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A POST LICENSING CASE STUDY OF COMMUNITY EFFECTS AT TWO OPERATING NUCLEAR POWER PLANTS

FINAL REPORT
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Bruce J. Purdy
Elizabeth Peelle
David J. Bjornstad
Thomas J. Mattingly, Jr.
Jon Soderstrom
Robert C. DeVault

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OAK RIDGE NATIONAL LABORATORY
Oak Ridge, Tennessee 37830
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Abstract

This exploratory case study examines the social, economic, and political/institutional impacts of two operating nuclear power complexes on two New England communities. This work is one of a series planned to broaden knowledge of the effects of large energy generating facilities upon the social structure of local communities. Its primary objectives are to investigate and assess social and economic impacts resulting from construction and operation of nuclear power plants and to generate hypotheses about such impacts for future testing.

The report includes discussions of the study design and objectives, profiles of the towns of Plymouth, Massachusetts, and Waterford, Connecticut, and analysis of the social, economic, and political impacts as observed by members of the ORNL staff. Results are presented from an attitude survey as well as a social impact classification schema devised as a methodological tool.

The study concludes that construction impacts were minor due to a dispersed commuting pattern by construction workers and that the only significant construction impact which can be identified retrospectively is construction worker traffic. The primary impact of the nuclear power plants in both communities was the massive increase in property tax payments paid to the local communities by the utilities and the option chosen by each community to maintain the existing tax rate while using the additional revenue to significantly increase and enhance the public service delivery systems and facilities within the community. Second-order consequences of the direct, first-order economic impact were: (1) changes in community land use policies, (2) increase in salience of growth issues, and (3) alteration of both inter- and intra-community relationships. The majority of residents in both communities express favorable attitudes toward the nuclear plants, primarily because of the substantial increase in the tax base of their communities. Most residents would permit construction of the nuclear facilities again because of real economic benefits and the lack of any perceived disbenefits.

1. INTRODUCTION

A. PURPOSE AND OVERVIEW

The purpose of this study is to investigate and assess social and economic impacts upon people and their communities resulting from the construction and operation of nuclear power plants.

For this purpose, socioeconomic impact analysis is conceived to be "estimating and appraising the condition of a society organized and changed by large scale applications of high technology."[1] A more specific definition is the extension or broadening of environmental impact assessment to include not only the biophysical environment but also the social environment in compliance with the precedents set in Section 102 of PL 91-190 of the National Environmental Policy Act of 1969 (NEPA) and the Calvert Cliffs decision.

Hence, the policy justification for conducting social impact analysis is primarily legal in nature. It can be viewed as formal compliance with legislative acts. Furthermore, it can be viewed as an inquiry into a series of unanswered questions which have arisen as a result of the impact of large scale technologies on society.[2] Because of an ever-increasing awareness of technological innovations in the environment, there is an increasing realization, primarily by social scientists, that technology may alter the direction and magnitude of certain aspects of the social order within that environment.[3]

B. STUDY DESIGN AND OBJECTIVES

This report uses the case study method to analyze social impacts of two New England communities with operating nuclear power plants. Funded by the Office of Regulatory Research, United States Nuclear Regulatory Commission (NRC), it is part of a series of efforts geared to more fully understand the effects of construction and operation of large energy generating complexes (i.e., nuclear generating and coal-fired plants) on communities located near the designated plant site.

The exploratory, descriptive case study approach permits us to increase our familiarity with the siting of reactors in communities, establish priorities for future research, and generate hypotheses to be tested in subsequent more highly structured studies.

Several specific objectives to be met are:

1) the identification of pertinent indicators related to social, economic, and political structure;

2) the exploration of the history and character of each community through local informants as a means of further identifying potentially significant factors;

3) the collection of detailed systematic and comparable data bases for the two communities and the assessment of their validity;

4) the development of a classification schema to assist in the identification of possible socioeconomic impacts;

5) the assessment of change in the communities over time in the variables identified; to determine, insofar as data permit, relationships between the siting of the nuclear power plant and changes in the social, economic, and political structures of the communities;

6) the generation of hypotheses to be tested in further research.

C. SITE SELECTION CRITERIA

To permit observation of actual social effects of both operation and construction periods, the decision was made to select one or more communities which were host to power reactors in operation for at least three years. Of the 53 power reactors licensed for operation in December 1974, 18 had been licensed for three or more years, as shown in Table 1. Eliminating small early reactors, nine reactors of at least 500-MWe capacity and three or more years operating experience remained. These nine reactors and their host communities were examined and reviewed in terms of:

1) technical features of reactors and cooling systems;

2) socioeconomic characteristics of the host communities;

3) availability of local and regional data sources;

4) evidence of cooperation and interest from both the utilities and communities involved;

5) desire to maximize the research output by utilizing sites which were geographically similar and accessible to each other.

On the basis of this review, Plymouth and Waterford were selected for the case study because of similarities in reactor characteristics, socioeconomic variables, regional settings, and geographical proximity. Tables 2 and 3 show comparisons of host community characteristics and reactor characteristics. One can see from Tables 2 and 3 that the two sites are similar in preconstruction population, seacoast location, political structure, percentage of the tax base provided by the utility, and certain reactor characteristics. They are dissimilar in subsequent rates of population growth, use of planning and zoning to control growth, and amount of additional nuclear reactor construction presently underway.

Table 1. Nuclear Powerplant Operating Licenses in Effect[1]

(As of Dec. 31, 1972)

FULL-POWER LICENSES

Licensee	Unit (location)	Date issued	Capacity (MWe)
Commonwealth Edison Co	Dresden-1 (Morris, Ill.)	9-28-59	200
Yankee Atomic Electric Co	Yankee (Rowe, Mass.)	7-09-60	175
Consolidated Edison Co	Indian Point 1 (Buchanan, N.Y.)	3-26-62	265
Pacific Gas & Electric Co	Humboldt Bay (Eureka, Calif.)	8-28-62	68.5
Consumers Power Co	Big Rock Point (Big Rock Point, Mich.)	8-30-62	70.3
Philadelphia Electric Co	Peach Bottom-1 (York Co., Pa.)	7-24-66	40
Southern California Edison Co	San Onofre-1 (San Clemente, Calif.)	3-27-67	410
Connecticut Yankee Atomic Power Co	Haddam Neck (Haddam Neck, Conn.)	6-30-67	575
Dairyland Power Cooperative	Genoa (formerly LaCrosse, Genoa, Wis.)	7-03-67	50
Jersey Central Power and Light Co	Oyster Creek 1 (Toms River, N.J.)	4-09-69	650
Niagara Mohawk Power Corp	Nine Mile Point-1 (Scriba, N.Y.)	8-22-69	625
Rochester Gas & Electric Corp	Ginna-1 (Wayne Co., N.Y.)	9-19-69	420
Commonwealth Edison Co	Dresden-2 (Morris, Ill.)	12-22-69	809
Carolina Power & Light Co	Robinson 2 (Hartsville, S.C.)	7-31-70	700
Northern States Power Co	Monticello (Monticello, Minn.)	9-08-70	545
Wisconsin Michigan Power Co	Point Beach-1 (Two Creeks, Wis.)	10-05-70	497
Millstone Point Co	Millstone Point-1 (Waterford, Conn.)	10-26-70	652
Commonwealth Edison Co	Dresden-3 (Morris, Ill.)	1-12-71	809
Virginia Electric and Power Co	Surry 1 (Gravel Neck, Va.)	5-25-72	788
Florida Power & Light Co	Turkey Point-3 (Biscayne Bay, Fla.)	7-19-72	693
Boston Edison Co	Pilgrim (Plymouth, Mass.)	6-08-72	655
Vermont Yankee Nuclear Power Corp	Vermont Yankee (Vernon, Vt.)	10-12-72	514
Consumers Power Co	Palisades (South Haven, Mich.)	10-16-72	700
Commonwealth Edison and Iowa-Illinois Gas & Electric	Quad Cities (Cordova, Ill.)	11-14-72	800
	Quad Cities-2 (Cordova, Ill.)	12-14-72[2]	800

LICENSES FOR STARTUP OPERATION

Licensee	Unit (location)	Date issued	Capacity (MWe)
Wisconsin Michigan Power Co	Point Beach 2 (Two Creeks, Wis.) (30% Power)	7-30-72[3]	497
Maine Yankee Atomic Power Co	Maine Yankee (Wiscasset, Me.) (75% Power)	9-15-72[4]	788

[1] Does not include AEC's Shippingport (Pa.) Atomic Power Station and N reactor near Richland, Washington, which produces power for Washington Public Power Supply System. Does not include Fermi 1 (Unit 1, which was shut down permanently in 1972, for "generation only" licenses for Babcock, which has been converted to fossil fuel and Elk River, which is being dismantled.

[2] Temporary 100% operating license, pending environmental review in progress. Original 1% license issued 3-21-72.

[3] Amendment to partial power license originally issued 3-24-71, limited to 85% of rated power on 12-8-72 pending resolution of fuel densification problem.

[4] License for 1% operation issued for Unit 1 on 10-1-71, amended to 30% on 4-21-72, along with issuance of 20% license for Unit 2. Amendment for 50% power operation with condenser cooling water diffuser pipe in operation were issued 5-12-72 for both Quad Cities 1 and 2.

[5] Hearing board decision on full power license pending.

[6] Limited to 50% power with condenser cooling water diffuser pipe in operation.

[7] Limited to 75% power pending resolution of fuel densification problem.

Source: *1972 Atomic Energy Programs: Regulatory Activities*, U.S. Atomic Energy Commission.

Table 2

Comparison of Selected Community Characteristics and Effects

	Plymouth, Mass. (Pilgrim I)	Waterford, Conn. (Millstone I)
Location	Seacoast 40 miles south of Boston New England	Seacoast Southeastern Conn. adjacent to New London, Conn. 40 miles equidistant from Hartford and New Haven, Conn. New England
Type of government	Representative Town Meeting	Representative Town Meeting
Population at onset of construction	15,400 (1965)	16,600 (1965)
Population – 1975 (estimated)	28,000	18,300
Percent increase in population	82%	10%
Effect on land values	Sharp increase	Sharp increase - ($25,000/acre, 1975)
Zoning and planning	No zoning laws until 1974	Tight planning and zoning regulations administered since the 1960s
Approximate percent tax base supplied by reactor – 1975	~50%	60%
Effect on housing starts	Sharp increase	Gradual increase
Median income - 1970	$7,900	$11,828

Source: Plymouth, Massachusetts, and Waterford, Connecticut, Annual Reports, 1970-1974; U.S. Census of the Population, Massachusetts and Connecticut, 1970.

Table 3

Reactor characteristics and facility information	Plymouth, Mass.	Waterford, Conn.	
	Pilgrim I	Millstone I	Millstone II
Size	670 MWe	652 MWe	828 MWe (current fuel loading date 3/76)
Type	BWR	BWR	PWR
Cooling	Once-through ocean water	Once-through ocean water	Once-through ocean water
Other facilities	Pilgrim II - construction permit hearings begun		Millstone II 95% completed Millstone III approved
Construction period	9/69 - 12/72	5/66 - 12/70	11/69 - 3/76
Operation date	12/72	12/70	12/75
Utility	Boston Edison	Millstone Point Co. (1970) Northeast Nuclear Co. (1975)	Millstone Point Co. (1970) Northeast Nuclear Co. (1975)
Transmission lines and corridors	Two 345 kv lines transmit electricity over 7.2 miles of new right-of-way corridors before connecting with pre-existing lines. Eleven angle points eliminate any tunnel effect.	Two 345 kv lines transmit electricity over 9 miles of new right-of-way before connecting with pre-existing lines. Corridors range from 415 ft. to 500 ft. in width. H-frame supporting structures are 80 ft. tall.	One additional 345 kv line. No new right-of-way.
Distance from center of town	3.5 miles	1.4 miles	1.4 miles
Land use	The site occupies 517 acres, about one-tenth of which have been modified for the nuclear power station. The 385-foot high Pine Hills form a forested backdrop for the 180-foot high station structure. Trees and brush form a sight barrier between the plant and motorists on Rocky Hill Road about one-half mile away.	The site occupies 500 acres, the station is the largest manmade installation in the immediate area with the turbine buildings approximately 105 ft. above mean sea level, and the reactor buildings approximately 160 ft. above. The particular location of the station, the flat terrain and the surrounding water areas along with low vegetation make it difficult to blend the buildings with the environs. The 375-foot high ventilation stack is particularly noticeable.	Same as Millstone I

Source: Final Environmental Statement, Pilgrim Nuclear Power Station, United States Atomic Energy Commission, May 1972: Final Environmental Statement, Millstone Nuclear Power Station Unit 3, U.S. Atomic Energy Commission, February 1974.

D. TOPICS COVERED IN THIS REPORT

To adequately explore the socioeconomic consequences of the siting of nuclear generating stations in these two communities, we have chosen the case study design which, by definition, is descriptive and exploratory in nature. The case study's purpose is to identify selected concepts and problems that might be addressed in further research.

The report focuses on five specific areas. First, a summary description of each of the two host communities is presented focusing on noted demographic, social, economic, and political changes from the preconstruction phase to the present operation stage. Included in each are selected results of the attitude surveys conducted in both communities during the research effort. The reader may find more detailed data tables portraying each community as well as more explicit descriptions of the survey methodology in Appendices A and F of the report. Second, a brief discussion of the nuclear power plants viewed as "inputs" into the social structure of each community will be presented. Four distinct characteristics and/or processes of each nuclear plant (i.e., facility characteristics, human resources, licensing and regulatory procedures, and generated revenue) will be outlined and treated separately, with emphasis on the property tax revenue generated by the nuclear plants as being of major significance to the local community. Third, after having profiled each community and its respective reactors, a concise economic analysis will follow, further explaining the impact of the generated property tax revenue on each local community. Since the increase in property tax revenue is noted to be so significant, more attention will be devoted to it than to other impacts in the study. Fourth, other significant social, economic, and political changes observed by the research team in each community will be presented: changes which cannot be directly related to the siting of the nuclear plant and which cannot be measured statistically, but which may be second- or third-order consequences of the construction and operation of the nuclear generating stations. Included in this section will be assessments of the changes occurring in the communities perceived by the research team and explanatory notes on the difficulty of demonstrating direct causality between the siting of a nuclear station and changes occurring within a community. Finally, conclusions and hypotheses will be presented suggesting a variety of potential impacts resulting from the construction and operation of the nuclear power generating stations. Broad general hypotheses are drawn for future testing since the development of these hypotheses is viewed as one of the major purposes of the case study approach to community analysis.

References — Chapter 1

1. C. P. Wolf, ed., *Social Impact Assessment, Environmental Design and Research Association Conference Proceedings*, Vol. 2, Milwaukee, Wis., June 1974, p. 3.

2. Ref. 1, p. 3.

3. Within professional sociology and psychology associations, Environmental Sections have been organized in recent years in which members are attempting to understand the relationship between technology development and the social order.

II. PLYMOUTH AND WATERFORD: A PORTRAYAL OF TWO NEW ENGLAND NUCLEAR COMMUNITIES

Presented below are brief portrayals of the two New England nuclear communities under study: Plymouth, Massachusetts and Waterford, Connecticut. Located in the northernmost portion of the eastern United States, both communities are shaped to a great extent by large scale institutions while manifesting, at the same time, very individualistic and unique cultural traits.

The discussion of the two communities will be brief, with emphasis on perceived social change as it has occurred over time. The reader may find more detailed data tables describing each community in Appendix A.

A. PLYMOUTH, MASSACHUSETTS

The town of Plymouth, Massachusetts, as shown in Fig. 1, is located on the coastal shores of southeastern Massachusetts, approximately 35 miles south of Boston and 40 miles northeast of Providence, Rhode Island. Surrounded by Kingston to the north, Middleboro and Carver to the west, Bourne and Cape Cod to the south, and Cape Cod Bay to the east, the 104-sq mile community (comprising the largest land mass of any Massachusetts town) is the county seat for the 27 community Plymouth County area, as shown in Fig. 1, and is part of the Southeastern Regional Planning and Economic Development District (SPREDD), a recently defined state planning area.[1]

The most significant feature of the community is the extensive residential and commercial growth which has occurred since 1965 and the transition from a small rural locale to a larger suburban community.

Like most communities in the Plymouth County area, Plymouth experienced steady growth during the 1950s and the early portion of the 1960s, shown in Table 4. The population increased from 13,650 in 1950 to 14,445 in 1960 and to 15,424 in 1965.[2] It was not until the period after 1965, however, that Plymouth began experiencing explosive growth from the 1965 figure of 15,424 to 18,606 in 1970 (a 21% change) to approximately 28,000 in 1975 (a 33% change). The growth rate during this period was approximately 11% per year.

This extensive growth manifests itself in many areas of change within the community, especially in two areas: annual school enrollment statistics and number of building permits issued.[3] School enrollments increased 108% from 3011 students in 1965 to 6630 students in 1975, necessitating double sessions for most pupils until 1974 when three new schools were completed.[4] Much of this growth occurred in the period 1972-1974, as illustrated in Tables 5 and 6. In 1972, the enrollment increased by 622 pupils, in 1973 by 1020 pupils, and in 1974 by 715 pupils. The Plymouth-Carver Regional School Board is presently considering the construction of a second regional high school to accommodate this rapid growth.[5]

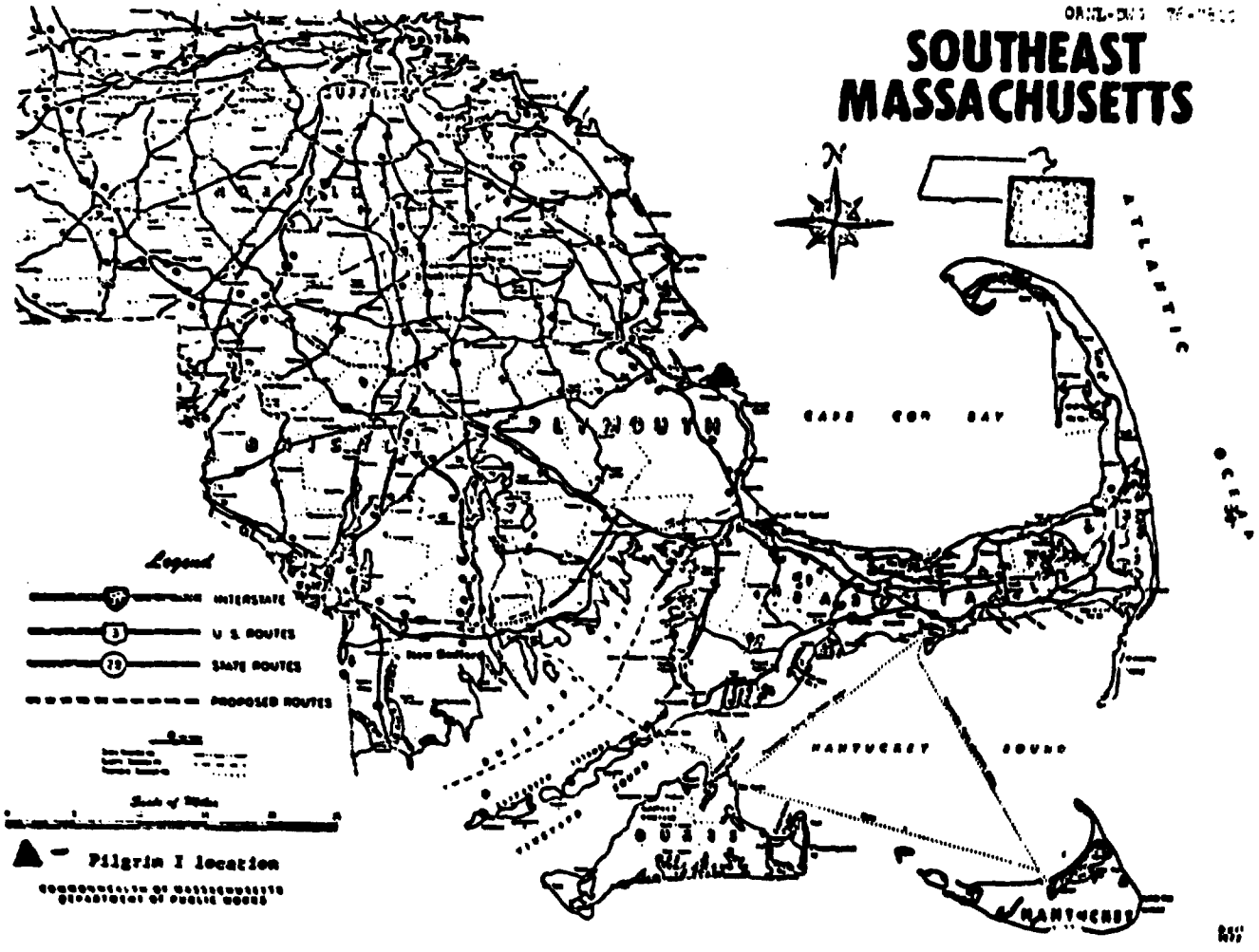

Fig. 1. Location of Plymouth, Massachusetts, in Southeastern Massachusetts

Table 4

Population Growth
Waterford, Connecticut, and
Plymouth, Massachusetts,
1950-1973

Town	1950	1960	Δ1950-1960	1965	1970	Δ1960-1970	1973	Δ1970-1973
Waterford	9,100	15,391	69%	16,600	17,227	12%	17,861	3.7%
Plymouth	13,658	14,445	6.2%	15,400	18,606	28.8%	23,584	26.8%

Source: U.S. Census of the Population, Massachusetts and Connecticut, 1950, 1960, 1970.

Table 5

School Enrollment — Plymouth, Massachusetts

Year	K	1	2	3	4	5	6	7	8	9	10	11	12	Total
1960		261	221	243	209	192	252	261	256	249	179	161	157	2720
1961		293	242	223	235	206	194	256	263	254	224	155	138	2758
1962		279	268	239	216	229	204	196	253	269	247	207	139	2822
1963*		291	257	262	239	216	225	197	195	280	297	272	211	3021
1964		NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1965-66		282	282	252	230	272	249	201	230	240	220	282	281	3011
1966		293	254	270	239	241	256	245	202	236	204	197	239	2948
1967		321	271	271	266	243	249	268	250	253	279	231	212	3225
1968		328	290	293	267	271	267	264	272	313	258	282	225	3386
1969		356	322	330	317	285	298	281	275	335	308	267	269	3743
1970*		321	335	332	330	307	291	307	284	343	342	292	261	3843
1971		397	354	359	363	359	343	323	319	378	355	335	278	4253
1972**		446	414	390	388	388	459	449	416	347	343	301	281	4709
1973	455	511	481	463	448	436	520	506	493	458	426	346	331	5980
1974	539	536	557	525	503	506	594	569	546	537	480	388	382	6728
1975	-	-	-	-	-	-	-	-	-	-	-	-	-	6630

*Plymouth and Carver have joined secondary school (grades 9-12).

**Intermediate schools become regional schools (grades 6-8).

Table 6

Plymouth School System
Percentage Change of Total Enrollment

1960-1961: 1.3%		
1961-1962: 2.2%		
*1962-1963: 6.5%	1960-1965: 14.5%	
1963-1964: 4.2%		
1964-1965: 2.7%		
1965-1966: -5.4%		
1966-1967: 3.7%		
1967-1968: 5.0%	1966-1970: 23.4%	1960-1974: 147.4%
1968-1969: 10.5%		
1969-1970: 2.6%		
1970-1971: 10.7%		
1971-1972: 10.7%		
1972-1973: 27.0%	1971-1974: 75.1%	
1973-1974: 12.5%		

* Plymouth and Carver combine Secondary Schools.

Source: Plymouth, Massachusetts, Department of Education.

Similarly, the number of building permits issued annually demonstrates how this explosive growth occurred.[6] The number of residential building permits rose sharply in 1971 with 476 permits issued during that year, 239 more than the previous year, as shown in Table 7. In 1972, 873 permits were issued, the largest number ever issued in one year in Plymouth. The number decreased to 635 in 1973 and again to 187 in 1974 due to national housing and economic trends and the passage of a strict local zoning ordinance.[7] Residents, when asked about their attitude toward this extensive development, were divided nearly 50-50 (slightly negative) on the issue of growth.[8] Reasons for respondents favoring growth were: (1) growth is beneficial, though it should proceed with proper planning (33.3%); (2) it improves the tax situation (17.4%); and (3) it increases job opportunities (15.9%). Reasons for opposing growth were: (1) there was too much growth occurring at the present time (49.2%); and (2) a general negative attitude toward social change (11.2%).

Further noticeable strains of growth also appear to be having some effect on the local political infrastructure.[9] Since its inception in 1620, Plymouth has been governed by a representative elective town meeting with representatives elected from seven precincts within the community. Presently, 105 elected town meeting members, elected for a two-year term of office, vote on issues of local and regional importance. In addition, seven elected selectmen have general responsibilities to oversee town affairs and define standard operating procedures for the community. The community is now faced with new and unfamiliar issues resulting in an increased work load for these town officials.[10] Hence, a full-time executive secretary for the town was hired in 1974 and a full-time public works director in 1975. Fears about the continuation of the explosive growth rate resulted in the hiring of a professional city planner in 1973 and renewing discussion in 1975 of hiring a second planner to cope with the additional work load. Debate also continues about the need to hire a full-time town counsel to handle the increasingly complex legal issues which the town now faces, rather than retain the present part-time counsel.

With extensive growth taking place in the community, one major factor which has remained constant and of great concern to local officials is the high unemployment rate, which not only affects Plymouth but the entire southeastern Massachusetts region.[11] Rapid development and persistently high unemployment appear incongruous at first glance; however, when viewed in the context of rapid growth the relationship between the two trends can be more clearly perceived. Until recently, the small cranberry industry, tourism, and summer residents supplied a major portion of Plymouth's income and employment.[12] With some new light industry moving into a newly created Industrial Park, the situation appears somewhat improved, however, unemployment still persists in the Plymouth labor area and has been the highest or second highest in the state since 1969. Unemployment for the area has not dropped below 14% since 1965. Plymouth's geographical location outside of the Boston Standard Metropolitan Statistical Area (SMSA), its historical reliance on tourism (i.e., seasonal labor), and its lack of major commercial or

Table 7

Bulding Permits Issued — Plymouth, Massachusetts

Year	Total[1] permits	Commercial permits	Residential permits (year round)	Residential permits (seasonal)
1960	219	7	56	NA
1961	188	8	69	NA
1962	146	9	118	NA
1963	157	7	88	NA
1964	170	9	90	91
1965	250	3	88	97
1966	233	8	85	67
1967	190	11	73	69
1968	276	10	145	33
1969	293	16	168	38
1970	348	12	237	34
1971	604	16	476	35
1972	1004	16	873	27
1973*	757	6	635	26
1974	255	18	187	20

[1]Total permits = Commercial permits + year round
Residential permits + summer dwellings + various other building code permits

*1973, addition of a strict zoning ordinance.

**Plymouth also administers 110 apartments for the elderly and 40 apartments for veterans. The housing authority is presently constructing 100 more elderly units.

industrial development accounts for much of this high unemployment rate.[13] The relative contribution of new residents to employment totals has not been analyzed in this study, though it is known that many new residents commute to jobs outside Plymouth in the Boston and Brockton areas.

B. WATERFORD, CONNECTICUT

The Millstone Nuclear Generating Stations I and II are located in the town of Waterford, Connecticut, on the north shore of Long Island Sound and on the east shore of Niantic Bay, as shown in Fig. 2. Bounded by the city of New London to the east and the suburban towns of Montville to the north and East Lyme to the west, Waterford is situated in the southeastern Connecticut region (as represented in Fig. 2), 40 miles equidistant from Hartford and New Haven. The 18 municipalities forming this region are variously known as the New London-Groton-Norwich Standard Metropolitan Statistical Area (SMSA), New London County, and the Southeastern Connecticut Regional Planning Area (SCRPA). Included in the region are municipalities of three types: 3 urban communities, 10 suburban towns, and 5 rural villages.[14]

Demographically, Waterford is similar to other suburban southeastern Connecticut communities but quite different from neighboring cities. Whereas Waterford in 1970 had a population of 17,300 on 40 sq miles, the city of New London had a population of 31,630 on 3.6 sq miles.[15] The 1970 Waterford population figure showed an increase of 12% (second smallest in the region since 1960; a considerably smaller increase than the 23% increase experienced by the county and 20% by the state). Moreover, it represented a Waterford grew from 9,100 to 13,391, an increase of 69% (as shown in Table 4). More recent population estimates indicate a 1974 population of 17,863 and a 1975 population of approximately 18,300 persons. Most of the growth in the 1960s can be attributed to natural increase as net migration accounted for only 151 of the 1836 increase, the second smallest immigration total in New London County. The more densely populated and decaying city of New London, on the other hand, had a net outmigration of 6300 persons.

Though Waterford is geographically bounded by heavily industrialized communities, it continues to maintain its residential character. Three-acre lots are the minimum in parts of the northern portion of the town, and one-half acre lots are the minimum in parts of the southern portion of the town.[16] Unlike Plymouth, residential growth in Waterford has been quite stable for the last decade with an average of 80 dwelling units being constructed per year, as seen in Table 8. Whereas 36% of the region's housing stock is multiple-dwelling units, Waterford's housing has been almost exclusively single-family residential development. Only recently have town officials included multiple-family dwellings in the zoning regulations.[17]

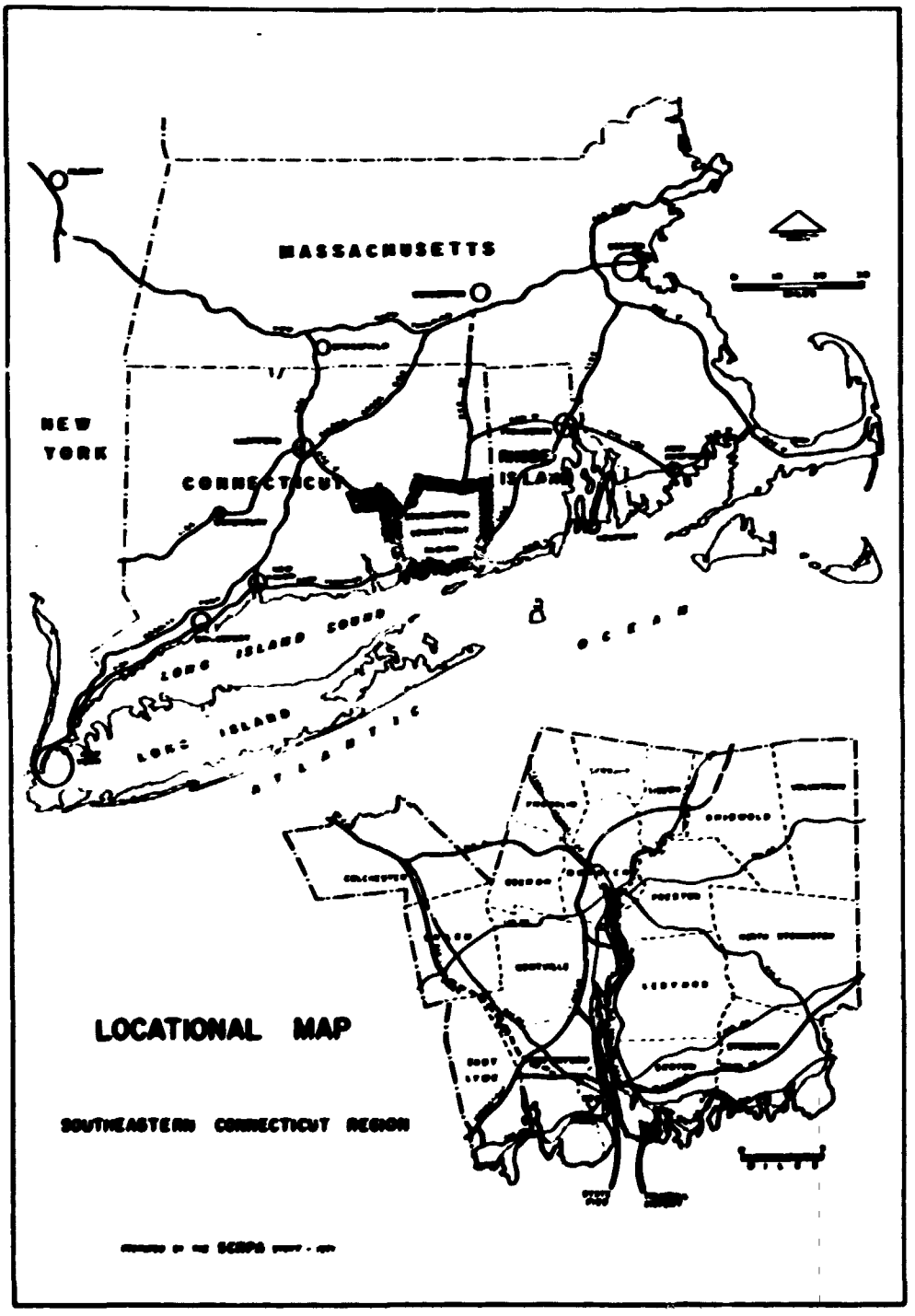

Fig. 2. Location of Waterford, Connecticut, in Southeastern Connecticut Region

Table 8

Commercial and Residential Growth
Number of Permits Issued
1960-1974

Year	Waterford, Connecticut	
	Commercial	Residential
1960-1961	61	80
1961-1962	22	103
1962-1963	17	92
1963-1964	18	64
1964-1965	15	57
1965-1966	NA	NA
1966-1967	12	52
1967-1968	23	64
1968-1969	11	74
1969-1970	16	66
1970-1971	37	98
1971-1972	45	122
1972-1973	35	147
1973-1974	8	103

Source: Town of Waterford, Connecticut, Building Inspectors Annual Reports 1960-1974.

Restrictive zoning ordinances implemented by the Representative Town Meeting and originating in the Planning and Zoning Commission are the major reasons for much of this relatively slow growth. To administer these ordinances and to oversee future land-use planning, a professional urban planner was hired in 1974, similar to the action taken in Plymouth in 1973.[18]

In keeping with this stabilized development, little significant change in total pupil enrollment occurred in the local school system in the past 15 years. A trend of naturally increasing enrollments within grades 5-12 was evident for the 1960s. Total enrollment, as displayed in Table 9, shows gradual increases for the 1960s, peaking in 1968 at 4574 students, followed by some fluctuation in the years 1970-1974 as enrollment dropped to 4159.

Politically, Waterford is similar to Plymouth in that it is governed by three elected selectmen and a Representative Town Meeting (RTM) of 33 members from five voting districts. Each member is elected for a two-year term – one representative for each 300 voters in the district. The RTM, an elected lay body, has eight standing committees which are the primary decision-making bodies within the community.[19]

In light of new service demands and group pressures, there has been some concern that the present "lay" government can no longer function properly and provide the needed direction for a community which continually faces increasing pressures. The lack of professional guidance in certain governmental affairs has increased debate within the community about the need for a different type of local government. Many community residents, though desiring to maintain the New England town meeting form of government, feel it is inadequate and are increasingly more vocal about the need for change within the local political infrastructure.

Unlike Plymouth, which is plagued by a continuing high rate of unemployment, Waterford has a very low rate of unemployment.[20] From 1972-1974, Waterford had an unemployment rate of approximately 3.3% as compared to 6% in New London City and 6% for the State of Connecticut. Figures from both the 1960 and 1970 Census show that more than 50% of Waterford's residents were listed as professionals or highly skilled workers. Many of Waterford's residents are employed in the Thames River Industrial Complex, an industrial grouping consisting of the General Dynamics Electric Boat and the U.S. Naval Submarine Base in Groton, the U.S. Coast Guard Academy, the U.S. Naval Underwater Sound Laboratory, and Phizer Corporation (chemicals) in New London. The New London County area is dominated by this complex which utilizes nearly two-thirds of the work force in the area. Due to the employment needs of these defense-related industries and large manufacturing concerns, the region's unemployment rate continues at the lowest level in the state.

Table 9

School Enrollment 1960-1974
Waterford, Connecticut

	Grade													
Year	K	1	2	3	4	5	6	7	8	9	10	11	12	Total
1960	347	401	367	348	295	302	289	208	284	258	208	222	194	3625
1961	352	392	383	355	351	305	283	289	299	298	219	209	207	3955
1962	355	391	354	387	343	358	306	288	296	328	258	224	202	4120
1963	354	412	394	359	373	329	335	300	282	327	283	241	212	4231
1964	360	397	382	383	342	379	317	342	300	305	262	276	236	4362
1965	347	379	388	386	356	345	378	309	335	326	268	254	262	4428
1966	330	380	368	369	364	358	329	370	312	360	264	269	238	4433
1967	325	371	378	370	365	362	352	323	375	305	324	272	259	4518
1968	324	356	372	373	361	371	371	359	314	370	279	309	256	4574
1969	338	335	355	380	366	371	367	377	388	333	336	273	305	4524
1970	270	360	328	375	363	370	367	369	365	390	282	337	265	4441
1971	238	301	340	317	376	384	373	365	365	376	329	278	317	4359
1972	216	264	288	347	330	375	386	386	380	372	337	311	259	4251
1973	241	243	270	315	364	341	376	401	385	410	328	51	289	4314
1974	236	257	239	265	305	374	335	362	395	415	353	309	314	4159

Source: Town of Waterford Annual School Reports: 1960-1974.

In summary, Waterford remains a primarily single-family residential community surrounded to a great extent by a highly industrialized area which employs many of its residents. Waterford continues its low level of public services and the strict zoning policy adopted after its sudden growth in the 1950s. This policy is defended by elected town officials who see extensive growth as harmful to Waterford's future, a position they believe is representative of local public opinion. A majority of residents sampled by the research team feel a strong sense of community attachment and believe that Waterford is a desirable place for peoples of all ages to live.[21] Those that have moved there recently have done so primarily because of job opportunities in the surrounding industrial complex and the favorable housing situation. A majority of those sampled (71%) (in contrast to local officials), believed growth to be beneficial to the town, but stated that this growth should proceed with utmost caution and planning. The major reasons given for favoring growth were: (1) it would secure (and improve) the present stabilized tax situation, and (2) it would bring additional business and industry to the community. When asked what changes were needed in the community, the respondents suggested: (1) an increase in communication within the community, (2) a change in the present political structure, and (3) a need for increased public services, primarily the addition of a sewer system for the entire community.[22]

References — Chapter II

1. Suburban Boston Community Research Project, United Community Services of Metroplitan Boston (Boston, 1969), p. 2.

2. U.S. Department of Commerce, Bureau of the Census, *United States Census of Population: 1970, Vol. 1, Characteristics of the Population, Massachusetts*.

3. These are two areas where change can be easily documented; other areas of change which might be explored are (1) number of new industrial and commercial developments, and (2) number of new business and residential telephone installations.

4. Plymouth Planning Board, *Plymouth School Department Summary* (Plymouth, Mass., 1974).

5. The decision to build a second regional high school has been made; present discussion focuses on where the school should be located. Various internal debates are focusing on dollar costs, location, and design of the school.

6. Plymouth Planning Board, *Number of Residential and Commercial Permits Issued* (Plymouth, Mass., 1975).

7. Rezoning ordinances were passed in the Plymouth Town Meeting in 1973.

8. See the results of the Plymouth survey in Appendix F.

9. During our interviews with local Plymouth officials, many complained of increased work loads and new demands caused by the influx of new residents.

10. New areas of work have evolved for Plymouth town officials primarily with local, State, and Federal officials and with several private industries (i.e., Boston Edison).

11. Thomas McDonald, Senior Economics Analyst, *Annual Manpower Planning Report, Report to the Massachusetts Division of Employment Security, January 1975* (Boston, Mass., 1975), p. 3.

12. Tourism has not been directly impacted by the siting of the nuclear plant. From 1968-1974, local tourism increased substantially, except for 1974 when national economic trends affected the industry. The Chamber of Commerce promotes visits to the site where the utility provides tours of the facility. The Plymouth Chamber of Commerce states that requests are made to tour the nuclear plant

by tourists and local residents. The Chamber does not maintain records on the number of such requests, only the approximate number of visitors annually to all attractions in the community. (The Chamber states that approximately 500 tourists request aid per day from local information booths, but this in no way represents the total number of tourists. The Chamber estimates that the total number of tourists who visit historical sites is close to 1 million annually.

13. Thomas McDonald, Senior Economics Analyst, *Annual Manpower Planning Report, Report to the Massachusetts Division of Employment Security, January 1975* (Boston, Mass., 1975), p. 3.

14. Regional Planning Program Staff, *1970 Social Indicators: Southeastern Connecticut Planning Region* (Norwich, Connecticut: Southeastern Connecticut Regional Planning Agency, 1973), p. 2.

15. United States Department of Commerce, Bureau of the Census, *United States Census of Population: 1970, Vol. 1, Characteristics of the Population, Connecticut.*

16. Town of Waterford, Annual Reports, 1974-1975.

17. Town of Waterford, Annual Reports, 1974-1975.

18. A local planner was hired after much debate within the community. At first, the position was to be essentially a consulting one; however, it eventually evolved into a full-time position.

19. Town of Waterford, Annual Reports, 1974-1975.

20. Connecticut Labor Department, Employment Security Division, Annual Report (Hartford, Conn., 1975).

21. See the results of the Waterford survey in Appendix F.

22. See the results of the Waterford survey in Appendix F.

III. INPUTS

A. INTRODUCTION

A social impact classification scheme was developed (see Appendix B) (1) to provide additional structure to the research design, (2) to assess impacts, and (3) to explain perceived causal linkages between the siting of the nuclear power plants and changes in the social structure of the host communities. The schema takes the form of an input-output model; inputs are defined as the process of nuclear power plant construction or operation interacting with the ongoing social structure; outputs are defined as impacts which occur from this interaction.

Changes introduced into the host communities derive from four distinct categories of characteristics which accompany the reactor siting process as shown in Fig. 3: facility characteristics, new human resources, generated revenue, and licensing and regulatory procedures. These characteristics are not unique to nuclear power plants but are common to the siting of all large energy or industrial plants on host communities. Also, an understanding of these characteristics of large technologies is important not only for specific site analysis but for more comprehensive regional analyses.

DESCRIPTION

Fig. 3. Inputs to the Social System

Facility Characteristics

- Reactor design
- Cooling system
- Transmission lines/corridors
- Effluents
- Visual characteristics
- Land use characteristics

Human Resources

- Work force
  - New residents
  - Commuters

Revenue

- Employment income
- Taxes/payment in-lieu-of-taxes
- Materials/goods and services purchased

Licensing and Regulatory Procedures

- Information flow/distribution
- Procedural participation
- Perceived/anticipated impacts

B. FACILITY CHARACTERISTICS

Facility characteristics include the actual physical plant and site characteristics of the nuclear reactors. As such, they encompass the nuclear generating stations, the transmission lines and corridors; the land on which the plant is sited, as well as the surrounding buffer zone utility owned land and all additional work-related and equipment areas; and all effluents from plant operation.

Pilgrim I – The Pilgrim nuclear station site occupies 517 acres, about one-tenth of which have been modified for the nuclear power station. The 395 foot Pine Hills surrounding the site forms a forested backdrop for the 180 foot high station structure.

The Pilgrim nuclear unit is a direct-cycle boiling water reactor which produces steam at 1000 psig for use in a steam-driven turbine generator. The net power output of the station is 655 MWe.

The station draws salt water from Cape Cod Bay for a condenser cooling water system (approximately 310,000 gpm) and for service water systems cooling water (approximately 10,000 gpm) and returns this water to the Bay through a discharge channel about 900 feet to the north of the station. The temperature of the cooling water is about 29°F above inlet temperatures.

The electrical output of the station is fed through the switchyard via two 345-Kv transmission lines to Northeast Gas and Electric Association Canal Station and Montaup Electric Company's Bridgewater station, which in turn are connected to the Northeast Power grid and the Boston Edison System. The transmission lines are routed about two miles south of the station and proceed in a southwest direction over the Pine Hills for approximately five miles where they connect with the pre-existing lines.

Millstone I and II – Millstone Nuclear Stations I and II are located on Millstone Point, a 500-acre rocky projection into Long Island Sound between Jordan Cove and Niantic Bay in the town of Waterford. The site had been in continuous operation as a quarry for many years prior to the construction of the plants. The nuclear plants presently occupy approximately 23 acres of the total acreage on Millstone Point.

The site includes one boiling-water reactor (652 MWe) and one pressurized-water reactor (828 MWe). The stations are the largest man-made installations in the area; the 375-foot high ventilation stack on Millstone I is particularly noticeable.

Major structures on the site include the turbine buildings and reactor buildings. The once-through cooling system draws water from Niantic Bay through two pump houses and discharges the water into a quarry which is approximately 100 feet deep. The water then flows over a weir into a shoreline discharge on the east side of Millstone Point. The circulating water discharge raises water temperatures about 23°F in the Bay.

Three 345-kV lines transmit electricity from the plants over nine miles of new right of way corridors before connecting with approximately 26 miles of preexisting lines in East Haddam, Oxbow, and Chestnut. Corridors range from 415 feet to 500 feet in width and have been designed to produce minimal ecological impact.

C. HUMAN RESOURCES

By human resources we mean the workers who help construct and operate the nuclear facility. Multiplier effects such as secondary employment and individual income which result from the influx of construction and operating workers will be covered in the section on "generated revenue" impacts.

We had difficulty in obtaining construction force data for Pilgrim I, from either the utility or the various union halls involved.[1] One hundred sixty-five permanent workers operate the reactor on a year-round basis. The utility did provide information on the construction force for Pilgrim II, however, and stated that figures were comparable to that for Pilgrim I, as shown in Table 10. From this assumption, one can estimate that approximately 1100 workers helped construct Pilgrim I, with a peak work force of 1300 workers . Workers came from union halls primarily in the Boston and Brockton areas, accounting for nearly 3000 man-years of work and a payroll of approximately $110 million.[2]

Northeast Utilities states that the total work force at peak construction for Millstone I was 780 workers (second quarter of 1968) and for Millstone II, 1020 workers (Third quarter of 1972). These totals mean 4535 man-years for Millstone I and 8766 man-years for Millstone II. Total wages for construction workers were unavailable for Millstone I, while $96.5 million were the total wages for Millstone II.[3] Labor was hired through local union halls in New London and Norwich and (at peak construction periods) from Hartford, Connecticut, Providence, Rhode Island, and New Haven, Connecticut, as shown in Table 11.

Northeast Utilities could not supply the actual number of operating workers at Millstone I and II for any one point in time because of fluctuations in construction, although they estimated that approximately 165 permanent workers were hired to operate both reactors.

Table 10

Estimated Bechtel Employment for Construction, Pilgrim Unit 2

	Union Hiring Hall	Total wages	Man-years
Boilermakers	Boston		95
Ironworkers	Boston	$26,100,000	450
Sheetmetal workers	Boston		135
Operating engineers	Allston	4,800,000	125
Carpenters	Brockton		215
Cement masons	Brockton		90
Electricians	Brockton		525
Millwrights	Brockton		90
Laborers	Brockton	84,100,000	40C
Plumbers	Brockton		850
Pipefitters	Brockton		
Teamsters	Brockton		50
	TOTAL	$115,000,000	3,025

*Excludes supervisory and field engineers; subcontractors; clerical personnel.

Source: Boston Edison Company, Boston, Mass.

Table II

Millstone I and II Operating
Nuclear Power Plants

Total work force at peak construction:		
Millstone I	780	(Second quarter of 1968)
Millstone II	1020	(Third quarter of 1972)
In thousands of man years of manual labor:		
Millstone I	4535	Man-years
Millstone II	8766	Man-years
Total wages for manual man hours:		
Millstone I	– information not available	
Millstone II	96.5	Million dollars

Source: Northeast Utilities: Hartford, Conn.

D. LICENSING AND REGULATORY PROCEDURES

The third major input into the system is the licensing and regulatory procedure, a process which encompasses all of the legal requirements and formal institutional arrangements necessary for the siting or operation of any reactor.

Licensing hearings for both Millstone I and II and Pilgrim I were similar in content and emphasis to hearings for other nuclear plants licensed in the same era. Licenses were obtained from all Federal, State, and local jurisdictions, and hearings proceeded on schedule with few delays (see Appendix C for listing of required licenses). In hearings for Millstone I and II, intervention from local citizens was raised primarily on ecological grounds focusing on thermal pollution of Long Island Sound. Intervenors from the Hartford area were part of an established national effort to halt the construction of nuclear plants rather than a local, indigenous effort. Intervention in Pilgrim I evolved around one individual whose primary concern was the disturbance of the ecological balance of Cape Cod Bay. His contentions were voiced at both the hearings and in the local press; however, the community of Plymouth made little response to his call for halting the construction effort. Since that time, this same individual has formed the Plymouth County Nuclear Information Center (PCNIC), whose function is to inform the local community about the negative aspects of nuclear power. Again, his call for opposition goes virtually unheeded in the community.

Since Pilgrim I began operation in December 1972, after 4 years of construction, Boston Edison and the Nuclear Regulatory Commission have monitored the routine operation of the facility on a regular basis.[4]

According to local newspaper accounts three nonroutine incidents have occurred at the site which have prompted Federal investigation. First, the killing of approximately 5000 menhaden fish in the thermal plume in April 1973; second, a seven-month shutdown from December 1973 to August 1974, due to damaged channel boxes which carry the cooling water through the reactor core; and third, a "scram" in September 1975 when the generator supplying power to the plant failed, causing an abrupt and automatic shutdown of the reactor.[5] General maintenance and fuel reloading procedures have shut down the plant at various other times, though these scheduled occurrences appear to be routine in nature (as seen in Appendix C).

Millstone I, which began operation in December 1970 after a 4-1/2 year construction period, and Millstone II, which recently went on-line in December 1975, have experienced few nonroutine incidents demanding Federal investigation, though there have been several minor abnormal occurrences in their operating history. In September 1972, higher than normal discharges of liquid radioactive materials into Long Island Sound occurred as a result of seawater intrusion into Millstone I. This water (2,000,000 gallons) contained a significant amount of radioactive isotopes and resulted in an increase in the "Technical Specification Annual Average Discharge" which exceeded Federal standards according to the *New London Day*. In April 1975, Millstone personnel improperly allowed 2500 gallons of radioactive water to escape from the plant instead of routing the liquid into a waste treatment system.[6] This event resulted in evacuation of employees for a short period. A second release of 1000 gallons into Long Island Sound occurred three days later causing a total of 3500 gallons to be discharged. NRC officials cited the releases as "infractions" and stated that the incidents resulted from "inadequate management."[7]

E. GENERATED REVENUE

The final input into the system is money. A nuclear plant may result in money inputs into the local or regional economy through worker payrolls, purchases of goods and materials, or through local tax payments. Since the change in potential tax revenues caused by the siting of the power stations in the two New England communities appears to be the major input into the system, an extensive discussion will cover: (1) the basis for the generated property tax revenue and (2) the changes that occurred in the tax structure in both Plymouth and Waterford.

Two characteristics of power reactors lead to significant impacts on local taxation: (1) massive capital investment in the physical plant and surrounding land and (2) location criteria which gives priority to low population density and water availability as well as electricity demand. Thus, unlike many industries that locate according to market potential or labor supplies, the power reactor avoids interacting with

other activities, providing the conditions for an almost certain massive increase in the tax base capacity. If the plant does not require additional public services in significant amounts, does not hire appreciable numbers of workers, and does not purchase important quantities of local goods and services, the major direct impact during operation will be its effect on the tax base.

For this report, the economic analysis of the local governments assumes that the local public economy identifies selected elements in the private sector as its tax base (value, income, etc.), levies a rate of taxation on this basis, and provides public services with the proceeds of this levy. The relative size of this base is termed the community's taxable capacity,[8] and the act of taxation means fewer dollars will be available to purchase the products of the private portion of the local economy.

In both Massachusetts and Connecticut, the land, plant, and equipment of electrical generation stations is subject to property taxation. Additionally, inventories and subcontractor's equipment are entered onto the tax roll in varying amounts. The value of these items can be reduced through an exemption on equipment used to mitigate air pollution or environmental damage. Finally, the value is further modified through the application of an assessment ratio, with the final amount equal to assessed valuation for tax purposes.

In both Plymouth and Waterford, the net worth method is used to arrive at a market value figure for the power reactor (i.e., requiring the development of a reconstruction schedule based on current prices and a depreciation schedule that reflects the effects of physical and technical obsolescence), and in each case the replacement value is derived by reducing the utility company's book value by indirect costs that are nonassessable.[9] Plymouth allows the Boston Edison Company (which owns the Pilgrim Station) to make this calculation for the town, while Waterford has retained an appraisal expert to oversee the calculations and prepare an annual report detailing the Millstone assessment. To calculate the depreciation schedule for Millstone, the town of Waterford has agreed to a stabilized rate of 30% depreciation over a 16-year period. In essence, this provides the town with a more or less constant tax base over time, in contrast to the declining value that could occur under alternative schedules. At present, there does not appear to be a depreciation schedule for the Pilgrim Station. However, Boston Edison reports approximately one-third of its capital investment as attributable to environmental protection equipment, while in Waterford, this exemption does not figure heavily in the calculation of value. Finally, each town applies the legal assessment ratio to its power station, a rate that is likely higher than that of most other parcels in town. For Plymouth this rate is 50%, and in Waterford it is 60%.

Thus, although the tax system sets the bounds for calculation of each facility's assessment, the final figure is in large part a negotiated value, with neither side pressing hard to gain advantage. Typically, the utility company does not want to exert excess pressure upon the community to grant

tax concessions because it does not wish objections either to its presence, or to the construction of additional generating units. The towns, on the other hand, do not wish to call unnecessary public attention to their unique tax situations by engaging in court battles that might increase assessments, particularly since both state legislatures have before them pending legislation that would redistribute tax payments from power reactors on a statewide basis. Moreover, from the point of view of Plymouth and Waterford, the addition of the stations to the tax base was an essentially costless gain; hence, they do not lodge extraneous protests.

The magnitude of the influence of the Millstone and Pilgrim Stations upon the tax structure can clearly be seen in Table 12, which presents the level of assessed values for each town prior to construction of the power plants, the taxable value recorded for each station, the proportion which the station comprises of total taxable values, and the value associated with property other than that of the complex. However, one should avoid direct comparisons of value between towns, since all values are shown in terms of actual assessments. To the degree that the average assessment ratios for the two towns differ, the value levels are not comparable.

For each town, the influence of the stations on taxable capacity began in about 1968 and in dollar terms remained about the same through 1973. At this point, a second generating unit at Waterford (which recently began operation) further increased the tax base. A similar impact will occur in Plymouth when and if the second Pilgrim unit arrives on the tax roll in approximately five years.

Perhaps the most important measure of the taxable capacity impacts is the percent of the total town property tax base which each plant comprises, shown in columns (3) and (7). In each case, this proportion is so large as to indicate that the traditional tax burden has been significantly altered with the town possessing the option for either major decreases in tax rates or major increases in service levels. At roughly 0.50, as in Plymouth and Waterford, this proportion indicates that service levels could be doubled at a constant tax rate or maintained at one-half the present tax rate. For individual households, this circumstance could mean an impact much greater than the Federal income tax rebate of 1975, and, for business, a potentially significant percentage increase on return per dollar of invested capital. Stated differently, the effective impact of the power stations is to match local property tax payments by the ratios shown in columns (3) and (7). That is, in Waterford, the facility pays $0.59 out of each local property tax dollar, or roughly $1.40 for each dollar that is raised locally. In Plymouth, the input is slightly less. Here the facility pays about $0.46 on the tax dollar, or $0.85 for each local dollar raised.

Since Plymouth has recently increased in population more rapidly than has Waterford, this growth is reflected in its increase in "non-plant" assessments. Between 1969 and 1974, Plymouth population increased by roughly 20%, a rate about three times larger than that of Waterford. For this reason, the per capita impact of Pilgrim on taxable capacity has been diluted somewhat, relative to Waterford. Over the period

Table 12

Impact of Millstone and Pilgrim Stations on Assessed Values

	Waterford, Connecticut				Plymouth, Massachusetts			
	Total value	Plant value	Plant proportion of total value	Non-Plant value	Total value	Plant value	Plant proportion of total value	Non-Plant value
1966*	$ 66,053			$66,053	$ 43,451			$43,451
1967	66,462			66,462	45,827			45,827
1968	72,744	$ 5,643	0.08	67,101	47,629	$ 132		47,497
1969	90,334	20,867	0.21	69,467	51,515	1,456	0.03	50,059
1970	97,983	25,846	0.26	72,137	68,751	14,510	0.21	54,241
1971	112,585	39,369	0.33	75,216	93,728	29,808	0.32	63,290
1972	130,564	51,351	0.39	79,213	114,559	44,808	0.39	69,751
1973	168,456	81,728	0.49	86,728	154,429	76,442	0.49	77,987
1974	221,189	129,756	0.59	91,443	165,212	76,442	0.46	88,770

*Due to differing fiscal years, this column indicates similar but not identical timeframes for each town.

Source: *Annual Report*: Town of Waterford (various years).
Annual Report: Town of Plymouth (various years).
Additional unpublished data was provided by each town's assessor's office.

shown, total assessed values per capita tripled in Waterford and more than doubled in Plymouth, but nonplant assessments increased only about 25% per capita in each town.

Thus, by almost any standard of measurement, the economic impact of the power stations on Plymouth and Waterford must be evaluated as extremely significant. In relative terms, however, the impact is somewhat larger in Waterford, due to the influence of the second Millstone unit. However, the addition of Pilgrim II would likely swing the balance in Plymouth's favor.

References Chapter – III

1. Though the research team attempted to gather such information, we were unable to reconstruct the actual construction worker totals for Pilgrim I from present sources.

2. Boston Edison, "Estimated Bechtel Employment for Construction, Pilgrim Unit 2," (Boston, Mass. 1975).

3. Northeast Utilities, "Estimated Work Force and Man Years for Millstone I and II," (Hartford. Conn. 1976).

4. "Pilgrim I Scrammed in Serious Incident," *Old Colony Memorial*, (September 18, 1975), p. 1.

5. "Pilgrim I Fish Kills. Prompt New Investigation," *Old Colony Memorial*, (April 19, 1973).

   "AEC Orders Pilgrim I to Halt Operation Next Week," *Old Colony Memorial*, (December 20, 1973).

   "Pilgrim I Scrammed in Serious Incident," *Old Colony Memorial*, (September 18, 1975).

6. "Utilities Place Faith in Technology," *New London Day*, (May 1, 1975), p. 1.

7. "Nuclear Leak Causes Alarm at Millstone," *New London Day*, (March 27, 1975), p. 6.

8. Taxable capacity measures the relative ability of governmental jurisdictions to raise revenues under a given taxing structure (i.e., with a given definition of tax base). In the Plymouth and Waterford cases, the primary tax base is the assessed value of nonexempt real and personal property. Because the physical capital of the nuclear generation unit (under private ownership) is eligible for this type of taxation, construction of a power reactor significantly enhances the capacity of the host town to raise revenues. In other words, a given tax rate will generate a proportionately greater amount of revenues according to the percentage increase in the property tax base. It does not follow, however, that revenues will automatically rise, or that the existing tax rate multiplied times the capital investment adjusted to assessed value will predict future revenues accurately, since the town may choose to lower its tax rate in response to the increase in capacity. In doing so, it may recover the benefits (or a fraction of the benefits) of its capacity increase through the private sector, since effectively the lowering of the tax rate leaves additional dollars in the hands of taxpayers.

It should be emphasized that public expenditures are not neutral in terms of job creation, and in fact, should stimulate the local economy approximately as much as private expenditures. Thus, while the increase in taxable capacity can potentially influence disposable income in the private sector by permitting a lowered tax rate, the "price" of public services is also halved (assuming a doubling of the tax base), a phenomenon that at least in theory should provide an impetus for additional expenditures.

These "feedback" effects through which the local economy is enhanced are termed multiplying effects, and it is unlikely that public and private spending differ greatly in terms of stimulating the local economy. However, it should be clear, if somewhat paradoxical, that the higher the local tax rate, the greater will be the impact on the local economy, because as the tax rate increases, the quantity of tax dollars "imported" from the power station also increase. Nevertheless, one should not conclude from this fact that an optimal strategy on the part of the host community would be to continually increase its tax rate. This is because, while in the aggregate, the local economy would be benefited, this practice can also result in significant redistribution of local income, while simultaneously generating excess quantities of public goods.

9. Interviews with local Tax Collectors, Mr. Lothrop Withington and Mr. Kenneth Dimmock, Plymouth and Waterford, June 1975.

IV. NUCLEAR POWER PLANT SITING: THE IMPACT ON PROPERTY TAX REVENUES

The research team believes the principal direct impact in this study to be the massive increase in property tax revenues experienced in both communities by the siting of the nuclear plants and the option chosen by each host community to lower or stabilize the existing tax rates with the increased revenue. There is a relative lack of other noticeable inputs of money to date into the local economy since few jobs have been created and relatively few goods and services have been purchased.

The following section presents an analysis of this phenomenon as observed in each community; first, examining the magnitude of the tax base changes that occurred in each of the host communities and, second, examining the manner in which each community reacted to the observed change.

A significant increase in a community's revenue base allows that community to: (1) increase services greatly with a constant tax rate, (2) maintain service levels with a commensurately reduced tax rate, or (3) adopt both a lower tax rate and a higher level of services. In practice, however, the actual transactions entered into are much more difficult to distinguish than these simple illustrations imply.

First, the tax base increase occurs incrementally, so that its full weight is not felt at once. Separating the influence of the power station from other influences over time is therefore troublesome. Second, with increasing revenues, various pressures are placed upon budgetary officials that would otherwise not be present. These pressures tend to increase expenditures, but may have only limited influence on service levels. Third, towns such as Plymouth and Waterford do not operate in a vacuum, but are subject to the influence of their respective state governments. Thus, when the state makes mandatory a kindergarten program, as was recently done in Massachusetts, one must take care to avoid erroneously attributing the spending increase to the influences of the station. Also in the case of Plymouth, a number of events combined to bring about a rapid increase in population, among them, outmigration from Boston and the completion of a coastal highway, as well as the presence of a favorable public service to tax payment ratio. Such growth entails the construction of roads, sewers, and water lines, all of which require large expenditures. Once again, the influence of the plant is difficult to ascertain. Finally, in both states, a uniform fiscal year is now mandatory. Plymouth made its adjustment in 1973, and, as a consequence, expenditure data since then are inconsistent with earlier periods. Waterford has only recently made this change; it recently created a special fund to stabilize its cash position during the transition period. This practice has artificially inflated its tax rate over the past few years.

For these reasons, as well as the general difficulty in quantifying public sector outputs, it is difficult to draw firm conclusions regarding

the uses of the additional taxable capacity in the two towns, and even more difficult to pinpoint individual services that have been extended or improved.[1]

Table 13 shows the rate at which assessed value in each town is taxed. The fact that the Plymouth rate is nearly twice that of Waterford, however, should not be interpreted as a measure of differential tax burdens, for the reasons regarding fractional assessment of market value. Most significant in this table is the fact that neither town has maintained its previous level of taxation, even though one might well expect that the average assessment ratio had fallen over time, which suggests an increasing tax rate on assessed value would be necessary to keep constant the rate at which market value is taxed.

Waterford has maintained a relatively constant tax rate over the years shown, but in the final year reduced the tax rate by nearly one-third. As noted above, however, the rate in Waterford was artificially held at a level higher than normal for a portion of this period to accumulate funds to finance a change in its fiscal year.

In Plymouth, the rate on assessed value began to decline as early as 1970. The one exception to this pattern, evident in 1972, represented an instance in which the town chose to finance a significant capital item out of current expenditures, a luxury seldom possible for modern local governments.

Table 14 shows the proportion of general revenues that property taxes comprised of total revenues for the two towns, as well as reference statistics for the United States and Massachusetts and Connecticut towns. As the first two columns indicate, the property tax has been a declining source of revenue nationally, but has been stable for Connecticut towns and has actually increased for Massachusetts towns. While these data do not actually reflect the impact of the Millstone and Pilgrim facilities, owing to the fact that only a fraction of their value was entered on the tax role in fiscal 1971 as shown in Table 14, they do serve to place the Plymouth and Waterford experience in perspective with that of similar towns.

Waterford generally follows the Connecticut pattern, with a slight decline in the proportion of revenues supplied by the property tax over the five year period shown. This was due to an increase in revenues obtained from other local tax sources that exceeded growth in property tax revenues. The yield from the property tax grew by 106%, while overall revenues grew by 110%. For all state towns, total revenue grew by an average 95%.

Plymouth, in contrast, experienced a rapid increase in the share of local revenues accounted for by property taxes, though still below the state average. This tendency generally mirrors that of other towns in the state, but nonetheless is much more pronounced. In Plymouth, property tax revenues grew by more than 200% over the five year period, while total revenues increased by only 118%, resulting in a much decreased

Table 13

Property Tax Rates in Plymouth, Massachusetts and Waterford, Connecticut

	Published Tax Rate	
	Waterford	Plymouth
1966	42.0	74.4
1967	42.0	78.8
1968	42.0	92.8
1969	42.0	97.2
1970	43.0	88.4
1971	43.0	79.6
1972	38.0	96.0
1973	31.0	76.4
1974-75	31.0	76.0

Source: *Annual Report:* Town of Waterford (various years).

Annual Report: Town of Plymouth (various years).

Table 14

Property Taxes as a Proportion of Local General Revenue
in Plymouth, Massachusetts and Waterford, Connecticut

	All U.S. local governments	All U.S. municipalities	Massachusetts townships	Connecticut townships	Waterford	Plymouth
1966-67	0.43	0.38	0.67	0.71	0.70	0.52
1967-68	0.42	----	----	----	0.68	0.51
1968-69	0.41	----	----	----	0.69	0.56
1969-70	0.40	0.34	----	----	0.66	0.66
1970-71	0.39	0.32	----	----	0.70	0.69
1971-72	0.39	0.31	0.75	0.71	0.68	0.73

Source: Columns 1-2, *1972 Census of Governments*, Vol. 6, No. 4
Columns 3-4, *1967, 1972 Census of Governments*, Vol. 4, No. 5
Columns 5-6, See sources, Table 2.

decreased share for nonproperty tax sources. During this same time, property tax receipts for all towns in the state increased by 94% and total revenues by 73%.

More striking than the overall scope of activities in each town, however, is the change relative to population growth. Here the two towns present distinct contrasts. Plymouth increased in population significantly over the period, while Waterford remained nearly stable. The rapid revenue growth in Plymouth must be tempered by the fact that on a per capita basis revenues increased by only 74%, but in Waterford, they increased by 98%. This finding highlights the fact that a major influence on the part of the power stations was to present each town with a much more varied set of options than those found in the typical governmental jurisdiction. It is, moreover, somewhat surprising to find a similar response in terms of property tax rate changes, in view of the revenue comparisons.

Perhaps the most useful predictive statistic for analyzing the fiscal impact of siting a power reactor would be the tax rate elasticity relative to the plant proportion of the tax base.[2] This would indicate, for example, that if a power station increased the property tax base by a given percentage, the tax rate would change by a corresponding percent. In fact, so many additional variables influence tax rate levels that it would be quite difficult, if not impossible, to estimate such a statistic accurately and with confidence, particularly if it were to have applicability to other jurisdictions. Among the intervening variables of greatest importance is the assessment ratio, which is used to define the rate of taxation on market value. Moreover, the elasticity of greatest usefulness would measure not marginal changes, but very large ones, a significant departure from the common definition of an elasticity. Thus, undertaking a thorough analysis of the problem is beyond the scope of this analysis. Nonetheless, because of its potential usefulness, some calculations will be made in an attempt to place a limit on the range this statistic might take, based on the behavior evident in Waterford and Plymouth.

When these calculations were carried out for Plymouth and Waterford, individual years show little or no pattern, particularly for Waterford, which retained a constant tax rate over a large part of the period under study. When the calculations are carried out for the period spanning the life of each plant through 1973, however, the values generated were reasonably consistent. For Waterford the calculated elasticity was -0.27 and for Plymouth it was -0.18. If interpreted literally, these elasticities would indicate that for each percent increase in the defined price ratio, the rate of taxation would decline by 0.27% in Waterford and 0.18% in Plymouth. In practical terms, they suggest that tax rates may be expected to fall over a period of years as the effects of the massive tax base increase become cumulative, but that the change in the base greatly exceeds the change in rate. In other words, the localities under consideration showed no inclination to maintain a constant level

of expenditure with a greatly reduced tax rate. Nonetheless, from this evidence, it also appears that the expected assessed value of the power station multiplied times the tax rate prior to construction probably will overstate the tax revenues associated with the siting.

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1. We are able to pinpoint improvements and extensions in individual services in both communities; however, we are unable to state that these improvements or extensions are directly due to the utility revenues.

2. To calculate this statistic, defined as the ratio of percentage change in the tax rate to the percentage change in the contribution of the plant to taxable capacity, one first divides the assessed values not associated with the station into the total assessments, arriving at a "price." This price indicates the total revenue yield from a dollar of locally raised revenues. It is equal to unity when a zero value is entered for the station and increases as the station's value increases. The crude elasticity is then estimated by dividing the percentage change in the tax rate by the percentage change in the price ratio.

V. FURTHER ANALYSIS AND DISCUSSION OF SELECTED SOCIOECONOMIC IMPACTS

A. INTRODUCTION

Whereas the previous discussion focused on direct economic impacts of the siting of the nuclear plants on the two host communities, this section discusses indirect impacts, which, though often not statistically measurable, are considered significant. The major focus is therefore on secondary and tertiary impacts as described in Appendix B. Data for this section was gathered primarily through the use of the informal attitude survey conducted in both communities and a variety of unobtrusive measures ranging from public and private archival searches to simple behavior observations of community individuals.

B. CONSTRUCTION IMPACTS

Unlike most large nuclear construction projects which impose vast changes upon host communities in rural areas, there were few construction impacts to be observed in either of the two communities under study. The most important reason for this lack of significant impacts during construction was that in both instances, most of the labor pool commuted to the work site from the surrounding regions rather than move their families and relocate to the site.[1] A commuting labor force, dispersed throughout a metropolitan region, does not impose vast socioeconomic or political changes upon the host communities as does a residential labor force, on-site within the host community.

Due to these dispersed commuting patterns, there appeared to be little impact on housing and land values in either community during construction. Some mention was made by residents of high construction worker wages forcing a rise in residential property prices in Waterford; however, the research team could find no evidence to substantiate this belief. Prices for residential property were rising substantially in Plymouth during the construction period, though this rise tended to be linked to factors other than the construction of the nuclear plant.[2] The Chief of Police in Waterford mentioned that some workers rented rooms in local motels during the week and returned to their families on the weekends. Little impact was noted on the housing occupancy rate in either Plymouth or Waterford except for a slight increase in occupancy of the few rental properties available. Workers who did relocate to the site for a short time in Plymouth oftentimes rented or purchased local summer cottages, winterized them and thus, were instrumental in upgrading the existing housing stock in the community.

Minimal social interaction took place between local community residents and construction crews in either Waterford or Plymouth. Occasional disputes erupted in local taverns after working hours, but these appear to be no different in type or quantity than those at other large construction sites. A strike by construction workers brought police to the site

for several weeks in Plymouth, but few other disturbances were noted.[3] The Plymouth fire chief stated that several fires erupted in construction storage areas but were easily controlled. It is assumed that if most construction workers had moved to the reactor site, the frequency of interaction between workers and residents would have been greater and the quality of that interaction would have been somewhat different.

Few other impacts are noted during construction. Construction noise emanating from the site during daytime hours did not appear to be a concern to residents in either community due to the isolation of the plants from more densely populated residential areas. Likewise, high intensity lighting used by night crews as at other large construction sites was not perceived as a problem by local residents at either site.[4]

The one significant impact that can be identified retroactively in both communities is construction worker traffic.[5] The isolation of the sites and the limited number of secondary and feeder roads leading to and from the sites from other major arteries created some problems for residents and town officials in both host communities. In Plymouth, only three secondary roads connected the plant site with the two major arteries (Routes 3 and 3A) feeding into the surrounding region, as shown in Fig. 1. Some residents stated that they had scheduled appointments around commuting hours so as not to become involved in construction worker traffic. The police chief mentioned some speeding on the part of workers but managed to control it with the use of radar surveillance. In Waterford, most of the commuting work force came to and left Waterford via I-95 or the Connecticut Turnpike and converged on one main road in Waterford leading to the construction site. The volume of traffic became so heavy during peak commuting hours that the Chief of Police had to reroute traffic and create a separate truck route for plant vehicles. Signs prohibiting trucks were placed on certain roads. Speeding by construction workers also appeared to be a problem in Plymouth. Hence, a police officer had to be placed at the entrance to the construction site each night in order to control speeding onto secondary town roads.

C. FURTHER SOCIOECONOMIC IMPACTS DURING OPERATION: PLANNING COORDINATION AND GROWTH MANAGEMENT: EDUCATIONAL AND NONEDUCATIONAL EXPENDITURES; INSTITUTIONAL AND RELATED POLITICAL ACTIVITIES; SELECTED IMPACTS ON ATTITUDES AND LOCAL RESPONSES

Since the construction of the nuclear reactor, the town of Plymouth has grown from a population of 18,606 in 1970 to approximately 28,000 in 1975. Strains of growth are evident in the amounts of public services offered and in the changes within the local political infrastructure. Waterford, on the other hand, experienced rapid growth well before the nuclear plant was built, and has grown only moderately since 1970. It remains a primarily single-family residential community, relying on strict enforcement of its zoning policy and a generally increasing level of public services.

The large influx of revenue and the resultant lowering and stabilization of the existing property tax rate is the major observable direct impact of the siting of the nuclear reactors in these two communities. The percentage of total revenue generated by the reactors has increased to the extent that Boston Edison now pays nearly 50% of the property taxes in Plymouth and Northeast Utilities nearly 60% in Waterford.[6]

With the declining or stabilizing tax rate in both communities, efforts at management of community development and the expansion of expenditures across a broad spectrum is also evident in both. To address these areas more fully, we begin this section by examining local efforts at growth management and dividing local government services into two categories: education and other expenditures, realizing that the provision of elementary and secondary education remains the principal activity of most localities.

1. Planning and Growth Management

One major anticipatory response to the dramatic increase in property tax revenues brought on by the siting of a privately owned nuclear plant may be some form of growth and development within the host community. As in these two cases, this growth may range from extensive uncontrolled development (leading to the "boom-town" effect) to minimal growth with strict enforcement of zoning and subdivision regulations. The particular point on the growth continuum where a community arrives depends upon many factors; pre-existing land use controls and the local decision makers' attitudes toward growth and development seem to be two principal determinants.

Plymouth and Waterford responded quite differently to the siting of the nuclear plants in terms of this issue. The following section attempts to analyze the reasons behind these divergent responses.

The explosive growth which took place in Plymouth was a response to a variety of factors, one being Boston Edison's siting of Pilgrim I.[7] Prior to 1973, there were few existing zoning or subdivision regulations required in the community. Unlike surrounding communities which had stricter zoning regulations, nigher acquisition costs and more extensive housing codes and inspections, Plymouth had virtually no controls. Realizing this, local Plymouth developers and larger developers in Boston and Brockton who anticipated the increased revenue (and hence, stabilized tax rate), purchased land for subdivision development at approximately $250 to $300 per acre beginning in 1967 prior to actual plant construction. Land developers and contractors purchased hundreds of acres primarily in West and South Plymouth, subdivided the land into quarter and half-acre lots, and sold homes in the price range affordable by younger families, stressing Plymouth's low tax rate in their local advertising campaigns.[8] Construction of these subdivisions and the purchase of these units by individuals looking for a community with a stabilized tax rate was a major factor in the rapid growth of Plymouth since 1969.

Realizing that the community was doubling in size and fearing further explosive growth, with the accompanying need for adequate public services, local decision makers adopted two significant measures in 1973: (1) the development of strict land use, zoning, and subdivision controls as part of a more orderly, rational growth policy,[9] and (2) the hiring of a planner whose primary task was to develop a comprehensive plan for Plymouth.[10] The planner has spent most of his time discussing with town officials the need for planned, controlled growth rather than haphazard development characteristic of the six year period from 1968 to 1973. He is presently stressing the need for spatial growth with clustered Planned Unit Developments based on the Village Square Concept.

The siting of Pilgrim I in Plymouth, as previously mentioned, was not the primary causal factor for the extensive community development. Other local and regional events were also contributory factors. The siting of the plant may be viewed, however, as a catalytic agent, spurring growth which was likely to occur but perhaps would not have occurred nearly as rapidly if Boston Edison had not been contributing so extensively to the property tax base of the community. Had the fiscal impact been much smaller, it is questionable whether such explosive growth would have taken place.

Unlike Plymouth, Waterford maintained an efficient, organized Planning and Zoning Commission responsible for land use policies within the town prior to the existence of the nuclear plants. Waterford had previously adopted and enforced strict (large-lot) zoning ordinances curbing unrestricted and unwanted growth.[11] Hence, while the siting of the nuclear plants dramatically increased pressure from many external agents to expand, Waterford's land use pattern has changed little since the nuclear plant construction began.

In contrast to Plymouth, Waterford has not experienced an explosive rate of growth. In addition to the large lot residential zoning enforced by the Planning and Zoning Commission, Waterford appears to be restricted in its future land use options by its present geographical and geological setting. Approximately 26% of the present land within the town is developed, whereas one-third of the undeveloped and open space land is wetlands upon which building is prohibited.[12] This reduces the total of land available for future development to approximately 40%.

The combination of large lot zoning, strict enforcement of existing regulations, limited developable land, and the existing community financial situation has caused an increase in the mean price range of available land and housing within the community. A rise in prices of existing homes has ensued, together with an increase in residential housing starts as shown in Table 8. The average price of housing has now been raised to a range which is most easily affordable by professional and highly skilled workers.[13] Blue collar and semi-professional workers, as well as the elderly and young families, are forced to look elsewhere for suitable housing, principally to surrounding urban centers (i.e., New London and Groton) where prices are lower and housing can be rented as

well as purchased. The net effect has been to restrict residence of those with lower incomes and increase the solidly middle class base of the community.

Waterford, while experiencing increasing pressures from the rapidly growing surrounding region to expand, has been able to maintain one of the slowest growth rates in the Southeastern Connecticut region in the last 15 years.[14] Restrictive zoning policies, coupled with a low level of public services, have been two techniques used to curb further development. There is a pronounced apprehension by public officials concerning the likelihood of present and future nuclear plant tax payments acting as catalysts for future growth in the community. This apprehension has resulted in the development of stricter preventive local land use ordinances and in 1975, the hiring of a town planner to oversee their enforcement.[15] For the present, however, local planning efforts have effectively controlled the rate and direction of growth within the community.

Further differences between the two communities are shown by the significant differences between their present attitudes toward growth. In Plymouth which experienced rapid growth since 1968, only 49% of the sample interviewed favored further growth. In Waterford, which experienced rapid growth in the 1950s and instituted growth control measures because of it, 71% now favor more growth.

2. Educational Expenditures

Since population change is age specific, with families that migrate commonly falling within age groups containing school-age children, one can predict *a priori* that education expenditures would play a key role in shaping the fiscal behavior of Plymouth. Indeed, analysis bears out this expectation.

In 1967, education expenditures made up only 35% of the budget in Plymouth but increased to 43% by 1972. In per capita terms, the rate increased to approximately 72%. One determinant, and perhaps the prime determinant, of this expenditure increase was the increase in school enrollment over this period. As Table 15 illustrates, school enrollments nearly doubled over the eight-year period following 1967. The cause of this sharp increase was twofold: the rapid growth in population which occurred, and the introduction of a state-mandated kindergarten program. If one examines the enrollment ratio, the ratio of students to population, one can see that between 1967 and 1975 the ratio increased from 0.18 to 0.27. By this measure, Plymouth saw a 50% gain between 1967 and 1972. Were data available for the last three years in which major changes in the enrollment ratio continued, continuation of this trend would likely be visible.[16]

Unlike Plymouth, Waterford's proportion of the budget devoted to educational expenditures declined between 1967 and 1973, though it was balanced by a 240% increase in per capita noneducational expenditures

over the extremely low level existing in 1967 as shown in Tables 15 and 16. Per student educational expenditures increased during this period. These facts can be partly explained by the absolute decline in total enrollment and the declining ratio of students to the total population, as students aged out of school-age groups more rapidly than they were replaced in Waterford's relatively stable population. Waterford is presently considering building a new $14-$16 million high school building. At the same time, the Connecticut state legislature appears ready to reduce the amount of matching funds available for the construction of school buildings. This contingency has sparked local discussion of replacing a currently viable building, rather than risk being frozen out at some future date.[17] It is unlikely that towns in less firm fiscal position could seriously consider such an outlay.

3. Noneducational Expenditures

In Plymouth, significant increases in per capita spending can be noted in public works and public safety programs.[18] Plymouth has responded to its rapid growth by forming a separate public works department responsible for the provision and maintenance of local public facilities. For the first time, a full-time public works director has been hired who now oversees a consolidated department of maintenance employees.[19] The primary concern of this new department is responding to the rapid growth and providing adequate public services in the newly developed subdivisions in West and South Plymouth. Approximately 20% of Plymouth is serviced by sewer connections and approximately 80% has town water. It is not known exactly what percentage of the community lacks adequate roads and sidewalks, though it is believed to be approximately 20%.[20] Presently, town officials are considering the building of a third new fire house in West Plymouth. This, like all recent building projects within the community, will be financed from the present budget. Debt service and capital outlay areas provide the town with an opportunity to spend potential revenue increases; therefore, Plymouth, unlike most communities its size, has not issued a long-term bond for any facility since the siting of the Pilgrim Station, preferring to cover all capital outlays through the current budget.

Similar to Plymouth, Waterford's noneducational expenditures were very low in 1967, as can be judged from Table 16. Between 1967 and 1972, however, Waterford's expenditures in these areas have increased at a rapid rate, especially in the areas of public works (roads, sewers, etc.) and public safety (police and fire). Yet, in 1971, water and sewer accounted for only 0.01% of the total budget, increasing to only 0.6% by 1974. Waterford, again like Plymouth, generally follows a pattern of covering capital outlays through the current budget, although recently it has issued some bonds to finance a major reworking of its sewer system. A tie-in to New London's sewer system was bonded at $23.8 million, a move forced by a 1975 state mandate to upgrade its services.[21] In the past year the public works budget has almost doubled, and is now set at $1,098,353, primarily for sidewalk construction and purchases of heavy equipment. The town has also bonded $1.5 million over ten years to cover the cost of the installation of a water system, and appropriated

Table 15

Population, School Enrollments, and Educational Expenditures
in Waterford, Connecticut and Plymouth, Massachusetts

	Waterford, Connecticut					Plymouth, Massachusetts				
	Population	School enrollment	Enrollment ratio	Per capita expenditure	Per student expenditure	Population	School enrollment	Enrollment ratio	Per capita expenditure	Per student expenditure
1967	16,495	4,435	0.27	148	550	16,060	2,948	0.18	142	[illegible]
1968	16,679	4,513	0.27	165	607	16,696	3,225	0.19	153	794
1969	16,863	4,574	0.27	180	664	17,332	3,386	0.20	173	851
1970	17,047	4,523	0.27	206	[illegible]6	17,968	3,743	0.20	196	919
1971	17,227	4,441	0.26	230	892	18,606	3,843	0.21	217	1,048
1972	17,507	4,339	0.25	255	1,036	20,265	4,253	0.21	244	1,164
1973	17,787	4,231	0.24	273	1,143	21,924	4,789	0.22	NA	NA
1974	18,067	4,314	0.24	291	1,219	23,584	5,080	0.25	NA	NA
1975	18,348	4,159	0.23	NA	NA	25,242	6,728	0.27	NA	NA

Source: Annual Reports: Town of Waterford (various years).
Annual Reports: Town of Plymouth (various years).

Note: Population figures are taken from the *Census of Population*, 1960-1970 and from estimates by the Federal State Cooperative Program for Population Estimates (1974). Estimates for intermediate years were calculated by linear interpolation.

Table 16

Noneducational Expenditures Per Capita
Plymouth, Massachusetts and Waterford, Connecticut

	Total		General control		Public works		Public safety		Debt service and capital outlay		All other		Waterford pension account
	Plymouth	Waterford	Plymouth	Waterford	Plymouth	Waterford	Plymouth	Waterford	Plymouth	Waterford	Plymouth	Waterford	
1967	$262	$ 88	$12	$11	$41	$13	$39	$10	$ 35	$10	$131	$13	$ [illegible]
1968	425	104	13	11	43	14	44	12	208	37	115	27	[illegible]
1969	278	143	13	16	48	16	48	15	9[illegible]	40	60	21	33
1970	286	159	16	19	53	20	56	19	81	61	77	15	16
1971	305	171	16	25	56	32	64	25	88	55	78	1[illegible]	1[illegible]
1972	327	380	19	22	59	32	63	26	109	[illegible]	[illegible]	19	31

Source: Annual Reports: Town of Waterford (various years).
Annual Reports: Town of Plymouth (various years).

$800,000 to install water mains. Another noneducational expenditure was $508,082 for the addition to the public library.

Our survey indicated the desire of Waterford residents to increase the quantity and quality of public services and facilities.[22] Of primary importance were the upgrading of the sewage system, the addition onto the public library, and the construction of a new high school and civic center. Local public officials appear hesitant to expand public services to the desired levels lest uncontrolled growth and development follow. This has been the principal justification for relatively restricted improvements in the area of public works, particularly the addition of sewers and tie-in with the New London system.

Though the tax rate has been stabilized and somewhat lowered, and Waterford has dramatically increased its noneducational expenditures, a surplus of $1,940,824 was accumulated in the 1973-74 budget. Since local governments are precluded by law from operating at a surplus over an extended period of time, the Waterford tax rate may well continue to decline, unless additional capital outlays are planned.

4. Local Political Impacts

The interrelationship between the political process and developing technology has been well documented at the Federal level where national policy decisions are made.[23] However, at the local level, where technological innovations may directly affect the political infrastructure, little work has been done to date.

The following section reviews in broad terms the political impact(s) of nuclear plant siting on the two-case study communities discussed in this document. Attention focuses not only on the political relations within these communities, but also considers regional effects and relations between communities.

Decision-makers, both elected and unelected, have expressed concern over becoming "nuclear towns." They view the increase in property tax revenues as beneficial to their communities, but note the strains and new decisions which face them in balancing competing interests within their communities. Both communities have hired full-time planners to help guide local growth policies, and full-time public works directors to oversee local public service development. In addition Plymouth hired a full-time town manager in 1974 to manage and coordinate local affairs.

Both communities have experienced changes in the style of decision making as well as in budgetary priorities and changes in the expectations of the community concerning the local government's role in promoting community development. In Plymouth, newcomers to the community have recently become more involved in the political process and have made new demands on services.[24] This politicization has led to debates in the community over the provision of needed services, as in the recent controversy over increased capital and operating appropriations for the Plymouth school system.

In Waterford, the influx of additional revenues has exacerbated existing tensions between community groups. One example is the disagreement between professional residents who reside in Waterford, yet work primarily in the defense-related industries in the surrounding industrial areas and public officials who reside in Waterford. They argue over allocation of funds and the needs of the community. Local town officials, fearful of losing the revenue by state mandate, are extremely cautious about the allocation of funds for major capital expenditures, whereas the professional community with higher amenity expectations is more willing to spend money on these expenditures. Debate within the community thus centers on when and how funds will be spent and reflects a strong disagreement over the use of these funds.

The relationship between these "nuclear towns" and their surrounding neighbors has also been somewhat strained by the nuclear plant sitings. Plymouth's neighboring communities are envious of the additional property tax base and new public services. Plymouth's neighbors are also concerned over the transportation of nuclear waste and the construction of transmission corridors within their borders. Local editorials point to the fact that while neighboring communities receive few of the positive (primarily economic) benefits of the plant, they may receive substantial negative impacts.[25] In Waterford, the favorable financial position has exacerbated existing tensions between Waterford and its neighbor, New London, which have a long history of rivalry and conflict. New London, which has a declining population, a decaying inner city, a substantially higher tax rate than Waterford and a population increasingly dependent on government subsidies, looks with envy upon its neighbor, Waterford. The nuclear plant sitings have only increased the social distance between the two communities and enhanced the political divisiveness between them.

Where relationships tend to be somewhat strained between each community and its neighbors, relations with the utilities appear to be very stable and exceedingly cordial. In Plymouth, community leaders express overwhelmingly positive attitudes toward Boston Edison management and plant operators.[26] Confidence is expressed not only in their managerial expertise but also in the utility's knowledge about the nuclear industry. Local fire and police departments have had courses in nuclear safety and evacuation procedures by the utility; copies of all evacuation manuals are obtainable at the town library. Boston Edison has developed a recreation area providing public access to fishing from the breakwaters near the discharge canal, a comfort station and shelters on the beach, and parking for approximately 100 automobiles. A footbridge has been built to permit fishermen access to the breakwater, benefiting both local residents and tourists. Waterford officials express similar positive attitudes toward Northeast Utilities.[27] All elected town officials have had nuclear safety courses offered by the utility, and the Chief of Police routinely maintains contact with plant administrators. A "hot line" has also been installed linking plant operators to elected Waterford town officials. The utility has reimbursed losses incurred by the town for beach property and water frontage since construction of the

plants, and has built and maintained a baseball field for public recreational activity on utility-owned buffer land adjacent to the site. They have also agreed to establish a communications director to deal with area towns concerning any operating problems at the Millstone Nuclear Plants.

What this suggests is that neither the utility nor the community desires to endanger the rather unique relationship which exists between them. The utility, not wishing to cause objections to its presence or to its possible future construction plans, remains exceedingly cordial to town officials. The towns, on the other hand, do not wish to disturb the favorable financial position they find themselves in, a position which is essentially a costless gain for them. Hence, the relationship evolves around a series of political tradeoffs wherein both parties have substantial amounts to lose if the relationship falters.

5. Impacts on Attitudes and Local Responses[28]

The siting of the nuclear generating units, though perceived with some skepticism by neighboring communities, is favorably received by a majority of residents in both Waterford and Plymouth. Survey results suggest that approximately 72% approve of the siting in Plymouth, while an overwhelming 94% in Waterford approve as shown in Appendix F. These findings compare with an approval rating found in approximately two out of three individuals polled in the national Ebasco survey in 1975 and also in the ORNL Hartsville Surveys in 1975.[29]

In both Plymouth and Waterford, the primary reason given for the favorable attitude was the substantial increase in the economic base of the community and subsequent stabilized tax rate (27% in Plymouth, 21% in Waterford). Primarily due to this economic impact and the perceived lack of any significant ill effects (even though both plants have experienced nonroutine incidents leading to shutdown), most residents would permit construction again (92% in Waterford, 72% in Plymouth).

The 72% approval rating in Plymouth suggests that a majority of Plymouth residents do, in fact, accept the siting of the nuclear plant in their community and perceive it as beneficial to them. Those residents not expressing approval have concerns about nuclear safety and the impact of the plant on growth and development within the community. Almost unanimous approval of the nuclear stations was found in Waterford. The majority of Waterford residents, having lived with nuclear power in their environment since General Dynamics Shipyard built the Nautilus in Groton in 1955, appear to be favorably disposed toward nuclear power and appreciate the favorable fiscal situation which the nuclear plants have provided for their community. Apprehension over the proposed siting of a possible oil refinery in the Quaker Hill Section of Waterford, the expansion of Connecticut Route 11 to converge with two other main state highways near the central business of Waterford, and a proposed regional shopping center are seen as more controversial issues with far greater negative implications for residents than the nuclear plants.

The highly favorable ratings expressed toward the nuclear plants in both communities, however, accompany increasing apprehension expressed by decision makers and local residents over the possible loss of revenues generated by the plant either by general depreciation or state mandate. In both Massachusetts and Connecticut, bills introduced by local state legislators are pending in the state legislatures to disperse utility tax payments more evenly throughout the state.[30]

This fear of potential loss of revenue in both communities has forced town officials to take anticipatory measures to maintain the current level of revenues. In Plymouth, the urgency with which the Industrial Development Commission seeks businesses to locate within the community to offset a possible eventual loss of revenues is one indicator of such apprehension. The development of the Industrial Park in 1967, while initially viewed as a solution to Plymouth's high unemployment rate and the 1958 closing of the Cordage Plant (one of Plymouth's largest industries), is now perceived as a major source of income which would assist in providing substantial revenue if the utility's payments were taken from the community.[31] In Waterford, town officials have also actively begun to seek industrial developers for their recently developed Industrial Triangle. Finally, town officials are presently courting local developers (Chase-Resnikoff, Inc., and May Stores Shopping Centers, Inc.) who have proposed and taken steps to gain approval of a Regional Shopping Center, located at the commercial center of the town.[32] Located just south of the Industrial Triangle and at the intersection of the Connecticut Turnpike, Route 95, and proposed Route 11,[33] the Shopping Center, consisting of 850,000 sq ft of retail floor space would generate 27,200 trips by shoppers per day and would drastically change vehicular activity in the town and roads adjacent to the site. The encouragement of such commercial activity, while seeming incongruous with stated goals of controlled growth and development espoused by community leaders, is generated by the increasing fear of potential loss of utility revenue.

References — Chapter V

1. In Plymouth, construction workers commuted from Boston, Brockton and Providence, Rhode Island. In Waterford, construction workers commuted from New Haven, Bridgeport, Hartford and Providence, Rhode Island. The lack of construction impacts seems to be a function of place, (i.e., urbanized, metropolitan areas) and is not due to the specific kind of construction undertaken.

2. Residential property values were rising due to local, regional and national economic trends rather than a site specific construction project, according to local Plymouth realtors.

3. A strike for higher wages by workers of Office and Clerical Union 387 against Boston Edison occurred in May 1973; 47 workers were involved — 38 production and maintenance workers and 9 engineers.

4. Residents in the vicinity of Surry I, for example, in Surry, Virginia complained of excessive glare from the construction activity at night.

5. Interviews with local residents and town officials in both communities showed the impact of traffic on local secondary roads as being their primary concern during the construction period.

6. See Chapter 4 for a more detailed analysis: In Waterford, the Millstone Nuclear Power Plant comprises nearly 60% of the town of Waterford's $2.5 million grand list with holdings valued at $160.6 million.

7. Plymouth's rapid growth from the period 1969 to 1975 may be attributed to the following factors:

   a. Its large land mass (the largest of any town in Massachusetts: 104 sq miles).
   b. Its sparsely settled condition in 1969: approximately 75% of its people lived on 25% of its land area.
   c. Its 17 miles of undisturbed coastline.
   d. Its accessibility to both Cape Cod and Boston via Routes 3 and 3A which bisect the community on a north-south axis.
   e. Its relatively low land prices in 1968-69: approximately $200 to $300 per acre.
   f. Its commercial center being the only one between Quincy on the South Shore and Hyannis on Cape Cod.
   g. Its location directly in the path of the onward southern suburbanization of the Boston Metropolitan area; the southern coastline is becoming saturated and growth continues to move directly toward Plymouth.
   h. Its social and political relationship to Boston; events occurring within the city of Boston are believed to have contributed to the growth. The desegregation of Boston's school system has resulted in the migration of many white ethnics from the city to Plymouth

seeking alternative education for their children. Many individuals come to Plymouth, winterize summer cottages, and declare permanent residence. By doing this, not only do they escape the educational problems within the inner city but also its higher property taxes or rents.

i. Its lowered/stabilized property tax due to the influx of revenues from Pilgrim.

8. Builders and developers advertised in both the *Boston Globe* and *The Boston Herald* stressing that the tax rate would remain relatively low in Plymouth due to the favorable property tax payments from Boston Edison.

9. See Plymouth, *Annual Report*, 1974.

10. The new planner maintains an office in the local town hall with access to the selectmen in the community.

11. See Waterford *Annual Reports*, Planning and Zoning Commission Report, 1969 to 1974.

12. Town of Waterford, Connecticut Natural Resource Date Maps: Prepared for the Waterford Conservation Commission by Connecticut College, October 1972.

13. The research team attempted to obtain actual price listings for houses in Waterford and New London County from the Multiple Listing Service in Norwich, Connecticut but was legally unable to do so. According to local realtors, Waterford now competes primarily with neighboring East Lyme for housing. Houses in East Lyme are comparable in price to those in Waterford though there are more homes available in Waterford.

14. Regional Planning Program Staff, 1970 Social Indicators: Southeastern Connecticut Planning Region.

15. The town planner maintains an office in the local Waterford Town Hall with easy access to the first selectmen.

16. Data from local Plymouth officials on actual population change was unavailable for the years from 1973-1975.

17. "What is Waterford's Future?," *New London Day*, April 29, 1975.

18. See Plymouth *Annual Reports*, 1970-1975. Also see Appendix A of this report.

19. The Public Works division in Plymouth now oversees: Water, Sewer, Highway and Cemetery, Parks and Recreation, Building Maintenance and Insect Pest Control Departments.

20. Interview with Felix Carlino, Director of Public Works, Plymouth, Massachusetts, April 1975.

21. "Waterford Board OK's $23.8 Million in Sewer Bonding," *New London Day*, July 1, 1975.

22. See the survey results in Appendix F of this report.

23. See M. Cetron and B. Bartocha, *The Methodology of Social Assessment*, (New York, 1972).

24. Prior to the rapid growth, approximately 24 families held 34% of the elective offices in the town; newcomers are altering the pattern. Examination of the rosters of political meetings from 1968-1975 shows that established political families are losing their powers and newcomers' names are increasingly appearing on the political records.

25. Editorial, *Old Colony Memorial*, September 3, 1975. See also: "Opinion of the Day," *New London Day*, March 16, 1974.

26. Interviews conducted with local town officials and community residents, Plymouth, Massachusetts, April-June 1975.

27. Interviews conducted with local public officials and community residents, Waterford, Connecticut, February-June 1975.

28. See Appendix F of this report for complete survey results.

29. L. Harris et al. for Ebasco Services Inc., "A Study of Citizens and Leadership Attitudes Toward Nuclear Power Development in the United States," August 1975; and C. R. Schuller et al., "Citizens Views about the Proposed Hartsville Nuclear Power Plant," Oak Ridge National Laboratory, May 1975.

30. Bills introduced by Rep. James Collins (D-Amherst) in Massachusetts Legislature and Rep. Winfred Tanger (D-New London) in Connecticut Legislature.

31. One of the most ambitious projects undertaken by the town of Plymouth has been the development of an Industrial Park on State Route 44. Sited on 212 acres of which approximately 120 acres have roads, water, and sewer, the Industrial Park was initiated in 1967 with EDA assistance when Plymouth was recognized as a distressed area (unemployment rate approximating 10%). The development of the Industrial Park was viewed as a means of solving this high unemployment.

    Presently the Park has approximately 23 firms employing approximately 560 persons of whom approximately 60% are Plymouth residents. The Park has raised employment and considerably increased the taxable valuation of the town. The success of the Industrial Park to date has been traced to many factors. Basically, the complex offers the only full-service, industrially zoned land for smaller diversified growth industries south of Boston.

32. See "Assessment of the Waterford Square Shopping Center," prepared by University of Rhode Island Graduate School of Planning Students, May 1975.

33. See "Traffic Accident and Safety Study for the Town of Waterford, Connecticut," prepared by Scott Bander and Erik Brodin, Graduate School of Planning, University of Rhode Island, May 1975.

VI. CONCLUSIONS AND HYPOTHESES

A. INTRODUCTION

Analyses to date suggests a variety of potential impacts resulting from the construction and operation of nuclear generating facilities. From numerous possible organizational schemes, we have chosen to organize analyses of impacts into social, economic, and political areas by time-frame (construction and operation). Such an approach results in the following analytical framework:

	SUBJECT AREA		
TIMEFRAME	SOCIAL-ATTITUDINAL	POLITICAL-INSTITUTIONAL	ECONOMIC
CONSTRUCTION			
OPERATION			

Both the study conclusions and broad hypotheses for future tests in research to follow this study will be stated in the above format.

B. CONCLUSIONS

1. Construction Period

It is the nearly unanimous opinion of both the analysts and community leaders interviewed that construction impacts at both sites have been minor. Unlike most large construction projects where socioeconomic impacts are quite evident, there appeared to be little impact at either Waterford or Plymouth. Hence, the following conclusions:

- Social, political, and economic impacts upon the towns of Waterford and Plymouth during construction of their respective nuclear plants have been minimal. The only impact of any magnitude identified retrospectively is construction worker traffic.

- Most construction workers in the case of Pilgrim I and Millstone I and II commuted to the site from their existing place of residence within the metropolitan areas rather than relocate closer to the site or within the host community. As a result, little impact on commercial activity was noted in either community during construction.

- In both Plymouth and Waterford little interaction took place between construction worker crews and local townspeople. What interaction did take place was primarily in local grocery stores and taverns.

    - Speeding by construction workers appeared to be a problem in Waterford and Plymouth. In Waterford, a police officer had to be stationed at the entrance to the construction site each night in order to control speeding onto secondary town roads.

2. Operation Period

Since the economic impacts during operation were large in magnitude as well as the source of many of the secondary impacts in both the social and political areas, economic impacts will be considered first. Impacts upon the social and political structure appear to be more diverse and are second order consequences of the primary economic impacts which occur.

(a) Economic impacts

- The major impact of the nuclear plant in both Plymouth and Waterford is the large increase in tax base provided by the operating reactor.

- Other economic impacts are minimal since there are few permanent jobs created, minor quantities of local goods or services purchased, and few public services demanded as a direct result of the siting of the power plant. Both utilities provide their own security guards and elaborate fire protection in case of emergency. Both utilities have provided their own water and sewer hookups and have provided their own roadways linking the plant site with existing town roadways.

(b) Political-institutional impacts

- One option chosen by both communities has been to lower (or stabilize) the existing tax rates while currently using the additional revenues to significantly increase public services and facilities.

- Both communities have taken some steps to professionalize administration of services through hiring new staff and creating some new positions in local government. In both communities new departments of public works have been established and town planners have been established and town planners have been hired to control future land use development. In Plymouth, a town manager has been hired to oversee local affairs.

- External relationships of the two communities have been altered by the presence of the nuclear power plant, principally because of the augmented tax base. The presence of the nuclear power plant may create new tensions or exacerbate existing tensions.
    - Neighboring towns have, in varying degrees, become resentful or antagonistic over the favored status and resources of the host community. The transportation of nuclear waste through neighboring towns in both Plymouth and Waterford has caused some concern and has resulted in challenge of the legality of the transfer of that waste.
    - Efforts have been initiated in both states to redistribute the utility tax payments so that a larger proportion will go to other jurisdictions and/or the state.
- Existing relationships between the utility and community decision makers are constructive and stable in both communities.
    - Both communities maintain both formal and informal links of communication with the utility. Relations in both communities are based on equilateral trade-offs. The communities' attempt to stabilize relations so as not to disturb their favorable financial position; the utilities in turn attempt to maintain cooperation, lest agitation reaches a level wherein communities (or states) no longer permit siting of power plants within their boundaries.
    - The majority of citizens in each community have favorable attitudes toward the utility in their communities.
- Residents, in general, are unconcerned about the nuclear plant in their community unless it has an accident or radioactive spill.
    - Intervenors in both communities are few; those who do intervene or are vocal about nuclear power face opposition from the majority of local residents.
    - Intervention in both Waterford and Plymouth focuses primarily on health/safety and environmental issues rather than socioeconomic or political concerns.

- Communities appear to adopt an "out of sight, out of mind" attitude toward the facility. The relative isolation of the physical plant appears to be a factor in the perceptions of residents. Transmission lines and corridors which are more highly visible may have more of a visual and, hence, psychological impact upon local residents than the actual physical plant structure.

(c) Social impacts

- The sudden population growth occurring in Plymouth since 1968 (the beginning of the nuclear plant construction) was intensified by construction and operation of Pilgrim I, but growth would have occurred soon because of regional growth patterns and proximity to Boston. Growth was one consequence of the lowered tax rate in Plymouth.

- Strict zoning ordinances and definitive planning regulations adopted by the town of Waterford prior to the siting of the nuclear plant have prevented rapid population growth such as that which occurred in Plymouth.

    - Waterford officials, while desiring controlled growth for the community, feel pressured by neighboring communities (and some local residents) to grow at a more rapid rate and provide additional housing and services with their new monies to all groups in society.

- Community cohesion has been disrupted in Plymouth due to the influx of newcomers interacting with long-time Plymouth residents. Newcomers demand more public services and facilities while at the same time they want to control growth and maintain the "rural," low-density character of their community.

- Tourism is little affected by the presence of the nuclear power plant in either community. In Plymouth, tourists now visit the plant along with their visits to historical sites in the community.

- Few, if any, groups within the community remain totally unaffected by the presence of the nuclear plant. Those most directly affected are those who interact either directly with the physical plant (i.e., residents who live near the plant) or the local utility officials (i.e., local public officials). Those indirectly impacted are taxpayers, who in both Plymouth and

Waterford, have an increased disposable income as a result of the stabilized or lowered tax rates relative to residents of other communities in the surrounding region.

C. GENERAL HYPOTHESES FOR FUTURE TEST

Combining general knowledge with the specific circumstances of impacts at Plymouth and Waterford, the following attempt is made to draw broad, general hypotheses for testing in future research.

1. Construction Period

(a) Economic impacts

- A commuting labor force generates minimal fiscal, social, or political impacts on a host community.
- If a nuclear plant is sited in or near a metropolitan area, the likelihood of access to an adequate labor force increases.
- If substantial numbers of construction workers relocate to the site, substantial economic effects through payroll infusions to local economies are created.

(b) Social impacts

- If a large, temporary population increase occurs during construction, then major changes in social composition and organization of a host community will occur.
- A community can accommodate some influx of new population without "significant" disruption given a certain level of social, political, and economic development as indicated by size, level of services, location, etc.

(c) Political-institutional impacts

- If an increasing construction population demands major increased public services, then major political impacts upon local governments will occur.
- If a community lacks revenue, staff, planning capability, experience, or the administrative infrastructure needed for dealing with sudden growth, then these inadequacies will exacerbate the need to deal with immediate problems and intensify social and political impacts.

2. Operating Period

(a) Economic impacts

- If utility property tax payments from the nuclear plant siting go directly to the local municipality, then the major impact of the operating power plant is the augmented tax base.

- When utility property tax payments go directly to the local municipality, then new economic-fiscal options include the choice between recovering money benefits in the private sector through lowered tax rates, recovering money benefits through the public sector with increased services, or some combination of these two.

(b) Political-institutional impacts

- When an operating nuclear reactor is sited within a community, it makes few public service or social service demands upon that community.

- If an operating nuclear reactor pays property taxes directly to the local municipality, then new options offered by the augmented tax base include needs and opportunities to (1) professionalize and develop administrative infrastructures, and (2) develop and/or alter political and decision-making structures.

- If an operating nuclear reactor pays property taxes directly to the local municipality, then the available economic and fiscal options present public officials with a variety of growth-no-growth options. If augmentation of the local tax base occurs, then siting of a nuclear generating station alters the relationships of the host community with neighboring towns, the region, and the state.

    - Neighboring towns may become resentful or antagonistic over the favored status and resources of the host community.

    - Efforts will be initiated or intensified on the state level to redistribute the utility tax payments so that more revenues go to the state or region involved.

(c) Social impacts

- Community growth is a function of many interrelated variables of which a nuclear plant is only one. If certain planning and zoning conditions exist, then a nuclear power generating station can act as a powerful catalyst to community growth and development.

(d) Public acceptance and perceptions of nuclear generating stations

- Unless a nearby operating nuclear plant has an accident, spill, or release, or a concerned citizens group brings attention to possible hazards, residents are generally unaware or unconcerned about the power plant.

- Local acceptance varies directly with actual or anticipated economic benefits. Lack of actual or perceived economic benefits means lowered acceptance or increased opposition.

- If a host community develops and enforces strict zoning and land use regulations prior to the siting of a nuclear reactor from which it will derive massive economic benefits, (1) the chances for major changes in the social and political composition of that community will decrease, and (2) the community will have a mechanism for controlling the rate and direction of population increase.

VII. APPENDICES

Appendix A

ADDITIONAL MATERIALS: PLYMOUTH AND WATERFORD

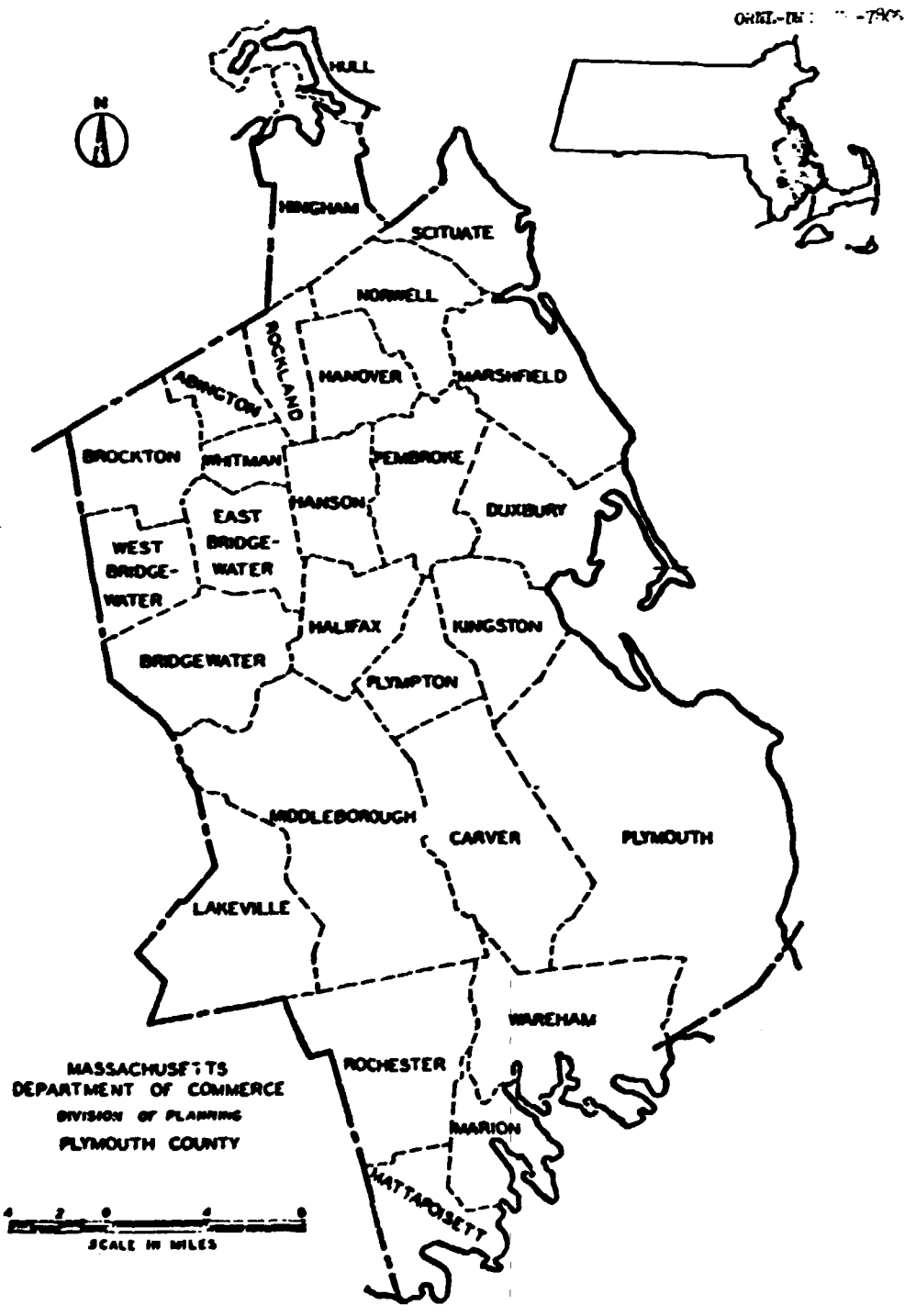


Fig. A-1. Map of Plymouth County, Massachusetts

Table A-1

Population for Plymouth, Plymouth County, and Massachusetts for 1950-1970

	Population		
	1950	1960	1970
Plymouth	13,608	14,445	18,606
County	189,468	248,449	333,314
State	4,690,514	5,148,578	5,689,170
	Absolute change		
	1950-1960	1960-1970	1950-1970
Plymouth	837	3,891	4,728
County	58,981	84,865	143,846
State	458,064	540,592	998,656
	Percent change		
	1950-1960	1960-1970	1950-1970
Plymouth	6.2	26.9	34.7
County	31.1	34.2	75.9
State	9.8	10.5	21.3

Source: U.S. Census of Population, Massachusetts, 1970.

Table A-2

Age, Education, Income: Plymouth County, 1970

Age Composition

Age	Number	% of Total County	% of Total State
Under 5	33,531	10.1	8.3
5 - 14	73,792	22.1	19.3
15 - 19	27,860	8.3	9.0
20 - 64	166,255	49.9	52.2
65 - over	31,876	9.6	11.2
Under 18	125,811	37.7	33.0
21 and over	194,041	58.2	61.7
Median age		27.1	29.0

Education
(Persons 25 years old and over)

Median number of	County	State
School years completed	12.3	12.2
Completing less than 5 grades	2.6%	4.1%
Completing high school	38.9%	34.9%
Completing college	11.4%	12.6%

Incomes of Families and Unrelated Individuals

	Families	Percentage County	Percentage State
Incomes under $3,000	4,533	5.6	6.4
From $3,000 - $5,999	8,497	10.5	11.8
From $6,000 - $9,999	20,883	25.9	25.7
$10,000 - $14,999	26,972	33.4	30.9
$15,000 and over	19,870	24.6	25.2
Median income		$9,651	$8,607
Per capita income		$3,220	$3,425

Source: U.S. Census of Population, Massachusetts, 1970.

Table A-3

Labor Area — Plymouth, Massachusetts

Includes Plymouth, Kingston, Plympton, and Carver
(Carver included as of January 1968)

Year*	Total Work Force	Total Employment	Total Unemployment	Unemployment Rate
1965	7,230	6,030	1,200	16.6
1966	6,280	5,720	1,100	16.1
1967	7,130	6,030	1,100	18.0
1968	7,050	5,880	1,170	16.7
1969	7,120	6,120	1,000	14.0
1970	7,720	6,650	1,070	13.9
1971	9,660	7,990	1,670	17.3
1972	9,210	7,440	1,770	19.2
1973	10,810	8,510	2,300	21.3
1974	12,750	10,780	1,970	15.5

*Based on January totals.

Source: Massachusetts Department of Employment Security, 1975.

Table A-4

Occupations, Employment, and Industries for Plymouth County

I. Occupations 1974

Group	Number	% of total County	% of total State
Professional, Technical and kindred	19,421	15.5%	17.4%
Managers, Office and Proprietors	12,785	10.2	8.6
Clerical, etc.	21,291	17.0	19.9
Sales	10,139	8.1	7.0
Craftsmen, Foremen, etc.	20,141	16.1	13.1
Operatives	20,742	16.6	17.6
Private Household workers	931	0.7	0.7
Service Workers	14,720	11.7	11.9
Laborers	5,134	4.1	3.8

II. Number of Industries: 1969 to 1974: Plymouth County

	1969	1970	1971	1972	1973	1974
1. Agriculture and Mining	91	93	87	92	102	109
2. Construction	813	813	836	886	956	892
3. Manufacturing	495	480	470	462	481	478
4. Transportation and Utilities	209	211	217	218	225	236
5. Wholesale and Retail Trade	2022	2049	2092	2149	2292	2294
6. Finance, Insurance and Real Estate	290	291	293	302	340	346
7. Service Industries	1276	1313	1308	1369	1459	1480

Source: Massachusetts Department of Employment Security, 1974.

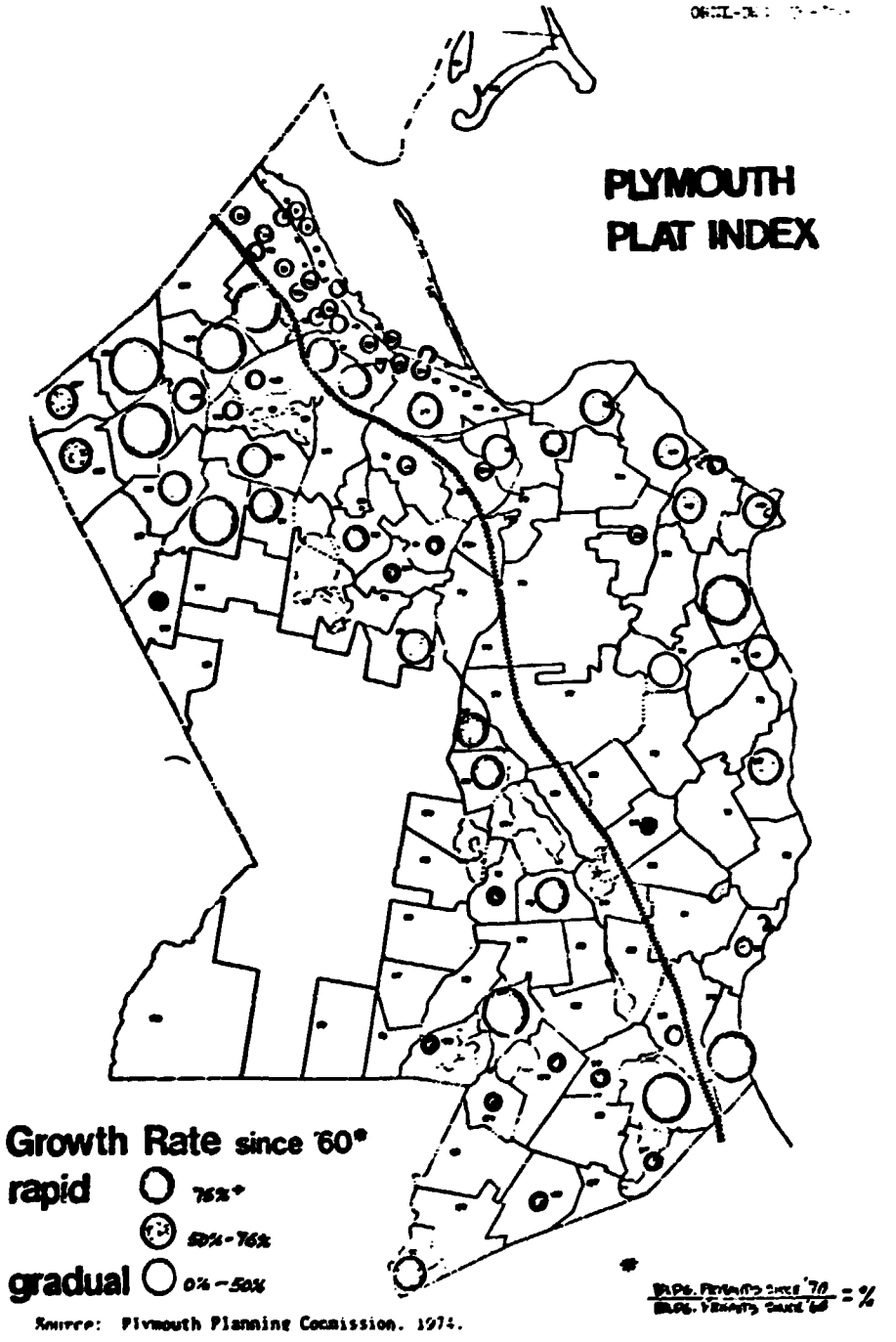


Fig. A-2. Plat Map of Plymouth, Massachusetts

Table A-5

Number of Business and Residential Main Phone Services for all Plymouth Exchanges* 1970-1974

Year	Residential	Business
1970	12,421	1,987
1971	13,346	2,155
1972	14,429	2,405
1973	15,814	2,554
1974**	16,710	2,614

Gain of Business and Residential Main Phone Services

Year	Residential	Business
1970	889	122
1971	925	168
1972	1,083	250
1973	1,385	149
1974**	896	60

* Includes Plymouth, Manomet, Buzzards Bay, and Sagamore exchanges

** 1974 to 12/1/74

Source: New England Telephone Traffic Reports, 1970-1974.

ORNL-DWG 76-7607

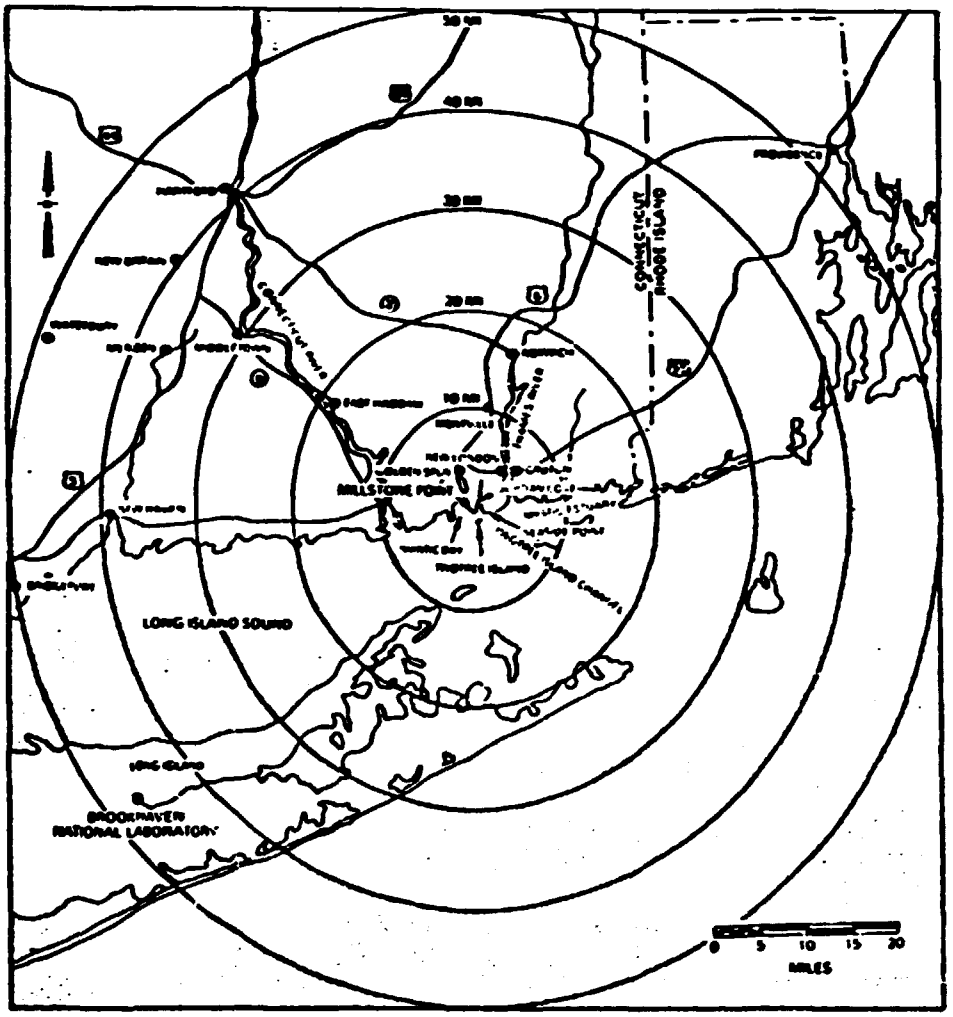


Fig. A-3. Millstone Station General Site Location

Source: Final Environmental Statement, Atomic Energy Commission, Washington, D. C.

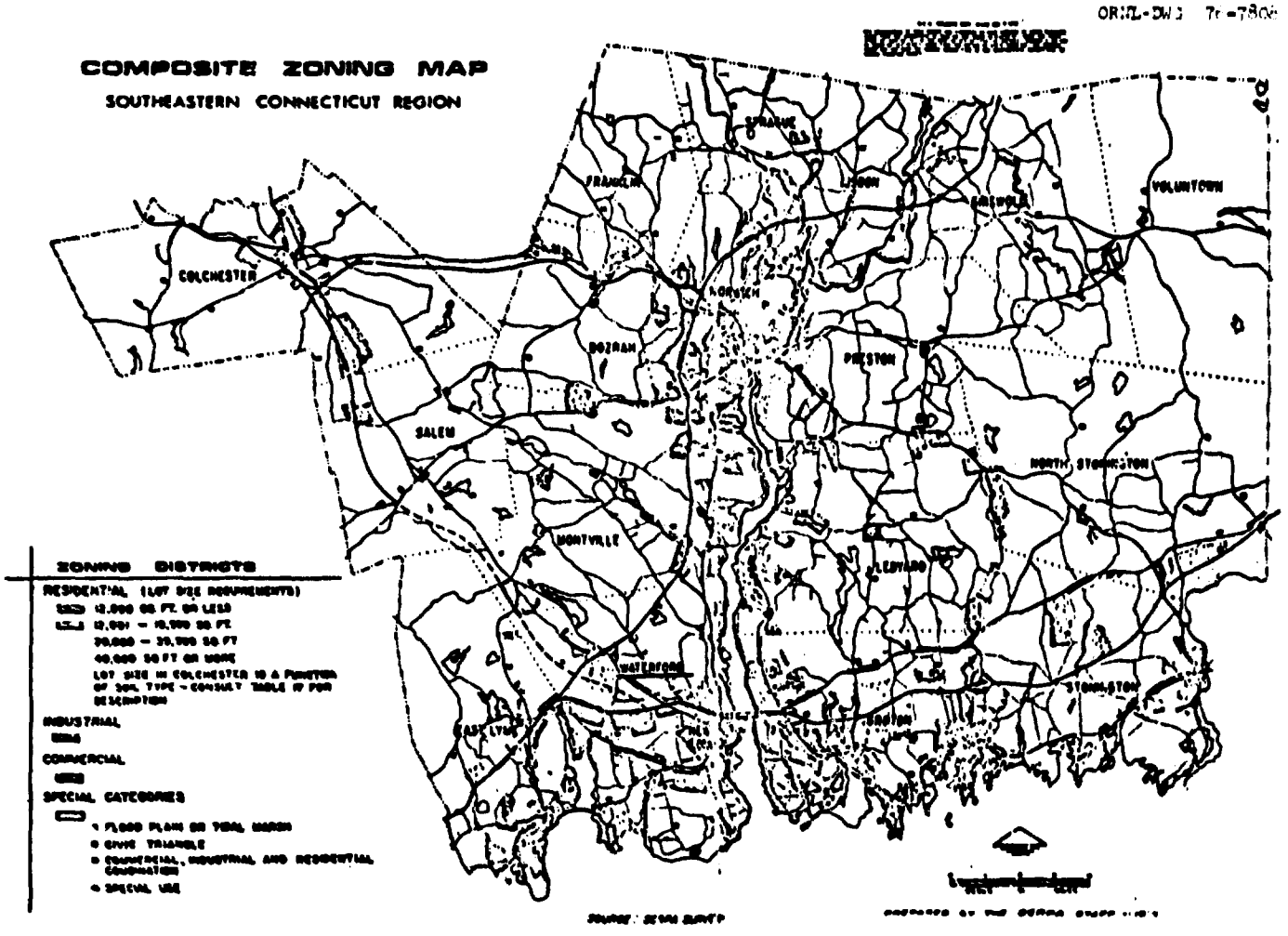


Fig. A-4. Composite Zoning Map of Southeastern Connecticut

Table A-6

Population Growth in Southeastern Connecticut, 1950-1970

	Population 1950	Population 1960	% Change 1950-60	Population 1970	% Change 1960-70
Groton	21,896	29,937	37	38,523	29
New London	30,551	34,182	12	31,630	(8)**
Norwich*	37,633	38,506	2	41,433	8
Colchester	3,007	4,648	55	6,603	42
East Lyme	3,870	6,782	75	11,399	68
Griswold	5,728	6,472	13	7,763	20
Ledyard	1,749	5,395	208	14,558	170
Lisbon	1,282	2,019	57	2,808	29
Montville	4,766	7,759	63	15,662	102
Preston*	1,775	4,992	181	3,593	(28)**
Sprague	2,320	2,509	8	2,912	16
Stonington	11,801	13,969	18	15,940	14
Waterford	9,100	15,391	69	17,227	12
Bozrah	1,154	1,590	38	2,036	28
Franklin	727	974	34	1,356	39
North Stonington	1,367	1,982	45	3,748	89
Salem	618	925	50	1,453	57
Voluntown	825	1,028	25	1,452	41
Regional totals	140,169	179,060	28	220,096	23

* In 1950 and 1960, the patient population of Norwich State Hospital was included in the Preston total population. In 1970, the Hospital population was included in the Norwich total population.

** Figures in parentheses denote population loss.

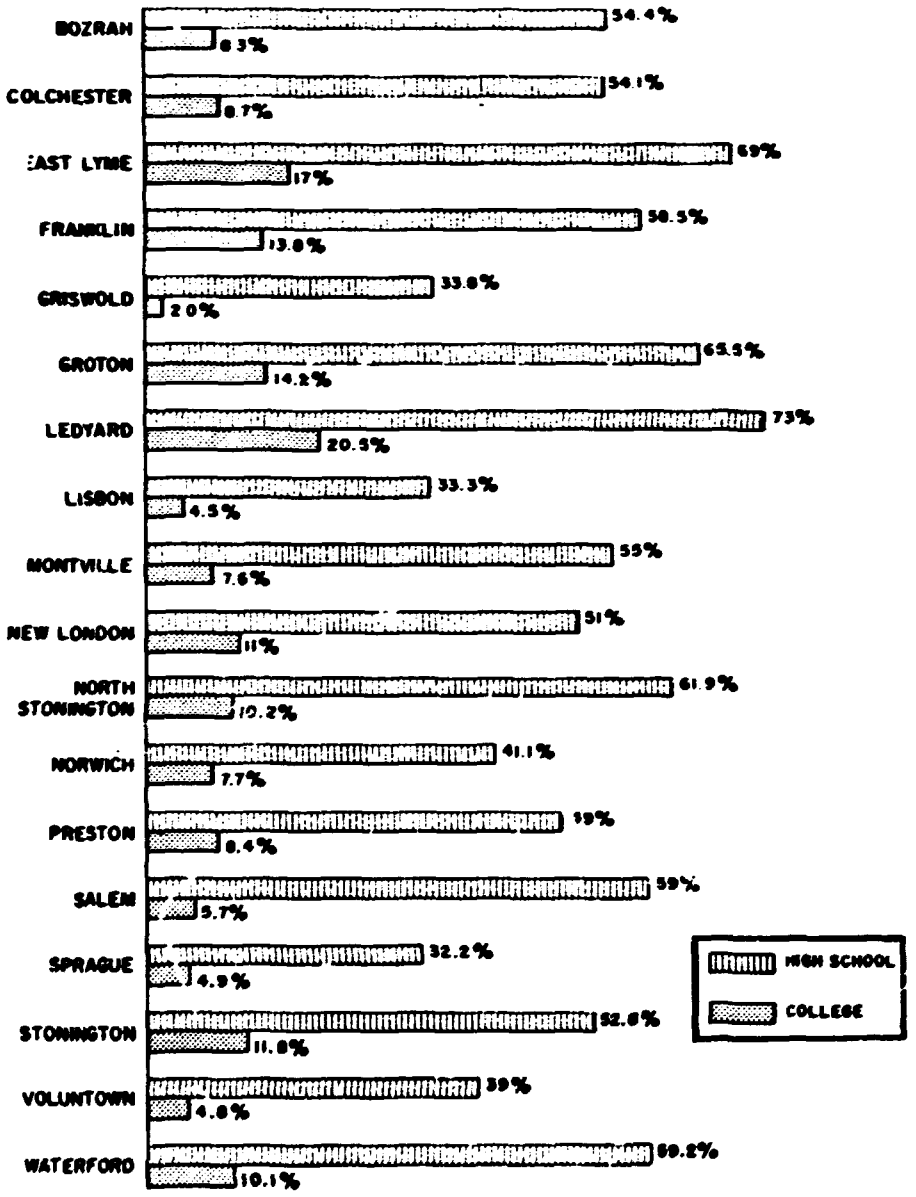
Source: *Selected Demographic Data by Towns and Mental Health Planning Regions in Connecticut*, Statistics Section, Connecticut State Department of Mental Health, Table 1, p. 4. *Population and Development, op. cit.*, Table 2, p. 8.

Table A-7

Population for Waterford, New London County, and Connecticut for 1950-1970

	Population		
	1950	1960	1970
Waterford	9,100	15,391	17,227
County	144,821	185,745	230,348
State	2,007,280	2,535,234	3,031,709
	Absolute change		
	1950-1960	1960-1970	1950-1970
Waterford	6,291	1,836	8,127
County	40,924	44,603	85,527
State	527,954	496,475	1,024,429
	Percent change		
	1950-1960	1960-1970	1950-1970
Waterford	69.1	11.9	47
County	28.2	24	37
State	26.3	20	34

Table A-8. Percent of High School and College Graduates, Among Population 25 Years and Older, 1970*



*THE HIGH SCHOOL PERCENTAGES CONTAIN THOSE WHO COMPLETED HIGH SCHOOL, 1-3 YEARS OF COLLEGE, AND 4 OR MORE YEARS OF COLLEGE.

SOURCE: *PHC(1)-143 NEW LONDON-GROTON-NORWICH SMSA AND PC(1)-C8 CONN.-GENERAL SOCIAL AND ECONOMIC CHARACTERISTICS.*

Table A-9

Family Median Income Among Southeastern Connecticut Towns
1959 and 1969

Town	1959 Median Income	1969 Median Income	% Increase
Ledyard	$7,053	$12,237	73.5
East Lyme	6,386	11,828	85.2
Waterford	7,162	11,645	62.6
North Stonington	6,182	11,496	86.0
Colchester	6,174	11,426	85.1
Franklin	6,548	11,421	74.4
Montville	6,644	11,129	67.5
Bozrah	6,281	11,009	75.3
Salem	5,667	11,000	94.1
Preston	6,685	10,763	61.0
Voluntown	5,344	10,607	98.5
Stonington	6,272	10,295	64.1
Griswold	5,953	9,833	65.2
Lisbon	6,430	9,771	52.0
Norwich	6,142	9,768	59.0
New London	6,098	9,657	58.4
Groton	6,361	9,584	50.7
Sprague	5,940	9,134	53.8
Region:	$6,216	$10,452	68.1

Sources: Bureau of the Census, *General Social and Economic Characteristics*, PC(1)-C8, 1970 Tables 107, 118.

Bureau of the Census, *Census Tracts*, PHC(1)-143, 1970, Table P-4.

Edward G. Stockwell, *Town and County Fact Book*, the University of Connecticut, Storrs Agricultural Experiment Station, January, 1964.

Table A-10

Labor Area — New London County, Connecticut

Year	New England County			State of Connecticut		
	Total labor force	Total unemployed	Unemployment rate	Total labor force	Total unemployment	Unemployment rate
1965	57,000	1,500	.6	1,185,000	46,000	3.9
1966	58,000	1,600	2.7	1,241,000	39,500	3.2
1967	56,200	2,000	3.6	1,285,600	43,100	3.4
1968	56,500	2,200	3.9	1,318,000	49,500	3.8
1969	57,200	2,100	3.7	1,340,000	51,700	3.9
1970	56,000	2,800	5.0	1,362,000	78,000	5.7
1971	57,000	3,600	6.3	1,379,000	116,000	8.4
1972	58,000	4,000	6.9	1,411,000	121,000	8.6
1973	61,600	3,100	5.0	1,420,000	89,000	6.3

Appendix B

SOCIAL IMPACT CLASSIFICATORY SCHEMA

To provide a structure for the study design, to assess impacts, to observe and explain perceived causal linkages between the siting of the nuclear reactors and changes in the socioeconomic and political conditions of the host communities and their respective regions, the research team has developed a social impact classification schema.

The model advances social impact work by providing the structure and systematization necessary to shift from primarily descriptive research to that which is more analytic. It may assist those in policy planning to clarify ambiguous issues in social impact analysis and to structure observations and analysis of actual field situations.

The basic character of the schema is an input-output model as shown in Fig. B-1.

Input variables (see Fig. B-2), or "nuclear power Plants," may be described as change agents which alter or introduce new roles and relationships into the local community social structure. Inputs are classified as (1) facility characteristics, (2) human resources, (3) generated revenue, and (4) licensing and regulatory procedures.

The interaction between the Input variables and the local Community Social System results in a number of primary Outputs or Impacts on the Social System. These impacts (see Fig. B-3) are the outcome of the Social System's attempt to maintain equilibrium, a process which acts to minimize the disruptive nature of the inputs. These first-order or direct impacts also introduce changes into the continually adapting Social System. Thus, a Feedback "loop" is established with each impact acting as another input into the community, creating second- and third-(tertiary)order impacts in a continual cycle. The magnitude and direction of the impacts can be determined by the relative importance, duration, frequency, and intensity of occurrence of interaction of the inputs (nuclear power plants) and local community social structure.

Other sources of inputs into this system, but non-nuclear in nature, are labeled exogenous variables (e.g., current national socioeconomic trends). Intervening variables mediate between Inputs and Outputs, also affecting the magnitude and direction of the observed impacts (e.g., degree of development of local planning infrastructure).

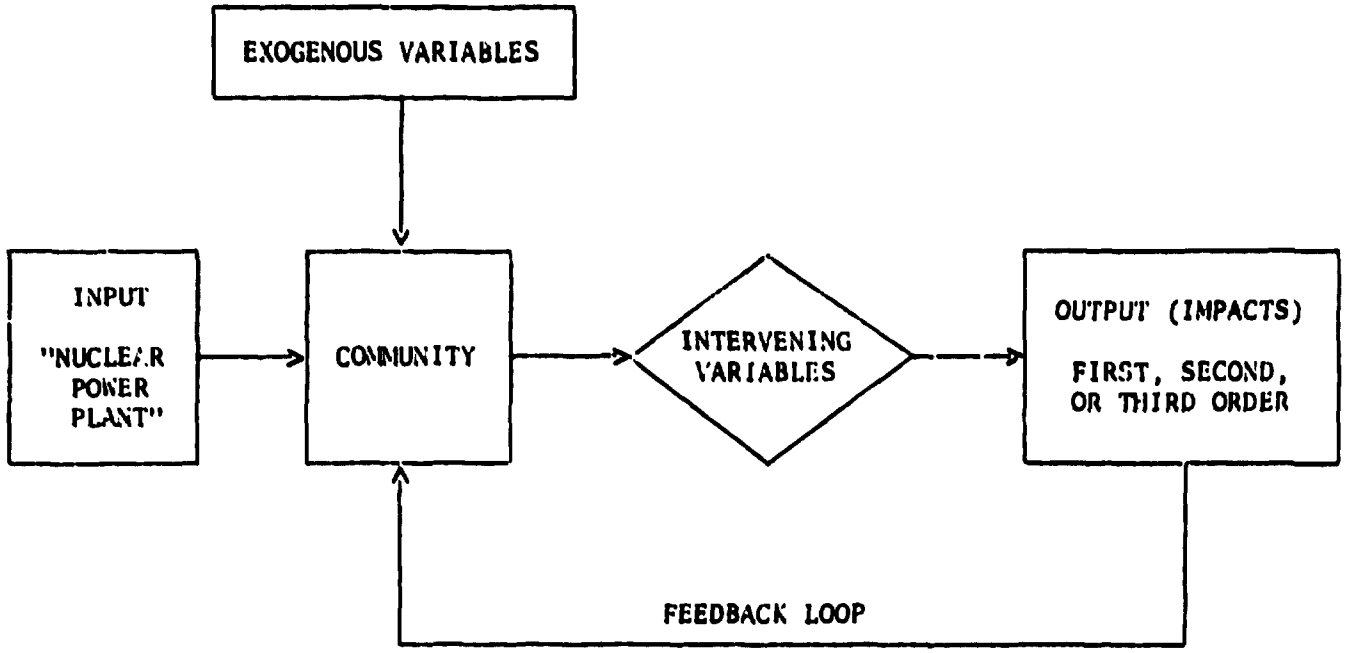


Fig. B-1. Social impact input-output model

Facility Characteristics

- Reactor design
- Cooling system
- Transmission lines/corridors
- Effluents
- Visual characteristics
- Land use

Human Resources

- Work force
  - New residents
  - Commuters

Revenue

- Employment income
- Taxes/payment in-lieu-of-taxes
- Materials/goods and services purchased locally

Licensing and Regulatory Procedures

- Information flow/distribution
- Procedural participation
- Perceived/anticipated impacts

Fig. B-2. Inputs to social system

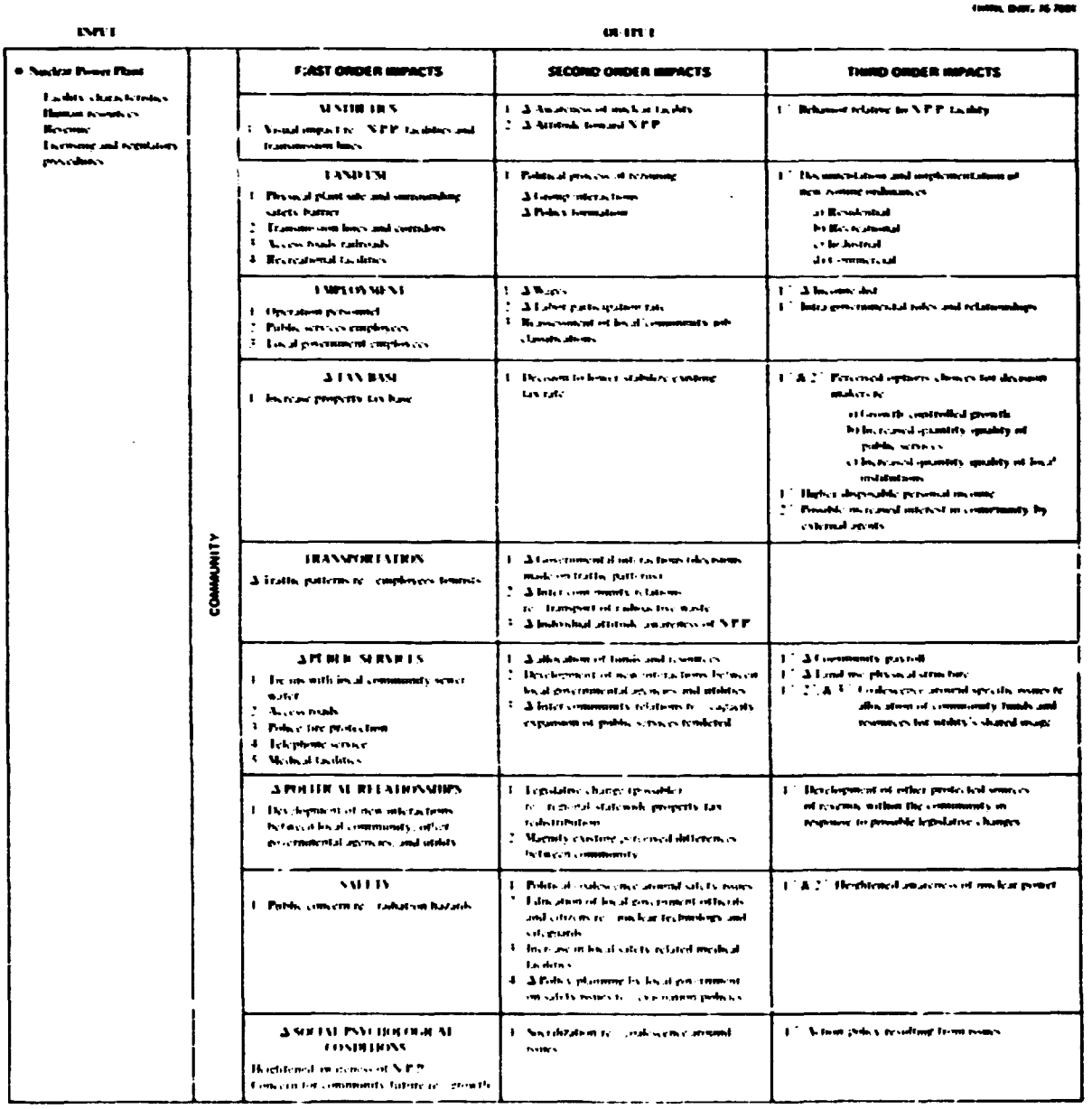


Fig. B-3. Social impact classificatory scheme.

Appendix C

CHRONOLOGY OF EVENTS: PILGRIM I AND MILLSTONE I AND II
PILGRIM NUCLEAR STATION

1967:	Site purchased on western shore of Cape Cod Bay in the Town of Plymouth
June 30, 1967:	Boston Edison applies for provisional construction permit
June 18, 1968:	Public hearings before ASLB at Plymouth, Mass.
August 26, 1968:	Construction Permit CPPR - 49 issued
January 8, 1969:	Interim industrial discharge permit from Massachusetts Department of Natural Resources Division of Water Pollution Control
September 1970:	"Applicant's Environmental Report - Operating License State"
October 16, 1970:	Notice of Availability of Environmental Report and Request for Comments, 35 *Federal Register* 16289
July 12, 1971:	Intervenor status granted jointly to Sierra Club, Union of Concerned Scientists, and the Commonwealth of Massachusetts
April 23, 1971:	"Notice of Consideration of Issuance of Facility Operating License" – requests for hearing and petitions to intervene received
April 23, 1971:	Certification required under Federal Water Quality Improvement Act of 1970
August 25, 1971:	Atomic Energy Commission issues Safety Evaluation for the Pilgrim facility
September 23, 1971:	Visit by AEC to site and surrounding areas; independent calculations and sources of information used in Commission's assessment of environmental impact
October 13, 1971: November 3, 1971:	Prehearing conferences before ASLB in Plymouth
November 9, 1971:	Proposed modifications to the treatment systems described in Amdt. 1 to the FSAR, dated the same day

November 1971: Submission of supplemental information to AEC in answer to comments on environmental report

December 6-8, 1971: Public hearings held in Plymouth

March 7, 1972: AEC requests comments on DES from interested parties (37 F.R. 4927)

May 1972: Final Environmental Statement made to public, Council on Environmental Quality, et al.

May 1972: Construction and preoperational testing completed and Station ready for low power operation

Fall 1972: Date for solidification and packaging system to be operational

April 1973: Menhaden fish kill in the thermal plume

May 1973: Strike by workers of Office and Clerical Union local 387 against Boston Edison for higher wages

November 1973: Boston Edison files for Pilgrim II and III

December 1973: Pilgrim I shuts down to "reconstitute" the fuel

January 1, 1974: Date of modification to gaseous waste treatment system also date for additional charcoal absorber equipment to be installed which will result in longer gas holdup prior to release

July 1974: Pilgrim III postponed indefinitely

August 8, 1974: Pilgrim I goes to full power after remaining shutdown for 7 months

October 1974: Nuclear waste container rolls off truck on Rt. 44 in Middlesboro, - 4 miles from Plymouth

January 1975: EPA hearing held on Pilgrim I - considered was Boston Edison's application for a national pollution discharge elimination system permit

February 1975: Boston Edison announces postponement of Pilgrim II plant from August 1975 to October 1975

April 1975: Pilgrim station gets EPA permit to discharge water into Cape Cod Bay effective May 9

September 1975: Pilgrim I shutdown due to faulty generator supplying power to the plant

January 1976: Preconstruction hearings begin on Pilgrim II

CHRONOLOGY OF EVENTS: MILLSTONE I AND II NUCLEAR STATION

Unit 1

November 10, 1965: Application submitted in accordance with 50.33 to cover all licenses (Class 104) necessary for construction and operation, Part A, Unit 1

February 9, 1966: Building permit - Town of Waterford

July 22, 1966: Permit received for offshore dredging and construction of circulating water intake structures - Connecticut Water Resources Commission

October 31, 1966: Permit received to perform offshore dredging and to construct a temporary dike and construct the intake structure - Army Corps of Engineers

December 12, 1966: Permit to obstruct navigable air space for construction of a concrete ventilation stack - Air Traffic Branch, Federal Aviation Administration

January 5, 1967: Permission to construct several temporary and permanent grade crossings over the New Haven railroad industrial side-track serving site - Connecticut Public Utilities Commission

March 15, 1968: Final Safety Analysis filed, Docket 50-245

October 14, 1968: Approval for methods and manner of construction of transmission line - CPUC

March 24, 1969: Certificate for energizing transmission lines - CPUC

April 26, 1969: Permit for access road to Millstone site - Connecticut State Highway Department

May 7, 1969: Approval for methods and manner of construction of transmission line - CPUC

July 25, 1969: Extension of permit obtained July 22, 1966, from CPUC

August 4, 1969: Certification that discharge from plant will not violate water quality standards - Conn. Water Resources Commission

August 22, 1969: Sanitary systems construction - Conn. Water Resources Commission

August 26, 1969:	Permit from Conn. Water Resources Commission allowing circulating water system discharge
September 12, 1969:	Permit from Army Corps of Engineers to dispose of dredged material in connection with the intake structure and dumping in Long Island Sound.
September 16, 1969:	Disposal permit for dredged material in Long Island Sound - Conn. Water Resources Commission
March 17, 1970:	Intent to issue license published 35 FR 4464
June 10, 1970:	Environmental report by applicant for Unit II, some portions relating to Unit I
July 7, 1970:	AEC "Statement on Environmental Considerations" relating to proposed operation of Unit I
December 28, 1970:	Commercial operation begun up to 652 MW(e)
May 11, 1971:	Five-year permit for sanitary system issued by Conn. Water Resources Commission
June 30, 1971:	Application with Corps of Engineers to discharge effluent into navigable waters
October 2, 1971:	License Holder's Statement relating to non-suspension of the provisional operating license pending NEPA review
November 15, 1971:	Environmental report for Unit I
November 22, 1971:	Staff concluded that operating license should not be suspended pending completion of review
September 1972:	Higher than normal discharges of liquid radioactive materials into Long Island Sound shutsdown Millstone I
October 7, 1973:	End date of extension of Provisional Operating License DPR-21
February 1975:	State hearings begin on safety of Millstone I
April 1975:	Millstone personnel improperly allow 2500 gallons of radioactive water to escape from the plant. A second release occurred three days later
June 1975:	State introduced radiation monitoring equipment at Groton detects a stagnant air mass containing radioactivity from Millstone I. Authorities stated that the radiation levels were 18% of the ceiling set by the federal NRC

Unit II

February 27, 1969:	Application to AEC for permits and licenses to construct and operate Unit II
August 22, 1969:	Approval for discharge of sanitary wastes - CWRC
October 7, 1969:	Building permit - Town of Waterford
March 12, 1970:	Permit for sanitary control of portable sanitary units — Town of Waterford
June 10, 1970:	Environmental Report (Construction Stage) Unit II submitted to AEC
July 21, 1970:	Permit received for offshore dredging and construction of circulating water intake structure - Conn. Water Resources Commission
July 24, 1970:	Certification that discharge from plant will not violate water quality standards - Conn. Water Resources Commission
August 31, 1970:	Permit from Conn. Water Resources Commission allowing circulating water system discharge
September 14, 1970:	AEC Environmental Statement
October 9, 1970:	Permit from U.S. Army Corps of Engineers to dispose of dredged material in connection with the intake structure and dumping in Long Island Sound
December 11, 1970:	Construction permit CPPR-76 by AEC
May 5, 1971:	Approval of waste disposal-operating state-CWRC
October 19, 1971:	License Holders Statement
October 29, 1971:	Revised effluent discharge permit with Corps of Engineers
November 22, 1971:	Construction permit allowed to run during NEPA review
January 1972:	Permit to replace transmission lines across Columbia River — Conn. Department of Environmental Protection
March 14, 1972:	Approval for method and manner of construction of transmission lines - CPUC
August 1975:	Millstone II awarded an operating license
January 1976:	Millstone II begins operation

Appendix D

DATA COLLECTION TECHNIQUES

Due to the exploratory nature of the research, triangulation[1] or the use of multiple methodologies to study the same phenomenon, was utilized. The following methodologies were applicable and therefore adapted:

- open-ended interviews
- unstructured observation
- local record analysis
- census data manipulation
- attitude surveys[2]

I. Within each community, approximately 35 open-ended interviews were conducted with local decision makers, utility personnel, concerned citizens and local nuclear intervenors (see Appendix E). Interviews focused on the perceived impacts of the nuclear power plants on the host communities and general attitudes towards community satisfaction and community cohesion. No attempt was made to either standardize the interview setting or format in order to allow the interviewers freedom to probe self-selected areas. This approach also gave the research team a chance to devise an inclusive list of pertinent social impact variables necessary for generating relevant hypothesis.

II. Secondary data was collected and analyzed in order to present accurate profiles of the host communities and their environs. Data were collected from local, regional and state sources for three specific time frames: pre-construction, construction and operation. Three distinct types of data were gathered: (1) nuclear power plant "input" data; (2) community level socioeconomic, demographic, and political information; and (3) regional socioeconomic and demographic data. Some regional data gathering was considered necessary in order to analyze whether changes in the host communities were a function of the nuclear plant sitings or of external forces in the surrounding region.

Data collection at the local and regional level proved somewhat tedious and difficult because of format and availability problems. Most often, data were available to the research team in a format or level of detail unsuited to research aims. Much needed information was simply unavailable; some had never been recorded, some was "missing" for a variety of unstated reasons, and much useful community information formerly collected by the State governments was no longer available in printed form for general public disclosure because of cuts in state printing budgets.[3] One futher hindrance was the unavailability of detailed historical data on basic socioeconomic or political characteristics of the host communities prior to 1970 or for most intercensal

years. It was our judgment that while local record keeping may function well for the immediate needs of the local residents, it is quite sporadic at best and inadequate for detailed analytical purposes.

References — Appendix D

1. Norman Denzin, *The Research Act*, Aldine Publishing Co., Chicago, Ill., 1972.

2. See Appendix F for a more detailed account of the attitude surveys.

3. This was especially found to be true in Massachusetts. Computer printouts of data from several offices were available for hand copying by the research staff, a prohibitively expensive task.

Appendix E

List of Interviewees
Plymouth, Massachusetts Area

1.	David Tarantino	Chairman, Plymouth Board of Selectman
2.	Andrew Collas	Plymouth Town Clerk
3.	William Gault	Assistant Superintendent of Schools, Plymouth
4.	Lothrop Withington	Plymouth Assessor of Taxes
5.	Horace Genovese	Plymouth Tax Assessor, part-time
6.	Raymond Freiden	Plymouth Town Planner
7.	Albert Saunders	Plymouth Building Inspector
8.	Richard Dudman	Executive Secretary, Plymouth
9.	William Nazel	Teacher, Plymouth-Carver Regional High School
10.	Capt. Ernest Leonardi	Plymouth Police Department
11.	Capt. William Le Voye	Plymouth Fire Department
12.	John Loupos	Concerned Plymouth citizen
13.	Mimi Loupos	Concerned Plymouth citizen and Realtor
14.	Robert Dawley	Finance Officer, Plymouth Federal Savings and Loan
15.	Ronald Ferioli	Plymouth Realtor
16.	James Dachtler	Concerned Plymouth citizen
17.	William Abbott	Intervenor for Pilgrim Nuclear Station, Attorney and concerned Plymouth resident
18.	Mark Johnston	Editor: *Old Colony Memorial* newspaper, Plymouth
19.	Titus Pressler	Assistant Editor, *Old Colony Memorial* newspaper, Plymouth

20.	Felix Carlino	Director, Plymouth Public Works Department
21.	Herbert Pegman	Director, Massachusetts Division of Employment Security, Plymouth area
22.	Melvin Coombs	Director, Plymouth Industrial Development Commission
23.	Silas Wade	Former Chairman, Plymouth Conservation Commission
24.	Robert Tis	District Manager, Boston Edison Company
25.	James Davis	Senior Nuclear Engineer, Boston Edison Company, Boston
26.	Eric Savollinen	Director, SRPEDD Planning Region, Marion, Massachusetts
27.	Glen Kitteridge	Massachusetts State Department of Community Affairs, Boston
28.	Alvin Sanders	Director, Massachusetts State Planning Agency, Boston
29.	Karen O'Donnell	Reporter, *Old Colony Memorial* newspaper, Plymouth
30.	Donal Dobbins	United Community Planning Agency of Metropolitan Boston, Boston
31.	Doris French	Member, Plymouth Historical Society
32.	Thomas McDonald	Senior Labor Market Economist, Massachusetts Division of Employment Security, Boston
33.	Dr. James Mogilnicke	School Psychologist, Plymouth
34.	Dr Julian Stauss	Demographer, Harvard School of Public Health, Cambridge
35.	Theodore White	Officer, Massachusetts Industrial Development Commission, Boston

List of Interviewees
Waterford, Connecticut

1.	Herbert Davis	First Selectman, Waterford
2.	Albert Swartzburg	Ex-Chairman, Waterford Planning and Zoning Commission
3.	Tony Sheridan	Town Planner, Waterford
4.	Richard Brooks	University of Rhode Island Professor and concerned Waterford citizen
5.	Sally Taylor	Connecticut College Professor and member of Waterford Conservation Commission
6.	Bruce Gathy	Coast Guard Academy Professor and member of Waterford Conservation Commission
7.	Le Roy Decker	Waterford Finance Officer
8.	Michael Garvey	Waterford Director of Public Works
9.	George Phillips	Waterford Building Inspector
10.	Kenneth Dimmock	Waterford Tax Assessor
11.	Janet Polinsky	Chairman, Waterford Planning and Zoning Commissio:
12	Robert Goodwin	Botanist, Connecticut College
13.	Harold Nash	Chairman of Concerned Citizens
14.	Clarence Coogin	Assistant School Superintendent, Waterford
15.	Richard Erickson	Director of Southeastern Connecticut Regional Planning Agency
16.	Dean Avery	Executive Editor, *New London Day*, New London
17.	John Foley	Managing Editor, *New London Day*, New London
18.	Richard Polman	Columnist, *New London Day*
19.	Jeffrey Muise	Columnist, *New London Day*
20.	Dr. Bernard Faber	Sociologist, Connecticut College, New London
21.	Robert Flannigan	Assistant City Manager, New London

22.	Howard Lowenberg	Student, Connecticut College, New London
23.	James Perkins	Police Chief, Waterford
24.	Mary Wynn	Taxation Clerk, Connecticut State Department of Taxation, Hartford, Connecticut
25.	Bradford Chase	Director, Connecticut State Planning, Hartford, Connecticut
26.	John O'Dell	Director, State Projections and Vital Statistics, Hartford, Connecticut
27.	Elizabeth O'Hara	Connecticut State Department of Education, Hartford, Connecticut
28.	Richard Symonds	Connecticut State Planning Department, Hartford, Connecticut
29.	George Fox	Northeast Utilities, Hartford, Connecticut
30.	Mr. & Mrs. David Collins	Concerned citizens, Waterford
31.	David Winkler	Intervenor Millstone 1 & 2 and "Nader's Raider," Hartford, Connecticut
32.	Nicholas Pollini	Realtor, Waterford and New London

Appendix F

Attitude Survey Methodology and Results

Although the linkages between attitudes and behavior are not well understood, attitudes are assumed for the purposes of our research to be general predispositions to act in certain ways.[1] We also assume that local residents are uniquely qualified to inform us of their life circumstances as these are affected by the presence of the nuclear generating station as well as other factors at work in the community. Hence, opinions and attitudes were solicited broadly from nearly all community leaders and from a random sampling of all residents in each town under study.

Three site visits have been made by three staff members to interview a wide variety of community leaders and other citizens.[2] From the open-ended interviews, a picture emerged of the impact of the construction and operation of each plant on each community. A major factor mentioned by supporters and opponents alike was the economic effect of the large tax base which the plants provide to each town. However, the persons interviewed were in the main unable to go substantially beyond the issue of taxes in delineating the impact of the plant on their community.

The distribution of attitudes in the general public about the plant and its effect(s) on each community is a major factor of interest to the research team. We further wished to see how satisfied local residents were with their respective communities now and what they saw for their communities' future. Utilizing measures initially developed for the Hartsville, Tennessee study in the Department of Regional and Urban Studies[3] at Oak Ridge National Laboratory, survey instruments were developed for each community. The Plymouth and Waterford survey results[4] are presented on the following pages as well as throughout this document.

The use of survey research techniques in social impact analysis has been documented in the Schuller et al., report on Hartsville. The authors note that:

> "Survey interviewing has the distinct advantage of allowing individuals to directly express their own views on specific questions rather than relying on the reports or interpretations of outside observers. Obtaining information directly from the people affected can be particularly critical where the same external events can be evaluated differently by different people. For example, 'industrial development' might be viewed as a 'good' by one segment of the population, but as 'bad' by another. Through survey research, the analyst obtains data on the direct feelings of people, rather than ideas filtered through others who may tend to impart their own values to their interpretations."[5]

Further, the survey work in Plymouth and Waterford utilizes questions similar to those used in the Hartsville study. Subjects covered by the surveys are as follows:

1. Respondents' perceptions of the community as a place to live;
2. Perceptions of future growth and development needs within the community;
3. Perceptions of the plant's effect(s) on their lives and community;
4. Perceptions of closeness to various groups in the community; and
5. Background characteristics of the persons interviewed.

Survey Logistics

The surveys were carried out in the towns of Plymouth, Massachusetts, and Waterford, Connecticut, utilizing a sample of 126 adults (18 and over) and in 182, respectively, in each community.[6] The interviews were conducted by interviewers hired and trained locally by one of the staff, and interviews are estimated to have taken around 20 minutes each.[7]

The on-site investigator met with local officials to inform them of the purposes of the survey and gain their support. The media in each town were kept fully appraised of each survey's progress.

References — Appendix F

1. See Bernard Hennessy, *Public Opinion*, Belmont, Calif. Wadsworth Press, Inc. 1970, pp. 209-212.

2. Persons interviewed by the staff in April, May, and June are listed in Appendix A.

3. C. R. Schuller, J. R. Fowler, T. J. Mattingly, Jr., et al., *Citizens' Views About the Proposed Hartsville Nuclear Power Plant — A Preliminary Report of Potential Social Impacts* (RUS-3, May 1975), Research for ERDA sponsored by the Division of Biomedical and Environmental Research (DBER).

4. See the Plymouth questionnaire in Appendix D.

5. Schuller et al., op. cit., p. 5.

6. A sample size of approximately 200 has 95% confidence with 7% accuracy. This means that repeated samplings within this population would yield the population value within 7% in either direction of the sample estimates for 95 to 100 iterations. See G. Terrence Jones, *Conducting Political Research*, (New York Harper and Row, 1971), pp. 64-66. Charles H. Backstrom and Gerald D. Hirsch, *Survey Research*. (Evanston, Illinois: Northwestern University Press, 1963), pp. 31-33.

7. Interviewers are trained utilizing guidelines found in Backstrom and Hirsch, op. cit., and the *Interviewers' Manual* (Institute of Social Research: University of Michigan, 1972).

POST LICENSING CASE STUDY - PLYMOUTH, MASSACHUSETTS SURVEY

YEARS LIVED IN PLYMOUTH

	ABSOLUTE FREQUENCY	RELATIVE FREQUENCY (PERCENT)	ADJUSTED FREQUENCY (PERCENT)
0 TO 4 YEARS	39	31.0	32.0
5 TO 9 YEARS	30	23.8	24.6
10+ YEARS	53	42.1	43.4
	4	3.2	MISSING
TOTAL	126	100.0	100.0

SHOULD PLYMOUTH ENCOURAGE GROWTH?

	ABSOLUTE FREQUENCY	RELATIVE FREQUENCY (PERCENT)	ADJUSTED FREQUENCY (PERCENT)
YES	59	46.8	47.6
NO	63	50.0	50.8
	2	1.6	1.6
	2	1.6	MISSING
TOTAL	126	100.0	100.0

HAS NUCLEAR PLANT AFFECTED YOUR LIFE?

	ABSOLUTE FREQUENCY	RELATIVE FREQUENCY (PERCENT)	ADJUSTED FREQUENCY (PERCENT)
YES	49	38.9	39.2
NO	76	60.3	60.8
	1	0.8	MISSING
TOTAL	126	100.0	100.0

WOULD YOU PERMIT CONSTRUCTION AGAIN?

	ABSOLUTE FREQUENCY	RELATIVE FREQUENCY (PERCENT)	ADJUSTED FREQUENCY (PERCENT)
YES	89	70.6	72.4
NO	28	22.2	22.8
	6	4.8	4.9
	3	2.4	MISSING
TOTAL	126	100.0	100.0

DO YOU FEEL CLOSE TO NEWCOMERS?

	CODE	ABSOLUTE FREQUENCY	RELATIVE FREQUENCY (PERCENT)	ADJUSTED FREQUENCY (PERCENT)
NOT CLOSE AT ALL	1	23	18.3	19.0
	2	9	7.1	7.4
	3	10	7.9	8.3
	4	12	9.5	9.9
	5	24	19.0	19.8
	6	14	11.1	11.6
	7	5	4.0	4.1
	8	8	6.3	6.6
	9	2	1.6	1.7
VERY CLOSE	10	14	11.1	11.6
		5	4.0	MISSING
	TOTAL	126	100.0	100.0

DO YOU FEEL CLOSE TO OTHER NEIGHBORHOODS

	CODE	ABSOLUTE FREQUENCY	RELATIVE FREQUENCY (PERCENT)	ADJUSTED FREQUENCY (PERCENT)
NOT CLOSE AT ALL	1	12	9.5	10.0
	2	6	4.8	5.0
	3	8	6.3	6.7
	4	10	7.9	8.3
	5	25	19.8	20.8
	6	13	10.3	10.8
	7	7	5.6	5.8
	8	15	11.9	12.5
	9	13	10.3	10.8
VERY CLOSE	10	11	8.7	9.2
		6	4.8	MISSING
	TOTAL	126	100.0	100.0

DO YOU FEEL CLOSE TO PUBLIC OFFICIALS?

	CODE	ABSOLUTE FREQUENCY	RELATIVE FREQUENCY (PERCENT)	ADJUSTED FREQUENCY (PERCENT)
NOT CLOSE AT ALL	1	35	27.8	30.7
	2	11	8.7	9.6
	3	16	12.7	14.0
	4	6	4.8	5.3
	5	11	8.7	9.6
	6	8	6.3	7.0
	7	9	7.1	7.9
	8	8	6.3	7.0
	9	3	2.4	2.6
VERY CLOSE	10	7	5.6	6.1
		12	9.5	MISSING
	TOTAL	126	100.0	100.0

DO YOU FEEL CLOSE TO OTHER OCCUPATIONS?

	CODE	ABSOLUTE FREQUENCY	RELATIVE FREQUENCY (PERCENT)	ADJUSTED FREQUENCY (PERCENT)
NOT CLOSE AT ALL	1	3	2.4	2.4
	2	7	5.6	5.7
	3	7	5.6	5.7
	4	5	4.0	4.1
	5	14	11.1	11.4
	6	9	7.1	7.3
	7	9	7.1	7.3
	8	19	15.1	15.4
	9	22	17.5	17.9
VERY CLOSE	10	28	22.2	22.8
		3	2.4	MISSING
	TOTAL	126	100.0	100.0

THIS IS NOT A QUESTION FOR PLYMOUTH

	ABSOLUTE FREQUENCY	RELATIVE FREQUENCY (PERCENT)	ADJUSTED FREQUENCY (PERCENT)
	126	100.0	MISSING
TOTAL	126	100.0	100.0

WHAT IS YOUR AGE?

	ABSOLUTE FREQUENCY	RELATIVE FREQUENCY (PERCENT)	ADJUSTED FREQUENCY (PERCENT)
18 TO 29	37	29.4	29.8
30 TO 39	38	30.2	30.6
40 TO 49	20	15.9	16.1
50+	29	23.0	23.4
	2	1.6	MISSING
TOTAL	126	100.0	100.0

DO YOU IDENTIFY WITH ANY GROUPS?

	ABSOLUTE FREQUENCY	RELATIVE FREQUENCY (PERCENT)	ADJUSTED FREQUENCY (PERCENT)
YES	43	34.1	34.4
NO	82	65.1	65.6
	1	0.8	MISSING
TOTAL	126	100.0	100.0

SEX OF RESPONDENT

	ABSOLUTE FREQUENCY	RELATIVE FREQUENCY (PERCENT)	ADJUSTED FREQUENCY (PERCENT)
MALE	56	44.4	44.8
FEMALE	67	53.2	53.6
HUSBAND&WIFE	2	1.6	1.6
	1	0.8	MISSING
TOTAL	126	100.0	100.0

WHERE WAS YOUR PREVIOUS RESIDENCE?

	ABSOLUTE FREQUENCY	RELATIVE FREQUENCY (PERCENT)	ADJUSTED FREQUENCY (PERCENT)
BOSTON	58	46.0	46.0
OTHER	21	16.7	16.7
PLYMOUTH 10+	47	37.3	37.3
TOTAL	126	100.0	100.0

WHY DID YOU DECIDE TO MOVE TO PLYMOUTH?

	ABSOLUTE FREQUENCY	RELATIVE FREQUENCY (PERCENT)	ADJUSTED FREQUENCY (PERCENT)
FAMILY	12	9.5	15.2
JOB	14	11.1	17.7
ECONOMIC	12	9.5	15.2
ATTRACTIVENESS	25	19.8	31.6
HOUSING	16	12.7	20.3
	47	37.3	MISSING
TOTAL	126	100.0	100.0

SECOND REASON FOR MOVING TO PLYMOUTH

	ABSOLUTE FREQUENCY	RELATIVE FREQUENCY (PERCENT)	ADJUSTED FREQUENCY (PERCENT)
ECONOMIC	9	7.1	56.3
ATTRACTIVENESS	3	2.4	18.8
MISCELLANEOUS	4	3.2	25.0
	110	87.3	MISSING
TOTAL	126	100.0	100.0

HAS PLYMOUTH CHANGED SINCE YOU MOVED?

	ABSOLUTE FREQUENCY	RELATIVE FREQUENCY (PERCENT)	ADJUSTED FREQUENCY (PERCENT)
COMMUNITY HAS GROWN	45	35.7	83.3
MISCELLANEOUS	9	7.1	16.7
	72	57.1	MISSING
TOTAL	126	100.0	100.0

SECOND RESPONSE CONCERNING CHANGES

	ABSOLUTE FREQUENCY	RELATIVE FREQUENCY (PERCENT)	ADJUSTED FREQUENCY (PERCENT)
	6	4.8	25.0
	18	14.3	75.0
	102	81.0	MISSING
TOTAL	126	100.0	100.0

HOW IS PLYMOUTH AS A PLACE TO LIVE?

	ABSOLUTE FREQUENCY	RELATIVE FREQUENCY (PERCENT)	ADJUSTED FREQUENCY (PERCENT)
EXCELLENT	39	31.0	31.2
GOOD	52	41.3	41.6
FAIR	6	4.8	4.8
POOR	4	3.2	3.2
ATTRACTIVE	14	11.1	11.2
MISCELLANEOUS	10	7.9	8.0
	1	0.8	MISSING
TOTAL	126	100.0	100.0

WHAT DO YOU LIKE ABOUT PLYMOUTH?

	ABSOLUTE FREQUENCY	RELATIVE FREQUENCY (PERCENT)	ADJUSTED FREQUENCY (PERCENT)
NATURAL BEAUTY	41	32.5	33.9
LOW TAXES	5	4.0	4.1
SCHOOLS	6	4.8	5.0
QUIET-PEACEFUL	8	6.3	6.6
PEOPLE	9	7.1	7.4
RURAL ATMOSPHERE	18	14.3	14.9
MISCELLANEOUS	34	27.0	28.1
	5	4.0	MISSING
TOTAL	126	100.0	100.0

SECOND RESPONSE CONCERNING LIKES

	ABSOLUTE FREQUENCY	RELATIVE FREQUENCY (PERCENT)	ADJUSTED FREQUENCY (PERCENT)
NATURAL BEAUTY	14	11.1	23.7
LOW TAXES	5	4.0	8.5
SCHOOLS	5	4.0	8.5
PEOPLE	4	3.2	6.8
RURAL ATMOSPHERE	10	7.9	16.9
	1	0.8	1.7
MISCELLANEOUS	20	15.9	33.9
	67	53.2	MISSING
TOTAL	126	100.0	100.0

WHAT DO YOU DISLIKE ABOUT PLYMOUTH?

	ABSOLUTE FREQUENCY	RELATIVE FREQUENCY (PERCENT)	ADJUSTED FREQUENCY (PERCENT)
NO DISLIKES	23	18.3	18.7
TOURISTS	10	7.9	8.1
TRAFFIC - PARKING	15	11.9	12.2
GROWTH	12	9.5	9.8
POLITICIANS	7	5.6	5.7
MISCELLANEOUS	56	44.4	45.5
	3	2.4	MISSING
TOTAL	126	100.0	100.0

SECOND RESPONSE CONCERNING DISLIKES

	ABSOLUTE FREQUENCY	RELATIVE FREQUENCY (PERCENT)	ADJUSTED FREQUENCY (PERCENT)
TRAFFIC - PARKING	8	6.3	20.0
MISCELLANEOUS	32	25.4	80.0
	86	68.3	MISSING
TOTAL	126	100.0	100.0

WHAT CHANGES WOULD YOU MAKE IN PLYMOUTH?

	ABSOLUTE FREQUENCY	RELATIVE FREQUENCY (PERCENT)	ADJUSTED FREQUENCY (PERCENT)
STOP DEVELOPMENT	11	8.7	8.9
PROGRESS	17	13.5	13.7
COMMUNICATION	14	11.1	11.3
CLEAN UP POLITICS	7	5.6	5.6
MISCELLANEOUS	75	59.5	60.5
	2	1.6	MISSING
TOTAL	126	100.0	100.0

SECOND RESPONSE CONCERNING CHANGES

	ABSOLUTE FREQUENCY	RELATIVE FREQUENCY (PERCENT)	ADJUSTED FREQUENCY (PERCENT)
PROGRESS	4	3.2	12.1
BETTER POLICE	4	3.2	12.1
MISCELLANEOUS	25	19.8	75.8
	93	73.8	MISSING
TOTAL	126	100.0	100.0

PLYMOUTH AS A PLACE FOR YOUNG MARRIEDS

	ABSOLUTE FREQUENCY	RELATIVE FREQUENCY (PERCENT)	ADJUSTED FREQUENCY (PERCENT)
EXCELLENT	26	20.6	20.6
GOOD	63	50.0	50.0
AVERAGE	20	15.9	15.9
FAIR	13	10.3	10.3
POOR	3	2.4	2.4
	1	0.8	0.8
TOTAL	126	100.0	100.0

PLYMOUTH AS A PLACE FOR THE ELDERLY

	ABSOLUTE FREQUENCY	RELATIVE FREQUENCY (PERCENT)	ADJUSTED FREQUENCY (PERCENT)
EXCELLENT	9	7.1	7.1
GOOD	58	46.0	46.0
AVERAGE	31	24.6	24.6
FAIR	17	13.5	13.5
POOR	10	7.9	7.9
	1	0.8	0.8
TOTAL	126	100.0	100.0

PLYMOUTH AS A PLACE FOR CHILDREN

	ABSOLUTE FREQUENCY	RELATIVE FREQUENCY (PERCENT)	ADJUSTED FREQUENCY (PERCENT)
EXCELLENT	29	23.0	23.0
GOOD	53	42.1	42.1
AVERAGE	27	21.4	21.4
FAIR	12	9.5	9.5
POOR	4	3.2	3.2
	1	0.8	0.8
TOTAL	126	100.0	100.0

WHY SHOULD PLYMOUTH GROW?

	ABSOLUTE FREQUENCY	RELATIVE FREQUENCY (PERCENT)	ADJUSTED FREQUENCY (PERCENT)
SLOW PLANNED GROWTH	22	17.5	31.9
IMPROVE TAXES	12	9.5	17.4
MORE JOBS	11	8.7	15.9
MISCELLANEOUS	24	19.0	34.8
	57	45.2	MISSING
TOTAL	126	100.0	100.0

WHY SHOULD PLYMOUTH NOT GROW?

	ABSOLUTE FREQUENCY	RELATIVE FREQUENCY (PERCENT)	ADJUSTED FREQUENCY (PERCENT)
TOO MUCH GROWTH NOW	29	23.0	49.2
TO KEEP BEAUTY	8	6.3	13.6
GOOD AS IT IS	7	5.6	11.9
MISCELLANEOUS	15	11.9	25.4
	67	53.2	MISSING
TOTAL	126	100.0	100.0

HOW HAS NUCLEAR PLANT AFFECTED YOUR LIFE

	ABSOLUTE FREQUENCY	RELATIVE FREQUENCY (PERCENT)	ADJUSTED FREQUENCY (PERCENT)
LOWER TAXES	28	22.2	60.9
MISCELLANEOUS	18	14.3	39.1
	80	63.5	MISSING
TOTAL	126	100.0	100.0

SECOND RESPONSE CONCERNING EFFECTS

	ABSOLUTE FREQUENCY	RELATIVE FREQUENCY (PERCENT)	ADJUSTED FREQUENCY (PERCENT)
LOWER TAXES	75	59.5	97.4
MISCELLANEOUS	2	1.6	2.6
	49	38.9	MISSING
TOTAL	126	100.0	100.0

PLANT'S POSITIVE EFFECTS ON YOUR JOB

	ABSOLUTE FREQUENCY	RELATIVE FREQUENCY (PERCENT)	ADJUSTED FREQUENCY (PERCENT)
NO EFFECT	55	43.7	44.4
SOME EFFECT	8	6.3	6.5
GREAT EFFECT	1	0.8	0.8
NO ANSWER	60	47.6	48.4
	2	1.6	MISSING
TOTAL	126	100.0	100.0

PLANT'S NEGATIVE EFFECTS ON YOUR JOB

	ABSOLUTE FREQUENCY	RELATIVE FREQUENCY (PERCENT)	ADJUSTED FREQUENCY (PERCENT)
GREAT EFFECT	1	0.8	100.0
	125	99.2	MISSING
TOTAL	126	100.0	100.0

PLANT'S POSITIVE EFFECTS ON PLYMOUTH

	ABSOLUTE FREQUENCY	RELATIVE FREQUENCY (PERCENT)	ADJUSTED FREQUENCY (PERCENT)
NO EFFECT	30	23.8	27.0
LITTLE EFFECT	4	3.2	3.6
SOME EFFECT	15	11.9	13.5
GREAT EFFECT	3	2.4	2.7
UNDECIDED	1	0.8	0.9
NO ANSWER	58	46.0	52.3
	15	11.9	MISSING
TOTAL	126	100.0	100.0

PLANT'S NEGATIVE EFFECTS ON PLYMOUTH

	ABSOLUTE FREQUENCY	RELATIVE FREQUENCY (PERCENT)	ADJUSTED FREQUENCY (PERCENT)
SOME EFFECT	10	7.9	76.9
GREAT EFFECT	3	2.4	23.1
	113	89.7	MISSING
TOTAL	126	100.0	100.0

POSITIVE OR NEUTRAL SAFETY EFFECTS

	ABSOLUTE FREQUENCY	RELATIVE FREQUENCY (PERCENT)	ADJUSTED FREQUENCY (PERCENT)
NO EFFECT	44	34.9	40.7
LITTLE EFFECT	1	0.8	0.9
SOME EFFECT	1	0.8	0.9
UNDECIDED	3	2.4	2.8
NO ANSWER	59	46.8	54.6
	18	14.3	MISSING
TOTAL	126	100.0	100.0

PLANT'S NEGATIVE SAFETY EFFECTS

	ABSOLUTE FREQUENCY	RELATIVE FREQUENCY (PERCENT)	ADJUSTED FREQUENCY (PERCENT)
LITTLE EFFECT	3	2.4	17.6
SOME EFFECT	5	4.0	29.4
GREAT EFFECT	2	1.6	11.8
UNDECIDED	7	5.6	41.2
	109	86.5	MISSING
TOTAL	126	100.0	100.0

WHY WOULD YOU PERMIT CONSTRUCTION AGAIN?

	ABSOLUTE FREQUENCY	RELATIVE FREQUENCY (PERCENT)	ADJUSTED FREQUENCY (PERCENT)
NEED POWER,TAXES	9	7.1	10.0
LOWER TAXES	22	17.5	24.4
FAVOR NUCLEAR ENERGY	5	4.0	5.6
FAVOR PROGRESS	7	5.6	7.8
THINK PLANT IS SAFE	5	4.0	5.6
SEVERAL REASONS	8	6.3	8.9
NO BAD EFFECTS	11	8.7	12.2
ECONOMIC BENEFIT	5	4.0	5.6
MORE JOBS	6	4.8	6.7
NO SPECIFIC REASON	5	4.0	5.6
MISCELLANEOUS	7	5.6	7.8
	36	28.6	MISSING
TOTAL	126	100.0	100.0

WHY WOULD YOU NOT PERMIT CONSTRUCTION?

	ABSOLUTE FREQUENCY	RELATIVE FREQUENCY (PERCENT)	ADJUSTED FREQUENCY (PERCENT)
PERSONAL DANGER	6	4.8	21.4
MISCELLANEOUS	22	17.5	78.6
	98	77.8	MISSING
TOTAL	126	100.0	100.0

YOUR FEELINGS ABOUT BOSTON EDISON

	ABSOLUTE FREQUENCY	RELATIVE FREQUENCY (PERCENT)	ADJUSTED FREQUENCY (PERCENT)
EXCELLENT	10	7.9	8.2
VERY GOOD	6	4.8	4.9
GOOD	21	16.7	17.2
AVERAGE	12	9.5	9.8
FAIR	7	5.6	5.7
POOR	2	1.6	1.6
UNDECIDED	24	19.0	19.7
NO OPINION	36	28.6	29.5
MISCELLANEOUS	4	3.2	3.3
	4	3.2	MISSING
TOTAL	126	100.0	100.0

WHAT IS YOUR PRESENT OCCUPATION?

	ABSOLUTE FREQUENCY	RELATIVE FREQUENCY (PERCENT)	ADJUSTED FREQUENCY (PERCENT)
PROFESSIONAL	3	2.4	2.4
FARMER	13	10.3	10.4
MANAGER	5	4.0	4.0
CLERICAL	14	11.1	11.2
SALES	4	3.2	3.2
CRAFTSMAN	15	11.9	12.0
BLUE COLLAR	11	8.7	8.8
SERVICE	9	7.1	7.2
STUDENT	3	2.4	2.4
HOUSEWIFE	24	19.0	19.2
RETIRED	16	12.7	12.8
MILITARY	2	1.6	1.6
UNEMPLOYED	6	4.8	4.8
	1	0.8	MISSING
TOTAL	126	100.0	100.0

DO YOU IDENTIFY WITH ANY GROUPS?

	ABSOLUTE FREQUENCY	RELATIVE FREQUENCY (PERCENT)	ADJUSTED FREQUENCY (PERCENT)
SOCIAL	6	4.8	4.8
PUBLIC AFFAIRS	8	6.3	6.4
CHURCH GROUPS	12	9.5	9.6
MISCELLANEOUS	13	10.3	10.4
NO SPECIFIC GROUP	86	68.3	68.8
	1	0.8	MISSING
TOTAL	126	100.0	100.0

POST LICENSING CASE STUDY - WATERFORD, CONNECTICUT SURVEY

YEARS LIVED IN WATERFORD

	ABSOLUTE FREQUENCY	RELATIVE FREQUENCY (PERCENT)	ADJUSTED FREQUENCY (PERCENT)
0 TO 4 YEARS	23	12.6	12.8
5 TO 9 YEARS	27	14.8	15.1
10+ YEARS	129	70.9	72.1
	3	1.6	MISSING
TOTAL	182	100.0	100.0

SHOULD WATERFORD ENCOURAGE GROWTH?

	ABSOLUTE FREQUENCY	RELATIVE FREQUENCY (PERCENT)	ADJUSTED FREQUENCY (PERCENT)
YES	127	69.8	70.9
NO	52	28.6	29.1
	3	1.6	MISSING
TOTAL	182	100.0	100.0

HAS NUCLEAR PLANT AFFECTED YOUR LIFE?

	ABSOLUTE FREQUENCY	RELATIVE FREQUENCY (PERCENT)	ADJUSTED FREQUENCY (PERCENT)
YES	72	39.6	40.0
NO	108	59.3	60.0
	2	1.1	MISSING
TOTAL	182	100.0	100.0

WOULD YOU PERMIT CONSTRUCTION AGAIN?

	ABSOLUTE FREQUENCY	RELATIVE FREQUENCY (PERCENT)	ADJUSTED FREQUENCY (PERCENT)
YES	159	87.4	93.5
NO	11	6.0	6.5
	12	6.6	MISSING
TOTAL	182	100.0	100.0

DO YOU FEEL CLOSE TO NEWCOMERS?

	CODE	ABSOLUTE FREQUENCY	RELATIVE FREQUENCY (PERCENT)	ADJUSTED FREQUENCY (PERCENT)
NOT CLOSE AT ALL	1	31	17.0	17.4
	2	14	7.7	7.9
	3	15	8.2	8.4
	4	1	0.5	0.6
	5	30	16.5	16.9
	6	23	12.6	12.9
	7	6	3.3	3.4
	8	23	12.6	12.9
	9	14	7.7	7.9
VERY CLOSE	10	21	11.5	11.8
		4	2.2	MISSING
	TOTAL	182	100.0	100.0

DO YOU FEEL CLOSE TO OTHER NEIGHBORHOODS

	CODE	ABSOLUTE FREQUENCY	RELATIVE FREQUENCY (PERCENT)	ADJUSTED FREQUENCY (PERCENT)
NOT CLOSE AT ALL	1	20	11.0	11.2
	2	7	3.8	3.9
	3	6	3.3	3.4
	4	6	3.3	3.4
	5	33	18.1	18.5
	6	22	12.1	12.4
	7	9	4.9	5.1
	8	16	8.8	9.0
	9	30	16.5	16.9
VERY CLOSE	10	29	15.9	16.3
		4	2.2	MISSING
	TOTAL	182	100.0	100.0

DO YOU FEEL CLOSE TO PUBLIC OFFICIALS?

	CODE	ABSOLUTE FREQUENCY	RELATIVE FREQUENCY (PERCENT)	ADJUSTED FREQUENCY (PERCENT)
NOT CLOSE AT ALL	1	44	24.2	25.3
	2	24	13.2	13.8
	3	15	8.2	8.6
	4	15	8.2	8.6
	5	24	13.2	13.8
	6	19	10.4	10.9
	7	6	3.3	3.4
	8	5	2.7	2.9
	9	10	5.5	5.7
VERY CLOSE	10	12	6.6	6.9
		8	4.4	MISSING
	TOTAL	182	100.0	100.0

DO YOU FEEL CLOSE TO OTHER OCCUPATIONS?

	CODE	ABSOLUTE FREQUENCY	RELATIVE FREQUENCY (PERCENT)	ADJUSTED FREQUENCY (PERCENT)
NOT CLOSE AT ALL	1	6	3.3	3.4
	2	12	6.6	6.7
	3	11	6.0	6.1
	4	5	2.7	2.8
	5	14	7.7	7.8
	6	19	10.4	10.6
	7	13	7.1	7.3
	8	26	14.3	14.5
	9	20	11.0	11.2
VERY CLOSE	10	53	29.1	29.6
		3	1.6	MISSING
	TOTAL	182	100.0	100.0

DO YOU FEEL CLOSE TO NEW LONDON?

	CODE	ABSOLUTE FREQUENCY	RELATIVE FREQUENCY (PERCENT)	ADJUSTED FREQUENCY (PERCENT)
NOT CLOSE AT ALL	1	18	9.9	10.1
	2	17	9.3	9.5
	3	7	3.8	3.9
	4	7	3.8	3.9
	5	18	9.9	10.1
	6	13	7.1	7.3
	7	16	8.8	8.9
	8	15	8.2	8.4
	9	17	9.3	9.5
VERY CLOSE	10	51	28.0	28.5
		3	1.6	MISSING
	TOTAL	182	100.0	100.0

WHAT IS YOUR AGE?

	ABSOLUTE FREQUENCY	RELATIVE FREQUENCY (PERCENT)	ADJUSTED FREQUENCY (PERCENT)
18 TO 29	14	7.7	8.0
30 TO 39	36	19.8	20.7
40 TO 49	50	27.5	28.7
50+	74	40.7	42.5
	8	4.4	MISSING
TOTAL	182	100.0	100.0

DO YOU IDENTIFY WITH ANY GROUPS?

	ABSOLUTE FREQUENCY	RELATIVE FREQUENCY (PERCENT)	ADJUSTED FREQUENCY (PERCENT)
YES	61	33.5	34.5
NO	116	63.7	65.5
	5	2.7	MISSING
TOTAL	182	100.0	100.0

SEX OF RESPONDENT

	ABSOLUTE FREQUENCY	RELATIVE FREQUENCY (PERCENT)	ADJUSTED FREQUENCY (PERCENT)
MALE	84	46.2	46.7
FEMALE	96	52.7	53.3
	2	1.1	MISSING
TOTAL	182	100.0	100.0

WHERE WAS YOUR PREVIOUS RESIDENCE?

	ABSOLUTE FREQUENCY	RELATIVE FREQUENCY (PERCENT)	ADJUSTED FREQUENCY (PERCENT)
IN CONN	37	20.3	20.3
OTHER	17	9.3	9.3
WATERFORD 10+	128	70.3	70.3
TOTAL	182	100.0	100.0

WHY DID YOU DECIDE TO MOVE TO WATERFORD?

	ABSOLUTE FREQUENCY	RELATIVE FREQUENCY (PERCENT)	ADJUSTED FREQUENCY (PERCENT)
FAMILY	10	5.5	18.5
JOB	12	6.6	22.2
ECONOMIC	3	1.6	5.6
ATTRACTIVENESS	16	8.8	29.6
HOUSING	13	7.1	24.1
	128	70.3	MISSING
TOTAL	182	100.0	100.0

SECOND REASON FOR MOVING TO WATERFORD

	ABSOLUTE FREQUENCY	RELATIVE FREQUENCY (PERCENT)	ADJUSTED FREQUENCY (PERCENT)
JOB	6	3.3	40.0
ECONOMIC	1	0.5	6.7
ATTRACTIVENESS	2	1.1	13.3
HOUSING	3	1.6	20.0
MISCELLANEOUS	3	1.6	20.0
	167	91.8	MISSING
TOTAL	182	100.0	100.0

HAS WATERFORD CHANGED SINCE YOU MOVED?

	ABSOLUTE FREQUENCY	RELATIVE FREQUENCY (PERCENT)	ADJUSTED FREQUENCY (PERCENT)
GROWTH	13	7.1	31.0
NO CHANGES	23	12.6	54.8
MISCELLANEOUS	6	3.3	14.3
	140	76.9	MISSING
TOTAL	182	100.0	100.0

SECOND RESPONSE CONCERNING CHANGES

	ABSOLUTE FREQUENCY	RELATIVE FREQUENCY (PERCENT)	ADJUSTED FREQUENCY (PERCENT)
GROWTH	5	2.7	55.6
MISCELLANEOUS	4	2.2	44.4
	173	95.1	MISSING
TOTAL	182	100.0	100.0

HOW IS WATERFORD AS A PLACE TO LIVE?

	ABSOLUTE FREQUENCY	RELATIVE FREQUENCY (PERCENT)	ADJUSTED FREQUENCY (PERCENT)
EXCELLENT	82	45.1	46.9
GOOD	55	30.2	31.4
AVERAGE	7	3.8	4.0
FAIR	1	0.5	0.6
POOR	7	3.8	4.0
ATTRACTIVE	22	12.1	12.6
MISCELLANEOUS	1	0.5	0.6
	7	3.8	MISSING
TOTAL	182	100.0	100.0

WHAT DO YOU LIKE ABOUT WATERFORD?

	ABSOLUTE FREQUENCY	RELATIVE FREQUENCY (PERCENT)	ADJUSTED FREQUENCY (PERCENT)
GOOD PLACE TO WORK	4	2.2	2.3
GOOD NEIGHBORHOOD	5	2.7	2.9
EVERYTHING	17	9.3	9.9
LOW TAXES	32	17.6	18.6
SCHOOLS	26	14.3	15.1
QUIET - PEACEFUL	13	7.1	7.6
PEOPLE	5	2.7	2.9
RURAL ATMOSPHERE	13	7.1	7.6
LOCATION	26	14.3	15.1
MISCELLANEOUS	31	17.0	18.0
	10	5.5	MISSING
TOTAL	182	100.0	100.0

SECOND RESPONSE CONCERNING LIKES

	ABSOLUTE FREQUENCY	RELATIVE FREQUENCY (PERCENT)	ADJUSTED FREQUENCY (PERCENT)
LOW TAXES	18	9.9	15.8
SCHOOLS	14	7.7	12.3
QUIET - PEACEFUL	3	1.6	2.6
PEOPLE	8	4.4	7.0
RURAL ATMOSPHERE	6	3.3	5.3
GOOD GOVERNMENT	4	2.2	3.5
POLICE - FIRE	4	2.2	3.5
LOCATION	18	9.9	15.8
RIVER	6	3.3	5.3
SERVICES	5	2.7	4.4
MISCELLANEOUS	28	15.4	24.6
	68	37.4	MISSING
TOTAL	182	100.0	100.0

WHAT DO YOU DISLIKE ABOUT WATERFORD?

	ABSOLUTE FREQUENCY	RELATIVE FREQUENCY (PERCENT)	ADJUSTED FREQUENCY (PERCENT)
NO DISLIKES	74	40.7	46.2
SEWAGE	11	6.0	6.9
TRAFFIC	12	6.6	7.5
POLITICIANS	10	5.5	6.3
MISCELLANEOUS	53	29.1	33.1
	22	12.1	MISSING
TOTAL	182	100.0	100.0

SECOND RESPONSE CONCERNING DISLIKES

	ABSOLUTE FREQUENCY	RELATIVE FREQUENCY (PERCENT)	ADJUSTED FREQUENCY (PERCENT)
MISCELLANEOUS	17	9.3	100.0
	165	90.7	MISSING
TOTAL	182	100.0	100.0

WHAT CHANGES WOULD YOU MAKE IN WATERFORD

	ABSOLUTE FREQUENCY	RELATIVE FREQUENCY (PERCENT)	ADJUSTED FREQUENCY (PERCENT)
COMMUNICATION	42	23.1	26.4
BETTER SCHOOLS	14	7.7	8.8
GOVERNMENT	10	5.5	6.3
COMMUNITY CENTER	9	4.9	5.7
SEWERAGE	25	13.7	15.7
MISCELLANEOUS	59	32.4	37.1
	23	12.6	MISSING
TOTAL	182	100.0	100.0

SECOND RESPONSE CONCERNING CHANGES

	ABSOLUTE FREQUENCY	RELATIVE FREQUENCY (PERCENT)	ADJUSTED FREQUENCY (PERCENT)
COMMUNITY CENTER	11	6.0	29.7
SEWERAGE	5	2.7	13.5
MISCELLANEOUS	21	11.5	56.8
	145	79.7	MISSING
TOTAL	182	100.0	100.0

WATERFORD AS A PLACE FOR YOUNG MARRIEDS

	ABSOLUTE FREQUENCY	RELATIVE FREQUENCY (PERCENT)	ADJUSTED FREQUENCY (PERCENT)
EXCELLENT	67	36.8	38.5
GOOD	73	40.1	42.0
AVERAGE	25	13.7	14.4
FAIR	5	2.7	2.9
POOR	4	2.2	2.3
	8	4.4	MISSING
TOTAL	182	100.0	100.0

WATERFORD AS A PLACE FOR THE ELDERLY

	ABSOLUTE FREQUENCY	RELATIVE FREQUENCY (PERCENT)	ADJUSTED FREQUENCY (PERCENT)
EXCELLENT	33	18.1	19.2
GOOD	53	29.1	30.8
AVERAGE	57	31.3	33.1
FAIR	20	11.0	11.6
POOR	9	4.9	5.2
	10	5.5	MISSING
TOTAL	182	100.0	100.0

WATERFORD AS A PLACE FOR CHILDREN

	ABSOLUTE FREQUENCY	RELATIVE FREQUENCY (PERCENT)	ADJUSTED FREQUENCY (PERCENT)
EXCELLENT	72	39.6	40.2
GOOD	90	49.5	50.3
AVERAGE	15	8.2	8.4
FAIR	2	1.1	1.1
	3	1.6	MISSING
TOTAL	182	100.0	100.0

WHY SHOULD WATERFORD GROW?

	ABSOLUTE FREQUENCY	RELATIVE FREQUENCY (PERCENT)	ADJUSTED FREQUENCY (PERCENT)
SLOW - PLANNED	28	15.4	23.5
IMPROVE TAXES	15	8.2	12.6
MORE BUSINESS	13	7.1	10.9
ROOM TO DEVELOP	10	5.5	8.4
GROWTH IS GOOD	37	20.3	31.1
MISCELLANEOUS	16	8.8	13.4
	63	34.6	MISSING
TOTAL	182	100.0	100.0

WHY SHOULD WATERFORD NOT GROW?

	ABSOLUTE FREQUENCY	RELATIVE FREQUENCY (PERCENT)	ADJUSTED FREQUENCY (PERCENT)
TOO MUCH GROWTH NOW	5	2.7	9.6
SPOILS BEAUTY	5	2.7	9.6
GOOD AS IT IS	22	12.1	42.3
AVOID OVERCROWDING	6	3.3	11.5
MISCELLANEOUS	14	7.7	26.9
	130	71.4	MISSING
TOTAL	182	100.0	100.0

HOW HAS NUCLEAR PLANT AFFECTED YOUR LIFE

	ABSOLUTE FREQUENCY	RELATIVE FREQUENCY (PERCENT)	ADJUSTED FREQUENCY (PERCENT)
LOWER TAXES	39	21.4	54.2
EMPLOYED AT PLANT	10	5.5	13.9
ECONOMIC BENEFITS	4	2.2	5.6
CONCERNED - SAFETY	5	2.7	6.9
MORE TRAFFIC	5	2.7	6.9
MISCELLANEOUS	9	4.9	12.5
	110	60.4	MISSING
TOTAL	182	100.0	100.0

SECOND RESPONSE CONCERNING EFFECTS

	ABSOLUTE FREQUENCY	RELATIVE FREQUENCY (PERCENT)	ADJUSTED FREQUENCY (PERCENT)
MISCELLANEOUS	5	2.7	100.0
	177	97.3	MISSING
TOTAL	182	100.0	100.0

PLANT'S POSITIVE EFFECTS ON YOUR JOB

	ABSOLUTE FREQUENCY	RELATIVE FREQUENCY (PERCENT)	ADJUSTED FREQUENCY (PERCENT)
NO EFFECT	55	30.2	75.3
LITTLE EFFECT	2	1.1	2.7
SOME EFFECT	4	2.2	5.5
GREAT EFFECT	12	6.6	16.4
	109	59.9	MISSING
TOTAL	182	100.0	100.0

PLANT'S NEGATIVE EFFECTS ON YOUR JOB

	ABSOLUTE FREQUENCY	RELATIVE FREQUENCY (PERCENT)	ADJUSTED FREQUENCY (PERCENT)
	182	100.0	MISSING
TOTAL	182	100.0	100.0

PLANT'S POSITIVE EFFECTS ON WATERFORD

	ABSOLUTE FREQUENCY	RELATIVE FREQUENCY (PERCENT)	ADJUSTED FREQUENCY (PERCENT)
NO EFFECT	45	24.7	65.2
LITTLE EFFECT	1	0.5	1.4
SOME EFFECT	17	9.3	24.6
GREAT EFFECT	6	3.3	8.7
	113	62.1	MISSING
TOTAL	182	100.0	100.0

PLANT'S NEGATIVE EFFECTS ON WATERFORD

	ABSOLUTE FREQUENCY	RELATIVE FREQUENCY (PERCENT)	ADJUSTED FREQUENCY (PERCENT)
SOME EFFECT	4	2.2	80.0
GREAT EFFECT	1	0.5	20.0
	177	97.3	MISSING
TOTAL	182	100.0	100.0

POSITIVE OR NEUTRAL SAFETY EFFECTS

	ABSOLUTE FREQUENCY	RELATIVE FREQUENCY (PERCENT)	ADJUSTED FREQUENCY (PERCENT)
NO EFFECT	35	19.2	58.3
LITTLE EFFECT	1	0.5	1.7
UNDECIDED	1	0.5	1.7
NO DANGER	23	12.6	38.3
	122	67.0	MISSING
TOTAL	182	100.0	100.0

PLANT'S NEGATIVE SAFETY EFFECTS

	ABSOLUTE FREQUENCY	RELATIVE FREQUENCY (PERCENT)	ADJUSTED FREQUENCY (PERCENT)
SOME EFFECT	6	3.3	40.0
FEEL UNSAFE	9	4.9	60.0
	167	91.8	MISSING
TOTAL	182	100.0	100.0

WHY WOULD YOU PERMIT CONSTRUCTION AGAIN?

	ABSOLUTE FREQUENCY	RELATIVE FREQUENCY (PERCENT)	ADJUSTED FREQUENCY (PERCENT)
CHEAPER POWER	15	8.2	9.7
LOWER TAXES	33	18.1	21.3
THINK PLANT IS SAFE	6	3.3	3.9
SEVERAL REASONS	12	6.6	7.7
NO BAD EFFECTS	17	9.3	11.0
ECONOMIC BENEFIT	15	8.2	9.7
MORE JOBS	20	11.0	12.9
NO SPECIFIC REASON	8	4.4	5.2
NECESSARY	6	3.3	3.9
LIMITED EXPANSION	6	3.3	3.9
MISCELLANEOUS	17	9.3	11.0
	27	14.8	MISSING
TOTAL	182	100.0	100.0

WHY WOULD YOU NOT PERMIT CONSTRUCTION?

	ABSOLUTE FREQUENCY	RELATIVE FREQUENCY (PERCENT)	ADJUSTED FREQUENCY (PERCENT)
PERSONAL DANGER	6	3.3	54.5
MISCELLANEOUS	5	2.7	45.5
	171	94.0	MISSING
TOTAL	182	100.0	100.0

YOUR FEELINGS ABOUT NORTHEAST UTILITIES

	ABSOLUTE FREQUENCY	RELATIVE FREQUENCY (PERCENT)	ADJUSTED FREQUENCY (PERCENT)
EXCELLENT	1	0.5	0.6
VERY GOOD	19	10.4	11.3
GOOD	36	19.8	21.4
AVERAGE	34	18.7	20.2
FAIR	9	4.9	5.4
POOR	6	3.3	3.6
NO OPINION	23	12.6	13.7
MISCELLANEOUS	40	22.0	23.8
	14	7.7	MISSING
TOTAL	182	100.0	100.0

WHAT IS YOUR PRESENT OCCUPATION?

	ABSOLUTE FREQUENCY	RELATIVE FREQUENCY (PERCENT)	ADJUSTED FREQUENCY (PERCENT)
PROFESSIONAL	29	15.9	16.1
MANAGER	4	2.2	2.2
CLERICAL	13	7.1	7.2
SALES	10	5.5	5.6
CRAFTSMAN	22	12.1	12.2
BLUE COLLAR	12	6.6	6.7
SERVICE	8	4.4	4.4
OTHER LABOR	3	1.6	1.7
STUDENT	1	0.5	0.6
HOUSEWIFE	59	32.4	32.8
RETIRED	16	8.8	8.9
MILITARY	1	0.5	0.6
UNEMPLOYED	2	1.1	1.1
	2	1.1	MISSING
TOTAL	182	100.0	100.0

DO YOU IDENTIFY WITH ANY GROUPS?

	ABSOLUTE FREQUENCY	RELATIVE FREQUENCY (PERCENT)	ADJUSTED FREQUENCY (PERCENT)
SOCIAL	15	8.2	8.3
PUBLIC SERVICE	12	6.6	6.7
CHURCH GROUP	16	8.8	8.9
MISCELLANEOUS	20	11.0	11.1
NO SPECIFIC GROUP	117	64.3	65.0
	2	1.1	MISSING
TOTAL	182	100.0	100.0