Income (2009 dollars), 2000 and 2005-2009

Geography	2000	2005-2009	% Change
Liberty	$41,236	$48,730	18.2%
Sullivan County	$47,644	$48,586	2.0%
New York	$55,879	$55,233	-1.2%

As shown in Figure 3.40, the Town of Liberty has experienced significant progress in the area of secondary and post-secondary educational attainment. Between 2000 and 2005-2009, the percentage of the Town's residents that were age 25-and-older who had not completed high school declined sharply, while the percentage of this age group with at least some college-level education increased.

Figure 3.40: Town of Liberty Educational Attainment (population 25 years and over), 2000 and 2005-2009



3.3.3.4 Town of Neversink

At 3,557, as Table 3.66 shows, the population of the Town of Neversink was virtually unchanged between 2000 and 2010. Population density in 2010 was approximately 43.0 persons per square mile, reflecting a community more rural in nature than either the Towns of Liberty or Fallsburg.

Table 3.66: Town of Neversink Population, 2000 and 2010

Geography	2000	2010	% Change
Neversink	3,553	3,557	0.1%
Sullivan County	73,965	77,547	4.8%
New York	18,976,457	19,378,102	2.1%

The number of total housing units in the Town of Neversink grew by 4.3 percent between 2000 and 2010 (Table 3.67), a slower rate of growth than was experienced in Sullivan County. Seasonal and recreational units accounted for virtually all of this growth, and in 2010 accounted for more than 28 percent of Neversink's housing stock.

Table 3.67: Town of Neversink Housing Units, 2000 and 2010

Geography	2000	2010	% Change
Neversink	1,960	2,045	4.3%
Sullivan County	44,730	49,186	10.0%
New York	7,679,307	8,108,103	5.6%

Neversink's median age rose slightly between 2000 and 2005-2009, to 40. Nevertheless, in contrast to many towns in the surrounding region, Neversink has a significantly larger number of residents below age 15 than of those age 65-and-older. Moreover, the under-15 group increased as a percentage of total population between 2000 and 2005-2009, while those over 65 declined (Figure 3.41).

Figure 3.41: Town of Neversink Age Distribution, 2000 and 2005-2009

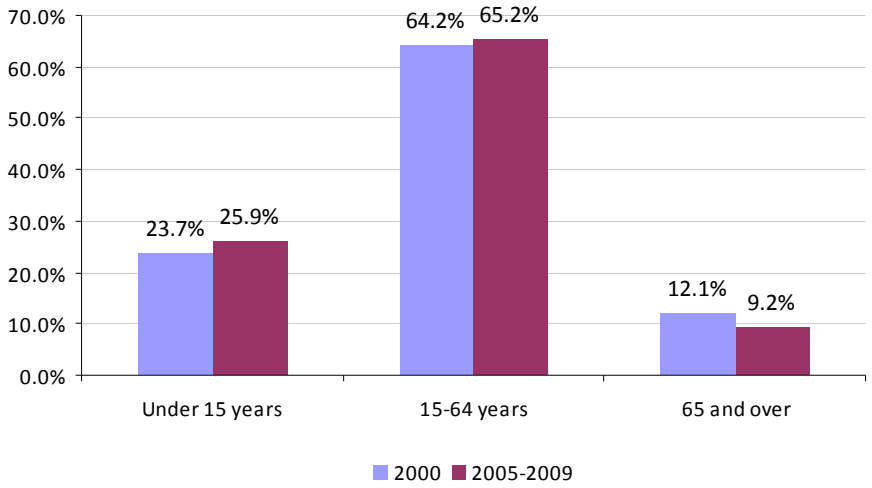


Table 3.68 shows that resident employment for the Town of Neversink increased by 4.9 percent between 2000 and 2005-2009, lagging somewhat behind the growth that occurred elsewhere in Sullivan County.

Table 3.68: Town of Neversink Resident Employment, 2000 and 2005-2009

Geography	2000	2005-2009	% Change
Neversink	1,483	1,556	4.9%
Sullivan County	30,244	34,440	13.9%
New York	8,382,988	9,102,596	8.6%

As Figure 3.42 shows, more than one-third of the employed residents of the Town of Neversink worked in education, health and social assistance in 2005-2009. About 14 percent worked for government agencies, nearly 11 percent in construction, and more than 9 percent in the arts, recreation and hospitality.

Figure 3.42: Town of Neversink Resident Employment - Top Employment Sectors, 2005-2009

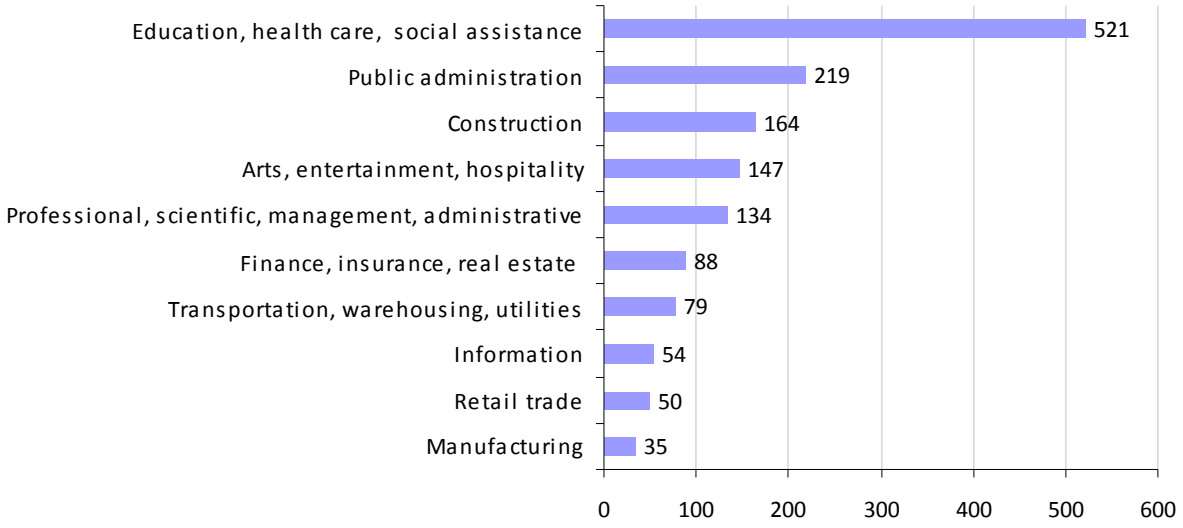


Table 3.69 shows that the unemployment rate for the Town of Neversink averaged 4.7 percent during 2005-2009, below the unemployment rates reported by ACS for both Sullivan County and the State during this period.

Table 3.69: Town of Neversink Unemployment Rate, 2000 and 2005-2009

Geography	2000	2005-2009
Neversink	5.8%	4.7%
Sullivan County	9.2%	6.5%
New York	7.1%	7.0%

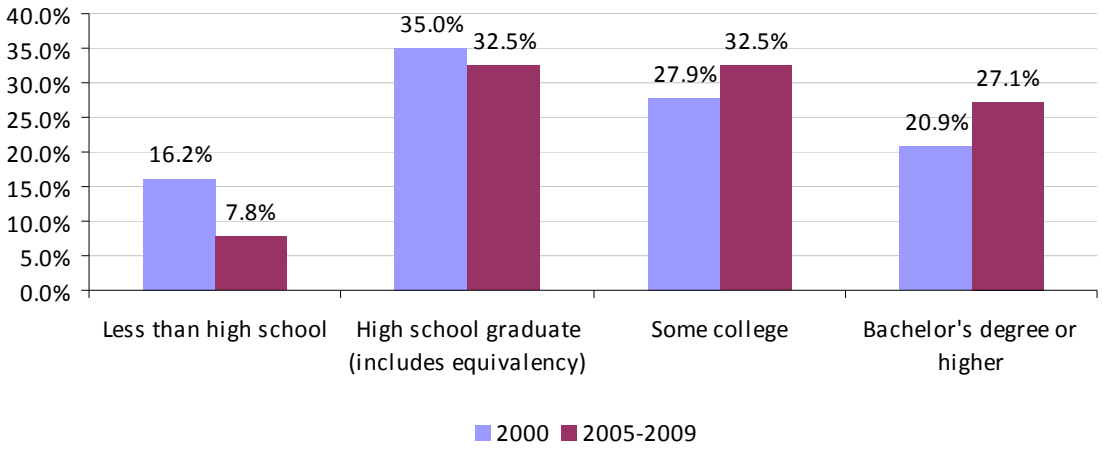
According to ACS data, the MHI for the Town of Neversink increased by more than 16 percent between 2000 and 2005-2009, as depicted in Table 3.70. The Town's MHI for 2005-2009 was 22 percent higher than the Statewide MHI, and 39 percent higher than that for Sullivan County.

Table 3.70: Town of Neversink Median Household Income (2009 dollars), 2000 and 2005-2009

Geography	2000	2005-2009	% Change
Neversink	$58,172	$67,708	16.4%
Sullivan County	$47,644	$48,586	2.0%
New York	$55,879	$55,233	-1.2%

As shown in Figure 3.43, the percentage of Neversink residents age 25-and-older who lacked a high school diploma declined between 2000 and 2005-2009 to 7.8 percent, while the percentage of this age group that had at least some college-level education rose to nearly 60 percent, including 27.1 percent who had at least a bachelor's degree.

Figure 3.43: Town of Neversink Educational Attainment (population 25 years and over), 2000 and 2005-2009



3.3.3.5 Town of Wawarsing

As shown in Table 3.71, the Town of Wawarsing's population in 2010 was 13,157 The Town's population grew by 2.1 percent between 2000 and 2010, slower than the growth rate for Ulster County as a whole, but equal to the growth rate for New York State. With a population density of 100.8 persons per square mile in 2010, Wawarsing is more densely populated than many of the more rural towns in vicinity of the Project, but less densely populated than Ulster County as a whole.

Table 3.71: Town of Wawarsing Population, 2000 and 2010

Geography	2000	2010	% Change
Wawarsing	12,889	13,157	2.1%
Ulster County	177,749	182,493	2.7%
New York	18,976,457	19,378,102	2.1%

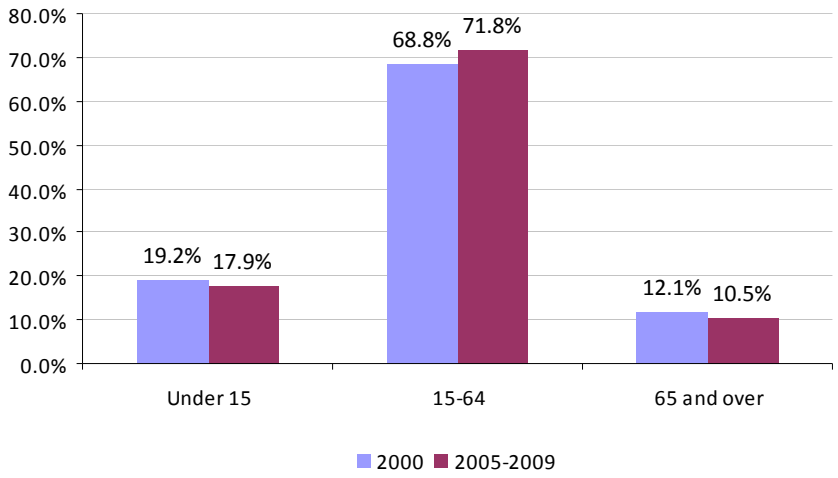
The number of housing units in the Town of Wawarsing grew by 6.7 percent between 2000 and 2010 (Table 3.72). About 16 percent of all housing units in the Town in 2010 were for seasonal or recreational use.

Table 3.72: Town of Wawarsing Housing Units, 2000 and 2010

Geography	2000	2010	% Change
Wawarsing	5,821	6,211	6.7%
Ulster County	77,656	83,638	7.7%
New York	7,679,307	8,108,103	5.6%

The median age in the Town of Wawarsing in 2005-2009 was 40.0 Figure 3.44 shows that between 2000 and 2005-2009, the under-15 and 65-and-older age groups both declined as a share of Wawarsing's population, while the share of all residents who are between 15 and 64 increased.

Figure 3.44: Town of Wawarsing Age Distribution, 2000 and 2005-2009



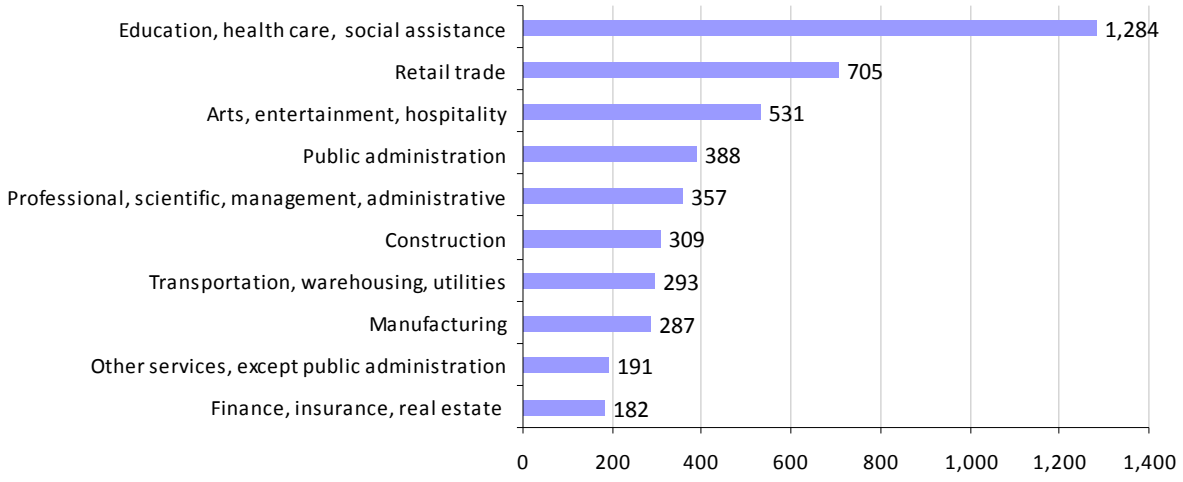
As shown in Table 3.73, resident employment in the Town of Wawarsing fell by 5.4 percent between 2000 and 2005-2009 – a sharp contrast with Ulster County as a whole, which saw an 8.1 percent increase in resident employment.

Table 3.73: Town of Wawarsing Resident Employment, 2000 and 2005-2009

Geography	2000	2005-2009	% Change
Wawarsing	5,088	4,814	-5.4%
Ulster County	83,748	90,507	8.1%
New York	8,382,988	9,102,596	8.6%

As Figure 3.45 shows, in 2005-2009 nearly 27 percent of the Town of Wawarsing's employed residents worked in education, health care and social assistance. Nearly 15 percent worked in retail trade, 11 percent in arts, recreation and hospitality and 8 percent in government.

Figure 3.45: Town of Wawarsing Resident Employment - Top Employment Sectors, 2005-2009



As Table 3.74 shows, the unemployment rate in the Town of Wawarsing for 2005-2009 was 8.2 percent, exceeding the rates for both Ulster County and the State.

Table 3.74: Town of Wawarsing Unemployment Rate, 2000 and 2005-2009

Geography	2000	2005-2009
Wawarsing	6.6%	8.2%
Ulster County	6.3%	5.6%
New York	7.1%	7.0%

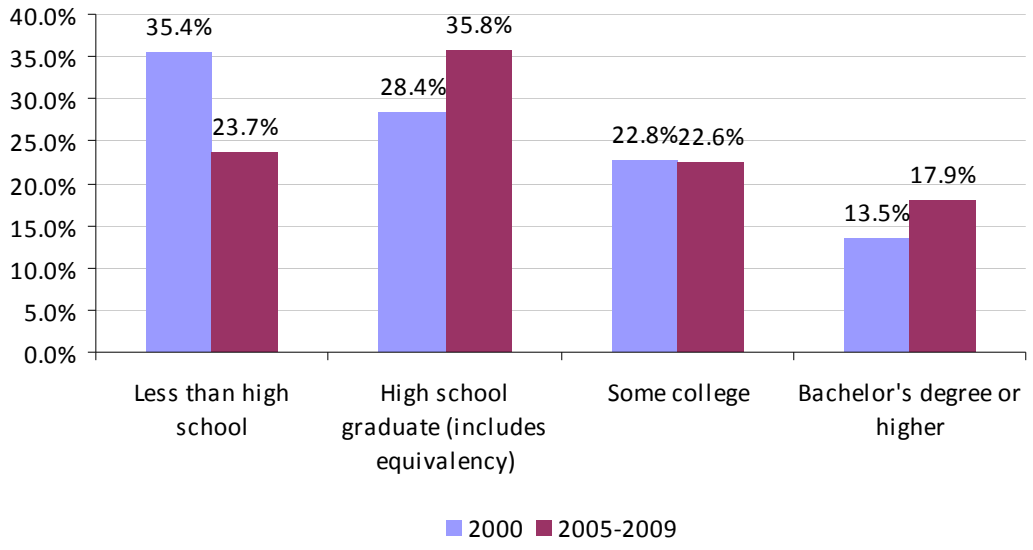
The MHI in the Town of Wawarsing dropped slightly in real terms between 2000 and 2005-2009, as shown in Table 3.75 – a trend that seems consistent with the decline in resident employment the Town experienced during this period, as well as its rising unemployment rate. For 2005-2009, the Town's MHI was 20 percent below the MHI for Ulster County as a whole.

Table 3.75: Town of Wawarsing Median Household Income (2009 dollars), 2000 and 2005-2009

Geography	2000	2005-2009	% Change
Wawarsing	$46,194	$45,813	-0.8%
Ulster County	$54,795	$57,485	4.9%
New York	$55,879	$55,233	-1.2%

As depicted in Figure 3.46, educational attainment improved significantly in the Town of Warwarsing between 2000 and 2005-2009, with a substantial decrease in the percentage of the Town's population age 25-and-older that had not earned a high school diploma, as well as a significant increase in the percentage of the Town's population in that age group that earned a high school diploma, a bachelor's or advanced degree. Despite this progress, the percentage of 25-and-older residents who have not completed high school remains relatively high, and the percentage of those with at least a bachelor's degree remained relatively low.

Figure 3.46: Town of Wawarsing Educational Attainment (population 25 years and over), 2000 and 2005-2009



3.3.4 Socioeconomic Conclusions

During the past decade, many of the fifteen towns profiled above have struggled with a variety of long-term structural problems, combined more recently with the effects of the recession and financial crisis that began in 2008. Long-term issues include:

- Population losses – 6 of the 15 towns experienced a decline in resident population between 2000 and 2010;
- Weak overall job growth – resident employment declined in 7 of the fifteen towns;
- Rising unemployment – in 8 of the 15 towns resident unemployment exceeded both their County and the State unemployment rates in 2005-2009;
- Low incomes – in 2005-2009, median household incomes were less than 80 percent of the statewide median income in 8 of the 15 towns; and
- Relatively low levels of educational attainment – in 11 of the 15 towns, fewer than 20 percent of all residents age 25 and older had bachelor's or higher degrees in 2005-2009 (as compared with 32 percent statewide); and 7 of the 15 towns have more residents who have not completed high school than they have four-year college graduates.

3.4 Economic Impact of Project Construction

The overall, anticipated economic impact of constructing the Project developments was assessed. For the Cannonsville and Pepacton Developments, the economic impact of constructing these Project developments on Delaware County was assessed. For the Neversink Development, the economic impact on Sullivan County was assessed. While the preceding description of current conditions and recent trends focused on town-level data, the analysis of the three developments'

economic impact focuses on county-level impact. This is because IMPLAN, like other input-output models, uses the county as its basic unit of economic analysis.

Based on the most recent estimates, the Cannonsville, Pepacton and Neversink Developments will cost approximately $42.5 million, $8.1 million and $4.4 million, respectively. A breakdown of estimated costs for each development is shown below in Table 3.76.

Table 3.76: Estimated Construction Costs, by Development

Costs	Cannonsville	Pepacton	Neversink
Mobilization& Demobilization (330)	$2,982,600	$454,500	$300,100
Powerplant Structures & Improvements (331)	$4,207,000	$181,000	$75,000
Reservoir, Dam & Waterway (332)	$6,330,000	$1,532,000	$842,000
Waterwheel, Turbines, and Generators (333)	$15,270,000	$1,828,000	$1,278,000
Accessory Electric Equipment (334)	$1,511,000	$457,000	$320,000
Substation and Switching Station Equipment (353)	$2,100,000	$542,000	$269,000
Transmission, Poles, and Conductors (335/336)	$408,000	$5,000	$217,000
Other Costs (including contingencies and services)	$9,734,000	$3,097,000	$1,135,000
Total	**$42,542,600**	**$8,096,500**	**$4,436,100**

In estimating the economic impact of construction of the Cannonsville, Pepacton and Neversink Developments in Delaware and Sullivan counties, as applicable, it is important to recognize that much of the work required for completion of the developments is likely to be performed by contractors and suppliers of specialized equipment that come from outside the two counties at issue. For purposes of this analysis, it was assumed that all of the major contracts for architecture, engineering, construction or procurement and installation of equipment will be awarded to firms based outside the county in which each respective development is located. It was further assumed that local economic impact of each development will be generated primarily through employment of local residents for part of the work done on-site, and to a lesser extent through local subcontracting.

Exactly how much work on any given project will be performed by local subcontractors or local workers is difficult to predict. Some assumptions can be made, however, based on information about the use of local subcontractors and local labor on other DEP construction projects in the vicinity of the Project region. For purposes of this analysis, the following assumption were utilized:

- None of the work done under waterwheels, turbines and generators (333), accessory electrical equipment (334), substation and switching station equipment (353), transmission poles and conductors (355/356), and other costs (including contingencies and services) will be contracted locally, or done by local workers;

- 10 percent of the work done under mobilization/demobilization (330), powerplant structures and improvements (331) and reservoirs, dams and waterways (332) will be done by local subcontractors; and

- 90 percent of the work done under mobilization/demobilization (330), powerplant structures and improvements (331) and reservoirs, dams and waterways (332) will be done by contractors from outside the local county, but 45 percent of all of the workers employed by these non-local contractors will be local residents.

Based on these assumptions, the direct and indirect and induced (or "multiplier") effects of projected payments to local subcontractors and construction workers associated with each development were estimated using the IMPLAN input-output modeling system – an econometric modeling system commonly used in analyses of economic impact.

3.4.1 Economic Impact of Construction of the Cannonsville Development

Based on the assumptions outlined above and using the IMPLAN input-output modeling system, of the $42.5 million estimated total cost of the Cannonsville Development, direct payments to Delaware County subcontractors and wages paid directly to Delaware County residents employed by contractors based outside the County would total approximately $3.1 million. The development would directly generate approximately 49 person-years of employment for County residents in construction and related industries, with compensation paid to these employees totaling approximately $2.1 million.

Through the multiplier effect, direct payments to local subcontractors and residents would generate approximately $1.2 million in additional economic output in Delaware County, and 10 additional person-years of employment, with employee compensation totaling nearly $380,000.

Taking into account both direct and indirect/induced effects, the Cannonsville Development would provide a one-time increase of approximately $4.3 million in economic output in Delaware County during the estimated 36 month construction period associated with the development, 59 person-years of work, and approximately $2.5 million in employee compensation.

Table 3.77: Impact of Cannonsville Development in Delaware County

Cannonsville (Delaware County)	*Impacts*	*Direct*	*Indirect and Induced*	*Total*
Subcontractors	Output	$1,351,960	$408,604	$1,760,564
	Employment	10	3	13
	Employee Compensation	$422,424	$139,953	$562,377
Non-local contractors' local employee spending	Output	$1,710,819	$790,066	$2,500,885
	Employment	39	7	46
	Employee Compensation	$1,710,819	$239,733	$1,950,552
Total	**Output**	**$3,062,779**	**$1,198,670**	**$4,261,449**
	Employment	**49**	**10**	**59**
	Employee Compensation	**$2,133,243**	**$379,686**	**$2,512,929**

3.4.2 Economic Impact of Construction of the Pepacton Development

Of the $8.1 million estimated total cost of the Pepacton Development, direct payments to Delaware County subcontractors and wages paid directly to Delaware County residents

employed by contractors based outside the County would total about $491,000. The development would directly generate approximately 8 person-years of employment for County residents in construction and related industries, with compensation paid to these employees totaling $342,000.

Through the multiplier effect, direct payments to local subcontractors and residents would generate approximately $192,000 in additional economic output in Delaware County, and 2 additional person-years of employment, with employee compensation totaling nearly $61,000. Taking into account both direct and indirect/induced effects, the project would provide a one-time increase of $683,000 in economic output in Delaware County during the estimated 21 month construction period associated with the development, 10 person-years of work, and $403,00 in employee compensation (Table 3.78).

Table 3.78: Impact of Pepacton Development in Delaware County

Pepacton (Delaware County)	*Impacts*	*Direct*	*Indirect and Induced*	*Total*
Subcontractors	Output	$216,750	$65,509	$282,259
	Employment	2	1	3
	Employee Compensation	$67,724	$22,438	$90,162
Non-local contractors' local employee spending	Output	$274,283	$126,665	$400,948
	Employment	6	1	7
	Employee Compensation	$274,283	$38,435	$312,718
Total	**Output**	**$491,033**	**$192,174**	**$683,207**
	Employment	**8**	**2**	**10**
	Employee Compensation	**$342,007**	**$60,873**	**$402,880**

3.4.3 Economic Impact of Construction of the Neversink Development

Of the $4.4 million estimated total cost of the Neversink Development, direct payments to Sullivan County subcontractors and wages paid directly to Sullivan County residents employed by contractors based outside the County would total more than $274,000. The development would directly generate approximately 5 person-years of employment for County residents in construction and related industries, with compensation paid to these employees totaling about $190,000.

Through the multiplier effect, direct payments to local subcontractors and residents would generate nearly $120,000 in additional economic output in Sullivan County, and one additional person-year of employment, with employee compensation totaling nearly $40,000.

Taking into account both direct and indirect/induced effects, the project would provide a one-time increase of $394,000 in economic output in Sullivan County during the estimated 21 month construction period associated with the development, 6 person-years of work, and $230,00 in employee compensation (Table 3.79).

Table 3.79: Impact of Neversink Development in Sullivan County

Neversink (Sullivan County)	*Impacts*	*Direct*	*Indirect and Induced*	*Total*
Subcontractors	Output	$121,710	$39,133	$160,843
	Employment	1	0.3	1.3
	Employee Compensation	$37,657	$13,288	$50,945
Non-local contractors' local employee spending	Output	$152,512	$80,629	$233,141
	Employment	4	1	5
	Employee Compensation	$152,512	$26,442	$178,954
Total	Output	**$274,222**	**$119,762**	**$393,984**
	Employment	**5**	**1**	**6**
	Employee Compensation	**$190,169**	**$39,730**	**$229,899**

3.5 Economic Impact of Project Operations

Estimates of the impact of operation of the three Project developments are based on the most recent estimates of operating revenues for each of the three facilities. Using IMPLAN, these revenue estimates can be translated into estimates of the number of people to be employed directly in the operation of the three facilities, their earnings, and the indirect and induced impact of spending within Delaware and Sullivan counties of plant operation and maintenance.

3.5.1 Economic Impact of Cannonsville, Pepacton, and Neversink Operations

Operating impacts for each of the three facilities in their first year of operation (assumed to be 2016 for Pepacton and Neversink and 2019 for Cannonsville) are shown below in Table 3.80.

- The Cannonsville Development operating revenue estimates would translate into the equivalent of approximately 5 full-time-equivalent ("FTE") jobs, create two additional FTE jobs in Delaware County through the multiplier effect, and would increase the County's total annual economic output in 2019 by more than $2.7 million.

- Because of its smaller scale, the Pepacton Development operating revenue estimates would translate into the equivalent of less than one FTE job (i.e., 0.6 FTE); and through the multiplier effect, would only generate 0.4 FTE jobs in Delaware County. The facility's operations would thus translate into an equivalent increase in employment in the County by one FTE job; and increase the County's total annual economic output in 2016 by about $454,000.

- The still-smaller Neversink Development operating revenue estimates would translate into the equivalent of only 0.3 FTE jobs, with 0.3 additional FTE jobs created in Sullivan County through the multiplier effect. The facility's operations would thus translate into an equivalent increase in employment by only 0.6 FTE, with the County's total annual economic output in 2016 increasing by slightly less than $273,000.

Table 3.80: Impact of Ongoing Operations, by Development

Project	Impact	Direct	Indirect and induced impacts	Total
Cannonsville (Delaware County)	Output	$2,473,177	$261,635	$2,734,812
	Employment	5	2	7
	Employee Compensation	$448,114	$78,295	$526,409
Pepacton (Delaware County)	Output	$408,939	$44,815	$453,754
	Employment	0.6	0.4	1
	Employee Compensation	$77,187	$13,487	$90,674
Neversink (Sullivan County)	Output	$241,644	$31,186	$272,830
	Employment	0.3	0.3	0.6
	Employee Compensation	$45,788	$10,170	$55,958

It should be noted that in contrast to the one-time impact of spending on construction (that is, lasting only for the duration of the Project-related construction activities for each development), the operating impacts cited above and summarized in Table 3.80 would be ongoing annual impacts.

3.5.2 Tax Impacts of Operations

Given potential changes in the market value of properties, variations in local assessment practices, and potential variability in local tax rates from year to year, estimates of the impact of the proposed developments on real property tax revenues are inevitably somewhat speculative. For purposes of this analysis, it was assumed that the market value of each facility is initially set at a level equal to the cost of construction. An estimated assessed value for each development was then calculated based on the equalization rate for the applicable town in which each development is located (as reported by the New York State Office of Real Property Services) and estimated real property taxes based on county, municipal and school tax rates for 2010.

As set forth in Table 3.81 the results of this analysis were as follows with respect to annual property tax payments for each development:

- The Cannonsville Development would pay approximately $1.7 million annually in county, municipal and school taxes;
- The Pepacton Development would pay approximately $158,000 annually in county, municipal and school taxes; and
- The Neversink Development would pay approximately $112,000 annually in county, municipal and school taxes.

Table 3.81: Estimated Real Property Tax Revenues Generated, by Development

Project	Town	Construction cost	Equalization rate, 2010	County tax rate (per $1,000), 2010	Municipal tax rate (per $1,000), 2010	School tax rate (per $1,000), 2010	Estimated property tax
Cannonsville	Town of Deposit	$42,542,600	10.0%	82.96	59.81	258.91	$1,708,851
Pepacton	Town of Colchester	$8,096,500	4.1%	126.31	82.26	268.50	$158,366
Neversink	Town of Neversink	$4,436,100	3.7%	141.64	105.27	443.98	$111,867

3.5.3 Impact on Local Government Services and Local Government Expenditures

Beyond their direct impact on real property tax revenues, the overall impact of the three Project developments on the overall financial condition of the affected local governments and school districts is likely to be positive. None of the development would displace any other, potentially more lucrative development projects in the vicinity of the Project area. Moreover, for reasons discussed below, any increases in demand for local public services associated with the operation of the developments are likely to be minimal.

Because of the relatively small number of equivalent jobs associated with the operations of the Project developments (fewer than 6.0 FTE jobs across all three proposed developments), and because neither the major inputs to nor major outputs from the facilities are transported by road, the impact on traffic and wear-and-tear on public roadways associated with the Project is likely to be minimal. Moreover, it is important to note that DEP maintains its own roadways in the immediate vicinity of the reservoirs associated with the Project developments. Thus none of the three developments would add significantly to local governments' road construction or maintenance costs – which in many of the region's towns constitute the single largest area of local government expenditure.

In addition, DEP maintains its own police force of approximately 185 officers to secure City-owned land and infrastructure in the watershed, including the lands and infrastructure associated with the Project. Accordingly, any additional local government expenditures for public safety incurred by local communities in the Impact Area as a result of the Project are likely to be minimal.

The number of equivalent jobs created by the developments is relatively small, and, thus, it is likely that they can be filled from within the existing work force of the affected communities. Because it is unlikely that the developments would draw new workers and their families from outside the region, they are unlikely to generate significant new demands on local school systems or for other local government services.

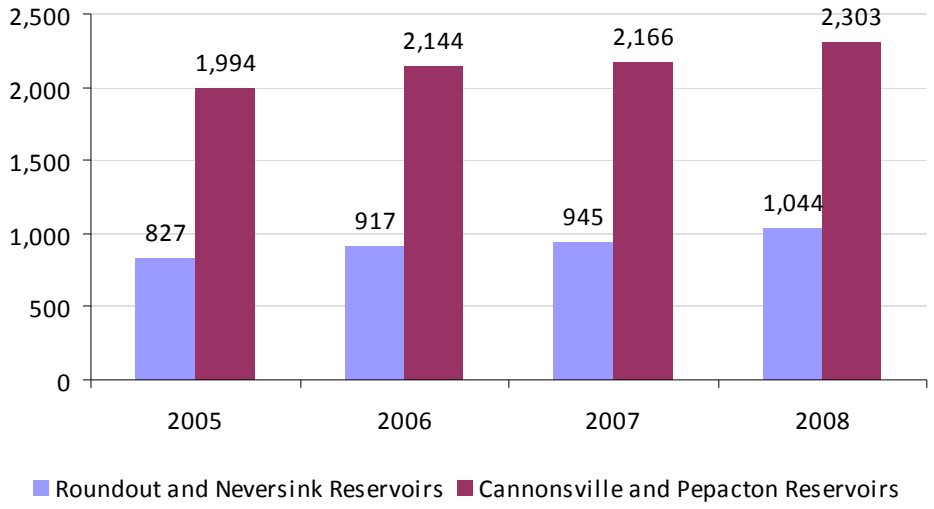
3.6 Project Impact on Community Character and Recreation

The DEP has made significant investments in opening up City-owned watershed lands for outdoor recreation during the past decade. The City's reservoirs and the streams into which they flow also comprise an important dimension of the region's recreational offerings – and thus a valuable asset for recreation and tourism-related businesses, which together constitute one of the most significant sectors of the economy in the vicinity of the Project area. One example of the City's investment and promotion of recreational use of the watershed is the Cannonsville

Recreational Boating Pilot Program. This three-year program was launched in 2008 to improve regional recreational activities and environmentally sound deveopment for activities that ranged from kayaking to canoeing and sailing.

Overall, the use of the watershed has been increasing. As Figure 3.47 shows, the number of active boating permits on the Cannonsville, Pepacton, Neversink, Reservoirs steadily increased between 2005 and 2008.

Figure 3.47: Active Boating Permit Holders for Cannonsville, Pepacton, Neversink, and Rondout Reservoirs[6]



DEP surveyed holders of its Access Permits in 2009, regarding the most common activity such permit holders participated in while on City-owned lands and/or reservoirs. As Figure 3.48 shows, about 60 percent of respondents' most common activity was fishing from shore or by boat.

In the same survey, DEP inquired of Access Permit holders that had fished (via shore or boat) on City-owned reservoirs which eservoir was used most by such permit holders for fishing purposes. Of those permit holders responding that they did use the reservoirs for fishing purposes, as shown in Table 3.82, Pepacton Reservoir ranked second among use, Cannonsville Reservoir ranked fourth, and Neversink Reservoir ranked eigth.

[6] Boating permits are issued for pairs of reservoirs. In the case of the Project, the applicable pairings are the Rondout and Neversink Reservoirs, and the Cannonsville and Pepacton Reservoirs. Accordingly, individual reservoir data regarding boating permits is not available.

Figure 3.48: 2009 Survey of Access Permit Holders Responses Regarding Most Common Activity Undertaken

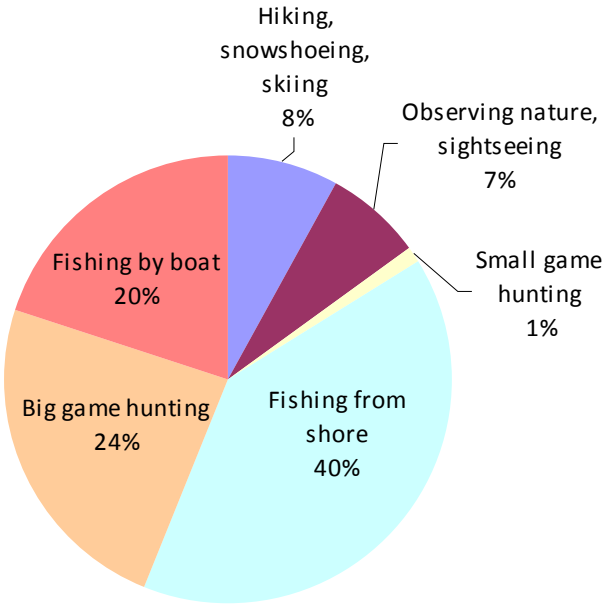


Table 3.82: Response to 2009 Survey of Access Permit Holders RegardingReservoir Use for Fishing

Reservoir	Used most
Ashokan	18%
Pepacton	14%
Kensico	10%
Cannonsville	8%
Croton Falls	8%
New Croton	7%
Rondout	7%
Neversink	4%
West Branch	4%
Cross River	3%
Schoharie	3%
All others	14%
Total	**100%**

The DEP intends to continue operating the Cannonsville, Pepacton, and Neversink Reservoirs according to the currently effective operating protocol agreed to by the parties to the 1954 U.S. Supreme Court Decree ("Decree Parties").[7] Accordingly, the water available for hydroelectric

[7] The Decree Parties are the City of New York, the States of Delaware, New Jersey, and New York, and the Commonwealth of Pennsylvania. In the event that the operating protocol is modified in the future, DEP intends to operate the reservoirs in accordance with any such modified protocol agreed to by the Decree Parties. For general information regarding the 1954 U.S. Supreme Court Decree please see *New Jersey v. New York*, 347 U.S. 995 (1954).

generation at the Cannonsville, Pepacton, and Neversink Developments will be comprised of conservation releases, directed releases, and water that would otherwise spill to the extent that such releases are consistent with discharge mitigation releases as outlined in such operating protocol. All such releases would be drawn by the existing release intake structures of the reservoirs associated with the Project developments, which are deep water intakes that draw from the deeper, cold portions of the water column. The City is currently not proposing to modify the magnitude, frequency, duration, and/or timing of discharges due to the addition of the hydropower facilities associated with the Project.

Accordingly, because (i) the City is not proposing to modify discharges as a result of the Project and is merely seeking to generate power from the discharges it is already obligated to provide; and (ii) the Project developments are being constructed at existing facilities, the Project is expected to neither create new recreational opportunities nor impair existing recreational activities undertaken on the reservoirs or downstream environs associated with the proposed Project developments.

3.6.1Conclusion: Overall Impact on Socioeconomic Conditions and Community Character

The preceding analysis indicates that construction and operation of the Cannonsville, Pepacton and Neversink Developments would have a modestly positive impact on demand for labor, employment and earnings, and overall economic output in Delaware and Sullivan counties.
For example, of the approximately 100 person-years of construction work that the Cannonsville Development would entail, 49 would be performed by Delaware County residents. Over the three-year construction period, this would equate to an average of about 16 FTE jobs per year. To put this number in context, between 2005 and 2009, according to the Census Bureau's ACS, an average of 2,051 Delaware County residents were employed in construction.

For the Pepacton and Neversink Developments, the direct impact of construction would be smaller during the less than two year estimated construction period associated with each development – fewer than three FTE jobs per year for Pepacton, and fewer than two FTE per year for Neversink (as compared with an average of 3,178 Sullivan County residents employed in construction between 2005 and 2009).

The impact of ongoing operations would similarly be modest, with the employment equivalent of the operating revenues at all three facilities totaling approximately 6 FTE jobs.

Because of the relatively small numbers of jobs the three developments would create and the following factors, other types of socioeconomic impacts are likely to be minimal or non-existent:

- Very small increases in labor demand are unlikely to affect wages in either the directly affected industries or in the labor force more broadly.

- Because the resident labor force in the two counties and in the surrounding area would easily absorb the modestly-increased demand for labor that the three projects would generate, they are unlikely to affect either housing demand or housing costs.

- The three developments are not expected to affect recreational opportunities either at the reservoirs themselves or downstream. They will neither create new recreational opportunities nor impair existing recreational uses.
- As noted above, the impact of the three developments on local government and school district finances is likely to be positive.
- Because they would not affect the rural character of the communities in which they are located, the population of those communities, local patterns of land use and development, or the overall mix of local economic activity, the three projects would have little or impact on the character of the towns in which they are located, or other nearby communities.

4.0 ASSESSMENT OF ENVIRONMENTAL BENEFITS, RELIABILITY BENEFITS AND WHOLESALE PRICE IMPACTS

The three proposed Project developments would be interconnected to the NYSEG transmission and distribution systems. Early design activities and a feasibility assessment are currently under way. According to the latest available information, the Cannonsville Development is currently anticipated to have a generating capacity of approximately 14.08 megawatts ("MW"), while the Pepacton and Neversink Developments are currently anticipated to have nominal generating capacities of 1.70 MW and .94 MW, respectively.

4.1 Impacts of Project Generation on Wholesale Energy Prices

The proposed Cannonsville, Pepacton and Neversink Developments are essentially zero variable cost generation resources. As such, they would be expected to operate whenever available (i.e., it will virtually always be economic to generate electricity from the facilities), [8] and whenever they do operate and generate electricity, they will displace an equivalent amount of generation from higher-cost, fossil-fuel fired generation sources. Such displacement not only reduces pollutant emissions from the burning of fossil fuels, which will be discussed in detail in the next section of this report, but in addition tends to reduce the overall wholesale market price of energy. This price reduction effect was estimated using a statistical analysis of actual NYISO historical wholesale market data.

The NYISO-administered day-ahead and real-time energy markets establish wholesale clearing prices for electricity based on supply and demand bids from market participants. These bids determine which generation resources will be dispatched to generate electricity, thereby meeting electricity demand at the lowest cost, while simultaneously protecting the transmission system from overload.[9] The price of electricity in any given hour (or fraction thereof) is determined by the price of the last generation unit needed to serve the load. Prices rise when demand increases (or when available low-cost generation decreases), because more expensive oil and gas units need to be run to serve customers.

Figure 4.1 shows a stylized illustration of how generation is deployed to serve load. The load curve represents hourly demand for electricity, ordered from low to high over a year.[10] Generation resources are ordered from low-cost to high-cost from the bottom of the figure to the top. Hydroelectric generation and nuclear generation have very low variable operating costs and so would run around the clock to the extent they are available. Coal generation has a wider variation in variable operating costs, with higher cost units operating less often. Large, natural

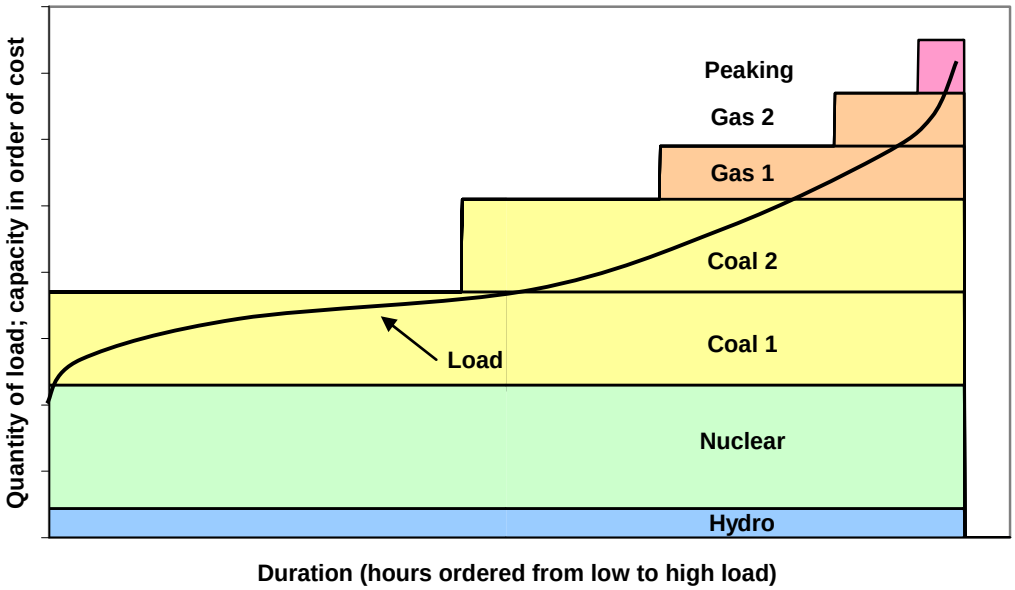
[8] There are occasional hours when NYISO locational energy prices are in fact negative, during which it would in principle be uneconomic to generate power from a zero variable cost resource.

[9] This is known as "security constrained economic dispatch."

[10] When load is considered chronologically it displays high variability within each day, in response to weather patterns, and according to season. The stylized figure shows load in order of increasing magnitude to illustrate how existing resources are deployed to meet load requirements at different levels.

gas-fired plants meet intermediate needs, while high variable cost peaking units, running on oil or natural gas, are used to meet peak demand.[11]

Figure 4.1: Illustration of Electricity Demand Supply



Hydroelectric generation can take several forms: (a) so-called "run-of-river", which is relatively constant; (b) peaking hydro, where generating is based on directed releases at periods of peak demand; and (c) pumped storage, where water is pumped up to a reservoir when electricity prices are low and then is released to generate electricity when prices are high. For the purposes of this assessment, it was assumed that output from the Project's hydroelectric generation facilities would not be actively adjusted based on market conditions, and, therefore, will effectively be run-of-river, corresponding to depiction of "Hydro" generation in **Figure 4.1**.

Consistent with other centralized markets, in the NYISO-administered markets, the going price for electricity is set by the price of the last generating unit needed to meet demand. The underlying logic of the model used to value the impact of generation from the Project can be illustrated with reference to **Figure 4.1**. If hydroelectric generation capacity is increased, there is reduced need to run higher cost generation resources, and the market will tend to clear at a lower corresponding price at each point on the load curve. Of course, this will not occur each and every hour, because the relatively small amount of generation output associated with the Project will often not be enough to displace the marginal (i.e., highest cost) generation unit required to meet load; however, on average and over time, such a price-reduction effect would be expected.

Because low-cost, hydroelectric generation is at the bottom of the supply resource stack, demand is always sufficient to justify its operation, and hydroelectric generation plants will run

[11] The relative capacity volumes in the figure are illustrative only, and, thus, are not intended to reflect the actual, current generation mix in New York. In reality, there are many more gradations in price, as well as overlap of fuel types.

regardless of the prevailing market clearing price. As a consequence of its place in the supply resource stack, an increase in the available quantity of hydroelectric generation has the same effect on the market clearing price as a decrease by the same amount in load.[12] In other words, changing the height of the hydroelectric segment in **Figure 4.1** has the same effect as would shifting the load curve.

To estimate the economic benefit of generation output from the Project, historical NYISO wholesale energy market data were used to develop a statistical model that describes the relationship between overall demand and prevailing market prices in western New York State for the period June 2008 to May 2011. This model estimates how wholesale energy prices change in response to a given change in load, while controlling for changes in natural gas prices.[13]

As noted above, the effect on market prices of an increase in hydroelectric generation is equivalent to that from a corresponding decrease in load, holding generation constant. Accordingly, the load-price model determines the value of an increase in hydroelectric output by estimating the price impact of an equivalent *decrease* in demand. The model controls for natural gas prices because natural gas-fired generation often sets the market clearing price in the NYISO-administered markets. By controlling for the effect of natural gas prices on market energy prices, the model is better able to isolate the effect of increased hydroelectric output.

To estimate the impact of increased hydro generation from the Project, expected market prices were first estimated from a regression of the load-price relationship based on historical data. Then, market prices were estimated again using the same function, but decreasing load each hour by an amount equal to the expected incremental hydro generation from the Project. The resulting price changes were then translated into an annual dollar value using the hourly load for western NYISO, by seasonal period.[14] The calculated reductions in wholesale power costs for the western NYISO region resulting from generation output is presented in **Table 4.1**.

[12] The same is true in the reverse: a decrease in hydroelectric generation capacity is equivalent in its effect on market clearing prices to an increase by the same quantity in load.

[13] The model covers the western NYISO region, comprising Zone A (West), Zone B (Genesee), Zone C (Central), and Zone E (Mohawk Valley). Appendix B includes a further discussion of the statistical model.

[14] The model distinguishes seasonal periods in two-month segments (e.g., January through February, March through April, etc.). Price impacts are calculated for each of these periods and applied across the corresponding average load.

Table 4.1: Estimated Reduction in Western NYISO Wholesale Power Costs Resulting from Project Generation

Model Sub-period	Historical Load Weighted LBMP, $/MWh	Estimated Decrease in Load-Weighted Avg Real-time price, $/MWh	Annual Reduction in NYISO Wholesale Energy Cost, $000s	% Reduction in Wholesale Energy Cost
Jan-Feb	$45.80	$0.30	$2,569	0.7%
Mar-Apr	$34.63	$0.27	$2,111	0.8%
May-Jun	$43.09	$0.31	$2,486	0.8%
Jul-Aug	$50.54	$0.35	$3,098	0.7%
Sep-Oct	$40.02	$0.23	$1,789	0.6%
Nov-Dec	$45.23	$0.19	$1,594	0.4%
Total	**$43.22**	**$0.27**	**$13,647**	**0.7%**

The benefit to the western New York region is estimated to be approximately $13.6 million annually, as indicated in **Table 4.1**. This value represents the benefit of lower electricity prices made possible by generation from the Project.

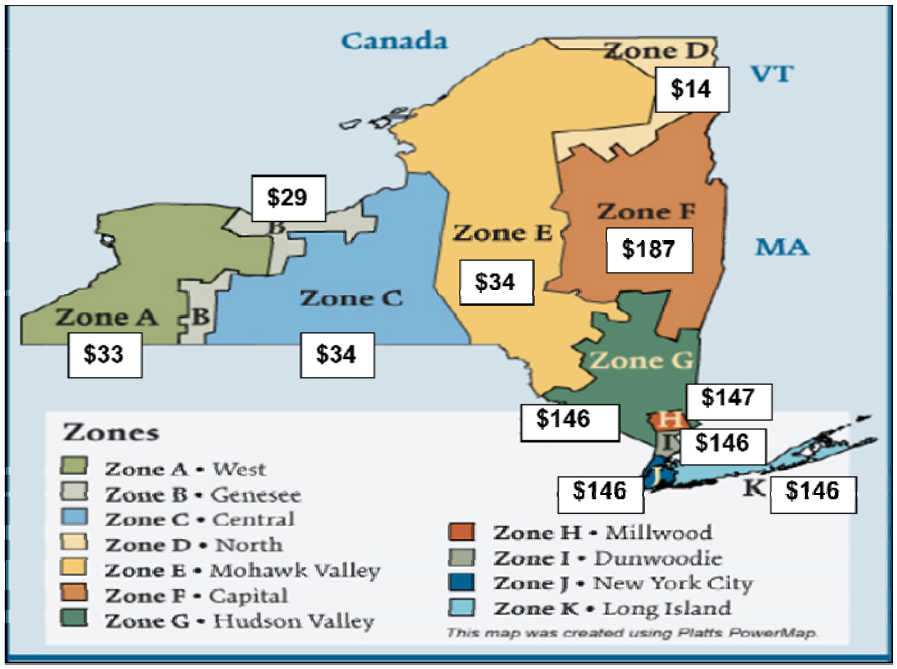
The model was constructed to cover the western portion of NYISO only,[15] because there is significant transmission congestion between this region and parts of NYISO to the east. During periods of transmission congestion, output from the Project would not be able to affect energy prices to the east and, consequently, the model of western NYISO was deemed to be more reliable than a NYISO-wide model. In addition to the estimated benefit to western New York presented above, there is likely an additional benefit to load in the east during zero-congestion periods that is not captured by the model.

4.2 Modeling Issues and Sensitivities

NYISO wholesale energy prices are determined on a locational basis, accounting for generation costs, transmission constraints and power losses when energy is moved over distance. Because regional demand is concentrated in New York City and the surrounding region in the southeast part of the State, power tends to flow from western New York State to the east. In periods of high demand, transmission from west to east is often constrained, meaning that it is not possible to move more power to the east. When this occurs, more expensive generating units must be operated in the east to meet demand, and locational market prices are consequently higher in the east than in western and northern parts of the State. This is illustrated in Figure 4.2, which shows actual real time energy prices for the various NYISO load zones on January 12, 2011 at 11 a.m. eastern time.

[15] The modeled region consists of the Mohawk Valley zone and market zones to the west (encompassing NYISO Zones A, B, C and E).

Figure 4.2: NYISO Real Time Energy Prices by Zone ($/MWh), Jan 12, 2011, 11AM



Adapted from NYISO system map; NYISO.

The significance of such price differences is that it indicates that the system is, in a sense, separated into distinct markets. When transmission congestion prevents more power from moving from the west to the east, increased generation in the west can affect prices in the "west market", but not in the "east market".

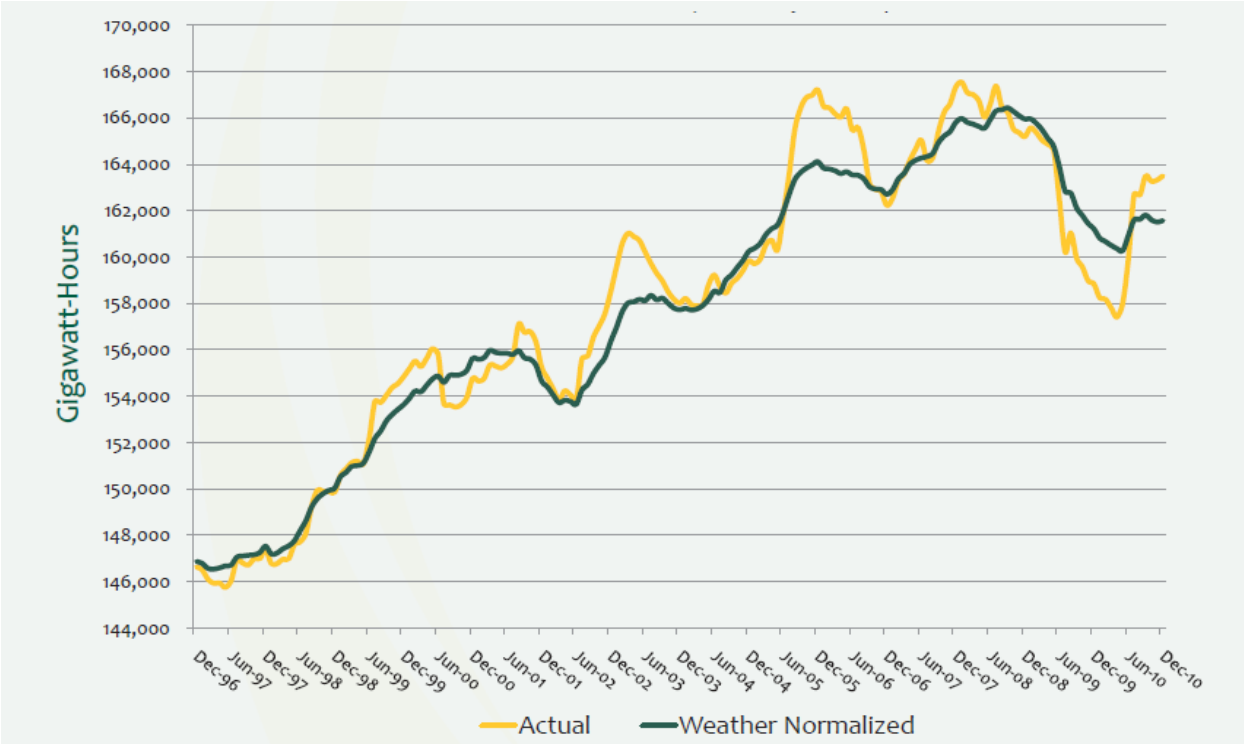
4.2.1 Model Sensitivity Case

Since power from the Project would be delivered into the NYISO Zone E (Mohawk Valley), and energy prices for this zone tend to correspond closely to those in zones to the west, but often show significant price separation with respect to prices in eastern NYISO zones, the load-price model was specified over Zones A, B, C and E only. This focus on the western NYISO region produces a more reliable estimate of price effects, but, by excluding benefits that may flow to eastern zones in some hours, would be expected to underestimate the effect for the NYISO as a whole. To examine the potential significance of such model-specification effects, a sensitivity case was run for all of NYISO. The sensitivity model showed an estimated dollar benefit $4 million greater than that estimated using the western New York model specification. However, part of this additional benefit results from the incorporation of periods when eastern NYISO energy prices are very high because of transmission congestion – periods when output from the Project could have no effect on prices in eastern zones. It is estimated that there may be up to $2 million of additional benefit, not captured in the estimates shown in **Table 4.1,** that accrues to load in eastern NYISO zones.

4.2.2 Decline in NYISO Demand During the Model Period

The data used in the load-price model cover a period during which there was a notable decline in electricity demand in NYISO, presumably reflecting the effects of the economic downturn. This decline can be seen in **Figure 4.3**, particularly during 2009.

Figure 4.3: NYISO Energy Usage, 12-month Rolling Total, 1996-2010[16]



Beginning in mid-2010, there was a sharp recovery in electricity demand, and load is currently trending roughly at 2007 levels (around 165,000 GWh over the past 12 months). The effect of this lull in demand on the model estimates of wholesale price effects is very modest. Alternative regressions were estimated excluding months from the decline period, and the results were found to be very similar to those for the full three-year data set. The price-load model does not include adjustments either to reflect unusual circumstances during the historical model period or to anticipate potential future market circumstances. Such an exercise would involve substantial speculation, and we believe the model results are more informative in unadjusted form. As discussed below, there are a number of factors that may influence the actual wholesale price impact of generation from the Project.

[16] NYISO, *Power Trends 2011: Energizing New York's Legacy of Leadership* at 20, available at http://www.nyiso.com/public/webdocs/newsroom/power_trends/Power_Trends_2011.pdf.

4.3 Interpretation of Benefits from Wholesale Energy Price Reduction

Factors Influencing Future Wholesale Price Benefits

There are a number of important factors to consider in interpreting the benefit estimates in Table 4.1. The statistical model utilized accounts for a variety of market factors over the historical period June 2008 to May 2011. For example, demand spikes, unexpected plant outages, variations in regional imports and exports, and the associated responses from market participants and the system operator are all reflected in the historical relationship of price and load, and this relationship is captured by the statistical model. Thus, the estimates are likely to be a reasonable estimate of short-term market impacts associated with the Project. However, the reliability of these estimates with respect to *future* generation from the Project depends on a number of factors, including:

- **Natural gas prices**. The statistical model reflects a period when there was substantial variation in natural gas prices, with a three year average of approximately $4.98/MMBtu.[17] Current natural gas futures prices for 2018 and 2019, the period during which the Project developments are currently anticipated to become operational, average approximately $6.46/MMBtu, 30% higher than the average over the historical period underlying the model.[18] Higher future natural gas prices will tend to increase the impact of hydroelectric generation on wholesale prices, because this will tend to magnify the cost difference between generators at the margin. The reverse is true for lower future natural gas prices.

- **Generation Supply.** During the modeled period, the summer capacity reserve margin (i.e., the excess of capacity relative to peak demand) for the New York Control Area as a whole averaged approximately 23%. However, NYISO forecasts show a higher projected summer reserve margin of greater than 30% for 2018 and beyond.[19] A higher capacity reserve margin means that marginal generating units that set the market clearing price for energy will generally be lower down the stack, and that the value of displacing that generation through increased hydroelectric generation will be lower, all else equal.

- **Electricity Demand.** As noted above, the historical data used to estimate the load-price model cover a period that includes a notable, if transitory, decline in electricity demand.

---

[17] Calculated as a simple average of daily closing prices at Henry Hub for the model period, June 2008 through May 2011.

[18] Calculated as a simple average of NYMEX natural gas futures for the corresponding months, quoted June 29, 2011.

[19] NYISO, *2011 Load & Capacity Data* (April 2011), available at http://www.nyiso.com/public/webdocs/services/planning/planning_data_reference_documents/2011_GoldBook_Public_Final.pdf.

Higher demand levels and rates of load growth in the future would tend to increase the wholesale price benefit from Project generation.

- **Limited new baseload capacity**. Projected new baseload capacity (i.e., resources such as nuclear, coal and large run-of-river hydro, at the bottom of the resource stack) is quite limited, and is dwarfed by the expected growth of peak load. As load continues to grow beyond the existing volume of baseload capacity, the benefit from increased hydroelectric generation increases because there are an increasing number of hours when higher cost resources are necessary to serve load. This effect will tend to offset that of the projected increases in system reserve margin, discussed above.

- **Regulation of greenhouse gases**. The potential for new state and federal controls on greenhouse gas emissions, particularly a carbon tax or cap-and-trade limits on carbon output, will tend to increase the cost of generating electricity from fossil fuels, and reduce the viability of baseload coal generation. This will increase the value of the generation from the proposed Project development hydroelectric generation relative to that estimated in our model.

On balance, it is expected that the future market price reduction benefits of generation from the Project stated herein are likely to be conservative.

4.3.1 Interpretation of Economic Benefits

The estimated benefits of lower wholesale energy prices would be expected to flow over time to consumers, mediated by the various rate setting mechanisms that apply in New York's utility service territories. While lower electric energy costs would seem an unalloyed benefit to the economy, the interpretation of estimated cost reductions as a net economic impact must be approached with caution. It must be recognized, for instance, that the benefit to consumers of slightly cheaper electricity is mirrored by the dis-benefit to certain suppliers of reduced revenue. For the economy as a whole, it is difficult to determine the net economic impact. If one were to consider such effects by modeling them in an economic impact analysis model, such as IMPLAN, it might be possible to specify a slight increase in overall demand in the economy resulting from increased disposable income and increased business expenditures made possible by reduced expenditures on energy, but the reduced expenditures on energy would need to be modeled as reduced demand in the energy sector. It is very likely that there would be a net positive effect from an overall increase in economic efficiency resulting from decreased energy costs, but this net effect is difficult to quantify, and such an analysis was not conducted as part of this assessment.[20]

Another potential complication is that, all else equal, a price reduction will tend to increase energy consumption. This must be considered a net benefit to energy consumers (otherwise

[20] Evaluating the effect of changes in input costs is difficult in a model such as IMPLAN because it is effectively specified with fixed input prices. With IMPLAN, economic impacts are estimated from dollar changes in demand for each industrial sector, and it is difficult (or practically infeasible) to modify the model matrices and inputs to reflect a change in input prices.

there would be no increase in consumption), yet such an effect will tend to offset such benefits as reduced emissions of pollutants, addressed below.

4.4 Environmental Externality Benefits

Generation from the Project, estimated at approximately 57,000 MWh per year of emissions-free electricity, would provide environmental benefits by displacing generation of electricity from fossil fuels. **Table 4.2** shows the annual tons of emissions associated with generating an equivalent amount of energy from coal, oil and natural gas.

Table 4.2: Emissions from Generating 57,000 MWh of Energy from Fossil Fuels[21]

	Tons of emissions		
Fuel	**SO_2**	**NOx**	**CO_2**
Coal	370	171	64,066
Oil	342	114	47,629
Natural Gas	3	48	32,332

Source: U.S. Environmental Protection Agency, based on data from eGRID 2000

To provide some further context for the data in **Table 4.2**, the potential CO_2 emissions reductions resulting from output associated with the Project was translated into the number of passenger vehicles removed from the road that would provide an equivalent reduction, as shown in **Table 4.3**.

Table 4.3: Passenger Vehicle Equivalent Output of CO_2 Relative to Generating 57,000 MWh by Fuel Type[22]

	# of Passenger Vehicles
Coal	11,088
Oil	8,244
Natural Gas	5,596

The reduction in pollutant emissions from displaced fossil generation would be a very concrete benefit of generation by the Project developments. It is necessarily true that output from the plants, though small, would cause output from fossil-fueled generation that is virtually always on the margin in NYISO to be reduced. This highlights another, closely related, benefit of an

[21] Emissions rates used for calculation are the U.S. national average rates for electric generation for each fuel type.

[22] Motor vehicle equivalent of CO_2 output is based on U.S. EPA calculations, available at http://epa.gov/otaq/climate/420f05004.htm.

increase in hydroelectric generation, which is simply the reduced consumption of non-renewable fossil resources.

4.5 System Reliability Benefits

The City retained the services of PowerGem, LLC ("PowerGEM"), a power grid engineering and markets consulting firm, to perform a preliminary transmission assessment of the Project in order to determine whether there are any transmission limitations at the Project development sites that may restrict the dispatch of the full output of the proposed plants. The preliminary assessment was conducted by PowerGem in a manner reflecting system reliability interconnection study requirements and practices, concluded that the interconnection of the Cannonsville Development is feasible as proposed. However, the assessment of the feasibility of interconnecting the Pepacton and Neversink Developments has not been fully completed to date.

As analyzed by PowerGem, the Cannonsville Development would be connected to one of two 46 kV NYSEG local transmission lines connected to the Stiles 115 kV substation. Both lines serve load in rural communities well below the lines' normal pre contingency and post contingency capacity ratings, as established by NYISO reliability criteria. The transfer analysis and redispatch analyses performed by PowerGem indicate it is feasible to interconnect the Cannonsville Development and operate it at its full output without undue impact on the reliability of the NYISO bulk transmission system.

In the case of the Pepacton and Neversink Developments, PowerGem has preliminarily identified two nearby existing 4.8 kV lines as potential points of interconnection. Upon filing of an application by the City to request review of the proposed interconnections with NYSEG, NYSEG will determine whether interconnection to the selected points is feasible. However, it is important to note that the maximum output of each of these proposed Project developments (currently anticipated to be less than 2 MW each) is well below the typical 5-10 MVA rating of a 4.8 kV distribution network, thus, interconnection at this voltage would appear to be feasible.

In addition to not negatively affecting the reliability of the New York power grid, as preliminarily determined by PowerGem, the interconnection of the proposed Project developments may, in at least two of the three sites, provide additional reliability and power quality benefits to the grid. These benefits, derived from the design and operational characteristics of similar hydroelectric projects, and accrued at both the local and the Statewide level, are discussed in the following sections.

4.5.1 Ancillary Service Benefits

The balancing of supply and demand in the day-to-day operation of a power system in order to maintain reliability and security requires that the system's operators manage the provision of ancillary services. These services are physically supplied by the generators, transmitters, and loads that are connected to the system.

Table 4.4: Ancillary Service Capabilities of Hydroelectric Generation Facilities

Regulation and Frequency Control Ancillary Services from Hydroelectric Generation	
Fast reserves (6 second response)	Not Fast Enough Potential negative initial response due to pressure drop upon opening gate valve.
Slow Reserves (60 seconds response)	Good Up and Down
Delayed Rserves (300 seconds response)	Good Up and Down
Fast start Up	Good
Regulation	Good Up and Down

Hydroelectric generators have technical advantages over other types of generation with respect to the supply of ancillary services. These advantages include: fast response, better part-load efficiency, better controllability, lower maintenance costs and minimal to no startup (unit commitment) costs; as illustrated in Table 4.4.

Two of the proposed hydroelectric generation facilities are well suited to provide at least two of these services: reactive supply and voltage control, and regulation and frequency response. In New York, these reliability-related services are the responsibility of the NYISO in its role as the balancing authority for the New York Control Area. NYISO operates a regulation service market in which the Cannonsville Development, in theory, could sell regulation services. As with the sale of the energy produced by the Project, the sale of ancillary services may have a similar price reducing impact on the market price for such services in the applicable NYISO pricing region for such services.

The Cannonsville and Pepacton Developments, as further explained below, may be entitled to compensation for their contribution to reactive power supply and voltage control under one of NYSEG's tariffs.

Reactive power is a concept used by engineers to describe the background energy movement in an Alternating Current ("AC") system arising from the production of electric and magnetic fields in electrical machinery used at consumers facilities, generators and transmission and distribution equipment. Different types of devices either generate or absorb reactive power. Since reactive power does not produce useful work while taking up transmission capacity and contributing to energy loss, utilities and system operators actively manage their occurrence. Reactive power flows can give rise to substantial voltage changes across the system, which means that it is necessary to maintain reactive power balances between sources of generation and points of demand on a "zonal basis". Unlike system frequency, which is consistent throughout an interconnected system, voltages experienced at different points across the system at different times are uniquely related to constantly changing local generation and demand profiles. Thus, power flows, both actual and potential, must be carefully controlled for a power system to operate within acceptable voltage limits. The local transmission and distribution utility is obligated to secure the transmission network to closely defined voltage and stability criteria, mainly through varying circuit arrangements, transformers and reactive compensation.

Most consumer equipment connected to an electricity system will generate reactive power, necessitating the application of devices that will absorb it, such as capacitors and synchronous generators, in order to control voltage. Synchronous generators are capable of producing and consuming reactive power (VARs) by varying the intensity of the magnetic field (excitation level) of the generator. When a synchronous generator is overexcited, it generates reactive power and delivers it to the system. When the generator is under-excited, negative reactive power flows from the system into the generator. When the generator operates at unity power factor it will neither draw from nor deliver reactive power to the system. Thus, a synchronous generator can provide a boost to the voltage at the point of interconnection akin to that provided by capacitor banks, which are often used by electric utilities to improve voltage regulation on their transmission and distribution lines.

The Cannonsville and Pepacton Developments will utilize synchronous generators, and will thus be able to provide reactive power support services to NYSEG, if necessary. This feature may prove of significant value to NYSEG depending on the topology of the transmission and/or distribution system at the respective points of interconnection. As noted previously, the Pepacton Development is currently proposed to be connected to 4.8 kV distribution lines serving relatively sparse load. Typically, the design and operation of this type of rural line is driven by voltage drop constraints and will thus likely benefit from the reactive and voltage support provided by the hydroelectric generation facility associated with the proposed Pepacton Development.

Figure 4.4: Line Voltage Regulation Benefit of Local generation

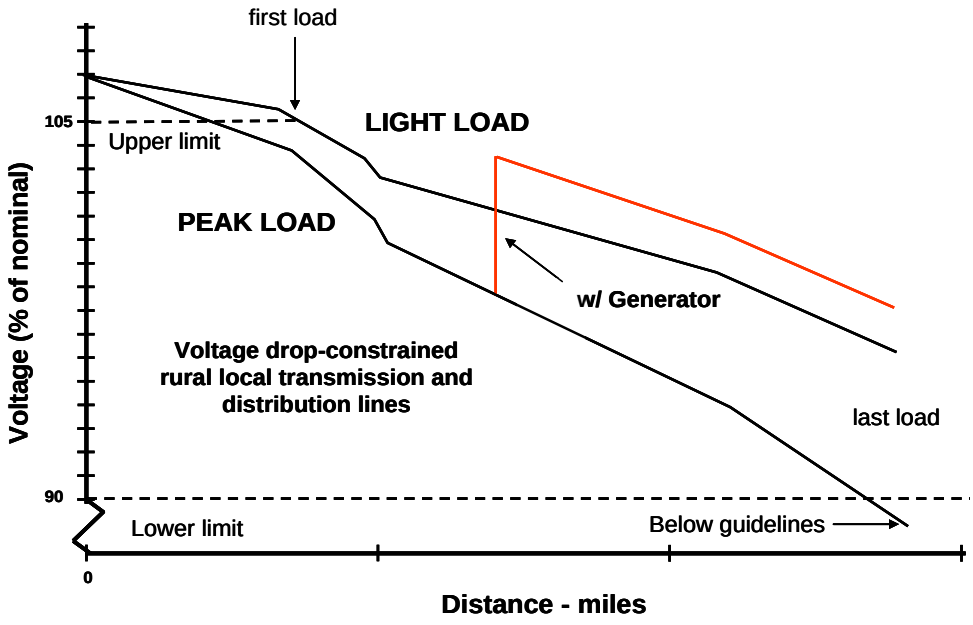


Figure 4.4 illustrates the potential impact of interconnecting a new synchronous generator to the voltage drop profile on an existing distribution line. Depending on the existing configuration of the distribution network and its capacity-demand balance, the Cannonsville and Pepacton

Developments may significantly improve the voltage regulation for the NYSEG customers downstream of the respective points of interconnection.

Another benefit potentially derived by NYSEG from the interconnection of the proposed Project developments may be the deferral of the need to add upstream capacity to meet growing demand. Distribution feeders, and the upstream transformers and switchgear that supply, are typically sized to accommodate growing demand for a number of years. As the growing load approaches the capacity limits of these components, the ability of the system to operate within the applicable service voltage standard during periods of high load, as illustrated in Figure 4.3, requires the utility to first rely on operational adjustments, such as raising the transformer's voltage at the substation where the feeder originates. As continued load growth eventually outstrips the capabilities of this solution, the utility can opt between adding capacitors and voltage regulators to keep all customers along the feeder within the minimum voltage standard; transferring part of the feeder's load to a new or existing feeder; or replacing the feeder's conductors with new ones of larger capacity (if the existing structures and conductor support hardware can accommodate it). The increasing load must also be accommodated by the existing switchgear, the voltage regulator and the distribution bus at the substation and, ultimately, by the substation transformer itself. As these components reach their capacity limits, additional substation equipment must be added to serve the increased load. In some cases, a new substation may be required.

With the exception of strictly operational methods to improve voltage regulation, the utility has to make capital investments to meet load growth for a number of years. However, upon interconnection, the energy and capacity produced by the Pepacton and Neversink Developments will help meet load growth, and, thus, may help to defer NYSEG's need for capital investment in upstream capacity.

5.0 CONCLUSION

The Cannonsville, Pepacton and Neversink Developments are projected to have a modestly positive impact on employment, earnings and economic output in Delaware and Sullivan counties. In part because of the relatively small number of jobs the three developments would create, adverse socioeconomic impacts are likely to be minimal or non-existent.

Moreover, the renewable electricity generated by the Project developments is expected to cause a small reduction in wholesale electricity market prices in New York and modest reductions in annual pollutant emissions from fossil-fuel fired generation sources by displacing the output from such sources. In addition, the Project developments may provide modest additional reliability and power quality benefits at both the local and statewide level.

APPENDIX A: IMPLAN MODEL AND THE MULTIPLIER EFFECT

Spending on the construction and operation of the Project – and the jobs associated with that spending – provide a direct measure of the Project's impact on the local economy. The regional impacts, however, go beyond these direct measures. Each dollar spent in connection with the Project produces what economists sometimes call indirect and induced effects – commonly referred to as the "multiplier effect."

The Project's *indirect impacts* are products of spending by the local companies, contractors and vendors from which the City and the Project's operators buy goods and services. Construction contractors, equipment suppliers, and other firms use the payments they receive to pay their employees, rent space, buy equipment, supplies and other services – all of these expenditures have an impact on the economy as well. The Project's *induced impacts* represent the impact of routine household spending by employees of the contractors, employees of the Project's operators, and by employees of the Project's suppliers (e.g., expenditures for rent, food, clothing, transportation and child care).

There are several quantitative economic models that can provide an approximate measure of indirect and induced effects. Using one of these models – IMPLAN – the impact of spending in connection with the Project on total economic output, wages and employment in Delaware County and Sullivan County was estimated.

The IMPLAN model allows for the tracking of the impact of each dollar of spending as it ripples through other industry sectors in Delaware ad Sullivan Counties, translating the allocation of spending across industries into estimates of employment and wages.

APPENDIX B: WHOLESALE ENERGY PRICE IMPACT MODEL

Consistent with other centralized markets, in the NYISO-administered markets, real-time energy prices are determined by the last generation unit required to meet demand, considering system transmission constraints. Output from the Project would reduce the need for higher-cost units to run in many hours, and thereby lower wholesale market-clearing prices. To assess the magnitude of the benefit of induced lower energy prices, a statistical model was developed to estimate the relationship between changes in generation capacity and changes in real-time energy prices. The statistical analysis for the NYISO-administered markets, the resulting model, and the underlying model logic are described in this Appendix B.

Fundamental to the estimation of economic benefits from the output of the Project is the fact that the generation facilities associated therewith are hydroelectric facilities with very low variable operating costs. It will therefore nearly always be economic to operate such facilities, and their output will displace generation of more expensive fossil-fuel fired generation setting the market price on the margin. The fact that the Project's proposed hydroelectric generation facilities operate at the bottom of the resource supply stack makes it possible to model the price impact of the generation output associated therewith as an equivalent, and opposite, change in load (i.e., electrical demand).

Using available historical market data (hourly loads, real-time clearing prices, and daily natural gas prices), a statistical model of the relationship between load and energy prices in the NYISO-administered markets was constructed. This relationship was then used to estimate the effect on prices of projected output from the Project.

For an arbitrary, short period of time, the availability of generation to serve load in a given area and the variable cost of such resources, can be considered fixed. In a system with economic dispatch and no transmission constraints, this amounts to a fixed supply curve, such that the market-clearing price is determined by the level of total demand. This is illustrated in Figure B.1, where a load of 8,500 MW results in a clearing price of approximately $50/MWh.

Figure B.1: Illustrative Load-Price Relationship

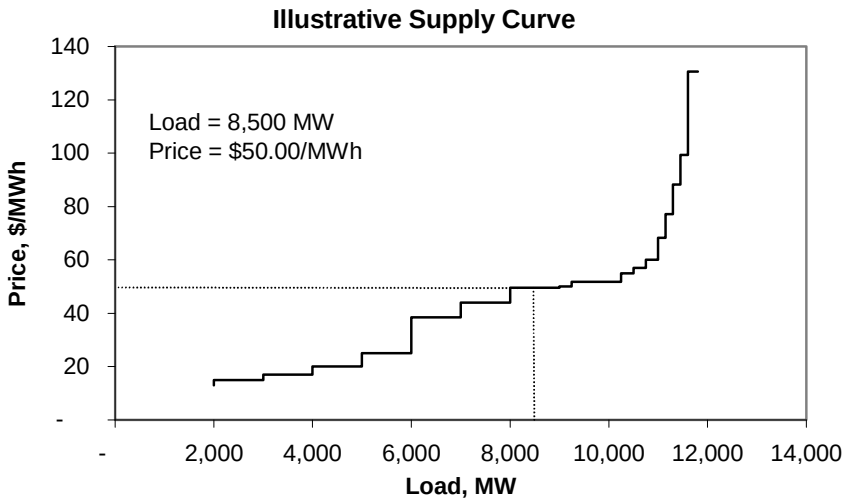
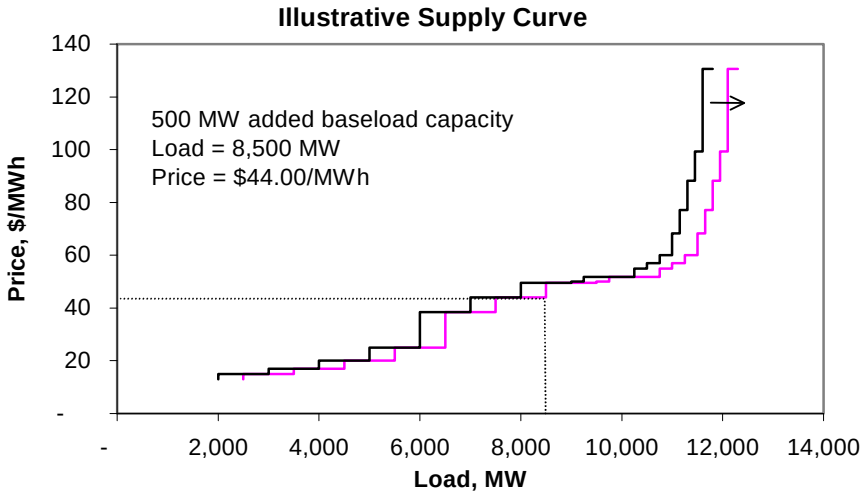


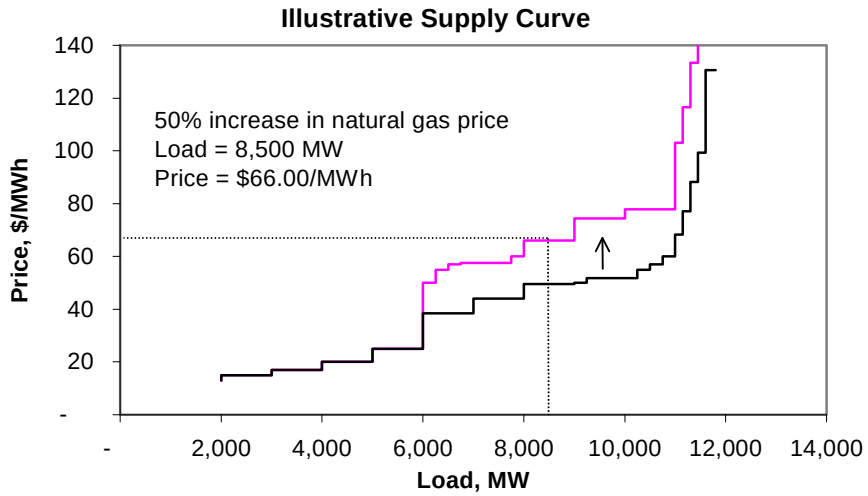
Figure B.2 illustrates what happens when baseload generation such as run-of-river hydroelectric or nuclear increases. The supply curve shifts to the right, eliminating the need for the $50.00/MWh resource to run in order to meet load, thereby, allowing the market-clearing price to be set by the next lowest cost resource at $44.00/MWh. This illustrative example shows the effect of adding 500 MW of baseload capacity, an amount far greater than the capacity associated with the proposed Project developments, in order to create a clear visual presentation. Though the magnitude of output from the proposed Project developments would be a fraction of that illustrated below, the fundamental principle is the same.

Figure B.2: Increased Baseload Generation



The shape of the supply curve is also sensitive to changes in fuel prices. The primary source of price volatility is the natural gas commodity price. Figure B.3 illustrates the impact on the supply curve of a 50% increase in natural gas prices.

Figure B.3: Natural Gas Price Increase



To account for changes in the shape of the supply curve, either resulting from fuel price changes or seasonal changes in resource capacity and availability, the load and price data were categorized by period and by the prevailing level of natural gas prices. Separate regressions of price on load were calculated for each grouping. The segmentation by natural gas price removes this factor as an explanatory variable and isolates changes in load as the explanatory variable determining price variation. The purpose of this analysis is not to forecast electricity prices, but, rather, to examine the relative impact of a change in baseload generation on energy prices.

This analytical approach offers some advantages over a structural model, particularly in reflecting market dynamics. For example, in a structural model (i.e., a model that attempts to simulate the operation of individual generation resources) shocks to the system, such as unforced generation outages, must be either ignored or specified as probabilities. Moreover, other factors, such as the ability of some plants to operate beyond nameplate capacity for short periods, or other dynamic responses by market participants, are difficult to incorporate in structural models. However, information about such influences is implicit in the historical market data utilized by the model, and the statistical approach can account for it as a matter of course.

NYISO Price-Load Model Specification

Hourly loads and hourly real-time locational-based marginal prices ("LBMPs") for the NYISO-administered markets were obtained from for the 36-month period June 2008 through May 2011. The 36-month period was selected to be long enough to encompass sufficient variation to produce meaningful statistical results, while not being so long as to invalidate the assumption of a reasonably stable generation supply curve.

The model was specified for the western part of NYISO, encompassing Zones A, B, C and E. Hourly load for the western region was determined as the simple sum of hourly zonal loads. Hourly prices were calculated on a load-weighted basis for the model region.

Daily natural gas spot prices at Henry Hub were obtained for the same June 2008 through May 2011 period.

The statistical model parses the year into six bimonthly groups. This segmentation accounts for seasonal differences in capacity availability and generation capability. The load and LBMP data were further parsed into subsets of the bimonthly groupings based on ranges of historical natural gas prices. Table B.1 shows the twelve parsed subgroups utilized by the model.

Table B.1: Regression Subgroups

Bimonthly Group	Gas Price Range, $/mmBTU	Hours in Subgroup	Average NG Price, $/MMBtu
Jan-Feb	Below $5.00	2496	4.60
	Above $5.00	1752	5.61
Mar-Apr	Below $4.00	2232	3.72
	Above $4.00	2160	4.27
May-Jun	Below $5.50	3672	4.13
	Above $5.50	696	12.64
Jul-Aug	Below $5.00	2976	3.86
	Above $5.00	1488	9.72
Sep-Oct	Below $5.50	2928	3.58
	Above $5.50	1464	7.20
Nov-Dec	Below $5.00	2352	3.74
	Above $5.00	2040	6.01

Regressions were then run for each of the subgroups, using the log-linear functional form shown below, where *LBMP* is taken to be the load-weighted average price,[23] and *Load* is the hourly New York Control Area load divided by 1,000.[24]

$$\ln(LBMP) = \alpha + \beta_1 Load + \beta_2 Load^2 + \beta_3 Load^3 + \beta_4 Load^4 + \beta_5 Load^5$$

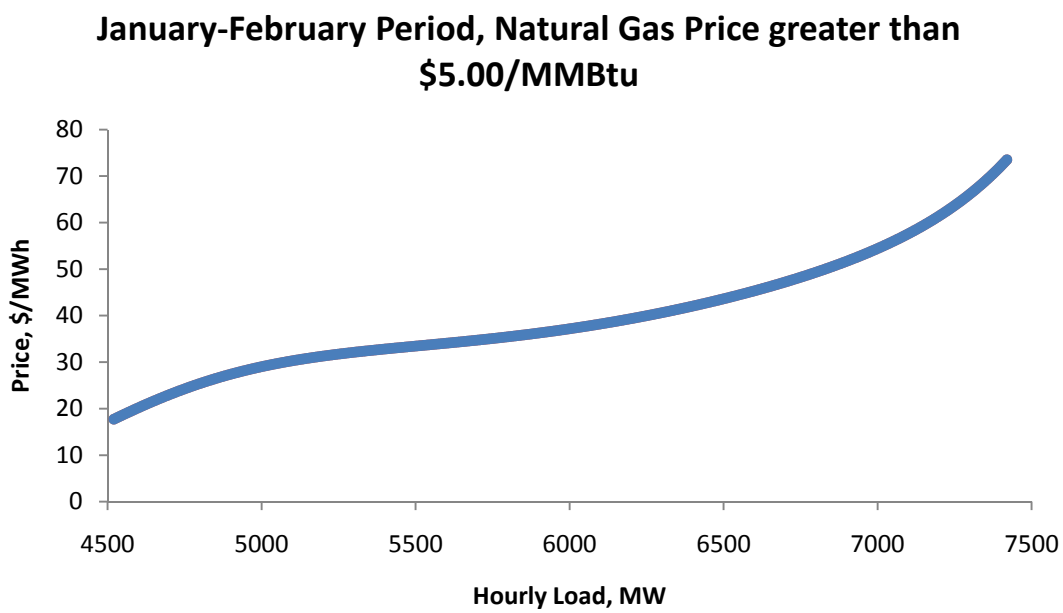
[23] Using the log of price in the regressions restricts the estimated prices to positive values. This is a commonly applied technique. In the occasional cases where negative hourly LBMPs occur (rendering the log of price meaningless) the previous hour's LBMP is used.

[24] The use of the divisor 1,000 prevents the power variables from exploding beyond the significant digit capability of Microsoft Excel, which was used to estimate the regressions.

The incorporation of the powers of load allows the estimated price curve to reflect the shape of the underlying, cost-based supply curve. For the NYISO-administered markets, the supply curve for a given period is generally characterized by: (1) a low and rising shape (i.e., low price) for lower levels of demand (corresponding to supply from hydroelectric, nuclear and baseload coal generation resources); (2) a middle plateau (corresponding to intermediate fossil–fuel fired generation); and (3) a sharp rise at high loads (corresponding to expensive, peaking resources).

Figure B.4 depicts the price-load function based on the regression results for the first January-February subgroup itemized in Table B.1. The X-axis represents the approximate range of actual load during the relevant periods (January and February of 2009, 2010, and 2011) when the price of natural gas was greater than $5.00/MMBtu.

Figure B.4: Example Estimated Price Curve



A reference series of hourly energy prices for each sub-period was first estimated to establish the status quo. Change cases were then calculated reflecting output from the Project. To do this, hourly loads for each estimation period were *reduced* by an amount corresponding to the projected average output from the Project.

The dollar benefit to load (consumers) in the western NYISO region from the generation associated with the Project was then calculated as the hourly price change, multiplied by the hourly load in each sub-period, summed over the three years of data and averaged to calculate an annualized value.

The base model assumed that daily generation associated with the Project would be spread evenly across all hours of each day.[25] An alternative representation of generation was also modeled as a sensitivity. For the purposes of such sensitivity, instead of modeling the impact of average hourly generation associated with the Project, the full capacity output of the Project's generation facilities was modeled for every hour, and the resulting impact was then reduced according to projected generator capacity factors.[26] The results of this alternative specification were very close to the base case results, reflecting the fact that total output and average output are both very small relative to the total NYISO system, and have effects at virtually the same part of the estimated load-price function.

[25] Daily generation was based on estimates provided by Gomez and Sullivan Engineers, PC – the City's lead consultant with respect to the Project – which was derived from 60 years of historical water release data.

[26] Capacity factor is a measure of actual or projected output as a percentage of theoretical maximum output across all hours.