BROADWATER

RESOURCE REPORT NO. 5

SOCIOECONOMICS

FOR A

PROJECT TO CONSTRUCT AND OPERATE A

LIQUEFIED NATURAL GAS RECEIVING TERMINAL

IN

LONG ISLAND SOUND

LONG ISLAND, NEW YORK

UNITED STATES OF AMERICA

JANUARY 2006

Privileged Information has been removed from the Public Volume and is contained in the Privileged Volume.

Resource Report 5 – Socioeconomics

Minimum Filing Requirement	Location in Environmental Report
• • For major aboveground facilities and major pipeline projects that require an EIS, describe existing socioeconomic conditions within the project area. (§ 380.12 (g) (1)).• •	Section 5.2
• • For major aboveground facilities, quantify impact on employment, housing, local government services, local tax revenues, transportation, and other relevant factors within the project area. (§ 380.12 (g) (2-6)).	Section 5.3

Additional Information	
• • Evaluate the impact of any substantial immigration of people on governmental facilities and services and describe plans to reduce the impact on local infrastructure.• •	Sections 5.3.2.6, 5.3.2.7, and 5.3.2.10 (Construction) Sections 5.3.3.2 and 5.3.3.5 (Operations)
• • Describe on-site manpower requirements, including the number of construction personnel who currently reside within the impact area, would commute daily to the site from outside the impact area, or would relocate temporarily within the impact area.• •	Sections 5.3.2.6 and 5.3.2.7 (Construction) Section 5.3.3.2 (Operations)
• • Estimate total worker payroll and material purchases during construction and operation.•	Section 5.3.2.5 (Construction) Section 5.3.3.1 (Operations)
• • Determine whether existing housing within the impact area is sufficient to meet the needs of the additional population.• •	Sections 5.2.7, 5.2.7.2, and 5.3.2.11 (Construction) Sections: 5.2.7, 5.2.7.2, and 5.3.3.6 (Operations)
• • Describe the number and types of residences and businesses that would be displaced by the project, procedures to be used to acquire these properties, and types and amounts of relocation assistance payments.• •	Section 5.3.2.11 (Construction) Section 5.3.3.6 (Operations)
• • Conduct a fiscal impact analysis evaluating the incremental local government expenditures in relation to incremental local government revenues that would result from construction of the project.• •	Section 5.3.2.10 (Construction) Section 5.3.3.5 (Operations)

Environmental Information Request
October 19, 2005

Request	Location in Environmental Report
22. State what fees and/or taxes Broadwater will pay to the New York State Office of General Services for use of the right-of-way and the FSRU site.	Resource Report No. 8, Section 8.9
23. With regard to commercial fishing: a. Describe the economic effects of construction and operation on commercial fishing and what mitigation measures Broadwater would incorporate into the project to eliminate or minimize those impacts; b. Compare the economic impacts presented in Item a to the impacts that resulted from construction of other subsea utilities such as the IGTS pipeline and the cross-sound cable; and c. Provide an estimate of the number of lobster fishermen and the number of lobster pots potentially displaced by a safety zone around the mooring tower/FSRU and compare this to the total number of lobster fishermen and pots in the Sound. What compensation options, if any, are being considered?	Resource Report No. 8, Section 8.3.3

Summary of Outstanding Environmental Information Requests
October 19, 2005

Request	Location in Environmental Report
• Describe existing coordination (if any) between the Orient Point ferry and other maritime ships, the frequency of ferry crossings, and the number of individuals typically taking the ferry. Draft Resource Report 5 does not describe existing coordination, the frequency of ferry transits, or the number of people typically taking the ferry.	Resource Report No. 8, Section 8.3.7.3

Summary of Outstanding Environmental Information Requests
October 19, 2005

Request	Location in Environmental Report
Specific impacts to be addressed included:	
• List all staging areas by state and municipality. Draft Resource Report 5 does not list staging areas or provide the number, type or approximate location of potential staging areas.	Onshore Resource Reports
• Describe the level of anticipated effort for local, state, and federal response personnel identified as part of standard operating procedures and Emergency Response Plans. The draft resource reports do not provide the anticipated level of response efforts or provide Emergency Response Plans.	Resource Report No. 11, Section 11.6
• Describe any potential fishing impacts to the pipeline. The draft resource reports do not describe whether fishing gear could impact the pipeline.	Section 8.3.3
• Describe the effect of construction and operation on recreational and commercial fishing including impacts on fishery resources, required changes in the behavior of fisherman, any fishing concerns along the pipeline route, and impacts to fishing navigation. Draft Resource Report 8 does not address economic impacts to the commercial or recreational fisheries, or impacts to commercial or recreational fishing activities associated with LNG carrier traffic.	Section 8.3.3

Table of Contents

List of Tables

List of Figures

List of Acronyms and Abbreviations

AFUDC	Allowance for Funds Used During Construction
bcf	billion cubic feet
bcfd	billion cubic feet per day
CEQ	Council on Environmental Quality
CO_2	carbon dioxide
DICE	Dynamic Integrated Climate Economy Model
DOE	(United States) Department of Energy
EMS	emergency medical service
FERC	Federal Energy Regulatory Commission
FSRU	Floating Storage and Regasification Unit
GHG	greenhouse gases
GMP	gross metropolitan product
GW-hr	gigawatt hour
IGTS	Iroquois Gas Transmission System
IMPLAN	Impact Analysis for Planning Software
km	kilometer
KW-hr	kilowatt-hour
LNG	liquefied natural gas
m	meter(s)
MW-hr	megawatt-hour
NAIC	North American Industrial Classification
NYS	New York State
NYSERDA	New York State Energy Research and Development Authority
NYSORPS	New York State Office of Real Property Services

$PM_{2.5}$	particulate matter 2.5 μm in diameter or smaller
PM_{10}	particulate matter 10 μm in diameter or smaller
SIC	Standard Industrial Classification
SO_2	sulfur dioxide
STV	shell and tube vaporizer
YMS	yoke mooring system

5. SOCIOECONOMICS

5.1 INTRODUCTION

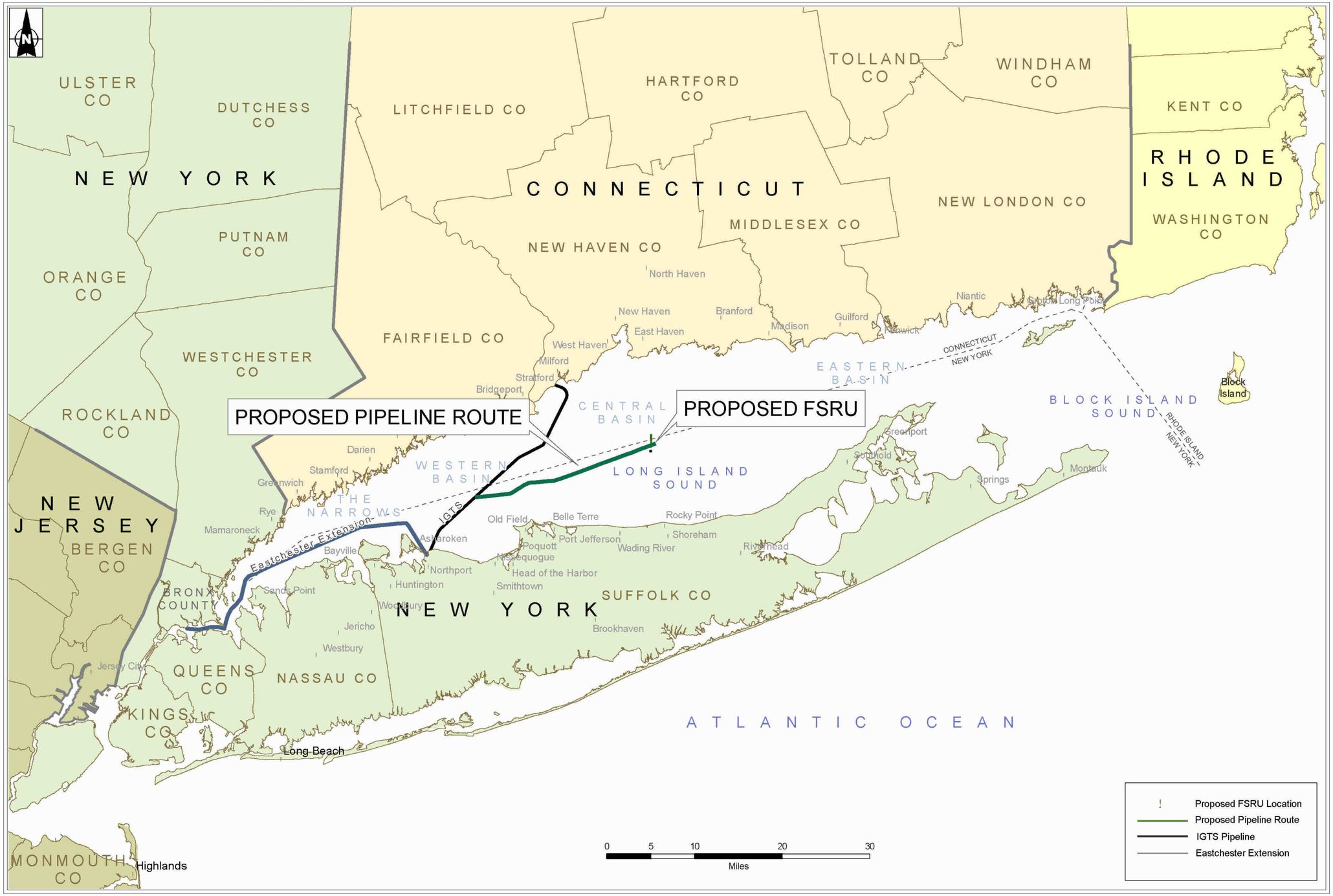
Broadwater Energy, a joint venture between TCPL USA LNG, Inc., and Shell Broadwater Holdings LLC, is filing an application with the Federal Energy Regulatory Commission (FERC) seeking all of the necessary authorizations pursuant to the Natural Gas Act to construct and operate a marine liquefied natural gas (LNG) terminal and subsea pipeline for the importation, storage, regasification, and transportation of natural gas. The Broadwater LNG Project (the Project) will increase the availability of natural gas to the New York and Connecticut markets through an interconnection with the Iroquois Gas Transmission System (IGTS). The FERC application for the Project requires the submittal of 13 Resource Reports, with each report evaluating Project effects on a particular aspect of the environment.

Resource Report 5 describes the existing socioeconomic conditions in the Project area, provides an assessment of the potential impacts resulting from construction and operation of the Project, and describes methods to mitigate any potential adverse impacts. Section 5.2 summarizes the existing base conditions in the vicinity of the Project, including descriptions by county; Section 5.3 discusses socioeconomic impacts and their mitigation; and Section 5.4 presents a complete list of sources used to prepare this report.

The proposed Broadwater LNG terminal will be located in Long Island Sound (the Sound), approximately 9 miles (14.5 kilometers [km]) from the shore of Long Island in New York State waters, as shown on Figure 5-1. The LNG terminal facilitates the sea-to-land transfer of natural gas. It will be designed to receive, store, and regasify LNG at an average throughput of 1.0 billion cubic feet per day (bcfd) and will be capable of delivering a peak throughput of 1.25 bcfd. The Project will deliver the regasified LNG to the existing interstate natural gas pipeline system via an interconnection to the IGTS pipeline. Onshore facilities are discussed in the Onshore Facility Resource Reports.

The proposed LNG terminal will consist of a floating storage and regasification unit (FSRU) that is approximately 1,215 feet (370 meters [m]) in length, 200 feet (60 m) in width, and rising approximately 80 feet (25 m) above the water line to the trunk deck. The FSRU's draft is approximately 40 feet (12 m). The freeboard and mean draft of the FSRU will generally not vary throughout operating conditions. This is achieved by ballast control to maintain the FSRU's trim, stability, and draft. The FSRU will be designed with a net storage capacity of approximately 350,000 cubic meters [m^3] of LNG (equivalent to 8 billion cubic feet [bcf] of natural gas) with base vaporization capabilities of 1.0 bcfd using a closed-loop shell and tube vaporization (STV) system. The LNG will be delivered to the FSRU in LNG carriers with cargo capacities ranging from approximately 125,000 m^3 up to a potential future size of 250,000 m^3 at a frequency of two to three carriers per week.

\\BUFSDL4\GIS\Pensacola\LNG\BROADWATER\Maps\MXD\Resource_Reports_Final\RR5\site_map_with_Eastchester.mxd 01/11/2006



Source: ESRI StreetMap, 2002.

Figure 5-1
Proposed Broadwater Project
Location in Long Island Sound

The FSRU will be connected to the send-out pipeline, which rises from the seabed and is supported by a stationary tower structure. In addition to supporting the pipeline, the stationary tower also serves the purpose of securing the FSRU in such a manner to allow it to orient in response to prevailing wind, wave, and current conditions (i.e., weathervane) around the tower. The tower, which is secured to the seabed by four legs, will house the yoke mooring system (YMS) allowing the FSRU to weathervane around the tower. The total area under the tower structure, which is of open design, will be approximately 13,180 square feet (1,225 square meters [m^2]).

A 30-inch-diameter natural gas pipeline will deliver the vaporized natural gas to the existing IGTS pipeline. It will be installed beneath the seafloor from the stationary tower structure to an interconnection location at the existing 24-inch-diameter subsea section of the IGTS pipeline, approximately 22 miles (35 km) west of the proposed FSRU site. To stabilize and protect the operating components, sections of the pipeline will be covered with engineered back-fill material or spoil removed during the lowering operation. Figure 5-1 presents the proposed pipeline route.

5.2 PROJECT AREA OVERVIEW

This section describes the existing socioeconomic environment of the communities closest to the proposed Project. Stakeholder outreach identified communities in the northern portion of Suffolk County (i.e., the North Shore) as having the greatest likelihood of being impacted by construction and operation of the Project. For this reason, the jurisdictions south of the proposed Project site were chosen for baseline analysis. These jurisdictions correspond to the areas that will most likely be used as staging areas to mobilize and position resources during construction. The purpose of describing and documenting the current level of socioeconomic activity in these areas is to form an evaluation baseline against which impacts of the proposed Project can be assessed. The study area, or region of influence, during the construction phase of the Project consists of the municipalities located on the southern (New York) shores of Long Island Sound.

5.2.1 Municipalities in the Project Area

Suffolk County encompasses the eastern two-thirds of Long Island and is the only New York county addressed in this section.

Table 5-1 identifies the relevant counties, towns, and villages that are proximate to the Project area. The counties and municipalities listed contain coastal communities that are within 15 to 20 miles (24 to 32 km) of the proposed Project. Summaries of county profiles are presented because a large portion of the demographic profile information and other relevant data is available from the U.S. Census in county form. County information is supplemented with select municipal (town and village) information and demographic data where it is needed to distinguish and document community profile subareas. The section on existing conditions examines key socioeconomic attributes of these municipalities with respect to baseline (i.e., without Project) conditions. The spatial distribution of these communities relative to the proposed Project is presented on Figure 5-2.

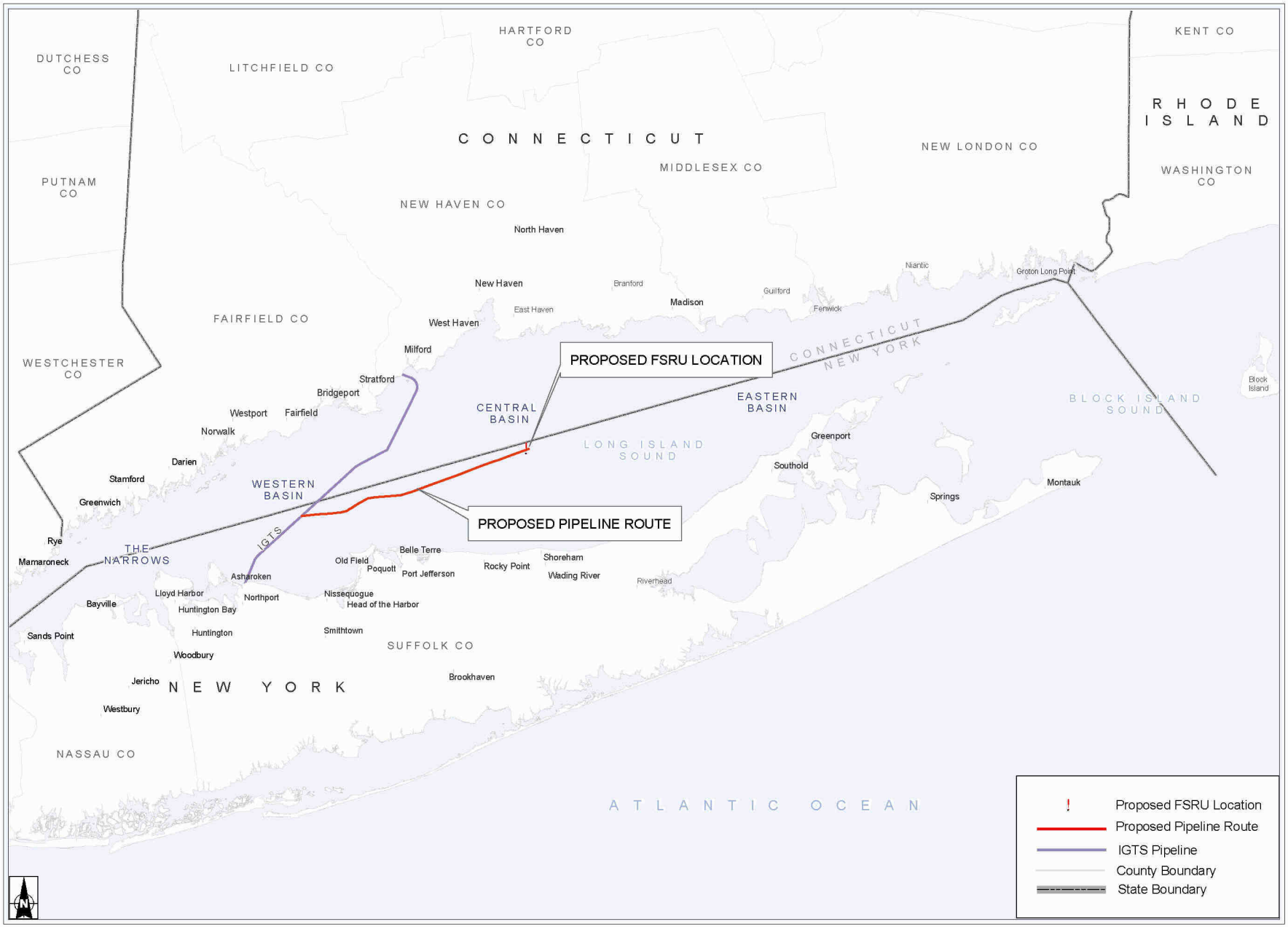
Table 5-1 Study Area Municipalities, Suffolk County, New York

Towns of:
1. Brookhaven
2. Huntington
3. Riverhead
4. Smithtown
Villages/Cities of:
1. Asharoken
2. Belle Terre
3. Head of Harbor
4. Huntington Bay
5. Lloyd Harbor
6. Nissequogue
7. Northport
8. Old Field
9. Poquott
10. Port Jefferson
11. Shoreham

The selection of the municipalities to be profiled was based on their proximity to the Broadwater Project area. The communities of interest are generally within a 15- to 20-mile (24- to 32-km) radius of the proposed Project. These municipalities are highlighted because they have the potential to be impacted during construction or operation of the Project. These municipalities are also the locations for key stakeholders and host jurisdictions that may provide municipal services.

For the construction phase of the Project, the socioeconomic assessment considers the influx of temporary workers coming into the host communities and the land-based impacts associated with installation of the infrastructure. The assessment also includes a fiscal impact analysis that evaluates potential impacts on local public services, including both incremental local government revenues and expenditures.

Table 5-2 shows the distribution of households and occupied housing units in Suffolk County by type of fuel used for home heating purposes. The table is provided to give a sense of the number of energy consumers within the county closest to the proposed Project site.



Source: ESRI StreetMap, 2002.

0 5 10 20
Miles

Figure 5-2 Distribution of Communities in the Vicinity of the Proposed Broadwater Project Location in Long Island Sound

Table 5-2 Households/Occupied Housing Units in Sufffolk County by Type of Heating Fuel Used

	No. of Households/ Occupied Housing Units	%
Utility natural gas	129,887	27.7
Bottled tank or LP gas	8,920	1.9
Electricity	30,153	6.4
Fuel oil, kerosene, etc.	297,010	63.3
Coal or coke	498	0.1
Wood	826	0.2
Solar energy	98	0.02
Other fuel	1,434	0.3
No fuel used	473	0.1
Total:	**469,299**	**100**

Source: U.S. Bureau of the Census 2000a.

Table 5-2 shows that about 28% of the households use cleaner burning natural gas to heat their homes, while the majority of homes are still dependent on fuel oil to provide heat. Table 5-2 reflects the distribution of households (final consumers) by fuel used directly for home heating purposes, and does not capture the fuels used to generate electric power.

5.2.2 Economic Base

Besides functioning as valuable source of commuter labor for the New York City economy, Suffolk County is an important economic area in its own right. For example, the gross metropolitan product (GMP), or the total value of goods and services produced within Nassau and Suffolk combined, was $113 billion in 2002, placing the Nassau/Suffolk GMP 16th in the nation (Long Island Association 2005). (The GMP is not measured separately for Suffolk County.) Table 5-3 provides an overview of key demographic indicators for select municipalities in the Project area. The economic base is also described by examining the distribution of employment by industry.

Table 5-3 Project Area Demographic Indicators

	2000 Population	2000 Population Density (per square mile)	1999 Per Capita Income
New York	**18,976,457**	**402**	**$23,389**
Suffolk County	1,419,369	1,556	$26,577
Huntington	195,289	2,440	$36,390
Northport	7,606	3,278	$43,694
Smithtown	115,715	2,484	$31,401
Brookhaven	448,265	1,858	$24,191

Table 5-3 Project Area Demographic Indicators

	2000 Population	2000 Population Density (per square mile)	1999 Per Capita Income
Shoreham	418	972	$37,620
Riverhead	27,680	407	$24,647

Source: U.S. Bureau of the Census 2000b.

5.2.3 Population

The population of Suffolk County was approximately 1.4 million in 2000 and grew by 7.4% between 1990 and 2000. Suffolk County has developed rapidly in recent years, especially as more people elect to commute greater distances to regional employment centers in New York City. Within Suffolk County, the towns of Huntington, Smithtown, and Brookhaven comprise the majority of the population in proximity to the proposed Project.

On Long Island, the North Shore communities exceed New York State average per capita income and population densities. Most of the municipalities identified in Table 5-3 can generally be described as densely populated, with population densities exceeding the Suffolk County average. An exception is Riverhead, which contains a relatively greater amount of undeveloped land. The population densities are indicative of the relatively advanced level of urban development in the Project area.

5.2.4 Income

Table 5-4 compares per capita incomes for Project area towns and villages to the U.S. and New York State averages. The North Shore of Long Island contains some of the wealthiest households in New York State, and many households possess incomes that are at least twice the New York State and national averages.

Table 5-4 Per Capita Incomes in Project Area Towns/Villages/Counties Compared to State and U.S. Averages

Area	Per Capita Income	Percent of U.S. Average
New York State (Long Island)		
Lloyd Harbor	$76,696	355
Old Field	$73,658	341
Huntington Bay	$71,798	333
Nissequogue	$63,148	293
Poquott	$58,455	271
Belle Terre	$56,191	260
Head of Harbor	$52,999	246
Asharoken	$51,159	237
Northport	$43,694	202
Shoreham	$37,620	174

Table 5-4 Per Capita Incomes in Project Area Towns/Villages/Counties Compared to State and U.S. Averages

Area	Per Capita Income	Percent of U.S. Average
Huntington	$36,390	169
Port Jefferson	$33,852	157
Smithtown	$31,401	145
Suffolk County	$26,577	123
Riverhead	$24,647	114
Brookhaven	$24,191	112
New York Average	$23,389	108
United States	$21,587	100

Source: U.S. Bureau of the Census 2000b.

Because per capita incomes are presented in descending order, national, state, and county averages are interspersed between municipalities to show their relative rankings.

5.2.5 Labor Force

The study area possesses a diverse, highly educated labor force characterized by a high level of participation (based on the number of persons who are part of the labor force as a percent of the total population). The following tables present select data on the size and composition of the labor force for communities within the study area. Table 5-5 shows the size of the civilian labor force in each county and average unemployment rates for 2004.

Table 5-5 2004 Civilian Labor Force and Unemployment Rates of Counties in the Study Area

	Labor Force	Unemployment Rate (%)
Suffolk County, New York	770,672	4.4
New York State	**9,355,000**	**5.8**

Source: U.S. Bureau of Labor Statistics 2004.

Suffolk County possessed a civilian labor force of almost 0.8 million workers in 2004, or about 8% of the New York State total labor pool.

Table 5-6 presents a breakdown of nonagriculture-related employment in the study area in 2002. Healthcare and social assistance together with manufacturing and retail trade are the largest sources of employment, followed by wholesale trade and the professional services industries.

Table 5-6 Comparison of 2002 Suffolk County Employment Levels

Industry	No. of Jobs	%
Forestry, fishing, hunting, and agriculture support	175	0.03
Mining	187	0.03
Utilities	2,082	0.39
Construction	36,767	6.85
Manufacturing	59,489	11.08
Wholesale trade	52,061	9.70
Retail trade	77,291	14.40
Transportation and warehousing	17,683	3.29
Information	19,133	3.56
Finance and insurance	27,297	5.09
Real estate, rental, and leasing	8,110	1.51
Professional, scientific, and technical services	38,848	7.24
Management of companies and enterprises	9,397	1.75
Admin., support, waste mgt., remediation services	35,876	6.68
Educational services	10,444	1.95
Health care and social assistance	77,889	14.51
Arts, entertainment, and recreation	6,893	1.28
Accommodation and food services	32,475	6.05
Other services (except public administration)	21,768	4.06
Auxiliaries (except corporate, subsidiary, and regional management)	2,828	0.53
Unclassified establishments	97	0.02
Total:	**536,790**	**100**

Source: U.S. Bureau of the Census 2005b.

Long Island (including Nassau and Suffolk Counties) is considered a diversified economy, not overly dependent upon any one industry or sector. Data compiled by the Long Island Association shows that the area outperformed other metropolitan regions during the last economic recession in terms of the relative number of job losses sustained (Long Island Association 2005).

Agriculture and commercial and recreational fishing are still important economic activities in Suffolk County. Data on the commercial fishing industry is provided in Resource Report 8, Land Use, Recreation, and Aesthetics.

5.2.6 Unemployment

Unemployment rates in the municipal jurisdictions within the study area are relatively low, ranging from 4% to 5.5%. Suffolk County's unemployment rate is below the New York average of 5.8% (*see* Table 5-7).

Table 5-7 Unemployment Rates

	2004 Unemployment Rate (%)
New York	**5.8**
Suffolk County	4.4

Source: U.S. Bureau of Labor Statistics 2005.

5.2.7 Housing

According to the 2000 Census, Suffolk County contained 374,371 owner-occupied housing units or households and 94,928 rental units. Within Suffolk County, median home values ranged from $151,000 to $900,000 (*see* Table 5-8). One half of the surveyed households possessed homes below the median value and one-half owned higher valued homes. The median is the midpoint above and below which one-half of the households lie. Lloyd Harbor and Huntington Bay have the highest concentration of owner-occupied units, and New Haven has the highest concentration of rental units.

Table 5-8 U.S. Census Housing Stock Characteristics for the Study Area

	Total Number of Housing Units	Number of Owner-Occupied Units	Owner-Occupied Vacancy Rates (%)	Median Value	Number of Occupied Rental Units	Rental Vacancy Rates (%)	Median Monthly Contract Rent
New York							
Suffolk County	522,323	374,371	1.0	$183,500	94,928	3.6	$861
Lloyd Harbor	1,188	1,104	1.9	$912,100	43	0.0	$667
Huntington Bay	560	523	1.1	$616,600	16	0.0	$1,188
Asharoken	314	229	0.0	$583,800	32	0.0	$1,344
Huntington	67,708	56,219	0.7	$276,800	9,698	3.9	$924
Northport	3,052	2,255	1.4	$313,400	697	5.2	$902
Smithtown	39,357	33,616	0.4	$247,900	4,871	2.4	$866
Nissequogue	570	484	0.4	$594,100	49	0.0	$956
Head of Harbor	501	453	1.7	$536,700	31	6.1	$917
Old Field	348	293	0.7	$657,700	22	0.0	$1,188
Poquott	383	272	1.1	$375,000	85	2.3	$1,138
Belle Terre	301	278	1.1	$462,900	9	0.0	$890
Port Jefferson	3,082	2,149	1.1	$251,300	847	0.8	$877
Brookhaven	155,409	115,894	1.2	$158,400	30,938	2.4	$851
Shoreham	172	132	0.0	$294,400	11	0.0	$795
Riverhead	12,479	8,290	1.0	$151,000	2,459	4.2	$729

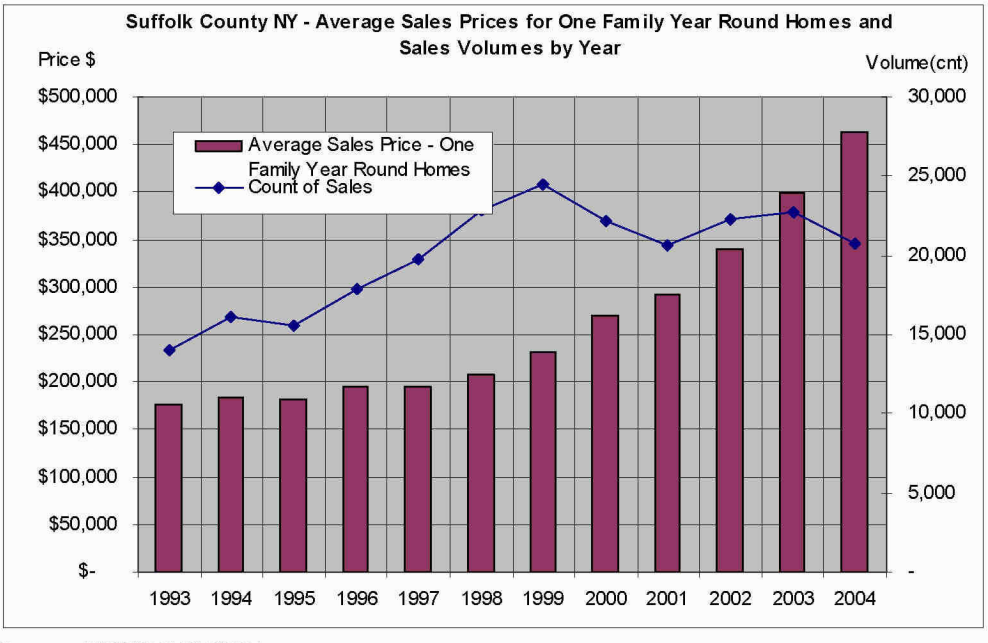
Source: U.S. Bureau of the Census 2000a.

Table 5-8 presents the basic housing statistics for the study area, including vacancy rates, home values, and rent statistics from the U.S. Bureau of the Census. This data is relevant for assessing the availability of the permanent housing stock and rental units needed to accommodate workers during the construction phase of the Project.

5.2.7.1 New York State Office of Real Property Analysis Data for Suffolk County

To provide background history on residential home price appreciation and market activity spanning several years, local data was assembled from the New York State Office of Real Property Services (NYSORPS) SalesWeb database. This readily available data represents tallies of actual "arm's length" valid sales transfers for local properties within Suffolk County and is useful for understanding basic trends in market activity and values over time. "Arm's length" sales reflect sales transfers with no conditions attached; the data just reflect valid sales that took place in an open market, between informed and willing buyers and sellers where neither was under any compulsion to participate in the transaction. This type of sale is unaffected by any unusual conditions that might indicate a reasonable possibility that the full sales price was not equal to the fair market value of the property (NYSORPS). The property sales data is recorded directly from deeds of sale title records.

Figure 5-3 shows a count of all valid arm's length sales for residential single-family year-round homes within Suffolk County from 1992 and corresponding average sales prices. The housing market appreciated substantially over the years 2000 to 2004 as vacant land for residential development is in limited supply. Data from the Long Island Association shows a declining trend since 2000 in the number of dwelling units authorized by permit for Nassau and Suffolk Counties combined (Long Island Association 2005).



Source: NYSORPS 2005.

Figure 5-3 Average Sales Prices for One-family, Year-round Homes and Sales Volumes by Year, Suffolk County, New York

Tables 5-9 and 5-10 show, respectively, sales volume and price trends in select municipalities located along the North Shore of Suffolk County. Table 5-10 presents the average sales values for the sales tallied in Table 5-9.

Table 5-9 Count of "Arm's Length" Sales for One-Family, Year-round Residences for Select Municipalities within Suffolk County

	1993	1996	2000	2004
Asharoken	8	8	17	12
Belle Terre	5	15	10	17
Brookhaven	4,210	5,127	7,139	6,480
Head of the Harbor	19	11	29	19
Huntington	1,884	2,439	2,392	2,457
Huntington Bay	23	22	29	22
Lake Grove	88	118	120	143
Lloyd Harbor	43	66	53	43
Nissequogue	13	24	39	24
Northport	92	104	112	84
Old Field	17	21	23	12
Poquott	10	23	20	16
Port Jefferson	93	128	134	118
Riverhead	232	306	596	488
Shoreham	4	7	7	4
Smithtown	1,245	1,430	1,468	1,342
Village of the Branch	21	24	18	16
Total:	8,007	9,873	12,206	11,297
Suffolk Total:	**14,012**	**17,887**	**22,140**	**20,746**

Source: NYSORPS 2005.

Table 5-10 Average Sales Prices for One-Family, Year-round Residences within Suffolk County

	1993	1996	2000	2004
Lloyd Harbor	$704,186	$754,480	$1,140,340	$1,588,603
Old Field	$235,735	$266,064	$401,476	$1,456,146
Nissequogue	$386,527	$437,271	$694,769	$1,315,729
Huntington Bay	$455,043	$482,102	$767,302	$1,139,818
Head of the Harbor	$337,613	$360,018	$733,242	$1,094,868
Asharoken	$395,303	$463,500	$741,618	$1,088,013

Table 5-10 Average Sales Prices for One-Family, Year-round Residences within Suffolk County

	1993	1996	2000	2004
Belle Terre	$413,000	$354,513	$649,050	$831,647
Poquott	$314,095	$280,550	$380,925	$823,977
Northport	$243,283	$267,108	$433,810	$619,246
Shoreham	$297,000	$229,177	$300,250	$546,250
Huntington	$226,006	$244,795	$337,857	$538,086
Port Jefferson	$201,455	$211,031	$286,290	$489,341
Smithtown	$190,167	$200,826	$284,735	$480,029
Village of the Branch	$211,095	$208,396	$351,939	$477,158
Lake Grove	$146,174	$161,084	$223,015	$397,991
Riverhead	$144,449	$151,429	$195,186	$374,024
Brookhaven	$133,901	$164,342	$180,192	$328,106
Suffolk County Avg.	**$177,007**	**$194,101**	**$270,905**	**$464,113**

Source: NYSORPS 2005.

Within the general vicinity of the Project study area, the bulk of sales activity, or turnover, has occurred in more relatively affordable areas such as Smithtown, Brookhaven, and Huntington. The value premiums shown for the higher-end villages of Suffolk reflect, among other attributes, homes with close access to Long Island Sound (e.g., water views) and larger parcel sizes.

5.2.7.2 Hotel/Motel Accommodations in Suffolk County

This section provides an inventory of local hotel/motel accommodations compiled in 2003. Within the town of Brookhaven, 29 hotels, providing 1,295 year-round rooms, were available in 2003. To assess potential impacts during the construction period, the hotel inventory can be compared to the number of construction workers and their dependents, some of whom can be expected to use these facilities during the construction period. Based on the 2003 inventory and accounting for rooms in nearby towns, the hotel/motel capacity is over 5,000 rooms (*see* Table 5-11).

Table 5-11 Hotels and Motels in Suffolk County, New York

Town	Hotels	Year-round Rooms	Seasonal Rooms
Brookhaven	29	1,295	199
Huntington	9	1,023	
Islip	21	1,917	85
Riverhead	13	405	
Smithtown	7	658	
Total:	**79**	**5,298**	**284**

Source: Suffolk County Department of Planning 2003.

5.2.8 Local Public Services

This section provides information on local public services (health, police, fire, and emergency services) for communities in the study area.

5.2.8.1 Health Services

Table 5-12 provides an overview of some key public health services and current capacities. Suffolk County possesses 20 hospitals, which provide 11,000 beds and over 5,000 doctors.

Table 5-12 Health Services

County	Health Services
Suffolk [a]	20 hospitals (public and private) 11,000 beds 5,143 physicians [b]

Sources:

[a] Suffolk County Comptroller's Office 2004.

[b] American Medical Association 2005.

5.2.8.2 Police/Fire/Emergency Services

The Suffolk County Department of Fire, Rescue and Emergency Services provides service to approximately 1.4 million residents. Service is provided through 109 fire departments and 27 Emergency Medical Service (EMS) agencies, employing approximately 10,500 fire and EMS responders (Suffolk County Fire Rescue Emergency) (*see* Table 5-13).

Table 5-13 Police/Fire/EMS

	Police[1]	Fire/EMS[1]
New York		
Suffolk County	2,500 officers 500 civilian personnel	109 fire departments, 27 EMS agencies, 10,500 fire and EMS responders

Sources: Suffolk Co. Dept. of Fire, Rescue, and Emergency Services 2005.
Suffolk County Police Department 2005.

Notes:

[1] Some of these statistics are estimates, and where information was available, full-time civilian support personnel were not included in the figures.

The Suffolk County Police Department provides service with a total force of over 2,500 sworn members and over 500 civilian members. The department provides all police services for the Suffolk County Police District, which includes the five western towns of Babylon, Brookhaven, Huntington, Islip, and Smithtown. The department also provides various police services as needed for eight incorporated villages within the five western towns that maintain their own police forces, as well as police services for the 11 towns and villages located in the eastern portion of the county.

5.2.9 Local Government Revenues and Expenditures

This section provides background data on the fiscal positions (public revenues and expenditures) of the local government that could be impacted during construction and operation of the Broadwater Project. Tables 5-14 through 5-18 provide Suffolk County expenditure and revenue information showing the size of the public resources currently available to fund facilities and municipal services in recent fiscal years. The fiscal impacts section addresses how infrastructure and public services in the county could potentially be affected by the Project. The fiscal impact analysis focuses on incremental local government revenues and expenditures most likely to occur during the Project's construction and operational periods.

5.2.9.1 Suffolk County, New York

Table 5-14 presents a breakdown of Suffolk County expenditures, by activity, for 2002 and 2003.

Table 5-14 Suffolk County Government-wide Expenses, by Function (in millions of dollars)

	2002	%	2003	%
Governmental Activities				
General government support	$277.7	13.5	$252.5	11.3
Economic assistance and opportunity	$532.0	25.9	$594.5	26.6
Health	$186.7	9.1	$187.5	8.4
Public safety	$653.0	31.8	$718.1	32.1
Culture and recreation	$27.5	1.3	$27.7	1.2
Education	$132.2	6.4	$184.0	8.2
Home and community services	$75.7	3.7	$83.6	3.7
Transportation	$80.1	3.9	$85.3	3.8
Interest on long-term debt	$32.8	1.6	$30.4	1.4
Business Activities				
John J. Foley Skilled Nursing Facility	$33.4	1.6	$36.9	1.7
Suffolk Health Plan	$23.6	1.1	$31.9	1.4
Suffolk County Ball Park	$1.1	0.1	$0.8	0.04
Francis S. Gabreski Airport			$1.7	0.07
Total:	**$2,055.6**	**100.0**	**$2,234.9**	**100.0**

Source: Suffolk County Comptroller's Office 2004.

In 2003 Suffolk County spent over $2.2 billion providing municipal services to its residents. Public safety, general government support, and economic assistance comprise the majority of public spending. Table 5-15 presents a breakdown of the county revenues used to support these expenditures.

Table 5-15 Suffolk County Government-wide Revenues (in millions of dollars)

	2002	%	2003	%
Program Revenues				
Charges for services	$219.4	10.1	$260.4	10.9
Operating grants and contributions	$485.4	22.5	$531.4	22.3
Capital grants and contributions	$12.4	0.6	$19.7	0.8
General Revenues				
Taxes	$1,380.1	63.8	$1,509.3	63.3
Grants and contracts not restricted to specific programs	$–	0.0	$–	0.0
Unrestricted investment earnings	$8.9	0.4	$7.7	0.3
Miscellaneous	$55.7	2.6	$56.6	2.4
Total:	$2,162.0	100	$2,385.1	100
Revenues less Expenses	**$106.44**		**$150.19**	

Source: Suffolk County Comptroller's Office 2004.

User fees and charges account for about one-third of Suffolk County's revenues, while general revenues (mostly property and sales taxes) comprise almost two-thirds of revenues. The fiscal position of Suffolk County has improved in recent years as public revenues have exceeded expenditures, resulting in net additions to the asset base of the county.

5.2.9.2 Town of Riverhead, Suffolk County

Tables 5-16 and 5-17 provide detailed expenditures and revenues for the Town of Riverhead, Suffolk County, New York. Riverhead is a local host government whose municipal service delivery and public infrastructure has the potential to be impacted during construction and operations.

Table 5-16 Town of Riverhead, Detailed Expenditures and Other Uses (millions of dollars, fiscal years)

	2002	%	2003	%
Expenditures				
General Government Support	$4.85	23.2	$5.70	23.4
Public Safety	$9.58	45.7	$10.52	43.3
Health	$0.01	0.1	$0.01	0.0

Table 5-16 Town of Riverhead, Detailed Expenditures and Other Uses (millions of dollars, fiscal years)

	2002	%	2003	%
Transportation	$0.27	1.3	$0.29	1.2
Economic Assistance and Opportunity	$0.66	3.2	$0.81	3.3
Culture and Recreation	$0.88	4.2	$1.00	4.1
Home and Community Services	$ .97	4.6	$1.07	4.4
Employee Benefits	$3.46	16.5	$4.55	18.7
Transfers	$0.26	1.3	$0.37	1.5
Total Detail Expenditures and Other Uses	**$20.95**	**100**	**$24.32**	**100**
Revenues less Expenditures	**$3.11**		**$0.61**	

Source: Town of Riverhead 2004.

Table 5-17 Town of Riverhead, Detailed Revenues and Other Sources (in millions of dollars, fiscal years)

	2002	%	2003	%
Revenues				
Real Property Taxes	$15.87	66.0	$17.57	70.5
Other: Payments in Lieu of Taxes, and other items	$0.23	1.0	$0.27	1.1
Non-Property Tax	$0.53	2.2	$0.53	2.1
Departmental Income (Fees, Program charges etc.)	$1.99	8.3	$1.70	6.8
Total Intergovernmental Charges	$1.03	4.3	$0.02	0.1
Use of Money and Property	$0.29	1.2	$0.25	1.0
Licenses and Permits	$0.05	0.2	$0.04	0.2
Fines and Forfeitures	$0.73	3.0	$0.75	3.0
Sale of Property and Compensation for Loss	$0.07	0.3	$0.12	0.5
Misc. Local Sources	$0.09	0.4	$0.08	0.3
Interfund Revenues	$0.71	3.0	$0.59	2.4
State Aid	$2.13	8.9	$2.74	11.0
Federal Aid	$0.15	0.6	$0.10	0.4
Interfund Transfers	$0.16	0.7	$0.17	0.7
Retirement System Credits	$0.02	0.1	–	0.0
Total Detail Revenues and Other Sources:	$24.06	100.0	$24.92	100.0

Source: Town of Riverhead 2004.

For fiscal year ended 2003, the Town of Riverhead's revenues exceeded expenditures, resulting in a net addition to the year-end equity fund. The majority of Riverhead's revenues are derived from property taxes, while spending is concentrated on general government support and public safety. Payments in lieu of taxes (including other items) are a relatively small revenue stream, averaging about $250,000 per annum during the last several years. Expenditures for general government support include operation of plant and municipal government administrative functions.

5.3 SOCIOECONOMIC IMPACTS

5.3.1 Introduction

This section addresses the anticipated socioeconomic impacts during the construction and operational phases of the proposed Project. FSRU and marine pipeline installation are expected to commence at the end of 2009 and continue through 2010, with commissioning expected at the end of 2010. The operational phase, during which LNG will be regasified and distributed to end users via an interconnection with the IGTS pipeline, is expected to last an additional 30 years, to 2040.

In addition to describing the anticipated impacts on socioeconomic resources described under Section 5.2, this section also describes the potential effects on the regional energy market. An order-of-magnitude estimate of the environmental benefits attributable to the air pollutant emissions (from regional electric power generation) that would be avoided through use of a share of the Project's throughput gas as a generation fuel type also is provided and is described in greater detail in Appendix B. This estimate assumes that, over time, future electric power generation will rely on increasingly more natural gas as a generation fuel, in accordance with the New York State Energy Research and Development Authority's (NYSERDA's) Energy Plan (NYSERDA 2002).

Additional socioeconomic impacts involving Long Island Sound's fisheries and ferry services are discussed in Section 8.3.7.3 (Ferry Routes) and Section 8.4 (Commercial and Recreational fishing) of Resource Report 8, Land Use, Recreation, and Aesthetics.

Total economic impacts were estimated for both Suffolk County and New York State. These impact areas were chosen based on the staging area of the Project during construction and a likely host area for resident employees during operations. A portion of the pipeline construction spending will also have a beneficial economic impact on the Tri-State Area (New York, New Jersey, and Connecticut). The majority of the pipeline direct capital expenditures will impact areas outside of the immediate Project study area (i.e., the Town of Riverhead, Suffolk County).

Economic impacts were measured by assessing the direct expenditures of the Project's construction and operational phases on total industry output, employee compensation, and employment levels. Economic impacts include estimated multiplier effects that consider inter-industry linkages with suppliers and households within Suffolk County and New York State. A recognized economic impact assessment software tool called

IMPLAN was used in conjunction with regional data sets that describe the local economic base.

What is IMPLAN (Impact Analysis for Planning)?

IMPLAN is an analytical software tool used to estimate socioeconomic impacts, which was originally developed by researchers at the U.S. Forest Service. The model is now owned and administered by Minnesota IMPLAN Group, Inc. (MIG 2000). The IMPLAN software is an input-output based model that describes the inter-industry relationships between industries and commodity purchases within a local economy. The model relies on county- and state-level data sets that are continually updated by the U.S. government and by MIG, Inc. IMPLAN is used to capture the multiplier impacts or total economic impacts associated with a given project's spending relationships or linkages to a region's vendors, suppliers, households, and government entities. A multiplier describes the response of the regional economy to a stimulus (e.g., annual spending associated with a project's operations) that is a change in final demand. The multiplier process represents the predictive part of the model. The model augments the traditional input-output framework with a social accounting matrix that takes into account non-industrial transactions such as the payment of taxes by businesses and households. The model can, therefore, also be used to conduct a fiscal impact analysis.

5.3.2 Construction Period

5.3.2.1 Introduction

The socioeconomic impacts expected during the construction phase of the Project are based on the economic activity that will at first be concentrated within the Project's staging area. The economic activity, or new stimulus, during the construction period will be of short-term duration but positive. The local/regional contracts that will be executed to physically erect and install the Project's components will have a positive short-term impact on the region's economic base. The driving catalyst for the expected short-term stimulus is contractual-related spending on goods and services to support construction and installation of the Project.

The estimated regional economic impacts are based only on capital costs components that are anticipated to have a local or regional impact. Most of these components, as will be explained below, relate to the marine pipeline installation activities. Due to the highly specialized nature of the energy production equipment and civil works, only a portion of the total construction period capital expenditures will ultimately impact the region's economy. Therefore, portions of the pipeline equipment capital costs and costs for the FSRU were not fully evaluated for their regional impacts because these components will be manufactured and fabricated outside of the region and towed to the site. Similarly, while the mooring tower is a component of the marine pipeline installation, it is anticipated that it will be constructed off site and shipped to the Sound for installation.

The majority of the Project's capital cost components will most likely be procured from international manufacturers and fabricators. Contract specifications also include transportation of key equipment and Project components to Long Island Sound by these

international vendors. These unique LNG industry features will have an impact on the anticipated scale of economic impacts on the region during the construction phase. To be conservative in estimating regional economic impacts, only certain expenditures associated with marine pipeline installation were evaluated, i.e., modeled with IMPLAN.

The IMPLAN model was used to estimate the economic impacts during the construction phase. This input-output based model describes the inter-industry relationships for the supply chain linked to the Project area. The model's input-output tables are based on county-level regional data; therefore, the economic structure of Suffolk County, New York, was used to estimate impacts.

Economic impacts are captured by several indicators. The broadest measure of impact is called total industry output, which is equal to the total value of industry production. Economic impacts also are reflected in employee earnings, value added in production, and employment. Value added in production represents the sum of employee compensation, proprietor income, other property income, and indirect business tax.

5.3.2.2 Construction Schedule and Timing of Impacts

The construction phase of the Project is expected to take place during late 2009 and 2010. The pipeline hookup to the IGTS and facility commissioning are projected to occur in the fourth quarter of 2010. However, certain costs that are part of the total capital costs of the Project, such as surveys, consulting, and design, have already started. For the purposes of modeling the *estimated* economic impacts associated with the construction and operational phases, the above dates were used.

The year 2010 was used to estimate the construction period impacts, and the years 2011 to 2040 were used to estimate operational period impacts (assuming a 30-year project life, inclusive of 2011). The year 2010 was used to estimate economic impacts during construction because the majority of economic activity will occur during this year. Specific contractual information that would have permitted a prorating of the full construction phase impacts by month was not available for this report. For the purposes of estimating order-of-magnitude economic impacts, this procedural simplification does not affect the analysis.

5.3.2.3 Total Project Capital Costs – FSRU and Pipeline

This privileged information has been removed.

Table 5-18 Summary of Broadwater Project Total Capital Costs

This privileged information has been removed.

5.3.2.4 FSRU and Pipeline Capital Cost Components

This privileged information has been removed.

Table 5-19 Broadwater FSRU Capital Costs

This privileged information has been removed.

Table 5-20 Summary of Broadwater Revised Pipeline Cost Estimate

This privileged information has been removed.

5.3.2.5 Construction Phase Direct Expenditures Used in Economic Impact Analysis

The total regional economic impacts during the construction phase will be generated by contractual spending associated with local and regional resources. As a company policy, Broadwater will utilize regional resources wherever reasonably possible. The procedure will be to assess locally (Long Island Sound) based resources to determine whether the service providers, commodities, and equipment are suitable for the Project purpose. If found to be suitable, these resources will be utilized. The local resources to be impacted by the project will most likely be:

- Fabricators;
- Storage facilities;
- Support vessels and tugboats;
- Barges; and

- Security Support.

The laybarge crew is expected to be drawn from local union labor in accordance with initial meetings held by Broadwater and the Pipeline Workers of America and planned discussions between the successful contractor and the respective unions.

The assumptions used in the economic impact analysis flow from the proposed project schedule, timing, and estimated resource requirements. Only a relatively small portion of the total capital costs shown in Tables 5-19 and 5-20 were modeled for their estimated total economic impacts on the region for the reasons stated above so as not to overstate the potential economic impacts.

Table 5-21 shows an allocation of the estimated total pipeline capital cost by the region most likely to be impacted by these direct expenditures. The costs shown do not include sales taxes, insurance, or borrowing costs.

Table 5-21 Broadwater Pipeline Estimated Direct Capital Costs – Direct Expenditures by Anticipated Regional Impact (in millions of 2005 $)

This privileged information has been removed.

This privileged information has been removed.

Total economic impacts include the initial direct expenditure plus indirect and induced effects. *Direct effects* represent the final demand spending impacts associated with marine pipeline installation direct expenditures assigned to the pipeline, water transportation, and engineering services industry sectors. *Indirect effects* represent the impacts to be experienced along the supporting supply chain resulting from the direct final demand expenditures. *Induced effects* capture the changes in impacts on all local industries caused by the expenditures of new household income generated by the direct and indirect effects of direct final demand changes.

This privileged information has been removed.

Table 5-22 Broadwater Project Pipeline Capital Costs Modeled for Regional Economic Impacts

This privileged information has been removed.

5.3.2.6 Labor Force - Construction Period Manpower Estimates

The estimated manpower requirements during the construction phase relate to marine pipeline installation and related vessel support services. Manpower mobilized during the construction period will vary based on the particular activity required to complete the pipeline installation.

Table 5-23 summarizes the estimated total manpower to be used over the entire construction period of the Project. For any given man-month and work activity, the manpower deployed on marine pipeline installation and support activities will be a percentage of the grand total amount shown. At the height of the construction period, it is estimated that over one hundred workers will be deployed on the Project during those particular months.

5.3.2.7 Labor Force, Employment Levels and Unemployment Rate Impacts

The estimated numbers of workers coming into the Project area will have a small, minor impact on the area's future total labor force, employment level, and unemployment rate. The civilian labor force of Suffolk County was 770,672 in 2004. Using a 1% annual growth rate, an extrapolated total county labor force in 2010 would be equal to 770,672 x $[1.01^{2010-2004}]$ = 818,084. The estimated 139 construction-period workers most likely working at the height of the construction period (during 2010) would represent 0.017% of this estimated 2010 labor force. Assuming the 2002 employment level for Suffolk County (536,790) also grew at a similar annual growth rate, the 139 workers would represent 0.024% (139/(536,790 x $[1.01^{2010-2002}]$) of the projected 2010 employment level of 581,267.

In a labor force of this size, the estimated number of construction workers would have a minor, non-material impact on employment levels and the unemployment rate for Suffolk County. While this impact is considered minor, the temporary in-migration would nevertheless be beneficial to the economy as the highly specialized workers would contribute towards a further diversification of the labor force.

Table 5-23 Broadwater Energy Pipeline Construction Equipment and Manpower Summary

	Estimated Manpower Requirements				Estimated Main Equipment Items To Be Utilized												
Construction Function	Total Man Power (No.)	Total Man Days	Local Man Days	Est. Local Man Day Share %	Support Vessel	Security Vessel	Survey Vessel	Dive Support Vessel	Material Hauler Tug	Lay Barge	Anchor Handling Tug	Pipe Hauler Tug	Marine Work Vessel	Helicopter	Load-Out Facility Yard	Metocean Buoy
Security/Logistics/Site Office	5	4,460	4,460	100%	√	√								√		
Survey	12	2,064	2,064	100%	√	√										
IGTS Hot Tap Installation	33	896	371	41%	√			√	√							
Pre-lay Diving Operations	33	1,452	627	43%	√			√	√							
Pipeline Construction Operations - Pipelay	139	14,700	5,796	39%				√√		√	√√	√√√√√				
Pipeline Lowering	133	11,398	2,706	24%	√√					√	√√					
IGTS Spool Piece Tie-in and FSRU Pipeline Tie-In Spool	139	2,610	702	27%	√√				√	√	√√					
Crossing Completion	33	990	428	43%	√√			√	√							
Additional Construction Requirements	33	1,408	583	41%	√			√	√							
Flooding, Cleaning & Hydro Test	27	1,248	348	28%	√√			√√								
Check & Isolation Valve Spool	33	768	318	41%	√			√	√							
Final IGTS Spool Tie-in	33	640	265	41%	√			√	√							
FSRU Tie-in [two spools]	33	960	398	41%	√			√	√							
Dewatering & Drying from FSRU (Pre-Commissioning & Commissioning)	27	1,134	347	31%	√√			√√								
Pipeline Material and load out facility	4	456	456	100%											√	
Pre-installation investigations MET ocean	6	36	36	100%												√
Trial plow	6	30	8	25%				√								
Geotechnical Deep Core	6	66	66	100%									√			
Fabrication Yard	12	1,080	1,080	100%												
Engineering	6	1,680	-	0%												
Construction Management and Inspection	28	5,175	454	9%												
Total:	781	53,251	21,511	40%												

Table 5-23 summarizes the distribution and intensity of direct economic activity (measured by manpower) associated with each construction function for pipeline capital expenditures. Table 5-23 shows the breakdown of manpower estimates for each activity associated with marine pipeline construction and the type of vessel(s) and main equipment items that will support that particular function. Pipeline construction operations, pipeline lowering, and the IGTS tie-in will account for the bulk of the man-hours and labor requirements during this period.

The manpower deployed will be spread out over the main year of construction (2010), with some tasks occurring in late 2009. Each task function lasts for a certain number of days within the year, with the exceptions of security and logistics. Total manpower mobilized for any given month will be a fraction of the 781 total shown in the table. For the economic impact analysis, IMPLAN manpower estimates are derived from a spending relationship based on labor requirements per dollar of direct final demand expenditure associated with a particular industry. The manpower estimates are consistent with the estimates shown above in Table 5-23. The man-day weighted average manpower equivalents for the estimated total and local man-days shown in Table 5-23 are 83 and 68, respectively.

5.3.2.8 Suffolk County Total Economic Impacts

Table 5-24 shows the estimated total economic impacts (Total Effects) associated with the Project's construction period. Because the total construction period economic impact will occur in the future, during 2010, the present value of the future impact is measured to take into account the time value of money. A 5% discount rate was used to calculate the present value of these future annual impacts. Detailed calculations, by year, for all measures of economic impact during construction are presented in Appendix A.

Table 5-24 Summary of Construction Period Economic Impacts for Suffolk County

	Direct Effects	Indirect Effects	Induced Effects	Total Effects	Multiplier
2010 Impacts (in millions of 2005 $, except employment)					
Total industry output	$11.1	$5.7	$3.2	$20.0	1.81
Employee compensation	$2.1	$2.1	$1.0	$5.2	2.51
Total value added	$3.3	$3.5	$2.1	$8.9	2.72
Employment	49	40	29	118	
Present Value of 2010 Impacts (in millions of 2005 $, except employment)					
Total industry output	$8.7	$4.5	$2.5	$15.7	1.81
Employee compensation	$1.6	$1.6	$0.8	$4.1	2.51
Total value added	$2.6	$2.8	$1.6	$6.9	2.72

Indirect effects capture the linked supply chain impacts associated with the initial final demand purchase or expenditure. The final demand expenditures were taken directly from the Pipeline Direct Capital Cost Estimate and were classified according to the relevant NAIC industry category. Direct expenditures during the construction period will generate the following total short-term positive economic impacts for Suffolk County:

- A total one time economic impact of $20 million in 2010, or $15.7 million in present value terms (2005 $). The economic impact is measured by total industry output, which is the total value of production by industry for a calendar year.

- Value added of $8.9 million in 2010, or $ 6.9 million in present value terms (2005 $). Value added is the sum of employee compensation, proprietor income, other property income, and indirect business tax.

- A total of $5.2 million in total employee compensation, or $4.1 million in present value terms (2005 $).

- The construction period expenditures will support an estimated grand total of 118 regional jobs (including all supporting industries and suppliers) during 2010. These jobs will be short-term and non-recurrent.

5.3.2.9 New York State Total Economic Impacts

Table 5-25 shows the estimated total economic impacts (Total Effects) during the construction period for New York State.

Table 5-25 Summary of Construction Period Economic Impacts for New York State

	Direct Effects	Indirect Effects	Induced Effects	Total Effects	Multiplier
2010 Impacts (in millions of 2005 $, except employment)					
Total industry output	$11.1	$5.2	$3.8	$20.13	1.819
Employee compensation	$2.5	$1.9	$1.2	$5.6	2.250
Total value added	$4.1	$3.2	$2.5	$9.7	2.390
Employment	49	35	38	122	
Present Value of 2010 Impacts (in millions of 2005 $, except employment)					
Total industry output	$8.7	$4.1	$3.0	$15.8	1.819
Employee compensation	$2.0	$1.5	$1.0	$4.4	2.250
Total value added	$3.2	$2.5	$1.9	$7.6	2.390

Direct expenditures during the construction period will generate the following total short-term positive economic impacts for New York State:

- A total one time economic impact of $20.13 million in 2010, or $15.8 million in present value terms (2005 $). The economic impact is measured by total industry output, which is the total value of production by industry for a calendar year. The large energy investment will enable the regional economy to achieve additional diversification benefits. A diverse economy with many

contributing sectors can better withstand an economic downturn than an economy reliant on only a few sectors.

- Value added of $9.7 million in 2010, or $7.6 million in present value terms (2005 $). Value added is the sum of employee compensation, proprietor income, other property income, and indirect business tax.

- A total of $ 5.6 million in total employee compensation, or $4.4 million in present value terms (2005 $).

- The construction period expenditures will support an estimated total of 122 statewide jobs (including all supporting industries and suppliers) during 2010. These jobs can be considered as short-term in nature and will not outlast the construction period.

5.3.2.10 Fiscal Impacts During Construction

This section addresses the impacts on the incremental public cost of services during construction that are attributable to the immigration of workers into the Project area. Fiscal impacts are measured by comparing the estimated incremental costs to the host local governments to the estimated incremental tax revenues to be generated by the Project during the construction phase.

The fiscal impact analysis takes into account the incremental burden facing local governments from new demands on public infrastructure facilities and municipal services. The source of the incremental demands are taxpayers who will temporarily reside within the host jurisdictions during the construction phase. The analysis considers the potential demands to be generated by these residents that would be imposed on the Town of Riverhead, Suffolk County, and New York State. The full amount of state and local tax revenues to be generated from Project-related spending are then compared to an estimate of the total expenditures required to support these new residents with municipal services. The analysis reveals whether the Project-generated public revenues will pay for or support the new demands placed on these localities.

The IMPLAN software also was used to generate a tax impact report using the software's social accounting matrix. Estimated state, and local tax revenues derived from the complete multiplier process associated with the construction phase were compared to an estimate of the incremental annual municipal expenditures to be generated by new residents during the construction period. Estimated tax receipts were developed from project-related economic impacts arising from households and enterprises.

In this analysis, the fiscal impacts flow directly from the anticipated Suffolk County total economic impact. It was assumed that 40 workers and their families would place demands on municipal resources by permanently relocating to the Project area (i.e., the Town of Riverhead, Suffolk County) during the construction year of 2010. It is possible that some workers associated with short-term contracts will make use of hotels/motels, local temporary housing, and campgrounds during this period, while others will commute

from adjacent areas. In addition, it is also possible that some contract workers may already be living in Suffolk County. However, for the purposes of the analysis it was assumed that 40 workers will relocate to Suffolk County in late 2009 and 2010. Forty workers represent almost the total number of workers (49) who are directly tied to the regional economic activity (portion of the total direct pipeline capital expenditures) that will impact Suffolk County.

Table 5-26 summarizes the tax revenue impacts associated with the construction period for 2010. These estimated one time tax receipts were generated from the economic impact modeling. The Suffolk County portion of the total direct pipeline capital expenditures ($11.1. million, *see* Table 5-22) was the catalyst for these total tax receipts. The tax payments represent aggregate monetary flows from institutions (households and enterprises) to governments in the host areas (Olson 1999).

Table 5-26 Tax Revenue Impact for Construction Period – Year 2010 Receipts (in 2005 $)

	Suffolk County	New York State
Federal	$793,188	$864,466
State and local	$988,928	$1,061,724
Total	$1,782,117	$1,926,190

Table 5-26 shows that $0.99 million in tax receipts will accrue to state and local governments from Suffolk County economic activity generated by the construction contracts, while $1.1 million in state and local tax receipts will be generated from the full multiplier impacts felt throughout New York State.

To determine the net fiscal impact (public revenues minus public expenditures) associated with the construction year, the following analysis was performed. It was assumed that 40 workers will relocate from outside of the Project area and establish residency (i.e., join the tax rolls). Municipal expenditures, or the monetary measure of annual public service demands, were obtained from recent municipal financial statements and expressed on a per capita basis.

The broadest measures of recent annual municipal expenditures were obtained from comprehensive annual financial reports for the State of New York, Suffolk County, and the Town of Riverhead. The total expenditures include both operational-related spending and annual capital outlays for public capital investments. The total expenditures were divided by the respective populations for these areas to arrive at a per capita expenditure amount. It was also assumed that each new family will have an average household size of three persons. This assumption was used to gauge the net public service demands that will be placed on the host municipalities during construction. Table 5-27 presents the assumptions and parameters that were used in the construction-period fiscal impact analysis.

Table 5-27 Construction Period Fiscal Impact Analysis Assumptions and Parameters

	Town of Riverhead	Suffolk County	New York State
Population (2000)	27,680	1,419,369	18,976,457
Total public expenditures (in millions of 2003 $)	$24.32	$2,234.9	$91,147.0
Per capita public expenditures ($/person)	$879	$1,575	$4,803
Total employees	40	40	40
Average household size	3.0	3.0	3.0
Estimated new residents	120	120	120
Annual Public Expenditures	$105,480	$189,000	$576,360

Sources: Town of Riverhead 2004.
Suffolk County Comptroller's Office 2004.
New York State Office of the State Comptroller 2004.

The sum total municipal annual expenditure for 2010 ($870,840 = Town of Riverhead + Suffolk County + New York State) was then compared to the projected total New York State and local tax revenues for 2010 to gauge the net fiscal, or cost revenue, impact. Table 5-28 shows the annual comparison and the sum total net revenue in present value terms for 2005.

- The construction period year of 2010 will result in municipal net revenues of $149,653 in present value terms (2005 $). Therefore, on balance, the construction phase will have a short-term positive impact on the fiscal positions of the Project area host municipalities. The Project's local economic impacts during construction will generate incremental revenues that more than offset demands placed on governmental facilities and services by new workers joining the tax rolls. Therefore, any supplemental mitigation to address these demands does not appear to be necessary.

Table 5-28 Fiscal Impact Analysis - Construction Phase - New York State

		Tax Revenue State+Local	Total Public Expenditures	Revenues - Expenditures	Discount Rate = 5%	Present Values Tax Revenue State+Local	Total Public Expenditures	Revenues - Expenditures
0	2005				1.000			
1	2006				0.952			
2	2007				0.907			
3	2008				0.864			
4	2009				0.823			
5	2010	$1,061,724	$ 870,840	$190,884	0.784	$832,392	$682,739	$149,653
	Total:	$ 1,061,724	$ 870,840	$ 190,884		$ 832,392	$ 682,739	$ 149,653

Proposed Stakeholder Investment Program

The fiscal analysis presented in this section is generated from the monetary flows associated with the local total economic impacts. The fiscal impact analysis provided in

this report does not consider municipal payments in lieu of taxes. However, it is Broadwater's intention to provide payments to the host locality in lieu of taxes.

While currently being negotiated, the payment arrangement has the potential to have a significant positive impact on the host area's municipal fiscal position. The Town of Riverhead's most recent annual revenue streams are reproduced in this report (*see* Table 5-17) so that reviewers have an indication of the current scale of resources available to the Town derived from all revenue sources.

In addition, Broadwater has proposed a Social Investment Program (SIP) that will provide funding to various activities to address concerns of local stakeholders and sustainability issues within the Long Island Sound environment.

5.3.2.11 Impacts on Future Population Levels, Housing, and Incomes

The immigration of workers during the construction period is expected to have a non-material impact on the area's population level.

The housing stock appears to have sufficient inventory and vacant units to accommodate workers and their families who will choose either to purchase or rent. In addition, the hotel/motel inventory is sufficient to accommodate workers (and their families) who participate on short-term contracts during part of the construction year.

The construction period should have a positive, short-term, non-recurrent impact on the area's per capita income as the energy investment is incremental or new to the area and involves a relatively small number of workers (vis-à-vis the Project area).

Existing residences and business establishments will not be displaced by the Broadwater Project.

5.3.2.12 Transportation Impacts

During the construction period, most of the materials and equipment will be transported to the proposed site by vessels or barges. On land, transportation impacts on local roads and main arteries will be minimal. Some workers will travel by car to the staging area, and some trucks will also be used. However, relative to overall traffic flows and the ability of existing infrastructure to accommodate these flows, the impact will be minimal.

5.3.3 Operational Period

5.3.3.1 Operational Direct Expenditures

The economic impacts during FSRU terminal operations are based on direct expenditures incurred in the Project area necessary to run and maintain the facility. The direct economic impacts, or expenditures, will come from annual recurring spending on personnel wages, facility maintenance, insurance, and materials necessary to sustain the FSRU terminal. Table 5-29 provides an overview of the direct expenditures associated with the operation and maintenance of the FSRU terminal. The annual recurring

expenditures will impact the host community and dependent economies over the years 2011 to 2040, a period corresponding the estimated useful life of the Project assets.

Table 5-29 Broadwater FSRU Terminal Operational Expenditures for Steady-State Year (in millions of 2005 $)

This privileged information has been removed.

This privileged information has been removed.

Table 5-29 also shows other variable cost components necessary for operating the facility. Expenditures for bulk chemicals (ammonia and odorant) will be made to outside vendors/suppliers and will have an impact on the supply chain supporting the facility. The expenditures will likely stimulate additional rounds of spending through the ripple, or multiplier, effect as impacted industries replenish inventories. Variable expenditures will change with the Project throughput volume. The economic impact analysis is based on average annual expenditures for an assumed steady-state year presented in Table 5-29.

This privileged information has been removed.

The economic impact analysis assumes that these operational expenditures will be spent within Suffolk County and will also benefit the regional (i.e., New York State) economy through multiplicative effects. This assumption is based on the location of the staging area of the Project (the Town of Riverhead in Suffolk County). Some facility employees may reside in other areas (e.g., Nassau County). However, for the purposes of describing the total potential economic impacts, the analysis evaluated impacts on Suffolk County and New York State. To the extent that a significant share of annual direct operational spending will ultimately recur or impact other adjacent counties, the total order-of-magnitude impacts estimated herein can be pro-rated to these areas.[1]

The IMPLAN model was used to estimate the economic impacts during operations. The IMPLAN model is an input-output based model that describes the inter-industry relationships for the supply chain and households linked to the Project area. The model's input-output tables are based on county-level regional data; therefore, the Suffolk County, New York, economic structure was used to estimate impacts.

Economic impacts are measured by total industry output, or the total value of industry production, employee earnings, value added in production, and employment. Value added in production represents the sum of employee compensation, proprietor income, other property income, and indirect business tax.

5.3.3.2 Operational Period Manpower

The FSRU terminal will employ a total of 60 persons. Approximately 50 persons will be directly involved in offshore operations, working in staggered shifts of 25 on and 25 off the terminal location. The remaining 10 individuals will be involved in various support activities.

5.3.3.3 Suffolk County Total Economic Impacts

Table 5-30 shows the estimated total economic impacts (Total Effects) associated with the Project's annual operational spending for a steady-state normal year, as well as the cumulative total economic impacts expressed in present value terms. Cumulative impacts are for all future years summed, discounted to present 2005 value. The Project life assumes a 30-year period from 2011 to 2040, inclusive of 2011. Because the operational phase will last for a 30-year period, the present value of future annual impacts is measured to take into account the time value of money. A 5% discount rate was used to calculate the present value of these future annual impacts. Detailed calculations by year for all measures of economic impact are presented in Appendix A.

[1] These adjacent counties have different economic structures, and total economic impacts may differ from county to county. However, this description is provided to show order-of-magnitude estimates of total economic impacts in relation to a host area.

Table 5-30 Summary of Broadwater FSRU Operational Period Economic Impacts for Suffolk County, New York (in millions of 2005 $, except employment)

	Direct Effects	Indirect Effects	Induced Effects	Total Effects	Multiplier
Impacts Associated with Average Steady-State Year (2011 to 2040)					
Total industry output	$25.6	$8.2	$5.6	$39.5	1.539
Employee compensation	$4.3	$1.6	$1.8	$7.7	1.792
Total value added	$10.1	$5.2	$3.6	$18.9	1.873
Employment	60	13	17	90	1.507
Cumulative Impacts Associated with Project Life of 30 Years: Sum of Annual Present Values (2011 to 2040)					
Total industry output	$308.7	$98.8	$67.6	$475.2	1.539
Employee compensation	$52.0	$19.6	$21.6	$93.2	1.792
Total value added	$121.7	$62.6	$43.7	$228.0	1.873

Direct effects represent the final demand spending impacts associated with annual operational spending originating from personnel wages, facility maintenance expenses, and the purchase of bulk chemicals. *Indirect effects* represent the impacts caused by the iteration of industries purchasing from industries initially stimulated by the direct final demand expenditure.

Indirect effects capture the linked supply chain impacts generated from the initial final demand purchase or expenditure. The final demand expenditures were taken from FSRU LNG Import Terminal operational expenditure table and are a combination of personnel costs, facility maintenance, insurance, ammonia, and odorant.

Induced effects capture the changes in impacts on all local industries caused by the expenditures of new household income generated by the direct and indirect effects of direct final demand changes. The main sectors along the supply chain generating the majority of the industrial output (total economic impacts) during operations are identified below:

- Natural gas distribution;
- Insurance carriers;
- Oil and gas extraction;
- Wholesale trade;
- Domestic Trade;
- Owner-occupied dwellings;

- Insurance agencies, brokerages, and related service establishments;
- Offices of physicians, dentists, and other health-care providers;
- Real estate;
- Hospitals;
- Food services and drinking establishments;
- Monetary authorities and depository credit intermediaries;
- Power generation and supply;
- Motor vehicle and parts dealers; and
- Foreign trade.

Appendix A contains detailed tables of all impacts, by year, over the life of the Project.

The direct expenditures to support FSRU operations will generate the following total economic impacts for Suffolk County:

- A total economic impact of $39.5 million per year recurring annually over the 30-year operational period. The cumulative economic impact over the entire life of the Project is estimated to be $475 million. Economic impact is measured by total industry output, which is the total value of production by industry for a calendar year.
- Value added of $19 million per year. Value added is the sum of employee compensation, proprietor income, other property income, and indirect business tax. Over the life of the Project a total of $228 million in value added will be generated after taking into account multiplier effects.
- A total of $7.7 million in total employee compensation. Cumulatively, $93 million in employee earnings will be created over the life of the Project.
- FSRU and supporting administrative operations will generate or support a total of 90 permanent jobs countywide on an annual basis.

5.3.3.4 New York State Total Economic Impacts

Table 5-31 shows the estimated total economic impacts (Total Effects) associated with the Project's annual operational spending for a steady-state normal year, as well as the cumulative total economic impacts to be experienced by New York State.

Table 5-31 Summary of Broadwater FSRU Operational Period Economic Impacts For New York State (in millions of 2005 $, except employment)

	Direct Effects	Indirect Effects	Induced Effects	Total Effects	Multiplier
Impacts Associated with Average Steady-State Year (2011 to 2040)					
Total industry output	$25.6	$8.8	$6.8	$41.3	1.610
Employee compensation	$5.3	$1.8	$2.2	$9.3	1.760
Total value added	$11.2	$5.5	$4.4	$21.0	1.882
Employment	62	13	20	95	1.545
Cumulative Impacts Associated with Project Life of 30 Years: Sum of Annual Present Values (2011 to 2040)					
Total industry output	$308.9	$106.2	$82.2	$497.3	1.610
Employee compensation	$63.8	$21.8	$26.6	$112.2	1.760
Total value added	$134.6	$65.9	$52.8	$253.3	1.882

The direct expenditures to support FSRU operations will generate the following total economic impacts for New York State:

- A total economic impact of $41.3 million per year recurring annually over the 30-year operational period. The cumulative economic impact over the entire life of the Project is estimated to be $497 million. Economic impact is measured by total industry output, which is the total value of production by industry for a calendar year. The additional economic output will be a positive addition to the regional economy and a beneficial diversification of the economic base. A diverse economy with many contributing sectors can better withstand an economic downturn than an economy relying on only a few sectors.

- Value added of $21 million per year. Value added is the sum of employee compensation, proprietor income, other property income, and indirect business tax. Over the life of the Project a total of $253 million in value added will be generated after taking into account multiplier effects.

- A total of $9.3 million in total employee compensation. Cumulatively, $112 million in employee earnings will be created over the life of the Project.

- FSRU operations will generate or support a total of 95 permanent jobs in New York State on an annual basis.

5.3.3.5 Fiscal Impacts During Operations

This section addresses the impacts on local government services during facility operations attributable to an estimated permanent number of FSRU staff coming into the

Project area. It is acknowledged that of the estimated 60 workers who will be required to both run the terminal and provide administrative support to operations, only about half of these workers can be expected to reside in the region. However, in conducting the fiscal impact analysis a conservative assumption was made that 60 incremental persons (and their families) would place demands on local government municipal services. The figure of 60 was used realizing that fewer persons will actually be incorporated into the tax rolls. An assessment of the incremental costs to the host local governments generated by these new residents (and their families) compared to the estimated incremental tax revenues is provided.

The IMPLAN software was also used to generate a tax impact report using the software's social accounting matrix, providing tax receipts, one input to the fiscal analysis. Estimated federal, state, and local tax revenues derived from the complete multiplier process associated with FSRU operations were compared to an estimate of the incremental municipal expenditures to be generated by new residents associated with terminal operations. To be conservative in assessing the potential impacts on the local governments, it was assumed that 60 operationally linked employees (and their families) will reside in Suffolk County. It is unlikely that all of these persons will contribute towards the incremental public demand for municipal services.

Table 5-32 summarizes the tax revenues associated with FSRU operation's total economic impacts for an average steady-state year. These estimated annual payments were generated from the economic impact analysis modeling. The tax payments represent aggregate monetary flows from institutions (households and enterprises) to governments in the host areas.

Table 5-32 Tax Revenue Impact from FSRU Operations – Average Year's Tax Receipts (2005 $)

	Suffolk County	New York State
Federal	$1,508,099	$1,763,363
State and local	$3,094,008	$3,426,165
Total:	$4,602,107	$5,189,528

Annual operational spending for the terminal will ultimately generate $3.1 million in state and local tax receipts from Suffolk County economic impacts and $3.4 million from statewide impacts.

The other input required for the fiscal analysis was an estimate of projected annual expenditures. To determine the net fiscal impact (public revenues minus public expenditures) associated with FSRU operations, the following analysis was performed. All of the personnel who will operate the terminal were assumed to come from outside of the Project area and to establish permanent residency. Municipal costs, or public service demands, were calculated using recent municipal financial statements and expressed on a per capita basis. The broadest measure of recent annual municipal expenditures was

sourced from comprehensive annual financial reports for the State of New York, Suffolk County, and the Town of Riverhead. The total expenditures were divided by the respective populations for these areas to arrive at a per capita expenditure amount.

It was an assumed that all 60 employees will reside in Suffolk County in the Town of Riverhead and have an average household size of three persons. This assumption was used to gauge the net public service demands that will be placed on the host municipalities over the Project's lifetime. Table 5-33 identifies the assumptions and parameters that were used in the fiscal impact analysis.

Table 5-33 Assumptions and Parameters Used in the Operational Period Fiscal Impact Analysis

	Town of Riverhead	Suffolk County	New York State
Population (2000)	27,680	1,419,369	18,976,457
Total public expenditures (in millions of 2003$)	$24.32	$2,234.9	$91,147.0
Per capita public expenditures ($/person)	$879	$1,575	$4,803
Total employees	60	60	60
Average household size	3.0	3.0	3.0
Estimated new residents	180	180	180
Estimated annual public expenditures	$158,220	$283,500	$864,540

Sources: Town of Riverhead 2004.
Suffolk County Comptroller's Office 2003.
New York State, Office of the State Comptroller 2004.

The sum total municipal annual expenditure ($1,306,260 = Riverhead + Suffolk County + New York State) was then compared to the total New York State and local tax revenues by year (generated from statewide economic impacts) from 2011 to 2040 to gauge the net fiscal or cost revenue impact. Table 5-34 presents the annual comparisons and the sum total net revenues in present value terms over the life of the Project.

- FSRU operations will result in cumulative present value municipal net revenues of $25.5 million over the 30-year life of the project. Therefore, FSRU operations will, on balance, have a positive long-term impact on the fiscal positions of the Project area local governments. Project-related spending and economic impacts will generate more in public revenues than is consumed in public resources. Annual demands on public infrastructure facilities and municipal services can be sustained or supported by the estimated tax receipts generated from the Project's operational expenditures; therefore, no mitigation will be necessary.

Table 5-34 Fiscal Impact Analysis – Broadwater Operational Phase (FSRU)

Fiscal Impact Analysis - Broadwater Operational Phase (FSRU)
2005 $

					Discount	Annual Present Values		
		Tax Revenue State+Local	Total Public Expenditures	Revenues - Expenditures	Rate = 5%	Tax Revenue State+Local	Total Public Expenditures	Revenues - Expenditures
0	2005			-	1.000			
1	2006			-	0.952			
2	2007			-	0.907			
3	2008			-	0.864			
4	2009			-	0.823			
5	2010				0.784			
6	2011	$ 3,426,165	$ 1,306,260	$ 2,119,905	0.746	$ 2,555,919	$ 974,470	$ 1,581,449
7	2012	3,426,165	1,306,260	2,119,905	0.711	$ 2,436,003	$ 928,751	$ 1,507,252
8	2013	3,426,165	1,306,260	2,119,905	0.677	$ 2,319,514	$ 884,338	$ 1,435,176
9	2014	3,426,165	1,306,260	2,119,905	0.645	$ 2,209,876	$ 842,538	$ 1,367,338
10	2015	3,426,165	1,306,260	2,119,905	0.614	$ 2,103,665	$ 802,044	$ 1,301,621
11	2016	3,426,165	1,306,260	2,119,905	0.585	$ 2,004,307	$ 764,162	$ 1,240,145
12	2017	3,426,165	1,306,260	2,119,905	0.557	$ 1,908,374	$ 727,587	$ 1,180,787
13	2018	3,426,165	1,306,260	2,119,905	0.530	$ 1,815,867	$ 692,318	$ 1,123,549
14	2019	3,426,165	1,306,260	2,119,905	0.505	$ 1,730,213	$ 659,661	$ 1,070,552
15	2020	3,426,165	1,306,260	2,119,905	0.481	$ 1,647,985	$ 628,311	$ 1,019,674
16	2021	3,426,165	1,306,260	2,119,905	0.458	$ 1,569,184	$ 598,267	$ 970,917
17	2022	3,426,165	1,306,260	2,119,905	0.436	$ 1,493,808	$ 569,529	$ 924,279
18	2023	3,426,165	1,306,260	2,119,905	0.416	$ 1,425,285	$ 543,404	$ 881,881
19	2024	3,426,165	1,306,260	2,119,905	0.396	$ 1,356,761	$ 517,279	$ 839,482
20	2025	3,426,165	1,306,260	2,119,905	0.377	$ 1,291,664	$ 492,460	$ 799,204
21	2026	3,426,165	1,306,260	2,119,905	0.359	$ 1,229,993	$ 468,947	$ 761,046
22	2027	3,426,165	1,306,260	2,119,905	0.342	$ 1,171,748	$ 446,741	$ 725,007
23	2028	3,426,165	1,306,260	2,119,905	0.326	$ 1,116,930	$ 425,841	$ 691,089
24	2029	3,426,165	1,306,260	2,119,905	0.310	$ 1,062,111	$ 404,941	$ 657,170
25	2030	3,426,165	1,306,260	2,119,905	0.295	$ 1,010,719	$ 385,347	$ 625,372
26	2031	3,426,165	1,306,260	2,119,905	0.281	$ 962,752	$ 367,059	$ 595,693
27	2032	3,426,165	1,306,260	2,119,905	0.268	$ 918,212	$ 350,078	$ 568,134
28	2033	3,426,165	1,306,260	2,119,905	0.255	$ 873,672	$ 333,096	$ 540,576
29	2034	3,426,165	1,306,260	2,119,905	0.243	$ 832,558	$ 317,421	$ 515,137
30	2035	3,426,165	1,306,260	2,119,905	0.231	$ 791,444	$ 301,746	$ 489,698
31	2036	3,426,165	1,306,260	2,119,905	0.220	$ 753,756	$ 287,377	$ 466,379
32	2037	3,426,165	1,306,260	2,119,905	0.210	$ 719,495	$ 274,315	$ 445,180
33	2038	3,426,165	1,306,260	2,119,905	0.200	$ 685,233	$ 261,252	$ 423,981
34	2039	3,426,165	1,306,260	2,119,905	0.190	$ 650,971	$ 248,189	$ 402,782
35	2040	3,426,165	1,306,260	2,119,905	0.181	$ 620,136	$ 236,433	$ 383,703
	Total:	**$ 102,784,950**	**$ 39,187,800**	**$ 63,597,150**		**$ 41,268,155**	**$ 15,733,902**	**$ 25,534,253**

5.3.3.6 Impacts on Future Population Levels, Housing, and Incomes

The impact associated with the estimated FSRU permanent facility staff and their families (projected at 60 x 3 = 180 persons) during the operational period is anticipated to have a non-material impact on the area's future population level. The depth and breadth of the available housing stock (discussed at length in Section 5.2) also will be able to accommodate personnel and their families who would have the option to either purchase or rent. The highly skilled, professional grade salaries associated with the permanent FSRU positions will have a minor but positive impact on per capita incomes in the region. The ripple effects from other industries and dependent incomes stimulated by the operational period expenditures also will have a small positive impact on regional per capita incomes.

5.3.3.7 Transportation Impacts During Operations

Due to the small number of workers attached to the FSRU and the staggered shift schedule, the impacts on transportation systems during operations also are expected to be negligible.

5.3.3.8 Impacts on Regional Energy Market

The commissioning of the Project will provide a new source of natural gas to end-users. The Project will serve to meet growing energy demand by offering a cleaner energy alternative to more emission intensive fossil fuels such as fuel oil and kerosene. The existing environmental data show that a significant number of consumers within the Project area are dependent upon fuel oil for their home heating energy needs. The natural gas supplied by the Broadwater Project will facilitate the transition to natural gas consumption by these consumers.

The Project's throughput has the potential to dampen or moderate seasonal price spikes in regional natural gas markets. The Project represents a supply shift, as opposed to an increase in supply intensity from pipelines already in place.

The Project can be viewed as enabling infrastructure that will link the region to global supplies of natural gas. LNG projects provide access, or energy bridgeheads, to global supplies. LNG imports, enabled by the Project development, have the potential to offer price stability and a reliable new source of energy secured by long-term supply contracts. It has been estimated that the additional supply (1 bcfd) coming in to the New York City market will reduce regional area basis differentials between the benchmark Henry Hub price and New York City regional price by a significant margin (Energy and Environmental Analysis 2005).

Average household energy expenditures are higher in the Northeast compared to the national average (DOE 2005), and the Project has the potential to lower these expenditures closer to the national average. Reduced energy expenditures (per unit of energy delivered to consumers) have the potential to effectively raise household disposable incomes and thereby boost consumer spending or increase savings. The savings can potentially boost regional gross domestic product through additional capital investment in other sectors and through reallocated consumer spending on commodities and sectors other than energy.

Furthermore, the incremental natural gas supply available to power generators has the potential to provide lower-cost energy to consumers based on both lower potential input costs and the efficiency of natural-gas-fired generation in electricity production (DOE 2004). This potential positive impact on households assumes that these producer savings will eventually be passed on to end-users/consumers.

5.3.3.9 Estimated Environmental Benefits

Overview and Purpose of Analysis

This section discusses potential future environmental benefits that may be realized from the Project and other gas supply augmentation projects in the form of avoided air emissions.

The Project will supply clean burning natural gas that will be available to fuel new and existing electric generation needs in the region. New York State projects an economic growth scenario where relatively more natural gas is used to generate electric power. Use of natural gas for new electric generation plants and the re-powering of existing generation plants will result in fewer air pollutant emissions. This benefit can be estimated and expressed in monetary terms. The estimated environmental benefits analysis is provided in Appendix B.

The following data and assumptions were used in the analysis.

- The projections were obtained from the NERC 2004 ES&D Forecast for the years 2011 to 2013. The NERC 2013 growth rate was applied to generate the values for the years 2014 to 2020. New York City and Long Island were assumed to account for 50% of New York State's projected power consumption.

- The estimate of the electric power to be generated from the Project's annual gas throughput is based on the projected share of electric power to be generated by natural gas in New York State and assumes that the Project's gas supply would be used to fire combined-cycle gas turbines and boiler and steam turbines.

- The projected shares of electric power to be generated by natural gas, oil, and coal were obtained from the New York State Energy Plan under two alternative growth scenarios (New York State Energy Plan 2002).

- The air emission factors showing pollutants per kW-hr were obtained from various studies and data from local power generation facilities.

- Unit value damage estimates were adapted from primary research studies for New York State and trans-boundary damage estimates associated with global climate change impacts.

- Consumer Price Index levels for various years from the U.S. Bureau of Labor Statistics were used to escalate unit value estimates from previous year studies to current price levels.

Summary Conclusion

Using data from the New York State Energy Plan on future electric power generation under two alternative growth scenarios, the public benefits from avoided air pollution damages expected with substantial additions to New York City and Long Island power generation capacity are estimated to average $181 million per year between 2011 and 2020. The cumulative present value of these avoided damages (public benefits) in 2005 dollars amounts to $1.3 billion.

The Project's annual natural gas throughput dedicated to electric power generation is estimated to supply between 15,000 to 26,000 gigawatt hours (GW-hr) (17% to 28% of regional total) of electric power to meet projected New York City and Long Island consumption over the life of the Project. The annual environmental economic benefits attributable to the Project are estimated to range from $31 to $51 million per year on average, or from $226 to $373 million in 2005 present value terms over the years 2011 to 2020.

5.3.3.10 Environmental Justice

Background

Executive Order 12898, "Federal Actions to Address Environmental Justice in Minority Populations and Low-Income Populations" (59 Fed. Reg. 7629 [1994]) provides that each agency shall integrate environmental justice into its mission by identifying and addressing, as appropriate, disproportionately high and adverse human health or environmental effects of its programs, policies, and activities on minority populations and low-income populations.

Executive Order 12898's mandate provides that the composition of the potentially affected area should be evaluated and, during the public participation/community outreach process, meaningful early notice and diligent public outreach should be conducted. It further provides that these activities should embrace all potentially impacted groups, irrespective of race, creed, or income. These aspects of Executive Order 12898 were fulfilled by the following public outreach activities:

- Development and distribution of the *Project Profile* to introduce the Project.
- Open houses held in New York and Connecticut following Project announcement.
- Establishment of a Project office in Riverhead, New York, to allow active stakeholder engagement.
- Establishment of a Project Web site (www.Broadwaterenergy.com) to allow for dissemination of Project information.
- Continued outreach to federal, state, and local stakeholders to identify concerns.

Project Area Composition

Table 5-35 provides an overview of the racial composition and income characteristics for the Town of Riverhead and compares these statistics to Suffolk County, New York and New York State.

Table 5-35 Racial Composition and Income Statistics for the Project Area

	Town of Riverhead	Suffolk County	New York State
Percent (%)			
White	85.2	84.6	67.9
Black	10.5	6.9	15.9
American Indian and Alaska Native	0.3	0.3	0.4
Asian	0.9	2.4	5.5
Persons Reporting Other Race	1.4	3.7	7.1
Persons Reporting Two or More Races	1.6	2.1	3.1
Persons of Hispanic or Latino Origin (of any race)	6.1	10.5	15.1
Per Capita Income (1999 $)	$24,647	$26,577	$23,389
Families Below Poverty Level (%)	5.3	3.9	11.5
Individuals Below Poverty Level (%)	8.6	6.0	14.6

Source : U.S. Bureau of the Census, American Factfinder, Census 2000 Demographic Profile Highlights
U.S. Bureau of the Census 2000b.

Implementation guidance for Executive Order 12898 states that "minority populations should be identified where either: (a) the minority population of the affected area exceeds 50 percent or (b) the minority population percentage of the affected area is meaningfully greater than the minority population percentage in the general population or other appropriate unit for geographic analysis." (CEQ 1997).

The table shows that the Town of Riverhead does not contain a relatively larger share of minority populations or a disproportionate share compared to both Suffolk County and New York State. Furthermore, the relative share of low-income population (as measured by families and individuals below the poverty level) is close to the Suffolk County average and below the New York State average.

Assessment of Possible Disproportionate Impact

While the Town of Riverhead does not contain any minority populations in excess of 50% of the general population, or a percentage meaningfully greater than Suffolk County, the environmental impacts analysis suggests that the location of the FSRU and subsea pipeline will not impact the identified populations within the Town of Riverhead in any

disproportionate manner. Activities during construction and operations also will not have a disproportionate impact on these identified populations.

5.4 REFERENCES

American Medical Association. 2005. Physician-Related Data Resources by State and County. Web site http://www.ama-assn.org/cgi-bin/sserver/datalist.cgi accessed on June 23rd, 2005.

Council on Environmental Quality (CEQ). 1997. Executive Office of the President, Environmental Justice Guidance Under the National Environmental Policy Act.

Energy and Environmental Analysis, Inc. 2005. *Regional Market Growth and the Need for LNG Imports into the Northeast U.S. and Eastern Canada*, September, 2005.

Institute for Sustainable Energy. 2003. Comprehensive Assessment and Report, Part II, *Environmental Resources and Energy Infrastructure of Long Island Sound*. Prepared by the Task Force on Long Island Sound Pursuant to Public Act No. 02-95 and Executive Order No. 26 June 3, 2003. Eastern Connecticut State University, p. 25.

Long Island Association. 2005. *Annual Business Fact Book – 2004-2005*.

Minnesota IMPLAN Group, Inc. (MIG). 2000. IMPLAN Professional Version 2.0 – Social Accounting and Impact Analysis Software, 2nd Edition, June 2000. Stillwater Minnesota.

New York State Office of the State Comptroller. 2004. New York Comprehensive Annual Financial Report for the Year Ended March 31, 2004. Available at http://www.osc.state.ny.us/finance/

New York State Energy Research and Development Authority (NYSERDA). 2002. New York State Energy Plan, p. 3-121. Available at:
http://www.nyserda.org/Energy_Information/energy_state_plan.asp

New York State Office of Real Property Services (NYSORPS). 2005. SalesWeb database, and Download Dictionary of fields and terms. (http://www.orps.state.ny.us/salesweb).

Olson, Douglas C. 1999. Using Social Accounts to Estimate Tax Impacts, MIG, Inc., June 11, 1999.

Suffolk County Comptroller's Office. 2004. Comprehensive Annual Financial Report for the Year Ended December 31, 2003. Available at Web site http://www.co.suffolk.ny.us/Comptroller/CAFR-2003.pdf

Suffolk County Department of Fire, Rescue, and Emergency Services. 2005. Phone conversation with Matthew Butwin of Ecology and Environment, Inc., regarding fire, rescue, and emergency services staff numbers, May 11, 2005.

Suffolk County Department of Planning. 2003. Hotel inventory maintained by the Suffolk County Department of Planning, Web site http://www.co.suffolk.ny.us/Planning/HotelS1

Suffolk County Police Department. 2005. Phone conversation with Matthew Butwin of Ecology and Environment, Inc., regarding police department staff numbers, May 11, 2005.

Town of Riverhead. 2004. *Annual Financial Report Update Document for the Town of Riverhead, County of Suffolk for the Year Ended 2003*. Prepared by the Town of Riverhead Accounting Department and available at http://riverheadli.com/accounting/.

United States Bureau of the Census. 2000a. DP4. Profile of Selected Housing Characteristics: 2000, Geographic Areas, Suffolk County, New York, Fairfield and New Haven Counties, Connecticut.

_____. 2000b. American Fact Finder, Census 2000, Demographic Profile Highlights.

_____. 2005. Governments-States Descriptions. Connecticut. Web site http://ftp2.census.gov/govs/cog/gc0212ct.pdf accessed June 23rd, 2005.

_____. 2005. 2002 County Business Patterns (NAICS). Economic data for New York State, Connecticut and the respective counties in the study area. Web site http://censtats.census.gov/cgi-bin/cbpnaic/cbpsect.pl, accessed on May 10, 2005.

United States Bureau of Labor Statistics. 2004. Population levels for the Town of Riverhead, Suffolk County and New York State.

_____. 2005. Web site database http://data.bls.gov/map/servlet/map.servlet.MapToolServlet?survey=la&map=county&seasonal=u, accessed June 23, 2005.

United States Department of Energy (DOE). 2005. Energy Information Administration, *Annual Energy Outlook, 2005*.

APPENDIX A

ECONOMIC IMPACTS OF THE PROPOSED BROADWATER PROJECT

Construction Period

Suffolk County Total Value Added Impacts - Construction Period
Broadwater EIS (Mils. Of 2005 US $)

	Year	Direct	Indirect	Induced	Total	Discount Rate = 5%	Annual Present Values Direct	Indirect	Induced	Total
0	2005				-	1.000				-
1	2006				-	0.952				-
2	2007				-	0.907				-
3	2008				-	0.864				-
4	2009				-	0.823				-
5	2010	$ 3.26	$ 3.52	$ 2.09	8.87	0.784	$ 2.55	$ 2.76	$ 1.64	6.95
	Total:	**$ 3.26**	**$ 3.52**	**$ 2.09**	**$ 8.87**		**$ 2.55**	**$ 2.76**	**$ 1.64**	**$ 6.95**

Suffolk County Total Output Impacts - Construction Period
Broadwater EIS (Mils. Of 2005 US $)

	Year	Direct	Indirect	Induced	Total	Discount Rate = 5%	Annual Present Values Direct	Indirect	Induced	Total
0	2005				-	1.000				-
1	2006				-	0.952				-
2	2007				-	0.907				-
3	2008				-	0.864				-
4	2009				-	0.823				-
5	2010	$ 11.1	$ 5.7	$ 3.2	20.03	0.784	$ 8.7	$ 4.5	$ 2.5	15.69
	Total:	**$ 11.06**	**$ 5.74**	**$ 3.23**	**$ 20.03**		**$ 8.67**	**$ 4.49**	**$ 2.53**	**$ 15.69**

Suffolk County Total Employee Compensation - Construction Period
Broadwater EIS (Mils. Of 2005 US $)

	Year	Direct	Indirect	Induced	Total	Discount Rate = 5%	Annual Present Values Direct	Indirect	Induced	Total
0	2005				-	1.000				-
1	2006				-	0.952				-
2	2007				-	0.907				-
3	2008				-	0.864				-
4	2009				-	0.823				-
5	2010	$ 2.1	$ 2.1	$ 1.0	5.22	0.784	$ 1.6	$ 1.6	$ 0.8	4.09
	Total:	**$ 2.08**	**$ 2.10**	**$ 1.03**	**$ 5.22**		**$ 1.63**	**$ 1.65**	**$ 0.81**	**$ 4.09**

New York State Total Value Added Impacts - Construction Period
Broadwater EIS (Mils. Of 2005 US $)

	Year	Direct	Indirect	Induced	Total	Discount Rate = 5%	Annual Present Values Direct	Indirect	Induced	Total
0	2005				-	1.000				-
1	2006				-	0.952				-
2	2007				-	0.907				-
3	2008				-	0.864				-
4	2009				-	0.823				-
5	2010	$ 4.06	$ 3.19	$ 2.46	9.71	0.784	$ 3.18	$ 2.50	$ 1.93	7.61
	Total:	**$ 4.06**	**$ 3.19**	**$ 2.46**	**$ 9.71**		**$ 3.18**	**$ 2.50**	**$ 1.93**	**$ 7.61**

New York State Total Output Impacts - Construction Period
Broadwater EIS (Mils. Of 2005 US $)

	Year	Direct	Indirect	Induced	Total	Discount Rate = 5%	Annual Present Values Direct	Indirect	Induced	Total
0	2005				-	1.000				-
1	2006				-	0.952				-
2	2007				-	0.907				-
3	2008				-	0.864				-
4	2009				-	0.823				-
5	2010	$ 11.1	$ 5.2	$ 3.8	20.10	0.784	$ 8.7	$ 4.1	$ 3.0	15.80
	Total:	**$ 11.10**	**$ 5.20**	**$ 3.80**	**$ 20.10**		**$ 8.70**	**$ 4.10**	**$ 3.00**	**$ 15.80**

New York State Total Employee Compensation - Construction Period
Broadwater EIS (Mils. Of 2005 US $)

	Year	Direct	Indirect	Induced	Total	Discount Rate = 5%	Annual Present Values Direct	Indirect	Induced	Total
0	2005				-	1.000				-
1	2006				-	0.952				-
2	2007				-	0.907				-
3	2008				-	0.864				-
4	2009				-	0.823				-
5	2010	$ 2.5	$ 1.9	$ 1.2	5.60	0.784	$ 2.0	$ 1.5	$ 0.9	4.40
	Total:	**$ 2.50**	**$ 1.90**	**$ 1.20**	**$ 5.60**		**$ 2.00**	**$ 1.50**	**$ 0.90**	**$ 4.40**

Operational Period

Suffolk County Total Value Added Impacts - Facility Operations
Broadwater EIS (2005 $)

						Discount Rate =	Annual Present Values			
		Direct	Indirect	Induced	Total	5%	Direct	Indirect	Induced	Total
0	2005	-	-	-	-	1.000	$ -	$ -	$ -	$ -
1	2006	-	-	-	-	0.9524	$ -	$ -	$ -	$ -
2	2007	-	-	-	-	0.9070	$ -	$ -	$ -	$ -
3	2008	-	-	-	-	0.8638	$ -	$ -	$ -	$ -
4	2009	-	-	-	-	0.8227	$ -	$ -	$ -	$ -
5	2010				-	0.7835	$ -	$ -	$ -	$ -
6	2011	10,103,664	5,194,422	3,630,708	18,928,794	0.7462	$ 7,539,510	$ 3,876,158	$ 2,709,290	$ 14,124,958
7	2012	10,103,664	5,194,422	3,630,708	18,928,794	0.7107	$ 7,180,485	$ 3,691,579	$ 2,580,276	$ 13,452,340
8	2013	10,103,664	5,194,422	3,630,708	18,928,794	0.6768	$ 6,838,557	$ 3,515,789	$ 2,457,406	$ 12,811,753
9	2014	10,103,664	5,194,422	3,630,708	18,928,794	0.6446	$ 6,512,912	$ 3,348,371	$ 2,340,387	$ 12,201,669
10	2015	10,103,664	5,194,422	3,630,708	18,928,794	0.6139	$ 6,202,773	$ 3,188,925	$ 2,228,940	$ 11,620,638
11	2016	10,103,664	5,194,422	3,630,708	18,928,794	0.5847	$ 5,907,403	$ 3,037,071	$ 2,122,800	$ 11,067,274
12	2017	10,103,664	5,194,422	3,630,708	18,928,794	0.5568	$ 5,626,098	$ 2,892,449	$ 2,021,714	$ 10,540,261
13	2018	10,103,664	5,194,422	3,630,708	18,928,794	0.5303	$ 5,358,189	$ 2,754,713	$ 1,925,442	$ 10,038,344
14	2019	10,103,664	5,194,422	3,630,708	18,928,794	0.5051	$ 5,103,037	$ 2,623,536	$ 1,833,754	$ 9,560,327
15	2020	10,103,664	5,194,422	3,630,708	18,928,794	0.4810	$ 4,860,035	$ 2,498,606	$ 1,746,433	$ 9,105,074
16	2021	10,103,664	5,194,422	3,630,708	18,928,794	0.4581	$ 4,628,605	$ 2,379,625	$ 1,663,269	$ 8,671,499
17	2022	10,103,664	5,194,422	3,630,708	18,928,794	0.4363	$ 4,408,195	$ 2,266,309	$ 1,584,066	$ 8,258,570
18	2023	10,103,664	5,194,422	3,630,708	18,928,794	0.4155	$ 4,198,281	$ 2,158,390	$ 1,508,634	$ 7,865,305
19	2024	10,103,664	5,194,422	3,630,708	18,928,794	0.3957	$ 3,998,363	$ 2,055,609	$ 1,436,794	$ 7,490,767
20	2025	10,103,664	5,194,422	3,630,708	18,928,794	0.3769	$ 3,807,965	$ 1,957,723	$ 1,368,376	$ 7,134,063
21	2026	10,103,664	5,194,422	3,630,708	18,928,794	0.3589	$ 3,626,633	$ 1,864,498	$ 1,303,215	$ 6,794,346
22	2027	10,103,664	5,194,422	3,630,708	18,928,794	0.3418	$ 3,453,936	$ 1,775,712	$ 1,241,157	$ 6,470,806
23	2028	10,103,664	5,194,422	3,630,708	18,928,794	0.3256	$ 3,289,463	$ 1,691,155	$ 1,182,054	$ 6,162,672
24	2029	10,103,664	5,194,422	3,630,708	18,928,794	0.3101	$ 3,132,822	$ 1,610,624	$ 1,125,766	$ 5,869,212
25	2030	10,103,664	5,194,422	3,630,708	18,928,794	0.2953	$ 2,983,640	$ 1,533,927	$ 1,072,158	$ 5,589,725
26	2031	10,103,664	5,194,422	3,630,708	18,928,794	0.2812	$ 2,841,562	$ 1,460,883	$ 1,021,103	$ 5,323,548
27	2032	10,103,664	5,194,422	3,630,708	18,928,794	0.2678	$ 2,706,249	$ 1,391,317	$ 972,479	$ 5,070,046
28	2033	10,103,664	5,194,422	3,630,708	18,928,794	0.2551	$ 2,577,380	$ 1,325,064	$ 926,171	$ 4,828,615
29	2034	10,103,664	5,194,422	3,630,708	18,928,794	0.2429	$ 2,454,648	$ 1,261,966	$ 882,067	$ 4,598,681
30	2035	10,103,664	5,194,422	3,630,708	18,928,794	0.2314	$ 2,337,760	$ 1,201,872	$ 840,064	$ 4,379,696
31	2036	10,103,664	5,194,422	3,630,708	18,928,794	0.2204	$ 2,226,438	$ 1,144,640	$ 800,061	$ 4,171,139
32	2037	10,103,664	5,194,422	3,630,708	18,928,794	0.2099	$ 2,120,417	$ 1,090,133	$ 761,963	$ 3,972,513
33	2038	10,103,664	5,194,422	3,630,708	18,928,794	0.1999	$ 2,019,445	$ 1,038,222	$ 725,679	$ 3,783,346
34	2039	10,103,664	5,194,422	3,630,708	18,928,794	0.1904	$ 1,923,281	$ 988,783	$ 691,123	$ 3,603,187
35	2040	10,103,664	5,194,422	3,630,708	18,928,794	0.1813	$ 1,831,696	$ 941,698	$ 658,212	$ 3,431,606
	Total:	**$303,109,920**	**$ 155,832,660**	**$ 108,921,240**	**$ 567,863,820**		**$ 121,695,780**	**$ 62,565,346**	**$ 43,730,853**	**$ 227,991,979**

Suffolk County Total Output Impacts - Facility Operations
Broadwater EIS (2005 $)

	Year	Direct	Indirect	Induced	Total	Discount Rate = 5%	Annual Present Values: Direct	Indirect	Induced	Adj. Total
0	2005					1.0000	$ -	$ -	$ -	-
1	2006				-	0.9524	$ -	$ -	$ -	-
2	2007				-	0.9070	$ -	$ -	$ -	-
3	2008				-	0.8638	$ -	$ -	$ -	-
4	2009				-	0.8227	$ -	$ -	$ -	-
5	2010				-	0.7835	$ -	$ -	$ -	-
6	2011	25,630,406	8,205,806	5,615,050	39,451,262	0.7462	$ 19,125,804	$ 6,123,299	$ 4,190,037	29,439,139
7	2012	25,630,406	8,205,806	5,615,050	39,451,262	0.7107	$ 18,215,051	$ 5,831,713	$ 3,990,511	28,037,275
8	2013	25,630,406	8,205,806	5,615,050	39,451,262	0.6768	$ 17,347,668	$ 5,554,012	$ 3,800,487	26,702,167
9	2014	25,630,406	8,205,806	5,615,050	39,451,262	0.6446	$ 16,521,588	$ 5,289,536	$ 3,619,511	25,430,635
10	2015	25,630,406	8,205,806	5,615,050	39,451,262	0.6139	$ 15,734,846	$ 5,037,653	$ 3,447,154	24,219,653
11	2016	25,630,406	8,205,806	5,615,050	39,451,262	0.5847	$ 14,985,568	$ 4,797,765	$ 3,283,003	23,066,336
12	2017	25,630,406	8,205,806	5,615,050	39,451,262	0.5568	$ 14,271,969	$ 4,569,300	$ 3,126,670	21,967,939
13	2018	25,630,406	8,205,806	5,615,050	39,451,262	0.5303	$ 13,592,352	$ 4,351,714	$ 2,977,781	20,921,847
14	2019	25,630,406	8,205,806	5,615,050	39,451,262	0.5051	$ 12,945,097	$ 4,144,490	$ 2,835,982	19,925,568
15	2020	25,630,406	8,205,806	5,615,050	39,451,262	0.4810	$ 12,328,664	$ 3,947,133	$ 2,700,935	18,976,732
16	2021	25,630,406	8,205,806	5,615,050	39,451,262	0.4581	$ 11,741,584	$ 3,759,174	$ 2,572,319	18,073,078
17	2022	25,630,406	8,205,806	5,615,050	39,451,262	0.4363	$ 11,182,461	$ 3,580,166	$ 2,449,828	17,212,455
18	2023	25,630,406	8,205,806	5,615,050	39,451,262	0.4155	$ 10,649,963	$ 3,409,682	$ 2,333,169	16,392,814
19	2024	25,630,406	8,205,806	5,615,050	39,451,262	0.3957	$ 10,142,822	$ 3,247,316	$ 2,222,066	15,612,204
20	2025	25,630,406	8,205,806	5,615,050	39,451,262	0.3769	$ 9,659,830	$ 3,092,682	$ 2,116,253	14,868,766
21	2026	25,630,406	8,205,806	5,615,050	39,451,262	0.3589	$ 9,199,839	$ 2,945,411	$ 2,015,479	14,160,729
22	2027	25,630,406	8,205,806	5,615,050	39,451,262	0.3418	$ 8,761,751	$ 2,805,154	$ 1,919,504	13,486,409
23	2028	25,630,406	8,205,806	5,615,050	39,451,262	0.3256	$ 8,344,525	$ 2,671,575	$ 1,828,099	12,844,199
24	2029	25,630,406	8,205,806	5,615,050	39,451,262	0.3101	$ 7,947,166	$ 2,544,357	$ 1,741,047	12,232,570
25	2030	25,630,406	8,205,806	5,615,050	39,451,262	0.2953	$ 7,568,730	$ 2,423,197	$ 1,658,140	11,650,067
26	2031	25,630,406	8,205,806	5,615,050	39,451,262	0.2812	$ 7,208,314	$ 2,307,807	$ 1,579,181	11,095,302
27	2032	25,630,406	8,205,806	5,615,050	39,451,262	0.2678	$ 6,865,061	$ 2,197,911	$ 1,503,982	10,566,954
28	2033	25,630,406	8,205,806	5,615,050	39,451,262	0.2551	$ 6,538,153	$ 2,093,249	$ 1,432,364	10,063,766
29	2034	25,630,406	8,205,806	5,615,050	39,451,262	0.2429	$ 6,226,813	$ 1,993,570	$ 1,364,156	9,584,539
30	2035	25,630,406	8,205,806	5,615,050	39,451,262	0.2314	$ 5,930,298	$ 1,898,638	$ 1,299,196	9,128,132
31	2036	25,630,406	8,205,806	5,615,050	39,451,262	0.2204	$ 5,647,903	$ 1,808,227	$ 1,237,329	8,693,459
32	2037	25,630,406	8,205,806	5,615,050	39,451,262	0.2099	$ 5,378,955	$ 1,722,121	$ 1,178,409	8,279,485
33	2038	25,630,406	8,205,806	5,615,050	39,451,262	0.1999	$ 5,122,814	$ 1,640,115	$ 1,122,294	7,885,224
34	2039	25,630,406	8,205,806	5,615,050	39,451,262	0.1904	$ 4,878,871	$ 1,562,015	$ 1,068,852	7,509,737
35	2040	25,630,406	8,205,806	5,615,050	39,451,262	0.1813	$ 4,646,544	$ 1,487,633	$ 1,017,954	7,152,131
	Total:	**$ 768,912,180**	**$ 246,174,180**	**$ 168,451,500**	**$ 1,183,537,860**		**$ 308,711,003**	**$ 98,836,616**	**$ 67,631,692**	**$475,179,311**

Suffolk County Employee Compensation Impacts - Facility Operations
Broadwater EIS (2005 $)

						Discount Rate =	Annual Present Values			
		Direct	Indirect	Induced	Total	5%	Direct	Indirect	Induced	Total
0	2005	-	-	-	-	1.0000	$ -	$ -	$ -	$ -
1	2006	-	-	-	-	0.9524	$ -	$ -	$ -	$ -
2	2007	-	-	-	-	0.9070	$ -	$ -	$ -	$ -
3	2008	-	-	-	-	0.8638	$ -	$ -	$ -	$ -
4	2009	-	-	-	-	0.8227	$ -	$ -	$ -	$ -
5	2010				-	0.7835	$ -	$ -	$ -	$ -
6	2011	4,318,588	1,626,171	1,794,934	7,739,693	0.7462	$ 3,222,597	$ 1,213,474	$ 1,339,407	$ 5,775,478
7	2012	4,318,588	1,626,171	1,794,934	7,739,693	0.7107	$ 3,069,140	$ 1,155,689	$ 1,275,626	$ 5,500,455
8	2013	4,318,588	1,626,171	1,794,934	7,739,693	0.6768	$ 2,922,990	$ 1,100,657	$ 1,214,882	$ 5,238,529
9	2014	4,318,588	1,626,171	1,794,934	7,739,693	0.6446	$ 2,783,800	$ 1,048,244	$ 1,157,030	$ 4,989,075
10	2015	4,318,588	1,626,171	1,794,934	7,739,693	0.6139	$ 2,651,238	$ 998,328	$ 1,101,934	$ 4,751,500
11	2016	4,318,588	1,626,171	1,794,934	7,739,693	0.5847	$ 2,524,989	$ 950,789	$ 1,049,461	$ 4,525,238
12	2017	4,318,588	1,626,171	1,794,934	7,739,693	0.5568	$ 2,404,751	$ 905,513	$ 999,486	$ 4,309,751
13	2018	4,318,588	1,626,171	1,794,934	7,739,693	0.5303	$ 2,290,239	$ 862,393	$ 951,892	$ 4,104,524
14	2019	4,318,588	1,626,171	1,794,934	7,739,693	0.5051	$ 2,181,180	$ 821,327	$ 906,564	$ 3,909,071
15	2020	4,318,588	1,626,171	1,794,934	7,739,693	0.4810	$ 2,077,315	$ 782,216	$ 863,394	$ 3,722,925
16	2021	4,318,588	1,626,171	1,794,934	7,739,693	0.4581	$ 1,978,395	$ 744,968	$ 822,280	$ 3,545,643
17	2022	4,318,588	1,626,171	1,794,934	7,739,693	0.4363	$ 1,884,186	$ 709,493	$ 783,124	$ 3,376,802
18	2023	4,318,588	1,626,171	1,794,934	7,739,693	0.4155	$ 1,794,463	$ 675,708	$ 745,832	$ 3,216,002
19	2024	4,318,588	1,626,171	1,794,934	7,739,693	0.3957	$ 1,709,012	$ 643,531	$ 710,316	$ 3,062,859
20	2025	4,318,588	1,626,171	1,794,934	7,739,693	0.3769	$ 1,627,630	$ 612,887	$ 676,492	$ 2,917,009
21	2026	4,318,588	1,626,171	1,794,934	7,739,693	0.3589	$ 1,550,124	$ 583,702	$ 644,278	$ 2,778,104
22	2027	4,318,588	1,626,171	1,794,934	7,739,693	0.3418	$ 1,476,309	$ 555,906	$ 613,598	$ 2,645,813
23	2028	4,318,588	1,626,171	1,794,934	7,739,693	0.3256	$ 1,406,008	$ 529,435	$ 584,379	$ 2,519,822
24	2029	4,318,588	1,626,171	1,794,934	7,739,693	0.3101	$ 1,339,056	$ 504,223	$ 556,551	$ 2,399,830
25	2030	4,318,588	1,626,171	1,794,934	7,739,693	0.2953	$ 1,275,291	$ 480,213	$ 530,049	$ 2,285,553
26	2031	4,318,588	1,626,171	1,794,934	7,739,693	0.2812	$ 1,214,563	$ 457,346	$ 504,809	$ 2,176,717
27	2032	4,318,588	1,626,171	1,794,934	7,739,693	0.2678	$ 1,156,727	$ 435,567	$ 480,770	$ 2,073,064
28	2033	4,318,588	1,626,171	1,794,934	7,739,693	0.2551	$ 1,101,644	$ 414,826	$ 457,876	$ 1,974,346
29	2034	4,318,588	1,626,171	1,794,934	7,739,693	0.2429	$ 1,049,185	$ 395,072	$ 436,073	$ 1,880,330
30	2035	4,318,588	1,626,171	1,794,934	7,739,693	0.2314	$ 999,224	$ 376,259	$ 415,307	$ 1,790,790
31	2036	4,318,588	1,626,171	1,794,934	7,739,693	0.2204	$ 951,642	$ 358,342	$ 395,531	$ 1,705,515
32	2037	4,318,588	1,626,171	1,794,934	7,739,693	0.2099	$ 906,326	$ 341,278	$ 376,696	$ 1,624,300
33	2038	4,318,588	1,626,171	1,794,934	7,739,693	0.1999	$ 863,167	$ 325,027	$ 358,758	$ 1,546,952
34	2039	4,318,588	1,626,171	1,794,934	7,739,693	0.1904	$ 822,064	$ 309,549	$ 341,674	$ 1,473,288
35	2040	4,318,588	1,626,171	1,794,934	7,739,693	0.1813	$ 782,918	$ 294,809	$ 325,404	$ 1,403,131
	Total:	**$ 129,557,640**	**$ 48,785,130**	**$ 53,848,020**	**$ 232,190,790**		**$ 52,016,173**	**$ 19,586,771**	**$ 21,619,473**	**$ 93,222,417**

New York State Total Value Added Impacts - Facility Operations
Broadwater EIS (2005 $)

						Discount Rate =	Annual Present Values			
	Year	Direct	Indirect	Induced	Total	5%	Direct	Indirect	Induced	Total
0	2005					1.0000				-
1	2006					0.9524				-
2	2007					0.9070				-
3	2008					0.8638				-
4	2009					0.8227				-
5	2010				-	0.7835	-	-	-	-
6	2011	11,172,793	5,473,006	4,382,554	21,028,353	0.7462	8,337,138	4,083,957	3,270,262	15,691,357
7	2012	11,172,793	5,473,006	4,382,554	21,028,353	0.7107	7,940,504	3,889,665	3,114,681	14,944,850
8	2013	11,172,793	5,473,006	4,382,554	21,028,353	0.6768	7,561,746	3,704,130	2,966,113	14,231,989
9	2014	11,172,793	5,473,006	4,382,554	21,028,353	0.6446	7,201,982	3,527,900	2,824,994	13,554,876
10	2015	11,172,793	5,473,006	4,382,554	21,028,353	0.6139	6,858,978	3,359,878	2,690,450	12,909,306
11	2016	11,172,793	5,473,006	4,382,554	21,028,353	0.5847	6,532,732	3,200,067	2,562,479	12,295,278
12	2017	11,172,793	5,473,006	4,382,554	21,028,353	0.5568	6,221,011	3,047,370	2,440,206	11,708,587
13	2018	11,172,793	5,473,006	4,382,554	21,028,353	0.5303	5,924,932	2,902,335	2,324,068	11,151,335
14	2019	11,172,793	5,473,006	4,382,554	21,028,353	0.5051	5,643,378	2,764,415	2,213,628	10,621,421
15	2020	11,172,793	5,473,006	4,382,554	21,028,353	0.4810	5,374,113	2,632,516	2,108,008	10,114,637
16	2021	11,172,793	5,473,006	4,382,554	21,028,353	0.4581	5,118,256	2,507,184	2,007,648	9,633,088
17	2022	11,172,793	5,473,006	4,382,554	21,028,353	0.4363	4,874,690	2,387,873	1,912,108	9,174,671
18	2023	11,172,793	5,473,006	4,382,554	21,028,353	0.4155	4,642,295	2,274,034	1,820,951	8,737,280
19	2024	11,172,793	5,473,006	4,382,554	21,028,353	0.3957	4,421,074	2,165,668	1,734,177	8,320,919
20	2025	11,172,793	5,473,006	4,382,554	21,028,353	0.3769	4,211,026	2,062,776	1,651,785	7,925,587
21	2026	11,172,793	5,473,006	4,382,554	21,028,353	0.3589	4,009,915	1,964,262	1,572,899	7,547,076
22	2027	11,172,793	5,473,006	4,382,554	21,028,353	0.3418	3,818,861	1,870,673	1,497,957	7,187,491
23	2028	11,172,793	5,473,006	4,382,554	21,028,353	0.3256	3,637,861	1,782,011	1,426,960	6,846,832
24	2029	11,172,793	5,473,006	4,382,554	21,028,353	0.3101	3,464,683	1,697,179	1,359,030	6,520,892
25	2030	11,172,793	5,473,006	4,382,554	21,028,353	0.2953	3,299,326	1,616,179	1,294,168	6,209,673
26	2031	11,172,793	5,473,006	4,382,554	21,028,353	0.2812	3,141,789	1,539,009	1,232,374	5,913,172
27	2032	11,172,793	5,473,006	4,382,554	21,028,353	0.2678	2,992,074	1,465,671	1,173,648	5,631,393
28	2033	11,172,793	5,473,006	4,382,554	21,028,353	0.2551	2,850,179	1,396,164	1,117,990	5,364,333
29	2034	11,172,793	5,473,006	4,382,554	21,028,353	0.2429	2,713,871	1,329,393	1,064,522	5,107,786
30	2035	11,172,793	5,473,006	4,382,554	21,028,353	0.2314	2,585,384	1,266,454	1,014,123	4,865,961
31	2036	11,172,793	5,473,006	4,382,554	21,028,353	0.2204	2,462,484	1,206,251	965,915	4,634,650
32	2037	11,172,793	5,473,006	4,382,554	21,028,353	0.2099	2,345,169	1,148,784	919,898	4,413,851
33	2038	11,172,793	5,473,006	4,382,554	21,028,353	0.1999	2,233,441	1,094,054	876,073	4,203,568
34	2039	11,172,793	5,473,006	4,382,554	21,028,353	0.1904	2,127,300	1,042,060	834,438	4,003,798
35	2040	11,172,793	5,473,006	4,382,554	21,028,353	0.1813	2,025,627	992,256	794,557	3,812,440
	Total:	**$335,183,790**	**$164,190,180**	**$131,476,620**	**$630,850,590**		**$ 134,571,819**	**$ 65,920,168**	**$ 52,786,110**	**$ 253,278,097**

New York State Output Impacts - Facility Operations
Broadwater EIS (2005 $)

						Discount Rate =				
	Year	Direct	Indirect	Induced	Total	5%	Direct	Indirect	Induced	Adj. Total
0	2005					1.0000				-
1	2006				-	0.9524				-
2	2007				-	0.9070				-
3	2008				-	0.8638				-
4	2009				-	0.8227				-
5	2010				-	0.7835	-	-	-	-
6	2011	25,645,002	8,817,512	6,825,529	41,288,043	0.7462	19,136,300	6,579,627	5,093,210	30,809,137
7	2012	25,645,002	8,817,512	6,825,529	41,288,043	0.7107	18,225,903	6,266,606	4,850,903	29,343,412
8	2013	25,645,002	8,817,512	6,825,529	41,288,043	0.6768	17,356,537	5,967,692	4,619,518	27,943,747
9	2014	25,645,002	8,817,512	6,825,529	41,288,043	0.6446	16,530,768	5,683,768	4,399,736	26,614,272
10	2015	25,645,002	8,817,512	6,825,529	41,288,043	0.6139	15,743,467	5,413,071	4,190,192	25,346,730
11	2016	25,645,002	8,817,512	6,825,529	41,288,043	0.5847	14,994,633	5,155,599	3,990,887	24,141,119
12	2017	25,645,002	8,817,512	6,825,529	41,288,043	0.5568	14,279,137	4,909,591	3,800,455	22,989,183
13	2018	25,645,002	8,817,512	6,825,529	41,288,043	0.5303	13,599,545	4,675,927	3,619,578	21,895,050
14	2019	25,645,002	8,817,512	6,825,529	41,288,043	0.5051	12,953,291	4,453,725	3,447,575	20,854,591
15	2020	25,645,002	8,817,512	6,825,529	41,288,043	0.4810	12,335,246	4,241,223	3,283,079	19,859,548
16	2021	25,645,002	8,817,512	6,825,529	41,288,043	0.4581	11,747,975	4,039,302	3,126,775	18,914,052
17	2022	25,645,002	8,817,512	6,825,529	41,288,043	0.4363	11,188,914	3,847,080	2,977,978	18,013,972
18	2023	25,645,002	8,817,512	6,825,529	41,288,043	0.4155	10,655,498	3,663,676	2,836,007	17,155,181
19	2024	25,645,002	8,817,512	6,825,529	41,288,043	0.3957	10,147,727	3,489,089	2,700,862	16,337,678
20	2025	25,645,002	8,817,512	6,825,529	41,288,043	0.3769	9,665,601	3,323,320	2,572,542	15,561,463
21	2026	25,645,002	8,817,512	6,825,529	41,288,043	0.3589	9,203,991	3,164,605	2,449,682	14,818,278
22	2027	25,645,002	8,817,512	6,825,529	41,288,043	0.3418	8,765,462	3,013,826	2,332,966	14,112,254
23	2028	25,645,002	8,817,512	6,825,529	41,288,043	0.3256	8,350,013	2,870,982	2,222,392	13,443,387
24	2029	25,645,002	8,817,512	6,825,529	41,288,043	0.3101	7,952,515	2,734,310	2,116,597	12,803,422
25	2030	25,645,002	8,817,512	6,825,529	41,288,043	0.2953	7,572,969	2,603,811	2,015,579	12,192,359
26	2031	25,645,002	8,817,512	6,825,529	41,288,043	0.2812	7,211,375	2,479,484	1,919,339	11,610,198
27	2032	25,645,002	8,817,512	6,825,529	41,288,043	0.2678	6,867,732	2,361,330	1,827,877	11,056,939
28	2033	25,645,002	8,817,512	6,825,529	41,288,043	0.2551	6,542,040	2,249,347	1,741,192	10,532,579
29	2034	25,645,002	8,817,512	6,825,529	41,288,043	0.2429	6,229,171	2,141,774	1,657,921	10,028,866
30	2035	25,645,002	8,817,512	6,825,529	41,288,043	0.2314	5,934,253	2,040,372	1,579,427	9,554,052
31	2036	25,645,002	8,817,512	6,825,529	41,288,043	0.2204	5,652,158	1,943,380	1,504,347	9,099,885
32	2037	25,645,002	8,817,512	6,825,529	41,288,043	0.2099	5,382,886	1,850,796	1,432,679	8,666,361
33	2038	25,645,002	8,817,512	6,825,529	41,288,043	0.1999	5,126,436	1,762,621	1,364,423	8,253,480
34	2039	25,645,002	8,817,512	6,825,529	41,288,043	0.1904	4,882,808	1,678,854	1,299,581	7,861,243
35	2040	25,645,002	8,817,512	6,825,529	41,288,043	0.1813	4,649,439	1,598,615	1,237,468	7,485,522
	Total:	**$769,350,060**	**$264,525,360**	**$204,765,870**	**$ 1,238,641,290**		**$ 308,883,790**	**$ 106,203,403**	**$ 82,210,767**	**$ 497,297,960**

New York State Employee Compensation Impacts - Facility Operations
Broadwater EIS (2005 $)

	Year	Direct	Indirect	Induced	Total	Discount Rate = 5%	Direct	Indirect	Induced	Adj. Total
0	2005					1.0000				-
1	2006				-	0.9524				-
2	2007				-	0.9070				-
3	2008				-	0.8638				-
4	2009				-	0.8227				-
5	2010					0.7835				
6	2011	5,293,778	1,813,788	2,209,813	9,317,379	0.7462	3,950,217	1,353,449	1,648,962	6,952,628
7	2012	5,293,778	1,813,788	2,209,813	9,317,379	0.7107	3,762,288	1,289,059	1,570,514	6,621,861
8	2013	5,293,778	1,813,788	2,209,813	9,317,379	0.6768	3,582,829	1,227,572	1,495,601	6,306,002
9	2014	5,293,778	1,813,788	2,209,813	9,317,379	0.6446	3,412,369	1,169,168	1,424,445	6,005,982
10	2015	5,293,778	1,813,788	2,209,813	9,317,379	0.6139	3,249,850	1,113,484	1,356,604	5,719,938
11	2016	5,293,778	1,813,788	2,209,813	9,317,379	0.5847	3,095,272	1,060,522	1,292,078	5,447,872
12	2017	5,293,778	1,813,788	2,209,813	9,317,379	0.5568	2,947,576	1,009,917	1,230,424	5,187,917
13	2018	5,293,778	1,813,788	2,209,813	9,317,379	0.5303	2,807,290	961,852	1,171,864	4,941,006
14	2019	5,293,778	1,813,788	2,209,813	9,317,379	0.5051	2,673,887	916,144	1,116,177	4,706,208
15	2020	5,293,778	1,813,788	2,209,813	9,317,379	0.4810	2,546,307	872,432	1,062,920	4,481,659
16	2021	5,293,778	1,813,788	2,209,813	9,317,379	0.4581	2,425,080	830,896	1,012,315	4,268,291
17	2022	5,293,778	1,813,788	2,209,813	9,317,379	0.4363	2,309,675	791,356	964,141	4,065,172
18	2023	5,293,778	1,813,788	2,209,813	9,317,379	0.4155	2,199,565	753,629	918,177	3,871,371
19	2024	5,293,778	1,813,788	2,209,813	9,317,379	0.3957	2,094,748	717,716	874,423	3,686,887
20	2025	5,293,778	1,813,788	2,209,813	9,317,379	0.3769	1,995,225	683,617	832,879	3,511,721
21	2026	5,293,778	1,813,788	2,209,813	9,317,379	0.3589	1,899,937	650,969	793,102	3,344,008
22	2027	5,293,778	1,813,788	2,209,813	9,317,379	0.3418	1,809,413	619,953	755,314	3,184,680
23	2028	5,293,778	1,813,788	2,209,813	9,317,379	0.3256	1,723,654	590,569	719,515	3,033,738
24	2029	5,293,778	1,813,788	2,209,813	9,317,379	0.3101	1,641,601	562,456	685,263	2,889,320
25	2030	5,293,778	1,813,788	2,209,813	9,317,379	0.2953	1,563,253	535,612	652,558	2,751,423
26	2031	5,293,778	1,813,788	2,209,813	9,317,379	0.2812	1,488,610	510,037	621,399	2,620,046
27	2032	5,293,778	1,813,788	2,209,813	9,317,379	0.2678	1,417,674	485,732	591,788	2,495,194
28	2033	5,293,778	1,813,788	2,209,813	9,317,379	0.2551	1,350,443	462,697	563,723	2,376,863
29	2034	5,293,778	1,813,788	2,209,813	9,317,379	0.2429	1,285,859	440,569	536,764	2,263,192
30	2035	5,293,778	1,813,788	2,209,813	9,317,379	0.2314	1,224,980	419,711	511,351	2,156,042
31	2036	5,293,778	1,813,788	2,209,813	9,317,379	0.2204	1,166,749	399,759	487,043	2,053,551
32	2037	5,293,778	1,813,788	2,209,813	9,317,379	0.2099	1,111,164	380,714	463,840	1,955,718
33	2038	5,293,778	1,813,788	2,209,813	9,317,379	0.1999	1,058,226	362,576	441,742	1,862,544
34	2039	5,293,778	1,813,788	2,209,813	9,317,379	0.1904	1,007,935	345,345	420,748	1,774,028
35	2040	5,293,778	1,813,788	2,209,813	9,317,379	0.1813	959,762	328,840	400,639	1,689,241
	Total:	**$158,813,340**	**$ 54,413,640**	**$ 66,294,390**	**$ 279,521,370**		**$ 63,761,438**	**$ 21,846,352**	**$ 26,616,313**	**$ 112,224,103**

APPENDIX B

ESTIMATED ENVIRONMENTAL BENEFITS

Table of Contents

1. INTRODUCTION

1.1 Overview and Purpose of Analysis

This analysis discusses potential future environmental benefits that may be realized from the Project and other gas supply augmentation projects in the form of avoided air emissions.

The Project will supply clean burning natural gas that will be available to fuel new and existing electric generation needs in the region. New York State projects an economic growth scenario where relatively more natural gas is used to generate electric power. Use of natural gas for new electric generation plants and the re-powering of existing generation plants will result in fewer air pollutant emissions. This benefit can be estimated and express in monetary terms.

The following data and assumptions were used in the analysis.

- The projections were obtained from the NERC 2004 ES&D Forecast for the years 2011 to 2013. The NERC 2013 growth rate was applied to generate the values for the years 2014 to 2020. New York City and Long Island were assumed to account for 50% of New York State's projected power consumption.

- The estimate of the electric power to be generated from the Project's annual gas throughput is based on the projected share of electric power to be generated by natural gas in NYS and assumes that the project gas supply would be used to fire combined cycle gas turbines and boiler and steam turbines.

- The projected shares of electric power to be generated by natural gas, oil and coal were obtained from the New York State Energy Plan under two alternative growth scenarios.

- The air emission factors showing pollutants per kilowatt-hour (kW-hr) were obtained from various studies and data from local power generation facilities.

- Unit value damage estimates were adapted from primary research for the Empire State and trans-boundary damage estimates associated with global climate change.

- Consumer Price Index levels for various years from the U.S. Bureau of Labor Statistics were used to escalate unit value estimates from previous year studies to current price levels.

Summary Conclusion

Using data from the New York State Energy Plan on future electric power generation under two alternative growth scenarios, the public benefits from avoided air pollution damages expected with substantial natural gas fired additions to New York City and Long Island power generation capacity are estimated to average $181 million per year between 2011 and 2020. The cumulative present value of these avoided damages (public benefits) in 2005 dollars is $1.3 billion.

The Project's annual natural gas throughput dedicated to electric power generation will supply between 15,000 to 26,000 gigawatt hours (GW-hr) (17% to 28% of total regional load) of electric power to meet projected New York City and Long Island consumption over the life of the Project. The environmental economic benefits attributable to Broadwater are estimated to range from $31 million to $51 million per year on average, or from $226 million to $373 million in 2005 present value terms over the years 2011 to 2020.

1.2 Environmental Benefits

The Broadwater Project will add 1 bcfd of natural gas to the regional natural gas market. In addition to the socioeconomic benefits that this additional energy supply source will bring to the region in the form of lower and less volatile natural gas prices, it will also provide a clean-burning substitute for oil and other more emission-intensive fossil fuels.

In the electric power generation market, the shift to cleaner burning combined-cycle technology is, in part, dependent upon adequate natural gas supplies. Without adequate natural gas supply, the ability to shift to more efficient, cleaner burning combined-cycle natural gas powered turbines for new or re-powered generation plants would not be possible. The region's environmental quality goals are therefore contingent, in part, on projects such as Broadwater being realized.[2]

The environmental benefits to the host region arising from the use of cleaner burning natural gas compared to other fossil fuels have been documented (Cordaro 2005). These benefits are usually expressed in terms of less criteria air pollutants (nitrogen oxides [NO_x], sulfur dioxide [SO_2], particulate matter [PM_{10}]) or carbon dioxide (CO_2) being emitted per kW-hr of electric power generated. A comparison was then made of the total amounts of pollutants emitted versus various fossil fuel inputs required to generate power over a given length of time. Cordaro's study only calculated the change in anticipated emissions.

Over time, significant reductions in emissions and particulates have beneficial public health and social benefits. The consumption of relatively more natural gas and alternative fuels compared to oil and coal will result in environmental benefits being realized over time, as well. Populations in densely populated areas (such as the North Shore of Long Island and Connecticut coastal communities) would no longer be exposed

[2] *See* M. Cordaro, "The Environmental Benefits of Re-Powering KeySpan Electric Generating Plants in Meeting Future Demand." The Center for Management Analysis, LIU, CW Post.

to the relatively higher levels of pollutants associated with the combustion of oil and coal. In addition, natural systems, plants, wildlife, and materials (structures) would no longer receive the same high levels of pollutants, some of which are also precursor emissions to acid rain (SO_2• sulfates).

1.3 Methodology of Analysis

Damage Value Method

The following analysis is based on applying dollars per ton estimates of environmental damages to projected emissions estimates resulting from regional electric power generation. The dollars per ton estimates were obtained from primary research for the United States and New York State (Palmer, Burtraw, Shih 2005). The analysis and calculations presented here adapt information from a recent (2005) and past study to illustrate the monetary benefits of air quality improvements using energy data from the New York City/Long Island region. The original research (to arrive at dollars per ton estimates) used a suite of models that translate changes in emissions of SO_2 and NO_X from power plants into changes in air quality, human health, and the monetary benefits of those changes in health status.[3]

The models applied by the researchers rely on the damage function, or damage value, method. The damage value method directly estimates the monetary values of damages caused by air pollutants. The method involves the following steps: (1) identification of emission sources, (2) estimation of emissions, (3) simulation of the air pollutant concentrations in the atmosphere, (4) estimation of exposure of humans and other objects to air pollutant concentrations, (5) identification of physical effects of air pollutant concentrations on humans and other objects, (6) valuation of physical effects, and (7) calculation of emission values in dollars per ton.[4] The damage value method captures the following categories of damages from air pollutants:[5]

- Human health effects (morbidity and mortality);
- Materials damages (structures, infrastructure);
- Vegetative damages (forests, agricultural crops); and
- Physical/aesthetic effects.

Epidemiologists and economists have worked together to measure social costs from criteria air pollutants to arrive at measures of damages expressed in dollars per pound or

---

[3] *See* Palmer, K., D. Burtraw, and J. Shih. 2005. "Reducing Emissions from the Electricity Sector: The Costs and Benefits Nationwide and in the Empire State," Resources for the Future, June 2005. See also, http://www.nyserda.org/programs/Environment/EMEP/project/7610/7610_pwp.asp

[4] *See* Wang, M. and D. Santini, "Monetary Values of Air Pollutant Emissions in Various U.S. Regions," Transportation Research Record 1475.

[5] *See* Wang, Santini, and Warinner. 1994. Methods *of Valuing Air Pollution and Estimated Monetary Values of Air Pollutants in Various U.S. Regions*, Dec. 1994, Argonne National Laboratory.

ton of pollutant emitted. These damages represent the monetized physical impacts from air pollution and can represent the costs of adverse health impacts (mortality and morbidity), loss of work, physical discomfort, and damage to ecosystems, agricultural crops, structural materials, and impaired natural scenery.

The damage value method results can be applied or adapted by taking the dollar per ton values and multiplying these rates by the future level of emissions to arrive at annual damages. Empirical studies are used to measure underlying dose/response relationships and valuation of damages by region to arrive at dollar-per-ton estimates. The damages from these studies are based on the population density and pollutant concentrations within a particular region. When adapting the results of an original study to perform an estimate of damages, it is important to apply values from the same region.

When policy decisions are made that consider environmental impacts such as air quality but choose not to compare these impacts to other monetary costs, the evaluators are in effect assigning a zero monetary value to these physical impacts or potential damages. This observation has been articulated before:

> While it is difficult to quantify externalized costs, one cannot escape setting some value. A decision not to consider external costs in itself quantifies them by setting their value at zero. This is unreasonable, given both the strong evidence that the costs are massive, and the significant differences between the externalized costs of traditional central station plants and alternative energy facilities. A crude approximation, made as exact as possible and changed over time to reflect new information, would be preferable to the manifestly unjust approximation caused by ignoring these costs.

(Ottinger et al. 1990).

The following analysis uses the projected annual New York City and Long Island power consumption in gigawatt hours (GW-hr) together with data from two of the New York State Energy Plan's alternative growth scenarios to estimate the foregone, or avoided, damages from air pollutants resulting from electric power generation between 2011 and 2020. A national-level unit value damage estimate that was applied in New York State is updated and applied to the future level of emissions to arrive at annual damages in dollars.[6]

This analysis assumes that physical impacts from future emissions will be similar in nature to those reflected in the original studies that quantified the environmental damage from electricity generation in New York State. The assumption is not unreasonable because the original primary studies were based on impacts to populations and urban centers within the State and the Project region is part of this larger urban area.

[6] These values were supplied by Dallas Burtraw of Resources for the Future.

The Project will contribute cleaner energy available for use to generate electric power in the region. The success in achieving this cleaner power generation would depend on adequate natural gas throughput to supply power plants, as well as market and regulatory incentives to re-power existing oil and coal facilities with natural gas. The Project is a key enabling part of the "with project" scenario used in the estimates below. While the Project was not explicitly considered in formulating the scenarios contemplated within the New York State Energy Plan, the substantial amount of projected electric generation capacity (MW) envisioned by the "with project" scenario will be more likely, or probable, to come on-line with the Project's available gas throughput.

Most natural gas projections expect growing gas usage led by increased use for power generation.[7] The estimates presented below are based on (1) the projected total power to be consumed throughout the New York City/Long Island region generated by facilities fired by natural gas, oil, and coal and (2) an estimate of the share of power attributable to the Project. The New York City and Long Island GW-hr projections were sourced from NERC projections.[8] Corresponding projected loads for Connecticut were not available at the time of this analysis.

2. ANALYSIS

2.1 Estimating Annual Emissions from Future Electric Power Generation

The first step in the analysis was to examine the New York State Energy Plan, which provided generation changes (future shares of electric power generation) by each generation fuel type from 2002 to 2020. The New York State Energy Plan provided projections for two scenarios: the No Additional Construction Scenario and the Future with Project Construction Scenario, the latter of which was labeled in the Plan as the Reference Resource Scenario. The Reference Resource Scenario identified future projects that were publicly announced at the time of the report. The No Additional Construction Scenario can be considered the "without project" scenario and contained generation shares by fuel type that showed relatively less reliance on natural gas as a fuel type between 2011 and 2020. The "with project" scenario is based on an assumption that 11,698 MW of generation capacity in New York City and 5,915 MW of generation capacity on Long Island will be available by 2006 or thereafter.

In addition, the New York State Energy Plan also listed nine approved FERC gas pipeline projects and 11 proposed projects. The lists did not include the proposed Project.[9] However, while the Project was not explicitly considered in formulating the scenarios contemplated within the State Energy Plan, the substantial amount of projected electric generation capacity (MW) envisioned by the "with project" scenario will be more likely, or probable, to come on-line with the Project's available gas throughput.

---

[7] *See* Energy and Environmental Analysis Inc., *Regional Market Growth and the Need for LNG Imports into the Northeast U.S. and Eastern Canada,* September 2005. See also *New York State Energy Plan*, p. 3-106, and Energy Information Administration, *2005 Annual Energy Outlook*, p. 95.

[8] *See* NERC 2004.

[9] *See* New York State Energy Plan pp. 3-166-167.

The fuel type generation shares for each scenario were applied to the projected total annual power consumption (GW-hr) for New York City and Long Island between 2011 and 2020 to associate the future power load with the most likely pollutants emitted from the combustion of the various power generation fuel types. Emission factors for generating a kW-hr of power per fuel type were used to estimate order-of-magnitude annual pollutant levels after the allocation of the total future power consumption by generation fuel type was completed.

Table 1 shows emission rates that were applied in estimating the emission levels associated with the future annual power consumption generated from coal- and oil-fired power plants for New York City and Long Island. Table 1 shows the clear advantage of natural gas in terms of less unit pollutants generated per kW-hr. The natural gas factors shown in Table 1 were not used, as will be explained below. In addition, other studies containing local emission rates were referenced for evaluation purposes.

Table 1 Air Emissions in Pounds per kW-hr

	Coal	Natural Gas	Oil
CO_2	2.13	1.03	1.56
SO_2	0.0134	0.000007	0.0112
NO_X	0.0076	0.0018	0.0021

Source: American Wind Energy Association 1998.

Table 2, which is reproduced from the New York State Energy Plan, identifies the emission factors (in boldface) associated with combined-cycle natural gas power generation that were used in the analysis. The remainder of Table 2 is displayed for the sole purpose of highlighting the emission differences between the various technologies. Only the factors shown in the last row were applied in the analysis.

Table 2 Emission Rates for Electric Generation Plants|
(pounds per megawatt hours [lb/MW-hr])
Comparison of Statewide Plants with Different Technologies

	NO_x lbs/MW-hr	SO_2 lbs/MW-hr	CO_2 lbs/MW-hr
Existing Upstate Coal Plant	4.7	28.4	2,310
Existing w/Low-Sulfur Coal	4.7	9.5	2,310
Existing w/Advanced Controls	1.6	3	2,412
New Advanced Coal: CFB	1.0	3	2,180
New Advanced Coal: IGCC	0.9	0.4	2,028
Natural Gas Combined-Cycle	0.05	0.02	819

Source: Table 10, p. 3-218, New York State Energy Plan, June 2002.

Table 2 shows the emission factors associated with various technologies, including integrated gasification combined cycle (IGCC) and circulating fluidized bed (CFB). The

benefits to be obtained from switching to natural-gas-fired plants are apparent in the table. The data in Table 2 for natural gas combined-cycle was used to compare the emission rates from actual Long Island power plants within the Project vicinity to get a sense of the baseline emission profile that will be improved over time with the installation of new cleaner burning technologies.

Table 3 reproduces local Long Island emissions data originally reported in the study entitled, "The Environmental Benefits of Re-Powering KeySpan Electric Generating Plants in Meeting Future Demand."[10]

Table 3 2003 Air Emissions for the Northport, Port Jefferson, and Barrett Steam Electric Generating Stations

Plant	Tons			Electricity Generated MW-hrs	Estimated Emission Rates (lb/MW-hr)		
	NO_x	SO_2	CO_2		NO_x	SO_2	CO_2
Northport	7,520	32,963	5,931,734	7,507,089	2.003	8.782	1,580
Port Jefferson	1,262	6,631	1,136,207	1,629,111	1.549	8.141	1,395
Barrett	994	643	961,660	1,318,472	1.508	0.975	1,459
Total:	9,776	40,237	8,029,601	10,454,672	1.870	7.697	1,536

Source: Cordaro 2005.

Comparing the emission rates in Tables 3 and 2 shows that the select local plants on Long Island are not as emission intensive as some other upstate coal-burning facilities portrayed in Table 2. However, the table also shows that regional air quality will likely improve with the repowering and installation of natural gas combined-cycle technologies.

Table 4 shows how the future emission levels were estimated for the "without project" scenario, and Table 5 shows all calculations for the "with project" scenario. The New York State Energy Plan states that "without project" scenario "assumes that no additional generation or transmission, other than those facilities under construction at the time of this analysis or committed through the SBC program (about 2000 MW total) will be installed, no additional benefits from new demand reduction programs will be achieved during the planning period, and about 570 MW of existing capacity will be retired."[11]

The "with project" scenario is the label given in this report to the New York State Energy Plan's "reference resource scenario". The Energy Plan states that, "the resources assumed in this analysis are the same for the no additional construction scenario plus others that might reasonably be expected (at the time of the analysis) to be available during the planning period, based on planned projects that have been publicly announced as of this time."[12]

[10] Center for Management Analysis, Long Island University/C.W. Post Campus, Matthew M. Cordaro, Ph.D.
[11] New York State Energy Plan, p. 3-119.
[12] *Ibid.* p. 3-124.

Table 4 Calculation of Future Emission Levels Using Fuel Type Generation Shares from NYS Energy Plan "Reference Resource Scenario (i.e., "with project" scenario)

With Project Situation Based on NYS Energy Plan "Reference Resource Scenario"																	
	Annual NYC \a & LI Power Consumption	Annual NYC & LI Power Consumption	With Project Generation Shares by Fuel Type			With Project Emissions (tons)									With Project Total Emissions (tons)		
						Natural Gas			Oil			Coal Burning					
Year	(GWh)	(MWh)	Natural Gas	Oil	Coal	CO2	SO2	NOX	CO2	SO2	NOX	CO2	SO2	NOX	CO2	SO2	NOX
2011	89,647	89,647,000	38.0%	1.5%	9.2%	13,949,970	341	852	1,048,870	7,530	1,412	8,783,613	55,258	31,341	23,782,453	63,129	33,604
2012	90,062	90,062,000	38.2%	1.6%	9.3%	14,084,211	344	860	1,131,779	8,126	1,524	8,888,219	55,916	31,714	24,104,209	64,386	34,097
2013	90,629	90,629,000	38.4%	1.7%	9.3%	14,242,982	348	870	1,217,450	8,741	1,639	9,008,523	56,673	32,143	24,468,954	65,762	34,651
2014	91,200	91,200,000	38.6%	1.8%	9.4%	14,403,262	352	879	1,304,160	9,363	1,756	9,130,032	57,438	32,577	24,837,454	67,153	35,212
2015	91,775	91,775,000	38.8%	1.9%	9.5%	14,565,060	356	889	1,391,921	9,993	1,874	9,252,756	58,210	33,015	25,209,736	68,559	35,777
2016	92,353	92,353,000	38.9%	2.1%	9.5%	14,728,226	360	899	1,480,726	10,631	1,993	9,376,600	58,989	33,456	25,585,552	69,979	36,349
2017	92,935	92,935,000	39.1%	2.2%	9.6%	14,892,927	364	909	1,570,602	11,276	2,114	9,501,674	59,776	33,903	25,965,203	71,416	36,926
2018	93,521	93,521,000	39.3%	2.3%	9.7%	15,059,172	368	919	1,661,556	11,929	2,237	9,627,987	60,570	34,353	26,348,716	72,867	37,509
2019	94,110	94,110,000	39.5%	2.4%	9.7%	15,226,810	372	930	1,753,583	12,590	2,361	9,755,443	61,372	34,808	26,735,835	74,334	38,098
2020	94,703	94,703,000	39.7%	2.5%	9.8%	15,396,009	376	940	1,846,709	13,258	2,486	9,884,152	62,182	35,267	27,126,869	75,816	38,693

Notes:

a NERC 2004 ES&D Forecast, NERC 2013 growth rate, New York City and Long Island assumed to be 50% of New York State.

PUBLIC

Table 5 Calculation of Future Emission Levels Using Fuel Type Generation Shares from NYS Energy Plan ("without project" scenario)

Without Project Situation Based on NYS Energy Plan (No Additional Construction Scenario)

	Annual NYC & LI Power Consumption	Annual NYC & LI Power Consumption	Without Project Generation Shares by Fuel Type			Without Project Emissions (tons)									Without Project Total Emissions (tons)		
						Natural Gas			Oil			Coal Burning					
Year	(GWh)	(MWh)	Natural Gas	Oil	Coal	CO2	SO2	NOX	CO2	SO2	NOX	CO2	SO2	NOX	CO2	SO2	NOX
2011	89,647	89,647,000	33.5%	6.2%	10.7%	12,298,000	300	751	4,335,329	31,125	5,836	10,215,724	64,268	36,450	26,849,052	95,694	43,037
2012	90,062	90,062,000	33.6%	6.4%	10.7%	12,391,811	303	757	4,480,284	32,166	6,031	10,273,673	64,632	36,657	27,145,768	97,101	43,445
2013	90,629	90,629,000	33.7%	6.6%	10.7%	12,506,938	305	764	4,634,163	33,271	6,238	10,349,077	65,107	36,926	27,490,177	98,683	43,928
2014	91,200	91,200,000	33.8%	6.7%	10.7%	12,623,083	308	771	4,789,824	34,388	6,448	10,425,072	65,585	37,197	27,837,979	100,282	44,416
2015	91,775	91,775,000	33.9%	6.9%	10.7%	12,740,251	311	778	4,947,284	35,519	6,660	10,501,660	66,067	37,471	28,189,196	101,897	44,908
2016	92,353	92,353,000	34.0%	7.1%	10.8%	12,858,308	314	785	5,106,505	36,662	6,874	10,578,728	66,552	37,746	28,543,542	103,528	45,405
2017	92,935	92,935,000	34.1%	7.3%	10.8%	12,977,397	317	792	5,267,556	37,818	7,091	10,656,392	67,040	38,023	28,901,345	105,175	45,906
2018	93,521	93,521,000	34.2%	7.4%	10.8%	13,097,523	320	800	5,430,453	38,988	7,310	10,734,652	67,533	38,302	29,262,627	106,840	46,412
2019	94,110	94,110,000	34.3%	7.6%	10.8%	13,218,549	323	807	5,595,153	40,170	7,532	10,813,396	68,028	38,583	29,627,098	108,521	46,922
2020	94,703	94,703,000	34.4%	7.8%	10.8%	13,340,622	326	814	5,761,731	41,366	7,756	10,892,739	68,527	38,866	29,995,092	110,219	47,437

Notes:

a NERC 2004 ES&D Forecast, NERC 2013 growth rate, New York City and Long Island assumed to be 50% of New York State.

PUBLIC

The formula used to calculate the future annual level of emissions is:

Annual emission levels $_{t+1,\ \text{pollutant x, tons}}$ = [Annual NYC and LI Power Consumption, (GW-hr)] x
[Shares/Generation by Fuel Type, %] x
[emission rate, lbs/MW-hr or lbs/kW-hr]/2000.

2.2 Monetizing or Valuing the Future Annual Emission Levels

Incremental environmental economic benefits are then measured by subtracting the emission levels associated with the "without project" scenario from the "with project" scenario. These emission levels represent the foregone, or avoided, emissions that are attributable to installation of cleaner burning power generation facilities that are dependent upon adequate future supplies of natural gas. To achieve these public benefits, the future natural gas supplies, which would be made available through implementation of the proposed Project and other supply augmentation projects, would be necessary.

The next procedural step in estimating damages was to subtract the "without project" emissions from the "with project" emissions for the pollutants evaluated. No damage estimates were made for particulate matter (i.e., either $PM_{2.5\ or\ 10}$). The averted damages therefore represent only part of the future public environmental benefit that would arise under the "with project" construction of additional facilities scenario. The calculation yielded the foregone, or averted, damages that would arise under the "with project" scenario.

The damages quantified in this report are presented for the purpose of showing the relative differences in the future power generation capacity mix, and the public benefits from obtaining relatively more natural-gas-fired capacity. The damages are provided as order-of-magnitude values but are linked to New York State through a recent New York State study. The emission estimates are based on total projected power consumption for the New York City/Long Island area. The emissions estimates and air pollutant damages attributable to power to be generated from the Project alone are estimated separately.

Table 6 shows the unit values per type of pollutant that were used to monetize the future emission levels and convert them to social costs. Since the original emission values per ton were from a past study, they were escalated to 2005 values using the consumer price index (CPI). The cost escalation factor was calculated by taking the ratio of the 2005 CPI index to the 1999 CPI, or 2000 CPI Index (for CO_2) and multiplying the original unit value estimate by this factor.

Table 6 Adjusted Estimates of Benefits, or Avoided Damages, per Ton[a] and CO_2 Damages per Ton (from DICE)[b]

	Original Unit Values ($/ton, 1999 $)	Updated Values ($/ton, 2005 $)
NO_X	$1,557	$1,827
SO_2	$3,701	$4,341
	2000	**2005**
CO_2	$5.74	$6.51

Sources:

[a] Dallas Burtraw, Resources for the Future and underlying data supporting the study entitled, "Reducing Emissions from the Electricity Sector: The Costs and Benefits Nationwide and in the Empire State" (June 2005)

[b] Newell and Pizer, Resources for the Future, Discounting the Benefits of Climate Change Mitigation: How Do Uncertain Rates Increase Valuations?, (Dec. 2001)

Note: the CPI escalation factor was obtained from U.S. Bureau of Labor Statistics, Series Id: CUUR0000SA0, Not Seasonally Adjusted, Area: U.S. city average, Item: All items, Base Period: 1982-84=100.

Unit value estimates for the damage value approach were used in the calculations, except for CO_2, which relied upon the Dynamic Integrated Climate Economy (DICE) Model developed by Nordhaus.[13] The DICE model is a stylized representation of the global economy and atmosphere that calculates greenhouse gas emissions, primarily CO_2, as a consequence of economic activity. The DICE model reports climate change consequences in terms of damages per ton of emitted carbon.

2.3 Results of Avoided Damages Estimates for New York City and Long Island

To calculate the averted, or avoided, damages associated with the relatively more pollutant intensive scenario, the "with project" minus the "without project" annual emission levels (in tons) were multiplied by the emission values ($/ton) to show the future annual costs in 2005 dollars. Table 7 shows the results of the calculations.

Columns 1 through 3 of Table 7 show the difference in future annual emissions (in tons) between the "with project" and the "without project" power generation scenarios. These tons of pollutant emissions were calculated by subtracting the relevant columns shown in Tables 4 and 5. Columns 4 through 7 show the total monetized emissions based on multiplying the emission values per ton times the future annual level of emissions (in tons).

Columns 4 through 7 present the avoided environmental and social damages based on having power generation capacity shares that show a greater future reliance on natural-gas-fired capacity compared to oil and coal. Without the Project's natural gas throughput

[13] Attributes of the DICE model and results were summarized in Newell and Pizer (Dec. 2001). See, Nordhaus, William, "An Optimal Transition Path for Controlling Greenhouse Gases," Science, vol. 258, November 20, 1992, pp. 1315-1319.

in place by 2010, the natural gas shares generating relatively smaller levels of emissions would be less likely, resulting in more damages (i.e., fewer public benefits).

Table 7 Estimated Avoided Incremental Annual External Costs (Environmental Damages) Associated with Future Avoided Emissions for the New York City/Long Island Area

	1	2	3	4	5	6	7	8	9
	Tons			In millions of 2005 $					
Year	CO_2	SO_2	NO_x	CO_2	SO_2	NO_x	Total	Discount Factor [i= 3%]	Discounted Total
2011	(3,066,600)	(32,564)	(9,433)	$(20.0)	$(141.4)	$(17.2)	$(178.6)	0.837	$(149.5)
2012	(3,041,559)	(32,715)	(9,348)	$(19.8)	$(142.0)	$(17.1)	$(178.9)	0.813	$(145.5)
2013	(3,021,223)	(32,921)	(9,277)	$(19.7)	$(142.9)	$(16.9)	$(179.5)	0.789	$(141.7)
2014	(3,000,526)	(33,129)	(9,204)	$(19.5)	$(143.8)	$(16.8)	$(180.2)	0.766	$(138.1)
2015	(2,979,460)	(33,338)	(9,131)	$(19.4)	$(144.7)	$(16.7)	$(180.8)	0.744	$(134.5)
2016	(2,957,990)	(33,548)	(9,056)	$(19.3)	$(145.6)	$(16.5)	$(181.4)	0.722	$(131.1)
2017	(2,936,142)	(33,760)	(8,980)	$(19.1)	$(146.5)	$(16.4)	$(182.1)	0.701	$(127.7)
2018	(2,913,912)	(33,973)	(8,902)	$(19.0)	$(147.5)	$(16.3)	$(182.7)	0.681	$(124.4)
2019	(2,891,263)	(34,187)	(8,824)	$(18.8)	$(148.4)	$(16.1)	$(183.4)	0.661	$(121.2)
2020	(2,868,222)	(34,403)	(8,743)	$(18.7)	$(149.3)	$(16.0)	$(184.0)	0.642	$(118.1)
Present Value Sum of Future Avoided Costs (2005), [I = 3%]									$(1,332)

An avoided environmental damage represents a public benefit in the following sense. Avoided damages in general terms, represent the averted regional public health costs, materials damages, and environmental damages caused by acid rain since projected emissions are precursors necessary for acid rain deposition. Because of the energy capacity mix associated with the "with project" scenario, the damages associated with the "without project" level of emissions are avoided, and resources required to pay for these damages will not be consumed. These public resources could, therefore, be committed to other productive uses and opportunities within the region. The New York State Energy Plan scenarios are used because they are forward looking and embrace key trends that are necessary to better inform the public concerning relative environmental impacts of different energy policies and market developments.

Table 7 shows that, cumulatively per year, the incremental environmental benefits from the "with project" scenario would average about $181 million per year. In present value terms, using a discount rate of 3%, the sum total of the environmental benefits over the planning horizon would be worth close to $1.3 billion in 2005 dollars. The 3% discount rate is used because this rate represents the social discount rate, or social rate of time

preference.[14] A social discount rate is used because the value of environmental costs and benefits to the public (as opposed to an investment for a utility) are being evaluated.[15]

2.4 Estimated Avoided Air Pollutant Damages Attributable to the Projected Power Generated from Broadwater Project Gas

To estimate the contribution that the Project could potentially make to the projected avoided environmental damages shown in Table 7, the electric power potential of the Project's throughput gas was first estimated. The energy potential of the Project (and the level of emissions to be generated) will vary based on the type of power plants and technologies that receive the gas fuel. Table 8 shows the potential energy contribution to the New York City and Long Island projected power demand that the Broadwater gas throughput could make under the following assumptions:

- 100 hundred cubic feet (ft^3) of natural gas can generate 18 kW-hr if using gas turbine and combined-cycle technology.
- 100 ft^3 of natural gas can generate 11 kW-hr if using boiler and steam turbine technology.
- The share of natural gas used to generate electric power is from the New York State Energy Plan.
- The projected net environmental benefits (avoided damages) were attributed to the Project based on the share of projected New York City and Long Island area power demand potentially supplied by the Project.

Column 1 shows the projected annual New York City and Long Island power consumption. Column 2 shows the annualized Project daily throughput (in bcf/yr) using a 365-day year. Column 3 shows the total energy potential (electric power) derived from converting total annual gas throughput at 100 ft^3 = 18 kW-hr using gas turbine combined-cycle technology. The New York State Energy Plan projects that statewide 38% of electric power will be generated from natural gas (column 4). This share was applied to the Project's potential electric power (derived from 100% of annual Project throughput gas) as the project would also supply other residential, commercial, and industrial gas consumers outside of the power market. Columns 5 and 6 show the amount of power, in GW-hr, to be generated under the two different technologies. Columns 6 and 7 show that the share of Project attributable power ranges from 17% to 28% of the total projected New York City and Long Island power consumption.

[14] The social rate of time preference (social discount rate) is the rate at which society is willing to exchange consumption now for consumption in the future. It reflects the ability of society to remedy environmental hazards over time.

[15] *See* Environmental Costs of Electricity, p. 44.

Table 8 Potential Share of Broadwater Project Gas Used to Generate Electric Power and Estimated Power Generated by Broadwater Project Gas as a Percent of Total New York City and Long Island Projected Power Consumption

Year	Annual NYC & LI Power Consumption (GW-hr)[a]	Broadwater Capacity Throughput (bcf/yr @ 1 bcfd)	If 100% of Natural Gas Throughput Is Used to Generate Electric Power (GW-hr)	Natural Gas Share Used for Electric Power Generation (%)[b]	Estimated Power (GW-hr) Generated by Broadwater Gas Using Different Technologies		Share of Projected New York City and Long Island Power Consumption	
					Gas Turbine Combined Cycle (GW-hr)	Boiler and Steam Turbine (GW-hr)	Gas Turbine Combined Cycle (%)	Boiler and Steam Turbine (%)
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
2011	89,647	365	65,700	38.0%	24,966	15,390	27.8%	17.2%
2012	90,062	365	65,700	38.2%	25,090	15,467	27.9%	17.2%
2013	90,629	365	65,700	38.4%	25,214	15,543	27.8%	17.2%
2014	91,200	365	65,700	38.6%	25,338	15,620	27.8%	17.1%
2015	91,775	365	65,700	38.8%	25,462	15,696	27.7%	17.1%
2016	92,353	365	65,700	38.9%	25,587	15,773	27.7%	17.1%
2017	92,935	365	65,700	39.1%	25,711	15,849	27.7%	17.1%
2018	93,521	365	65,700	39.3%	25,835	15,926	27.6%	17.0%
2019	94,110	365	65,700	39.5%	25,959	16,002	27.6%	17.0%
2020	94,703	365	65,700	39.7%	26,083	16,079	27.5%	17.0%

[a] NERC 2004 ES&D Forecast, NERC 2013 growth rate, NYC & LI assumed to be 50% of NYS.

[b] NYS Energy Plan, June 2002, page 3-129, Table 20, Reference Resource Scenario/Planned projects that have been publicly announced.

The estimated annual environmental economic benefits attributable to the Project would likely range from $31 to $51 million per year on average, or cumulatively between $226 and $373 million in 2005 present value terms over the sum of the years 2011 to 2020.

3.0 REFERENCES

American Wind Energy Association. 1998. Comparative Air Emissions of Wind and Other Fuels, based on data from the U.S. Department of Energy's *Energy Information Administration's Annual Energy Review*.

_____. 2000. Wind Energy Fact Sheet, Comparative Air Emissions of Wind and Other Fuels, Washington, D.C.

Cordaro, M. 2005. "The Environmental Benefits of Re-Powering KeySpan Electric Generating Plants in Meeting Future Demand." The Center for Management Analysis, LIU, CW Post. http://www.liunet.edu/cwis/CWP/pr/press/2005/19.html.

Energy and Environmental Analysis Inc. 2005. *Regional Market Growth and the Need for LNG Imports into the Northeast U.S. and Eastern Canada*.

Freeman III, Myrick A. 1996. "Estimating the Environmental Costs of Electricity; An Overview and Review of the Issues," *Resource and Energy Economics* 18:347-362.

Newall, Richard, and Pizer, William. 2001. *Discounting the Benefits of Climate Change Mitigation: How Much Do Uncertain Rates Increase Valuations?*, December 2001. Prepared for the Pew Center on Global Climate Change, Arlington, Virginia.

New York State Energy Research and Development Authority (NYSERDA). 2002. New York State Energy Plan, available at: http://www.nyserda.org/Energy_Information/energy_state_plan.asp.

Nordhaus, William. 1992. An Optimal Transition Path for Controlling Greenhouse Gases, *Science*, Vol. 258, November 20, 1992, pp. 1315-1319.

North American Electric Reliability Council (NERC). 2004. Electricity Supply and Demand, http://www.nerc.com/~esd/.

Ottinger, Richard, L. et al. 1990. *Environmental Costs of Electricity*, Prepared by the Pace University Center for Environmental Studies, Prepared for NYSERDA and the U.S. Department of Energy, Ocean Publications.

Palmer, K., D. Burtraw, and J. Shih. 2005. *Reducing Emissions from the Electricity Sector: The Costs and Benefits Nationwide and in the Empire State*. June 2005. Discussion Paper - 5-23, Resources for the Future, Washington, D.C.

Wang, M., and D. Santini. 1995. Monetary Values of Air Pollutant Emissions in Various U.S. Regions. Transportation Research Record 1475.

Wang, M., D. Santini, and S. Warinner. 1994. *Methods of Valuing Air Pollution and Estimated Monetary Values of Air Pollutants in Various U.S. Regions.* Argonne National Laboratory, December 1994.