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MARCH 1972

industrial development and the college of marine studies operations in lewes, delaware

REPORT NO. DEL-SG-2-72

SEA GRANT GH-109

UNIVERSITY OF DELAWARE
NEWARK, DELAWARE 19711

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The University of Delaware's Marine research facilities located in Lewes, Delaware may well act as a catalyst in attracting supportive and related industrial development to the area. It is the purpose of this report to analyze the development that is probable, and further, to predict the impact of this growth upon the town of Lewes and its immediate environs. At the outset it must be made clear that development that cannot be classified as "industrial" as such, must be considered also, for non-industrial growth (educational facilities, tourism and the like) must necessarily have an impact upon the locality.

The Oceans and Economic Development

The economic growth of the United States has always been closely tied to the oceans. Before the Revolutionary War, the new England colonies developed as fishing and trading centers. Among the first businessmen in America were merchants who extracted the wealth of the sea and traded these fish products with the West Indies and Europe to obtain products essential to the developing economy. After the War for Independence, the infant nation obtained the needed investment capital for industrial development from foreign trade. Important merchants such as Elias Hasket Derby of Salem were essential to the early economic growth of this country.

Today the United States still depends heavily upon the oceans. Industry and government are spending considerable sums of money on ocean exploration and development. It is often noted that the oceans represent the last great area for economic exploration on the earth. However, the complexity of the marine environment makes ocean exploration and development extremely difficult. Much effort and money must be exerted to expand marine knowledge and technology. The expected benefits of added research and

development expenditures include improved harbors, better recreational facilitie more efficient sea transportation, more and better food for an expanding world population, increased mineral resources, and many others.

Many types of American businesses are involved in various aspects of the marine industry. These range from traditional fishing and shipping companies to giant petroleum firms with large offshore drilling platforms. The untapped potential of the oceans provides many opportunities for diversification and profits. However, business development cannot be unrestricted or poorly planned. Unchecked growth and development will lead to foolish waste and the destruction of our natural ocean environment.

In recent years, many new companies have been formed to conduct ocean research and engineering, and to develop and manufacture instruments and equipment for ocean applications. Also, a number of companies, in particular some large aerospace firms, have become involved in military oceanography, especially submarine and anti-submarine warfare. Current estimates of the total oceanic market exceed $25 billion, as shown in Table 1.

Recent industrial growth and development of the ocean environment have been stimulated by increased interest in and support of the marine sciences. Beginning in the 1920's, the science of oceanography first concentrated in three geographical areas: Massachusetts, Washington, and California; and three strong marine science institutions emerged: Woods Hole Oceanographic Center, University of Washington's Oceanographic Laboratory, and Scripps Institution of Oceanography World War II led to further development of these and similar institutions.

Since the 1940's, an even greater expansion of oceanographic research and development has taken place. In the latter part of the 1950's, reports from the National Academy of Sciences and the U.S. Navy highlighted the

TABLE 1

THE UNITED STATES OCEANIC MARKET - 1969
(in millions of dollars)

General Expenditures	
Commercial Shipping	6,000
Marine Recreation	5,000
Defense	4,000
Shipbuilding	2,200
Offshore leases, exploration, production	2,000
Marine instrumentation	500
Waste disposal and control	400
Harbors, ports, waterways, beaches	350
Other non-military activities	50
Subtotal	20,500
Marine Science and Technology Expenditures	
Military research and development	2,000
Civilian science and technology	1,000
Subtotal	3,000
Value of Extracted Resources	
Offshore oil	1,000
Commercial fisheries	400
Offshore gas	300
Offshore minerals	300
Aquaculture harvesting	50
Desalting ocean water	10
Subtotal	2,060
Grand Total	25,560

Source: Victor J. Danilow, "How Much for Oceanology?" Oceanology International, (Vol. 4, June 15, 1969) p. 13.

importance of our underdeveloped marine resources. These and further studies culminated in the Marine Resources and Engineering Development Act of 1966. The Act expressed a conviction that the United States must give serious consideration to its marine environment. Two complementary agencies--the National Council on Marine Resources and Engineering Development and the Commission on Marine Science, Engineering, and Resources--were created to plan and coordinate the steps necessary to stimulate marine exploration, science, technology, and investment.

In order to carry out a major national effort, large numbers of well-educated, well-trained people will be needed. The National Sea Grant College and Program Act of 1966 was passed also to provide assistance for ocean-related research and education.

In its planning report, the Commission on Marine Science, Engineering and Resources points to a long, hard path to economic development of the ocean's resources. An ambitious $8 billion program is recommended for the decade of the 1970's.[1] However, the commission warns:

> The growth of scientific understanding of the world oceans will not be accomplished quickly or easily even with the greatly expanded effort recommended. The seas are vast, complex, subtle, and often hostile to man and his works. They will not yield their secrets in a decade or a generation. But, with determination and imagination understanding of ocean processes will increase continually, stimulating corresponding growth in the nation's capability to use and harvest and seas.[2]

To summarize, the resources of the sea offer the potential of long-term economic growth and development. To encourage ocean-oriented industries, the government has undertaken a major marine science program. The estimated Federal expenditures for fiscal years 1970, 1971, and 1972 are shown in Tables 2 and 3. The direct participation by government and industry in marine

TABLE 2

FEDERAL MARINE SCIENCE PROGRAM BY DEPARTMENT AND INDEPENDENT AGENCY[a]
(in millions of dollars)

	Estimated fiscal year 1970	Estimated fiscal year 1971	President's budget fiscal year 1972
Department of Defense	263.7	224.9	245.8
Department of Commerce[b]	118.3	140.9	161.5
Department of Interior	29.2	30.3	33.8
National Science Foundation	30.3	48.9	68.8
Department of Transportation	23.4	27.3	53.5
Atomic Energy Commission	9.5	8.6	8.7
Department of Health, Education, and Welfare	6.5	6.7	6.0
Department of State	7.7	8.3	8.8
Agency for International Development	2.3	0.5	0.5
Smithsonian Institute	1.9	2.4	3.1
National Aeronautics and Space Administration	2.3	2.1	2.0
Environmental Protection Agency	18.2	17.6[c]	17.0[c]
Total	513.3	518.5	609.1

[a]Many programs of the Departments of Defense, Commerce, Interior, and Transportation, and other agencies closely related to marine sciences are not included.

[b]Program elements of the Departments of Defense, Interior, and Transportation and the National Science Foundation were transferred to the Department of Commerce, National Oceanic and Atmospheric Administration.

[c]Does not include funds requested to implement new programs proposed in the President's Environmental Message of February 8, 1971.

Source: Marine Science Affairs, Annual Report of the President to the Congress on Marine Resources and Engineering Development. U.S. Government Printing Office, April 1971, p. 91.

TABLE 3

FEDERAL MARINE SCIENCE PROGRAM
BY MAJOR PURPOSE[a]
(in millions of dollars)

	Estimated fiscal year 1970	Estimated fiscal year 1971	President's budget fiscal year 1972
1. International Cooperation and Collaboration	10.0	8.8	9.3
2. National Security	127.0	101.5	116.2
3. Fishery Development and Seafood Technology	49.8	50.8	52.1
4. Transportation	23.5	36.1	61.8
5. Development of the Coastal Zone	43.5	45.8	48.5
6. Health	5.4	5.9	5.9
7. Non-Living Resources	10.5	10.6	11.5
8. Oceanographic Research	78.4	104.4	131.4
9. Education	8.2	7.8	7.2
10. Environmental Observation and Prediction	39.8	41.1	52.3
11. Ocean Exploration, Mapping, Charting and Geodesy	89.9	73.3	78.9
12. General Purpose Ocean Engineering	24.7	29.4	30.5
13. National Data Centers	2.6	3.0	3.5
Total	513.3	518.5	609.1

[a]Many programs of the Departments of Defense, Commerce, Interior and Transportation and other agencies closely related to marine science are not included.

Source: Marine Science Affairs, Annual Report of the President to the Congress on Marine Resources and Engineering Development. U.S. Government Printing Office, April 1971, p. 92.

science will guarantee an attractive future for university-related research and educational facilities.

If, as this section indicates, there is a significant growth potential associated with marine research, then the geographic areas that are dedicated to this research should feel the impact of this growth. The remainder of this report will explore the town of Lewes, Delaware and the growth effects that may be expected in the area.

A Brief Economic History of Lewes, Delaware

The first economic venture in Lewes, Delaware was undertaken in 1622 by the Dutch West Indies Company. The operation was a trading post to carry on trade with the Indians and was later abandoned. In 1630 Captain David Pietersen DeVries intended to establish a whale and seal fishery along the coast. An exploratory expedition was sent under the command of Peter Heyes, and in April of 1630 a party of 38 persons landed near what is now the Lewes Rehoboth Canal. Because of the abundance of swans and water fowl they named the settlement "Zwanendael" (Valley of the Swans). The village population was massacred by the Indians in 1632. From this first attempt by DeVries to establish a fishery to the present, Lewes has been primarily a fishing- and marine-oriented economy. The fishing industry has been supplemented by smaller industries throughout the years, but the surrounding waters still provide a major economic draw.

In 1662 Peter Cornelis Plockhoy, a Dutch Mennonite, started a new community and made the first treaty with the Indians. In 1664 Sir Robert Carr conquered the colony and transferred it to British rule. Upon the arrival of William Penn and the English in 1682, a concentrated effort was

made to transform Lewes into a merchant port. In the 1700's the town went through a gradual growth period. The primary industry was still fishing, and a trading post also thrived. Lewes had also become a residence for ship pilots who guided the trading vessels to and from the harbor. Also about this time the shipbuilding industry was starting to grow.

From the 1800's to the advent of the railroad (1870), the growth rate of Lewes in terms of population and economic activity was relatively low. Economic growth began to occur again about 1870 when the Junction and Breakwater Railroad came to Lewes. J. Thomas Scharf evaluates this period of time by the following:

> For many years the manufacturing interests of Lewes were limited to the ordinary trades, and it was not until the railroad shops were here located that the industrial life of the place was quickened into greater activity. After these were in operation, other enterprises were begun and some have been successfully continued. The repair-shops gave employment to about 50 men until their removal to Georgetown in 1884. . . . (When the repair shops left Lewes, it . . .) seriously affected the commercial prosperity of the Town.[3]

The railroad remained, and helped to encourage economic growth. It stimulated the commercial growing of fruits and vegetables to supply the growing city markets. In the 1880's a fruit processing plant was established in Lewes. A few grain mills opened in the 1880's, but their tenure was short-lived. About this time, the shipbuilding industry began to decline. In 1887 the oldest tin-handled brush factory in the United States was started and is still in operation. In the 1880's an iron pier was erected near Cape Henlopen, and this led to the building of factories in 1883 for the extraction of oil from the menhaden and other fish that abounded in the surrounding waters.

During the 1900's Lewes continued to rely upon its fish industry. It attracted firms such as the Fish Products Company and the Consolidated Fisheries Company. A poultry processing plant was established in the 1940's but later moved inland. The growth in popularity of pleasure boats after World War II helped to stimulate the tourist trade.

Throughout its past, Lewes has experienced very little industrial growth with the exception of the fishing industry. As a result of this lack of industrial opportunities and the decline of the fishing industry, the economy of Lewes has suffered from a lack of diversification. It is what might be classified as a "one-crop" economy, and when the crop fails, so does the economy.

The Present Economy of Lewes

Using employment as an economic indicator of the activity that is currently taking place in Lewes reveals some interesting characteristics of that economy.

Latest estimates of employment in Lewes show a year-round employment level of 1,000 persons which increases to 1,300 workers during the summer tourist season. At the time the employment survey was taken, there were 597 of the year-round employees engaged in some form of manufacturing. Thus, roughly 6 of every 10 Lewes workers were hired by manufacturing firms. The remaining 400 workers were in support operations such as retail trade, government, professions, banking and the like. Table 4 indicates the major employers at the time of the survey and the number of employees.

Between the time the employment survey was taken (1968) and the present, several significant changes have taken place.

TABLE 4

EMPLOYMENT IN LEWES

Name of Firm	Employees
Bookhammer Lumber Mills	17
Delaware Coast Press	1
Doxsee, Inc.	296
Faust Sheetmetal Works, Inc.	35
Fish Products Company	30
The Foley Corporation	21
Graves Block and Supply Co.	1
H. W. Hocker Co., Inc.	4
Inductor Engineering, Inc.	25
Lewes Boat Yard	2
Lewes Dairy, Inc.	19
Lewes Sand Co.	1
Fred L. Myers Co., Inc.	6
Price Packing Co.	44
Sussex Sportswear, Inc.	90
Vessels Co.	5
TOTAL	597

1. The Price Packing Company has closed down: Loss, 44 jobs.
2. Sussex Sportswear, Inc. has closed down: Loss, 90 jobs.
3. Fish Products Company has closed down: Loss, 30 jobs.
4. Doxsee, Inc., Plant burned down, rebuilt, but modern equipment reduces need for labor. Company reluctant to reveal current labor force except to say it is lower.

So, in three years the number of manufacturing jobs in Lewes declined by something more than 165. This loss is more than 25 percent and must have a profound effect upon an economy the size of Lewes. In addition, incoming manufacturers such as Barcroft with 32 employees have not taken up the job slack. Granted, the 90 jobs lost with the closing of Sussex Sportswear were probably mainly a secondary source of income for the families involved, but nevertheless the loss of payrolls and income had to be felt.

It was mentioned earlier in this section that it is estimated that some 300 persons join the year-round employed in Lewes in order to accommodate the summer residents and tourists who enjoy their recreation in the area each year. These visitors to the area are discussed in the following section.

Tourism in Lewes

One income-producing area activity that has shown a marked growth is tourism. While not an industry in the sense of producing or assembling a product, tourism nevertheless brings money into the area from other states and the northern portion of Delaware.

Unfortunately, accurate records or for that matter even crude estimates of past tourist and summer visitors to Lewes are not available. It has long been proposed that accurate data be obtained and kept current

relative to the impact of tourism on the Delaware economy, but as of this writing nothing along these lines has been accomplished.

The State Planning Office has, however, arrived at some estimates (by their own admission a "cautious exercise") that can be used to throw some light on the impact of this industry. The Planning Office report on population for Lewes estimated that the seasonal population in Lewes for the average summer day was 2,806 persons in 1968. The figure was then broken down as follows:

1,778 summer residents

1,028 overnight visitors

2,806 total

For the purpose of the report, summer residents are those persons who occupy a seasonal dwelling for longer than one week. Both owners and renters of summer cottages are included. Overnight visitors are those persons who occupy transient facilities for any period from one night to one week. These include vacationers, weekenders, and campers. It can be seen then that the influx of persons to Lewes on the average summer day exceeds the non-seasonal population. But what of the future trends? The same report goes on to estimate the following:

Year	Summer residents	Overnight visitors	Totals
1970	1,955	1,330	3,085
1980	2,844	1,644	4,488
1990	4,264	2,466	6,730

These estimates are justified by The Planning Office through certain observations that were made. First, the development of Lewes Beach would create a

potential attraction for both summer residents and overnight visitors. Second, the Lewes environment allows for a unique experience, taking into consideration the Bay as a recreation area, the proximity of the ocean, and the Henlopen State Park. Third, as Rehoboth Beach, Bethany Beach, and Fenwick Island reach a saturation point vis-à-vis the summer population (which is a possibility during the next twenty years) Lewes would then become quite attractive as a summer resort, more so than it is now.

Sources of Employment

An analysis of the labor force and employment opportunities provides a basis for determining the economic trends in Lewes. The following tables shed some light on the total population trends and the population trends of the labor force (15-64 age group).

TABLE 5

TOTAL POPULATION

Year	Number	Average Annual Percent Change
1940	2,246	-
1950	2,904	2.9
1960	3,025	0.4
1967	2,661	-1.7

TABLE 6

LABOR FORCE POPULATION
(15-64 age group)

Year	Number	Percent of Total Population	Average Annual Percent Change
1940	1,505	67.0	-
1950	1,806	62.2	2.0
1960	1,885	58.7	-0.2
1967	1,574	59.2	-1.6

These data indicate that not only has the total population tended to stabilize but the work force is a declining proportion of the total population. Perhaps this can be explained, at least in part, by the comment of a prominent Sussex Countian: when asked what the export base of Sussex County was, he said without hesitation "Our children." There are few job opportunities in Lewes, so as the young persons arrive at an employable age, they move out.

In summary, the economic history of Lewes shows an evolution from a marine-oriented beginning, through an agricultural cycle, and back to the water. It is the water that attracts the tourists who provide a substantial portion of the economic base of the town, and it is also the water that has attracted the operations of the College of Marine Studies of the University of Delaware.

Lewes and the Demand for Services

The town of Lewes appears to be in a position to absorb growth of economic activity when that growth occurs. There are several possible "soft spots" or questionable areas, but they should not present unsurmountable problems. A review of the physical facilities of Lewes will serve to clarify the position of the town as a supplier of services.

1. Power There does not appear to be any problem attending economic growth so far as power supply is concerned. The municipality-owned and -distributed electric supply is adequate for the power needs of the present and the immediate future. In addition, should rapid and substantial growth take place, the town would have the option of purchasing electric power from the Delmarva Power and Light Company and reselling this power to the consumers. This practice has been followed by several other Delaware communities, and not only has the service proved adequate, but the resale has provided the towns following this practice with substantial revenues. Electric power, then, does not appear to be a source of concern either now or in the long-range future.

2. Water At present the water supply is adequate to serve the needs of the town. Like the electric system, the water utility is owned by the town, and distribution is also a town function. The words at present should be emphasized. There may be problems when growth occurs and it becomes necessary to extend water supply lines. The water flow from the wells to the water plant is limited, and any extension of lines could well tax the capabilities of the facility. As in any area located on the coast, the water supply must be analyzed constantly in order to detect possible salt water intrusion and to protect the consumer from brackish water.

3. Sewers and Sewage Treatment The recently-installed sewer system in Lewes is adequate for present and future demands. It is estimated that the system can support a population of 6,000 persons, or more than twice the current population of the town. However, storm or rain drainage is a completely different story. Only on Savannah Road and King's Highway is there any storm sewer facility. In the rest of the town proper, the storm drainage is handled by the sanitary sewer system. This condition could well add to the carry-off problem as heavier rains occur. More important, the area of Lewes Beach has no facility in the way of storm sewers to carry off the water. When heavy rains occur, this portion of the town experiences some flooding. It should be recalled that it is the beach area that accounts for a great deal of the economic base of the town: summer tourism. Dissatisfied tourists are not return-tourists. In addition, anticipated industrial growth may well take place in the vicinity of the current site of the University's Marine Science complex and the beachside. Industries looking to locate in the area will necessarily be vitally interested in the provision of storm sewer service.

Both sanitary and storm sewer outputs are currently funneled through the one sewage treatment plant in the town. The future growth of the area plus the provision of storm sewers for the entire town would overburden the current facility. A report by the State Planning Office states the problem succinctly: "The Lewes sanitary sewer system is adequate relative to present and immediately foreseeable demands but the sewage treatment plant is hindered in its treatment of both sanitary and storm sewage." The report goes on to clarify the situation--"two independent systems are necessary if the treatment plant is to service the needs of the community. The immediate concern of this

situation cannot be over-emphasized, if the community is to accommodate planned urban growth." Important to note here is that many marine-oriented industries are high-water volume users, and not only is the supply of adequate water of importance to them, but also the disposition of the water must be of paramount concern.

While the sanitary sewer system appears to present few problems so far as growth is concerned, there is an obvious need to look more closely to the provisions of storm sewer service, and most important, the provision of adequate treatment facilities for both forms of sewage. A University of Delaware report that investigated the situation stated in part: "The neighboring towns of Lewes and Rehoboth Beach should combine to form a single regional sanitary district servicing not only both towns but the adjacent unincorporated areas as well. To provide adequate treatment for the proposed regional sanitary district over the next 30 years (year 2000), a new 6.5 MGD Secondary level sewage treatment plant should be constructed at or near the site of the present Lewes treatment plant."

The problem has been analyzed, the suggestion of a solution has been forthcoming, and now all that remains is implementation.

4. Traffic and Parking Traffic in and around the town of Lewes has not presented a pressing problem, nor is it likely to in the immediate future. True, the highway facilities are frequently taxed to handle the traffic in the peak tourist months of June, July, and August, but in the remaining nine months, the pressure is off. It is felt that there are two reasons that there should be no large expenditures for highway expansion in the immediate future. First, to provide facilities that would accommodate the peak summer traffic with a minimum of friction in travel would result in

a network that would be substantially underutilized for three-quarters of the year. Second, tourists tend to compare their vacation problems with their "at home" problems. These tourists might well want restaurant facilities, entertainment outlets, and the like; but Lewes would have to undergo unprecedented growth in the immediate period to produce traffic problems that would approach those in the urban areas from which the tourists come. Should industrial growth place a burden upon the traffic system in the off-peak periods, then the town should consider providing more adequate service.

Parking presents other problems, as the town grows, and as vacationers are forced to rent or buy facilities more remote from the major "draw"--the beach--it becomes more and more important that adequate parking facilities within short walking distance of the water be provided. Also, as the town grows in off-season activities, merchants, and the local government should concern themselves with the comfort and accommodation of the consumer.

5. Education Recent school district consolidation in Delaware resulted in the combination of Lewes, Milton, and Rehoboth Beach into a new school district--Cape Henlopen. According to projected plans, a new high school is planned for the Lewes area. However, high school facilities do not appear to be the immediate problem. According to interviews in the Lewes area, grades 1-4 were overcrowded. The alleviation of this problem was assured, but the recent financial pinch in the State cast some doubts as to whether and when the pressure would be off this portion of the educational system. If, as more recent reports indicate, school monies have been restored, the problem is apparently now resolved.

The consolidation process appears to have taken care of school crowding and diseconomies. The economic growth of the area may call for a

reexamination of the educational facilities, but at present they appear to present no major problem.

The prospects of expanded higher education will be explored elsewhere in this study.

6. Housing Housing in the Lewes area appears to be the most pressing of all the problems. According to a survey conducted in conjunction with this study, the lack of adequate housing was mentioned by the majority of respondents as critical in the area. Not only is there a general shortage of year-round housing in the Lewes area, but much of this housing is inadequate. There is no housing code in the town, and therefore there are no set standards to which housing units must conform. As a result, if one were to adopt the housing codes of other areas, much of the housing in the area would have to be categorized as substandard. Not only is this factor important for the present status of Lewes, but one of the more important considerations of a prospective employer in evaluating potential location sites is the availability of adequate housing for the work force.

According to one Lewes town official, the housing shortage will have to be alleviated before the town can expect to attract newcomers to the area.

A partial, but only temporary solution to the housing situation may be found in the soon-to-be-constructed Pilot Point project. This project, located almost adjacent to the Ferry landing, will consist of 32 town-house units with parking facilities for 96 cars, and a one-hundred unit apartment complex that has space for 250 cars. While this facility must certainly take some of the pressure off the housing shortage situation, it will do little or nothing to ease the existence of substandard housing in the area. It is assumed that the persons who can afford the town houses, motel units and

apartments, will not be those who now live in the substandard units. The pressures on seasonal housing may well be lessened by Pilot Point. If we consider a low occupancy of 3 persons per unit, the project can accommodate more than 700 persons. However,it is doubtful that long-range expansion will do much to keep these units occupied year round. Permanent residents prefer permanent housing, and the search will be on for single-family units. This statement is not meant to depreciate in any way the concept of Pilot Point, or to predict its success. It is made to point up the need for residential family dwellings. Pilot Point will fill a gaping void, and will, temporarily at least, act as a catalyst for attracting incoming industry. However, the fact should not be overlooked that the present and future demand for single-family units will persist. Future land-use planning must consider this demand, and furthermore, must be constantly aware of the need to upgrade much of the existing housing in the area. The housing pinch is already apparent to the College of Marine Studies. In the Summary Report of the 1970 Summer Activities at the Lewes Field Station, it was stated that "the most critical and obvious need is for student housing, especially for graduate students. Although about ten of our single graduate students resided in the dormitory, we have no provisions whatsoever for married graduate students. Because of this, students who are already paying rent in Newark to maintain their leases, must compete in a resort area at the height of the tourist season for housing. I believe the only reasonable short term solution to this problem would be to provide a housing subsidy to eligible students, perhaps from grant funds acquired for this purpose." It is obvious that this solution must be considered only as a stop-gap, for it does nothing to alleviate the long-standing absence of available housing at modest rentals for graduate students.

7. Medical Facilities There are only three hospitals in the whole of Sussex County, and one of them is located in Lewes. Not only does this excellent facility serve the population of Lewes, but it is also the most convenient medical center for Rehoboth Beach, Dewey Beach, Bethany Beach, Georgetown, and the unincorporated areas between. The facility has recently been expanded, and according to surveys in the area, is adequate to meet current and all anticipated demands. The fact that the hospital is located in Lewes also tends to attract physicians to the area, and there appears to be no reason that the medical services could not serve its future economic expansion. There also appears to be no reason that future expansion could not be accomplished should future demands warrant such expansion.

8. Legal Facilities The hub of legal activity in Sussex County is the County Seat--Georgetown. The courts and attorneys centered here are only 16 miles from Lewes so there appears to be little reason that legal services should show any increase in Lewes unless unprecedented growth should occur. Unlike medical services, legal services do not normally fall in the category of "emergency" and a half hour one way or another usually is of little consequence.

9. Police and Fire Protection Fire protection in Lewes appears to be adequate for present and anticipated future needs. The Department is on a volunteer basis and lists fifty men in its ranks. While some of the fire fighting equipment is old, it is still serviceable and capable of doing the job. On a scale of 1-10, the fire protection unit of Lewes is rated 6 by the Middle Department Association of Fire Underwriters, and the standards of the American Insurance Association are used for the rating. The scale runs from 1 (excellent protection) to 10 (unprotected) so Lewes is toward the low side

of the mean. Nevertheless, there apparently is no forseeable problem so far as this service is concerned.

Police protection, while considered adequate for the present, is marginal for the future. If one uses a rule of thumb of one policeman for each 500 residents, this ratio must be adhered to in the future. Even minimal growth over the next several years would require the addition of another policeman. Also, as growth extends the physical layout of the town, time and distance factors may well dictate a further expansion of the force.

All through this section of the study, reference has been made to economic growth. In actuality, to be meaningful, the concept of growth must be defined. If population is considered to be an indicator of economic growth, projections of the Delaware State Planning Office show that Sussex County as a whole will have population as follows:

Sussex County Population

Year	Population	% Change
1970	80,900	
1975	86,200	6.6
1980	91,781	6.5
1985	96,700	5.4
1990	101,931	5.4

If these county projection percentages are applied to Lewes, they would reveal the following:

Lewes Population

Year	Population
1970	2,661
1975	2,837
1980	3,021
1985	3,184
1990	3,356

Because of the unique position of Lewes vis-à-vis the rest of Sussex County, it is believed that the population growth in Lewes will be substantially greater than the 25% depicted above. The two major forces that should shape and guide this growth are tourism and the University's Marine Science facilities. True, tourism does not affect directly the permanent population of the town, but it does have an indirect effect upon the number of residents. Tourism and summer visitors require a sizable "support force," i.e., the persons providing the goods and services demanded by the summer residents. While all of the persons serving the visitors need not be Lewes residents, it is difficult to believe that there would not be some who would be attracted to the town as a place of employment and as permanent residents.

Perhaps not so dramatic as the influx of summer visitors, but certainly a more stable factor is the growth of the town as the University facility. If Lewes could somehow extend its summer activity for the entire year, there would be little question as to the viability of the economy. This obviously is not possible, and the community must seek a more stable economic base, and that base may well be the marine science facilities. While current plans for growth of the facility do not nearly approximate the impact that would result from a year-round extension of the tourist season, they certainly would contribute to the stability of the economy, a factor that is currently lacking in Lewes.

Survey of Businessmen

A major consideration when evaluating any facility which will economically affect an area is the perceived impact of this facility on local businessmen. Accordingly, a part of this project was a survey of Lewes

businessmen. The purpose was to ascertain their expectations for the economic future of Lewes, their plans for individual business growth, their attitudes toward future industrial development, and their knowledge and opinions of the University's marine facilities.

Interviews with forty Lewes businessmen were made during the week of July 5, 1971. The interviews were semi-structured to allow respondents ample opportunity to express their own personal views and opinions.[4] Table 7 shows the number and type of businesses surveyed and Table 8 shows the size of these businesses as indicated by the number of employees. Sales and income statistics were unavailable. As revealed by the Tables, the Lewes business community is composed primarily of small retail and wholesale establishments.

Like all resort and tourist areas, most Lewes businesses are seasonal. The seasonal impact ranged from an average of 25 percent increase in sales for grocery, hardware, and pharmacy stores to a high of an average 80 percent sales increase for local restaurants. These and other seasonal increases are shown in Table 9. Clearly, the economy of Lewes is very directly affected by tourism. Further, most businessmen expect greater seasonal variation in the future.

Economic Expectations

The businessmen interviewed are almost equally split on their expectations for the economy of Lewes. Slightly over half are optimistic. They see the town of Lewes and their businesses growing as tourism and recreation in the area continue to expand. However, they recognize that this growth would be largely seasonal and would do little to stabilize the economy.

TABLE 7

BUSINESSES SURVEYED

Type of Business	Number
Boating Supply	2
Clothing and Department	4
Fishing Supplies	1
Grocery Stores	4
Hardware, Home and Auto	2
Liquor	4
Motels and Hotels	5
Pharmacy	2
Plumbing and Heating	1
Restaurants	8
Seafood Retail and Wholesale	1
Service Stations	4
T.V. and Appliance	1
Variety	2
Total	40

TABLE 8

EMPLOYMENT STATISTICS

Number of Employees	Number of Businesses	Percentage of Businesses
0- 2	17	42.5%
3- 5	9	22.5%
6-10	7	17.5%
11-20	5	12.5%
more than 20	2	5.0%
Total	40	100.0%

TABLE 9

SEASONAL VARIATION

Type of Business	Average Estimated Percentage Sales Increase During Summer Months
Boating Supply	40%
Clothing and Department	35-40%
Fishing Supplies	50%
Grocery	25%
Hardware, Home and Auto	25%
Liquor	30%
Motels and Hotels	35%
Pharmacy	25%
Plumbing and Heating	50%
Restaurants	30%
Seafood Retail and Wholesale	N/A
Service Stations	30%
T.V. and Appliance	None
Variety	33%

The rest of the businessmen are pessimistic about the growth prospects for Lewes. These businessmen, and many who are optimistic, do not feel that seasonal growth will be sufficient. They point to the need for yearly stabilization of the economy of Lewes. Total reliance on tourism and recreation for economic growth is not satisfactory. Further, local businessmen feel that the limited size of Lewes and the conversion of beaches to national and state parks will limit the economic potential of tourism.

A major concern shared by all businessmen is the perceived lack of employment opportunities for young people. Because full-time employment is limited, many young people leave Lewes. Even those who stay are forced to commute to other communities (some as far as Dover) for employment. New industry is required to help retain Lewes' young people and attract others to the community.

A second concern expressed by many businessmen is that local and state governments have actually inhibited industrial growth. For example, the zoning laws are cited as limiting the expansion of business. Many businessmen feel that as long as government takes a myopic view of industrial development, Lewes will have difficulty attracting industry. The vast majority of businessmen interviewed expressed a desire for a more cooperative attitude toward business on the part of state and local governments.

Thus, there is much dissatisfaction among Lewes businessmen. They perceive a need for industrial growth and development, but they see little except increased tourism in the future. They are especially concerned that the seasonality of the Lewes economy be moderated. To do this, most suggest some form of light, controlled, and ecologically-oriented industry.

Impact of the University

The University's marine facilities fit the criteria suggested by the businessmen. However, the present economic impact of the marine facilities is slight. Most of the businessmen interviewed are aware of the facility, but they know very little about it. As a result, they have not perceived any particular effect on their businesses.

The only exceptions to this finding are marine-related firms, such as a seafood retailer and wholesaler, a fishing supplier, and boating suppliers. The first two companies see an important indirect benefit through advanced knowledge about the fish and shellfish industries. One of the boating supply firms provides the marine facility with marine equipment. This is the only instance where a businessman cited a direct, measurable effect of the marine facility on the economy.

There are undoubtedly other effects of the University's marine facility. The employees must buy food and clothing, they pay taxes, they must live somewhere, etc. However, the number of people now associated with the facility is still too small to be recognized. The future impact on the economy of Lewes will result from the growth of the marine facility. This will provide employment for a larger number of people who will live in Lewes year-round. Any increase in full-time residents will help to moderate the seasonality of the economy.

The University of Delaware's Marine Facilities and Economic Growth

To estimate the impact of the marine facilities of the University of Delaware is at best difficult. There is really no way of accurately anticipating where the facility is going in the future, (although the next

section will deal with this subject) and an even greater estimation problem arises when one attempts to hypothesize what support or ancillary operations might be attracted to the area as a result of the University's operations.

Perhaps the best place to start is to analyze the operations that have already been attracted to Lewes because of the facilities.

The Marine Science Consortium is a direct outgrowth of the University of Delaware facilities in Lewes. The consortium consists of twelve colleges and universities that generally do not have direct access to the sea and the associated marine activities. The schools involved are Bloomsburg State College (Pa.), California State College (Pa.), the Catholic University of America (D.C.), Cheney State, (Pa.), Edinboro State College (Pa.), Indiana University of Pennsylvania (Pa.), Kutztown State College (Pa.), Millersville State College (Pa.), the Pennsylvania State University, Shippensburg State College (Pa.), Slippery Rock State College (Pa.), and West Chester State College (Pa.).

It is not within the scope of this study to go into detailed descriptions or evaluations of the consortium programs. However, when we consider the number of persons that are attracted to the Lewes area in conjunction with the consortium programs, it is evident that there is a definite impact upon the local community. The several consortium programs and the number of participants are described below.

1. The Pre-College Oceanography Program

The Marine Science Consortium is now extending its programs to include those pre-college students of Pennsylvania and neighboring states who are interested in the field of science and who intend to pursue science on the college level. This introductory program is designed to offer the prospective

college student a broad sampling of the numerous facets of marine science and to help him decide in which field of science his interest lies. The Pre-College Program operates on the basis of 4-day courses starting on Sunday evening and ending Wednesday afternoon. In the fall of 1970 there were some 450 students who took advantage of the course offerings, and in the spring of last year the number swelled to 900 students. Indications are that this program will continue to grow in popularity, and more and more pre-college students will be working in Lewes.

In addition to the Pre-College Program described above, the consortium also runs a summer session for high school students and faculty. Last year the program attracted some 200 persons.

The main consortium program operates from March 1 through November 30, and provides formal course work and research field trips for undergraduates and graduate students of the 12 participating colleges. The 1971 program consisted of five sessions of three weeks each and a special one-week "mini-session," and was attended by 195 students.

Finally, the college weekend program is a two-day session that in 1970 had an enrollment of 800 students, and in the spring alone of last year there were more than 800 students in attendance.

It should be pointed out that the consortium activities in Lewes are a direct result of the location of the University of Delaware's College of Marine Studies. As the facilities of the Marine Studies College grow, so can it be expected that the activities of the consortium will also grow.

It is impossible to place a dollar value on the impact of the consortium activities upon Lewes. However, when one considers that these students

and faculty must be fed, that they certainly patronize the local merchants to some degree and that the consortium operation necessitates the purchase of supplies and equipment, the potential impact becomes obvious. If one looks to the concept of student days, (one student for one day) an estimate of impact can be made. In the three major programs--Pre-College, College Weekend, and Consortium, there are approximately 13,000 student days. Now, considering food alone, and once again being conservative by using a figure of an average of $1.00 per meal there is a food cost of $39,000 for the sessions. Obviously all of this food is not purchased in Lewes, but the estimate of the Director of the Consortium programs is that about $20,000 of the total is spent locally. The remainder is spent in Sussex County so not only the town benefits, but also the area surrounding it. It should be emphasized that food is only one source of revenue for the town, and that this group certainly makes a significant contribution to the local economy.

The major problem associated with the consortium programs is that they are operating at the height of the tourist season and must necessarily place a strain on the local facilities. Planners and decision-makers in Lewes should not overlook the operation of the Consortium as they guide the future economic growth of the area.

The Direct Effect of the College of Marine Studies Upon Lewes

The College of Marine Studies has projected its ten-year growth pattern in its community design plan presented to the administration, faculty, and students of the University of Delaware. This growth is gradual through 1979--thus there should be no sudden impact upon the town of Lewes. The

impact will be there; however, the town will have to adjust to this growth if compatability is to be maintained.

It is estimated that 70 percent of the facilities will be located in Lewes (except for boat crews who will be located at the Waterfront site), and the remaining 30 percent will be located at the main campus in Newark. Looking at the 1978-79 projections by the College, it can be seen that Lewes will be the new residence for 42 faculty members, 8 scientific staff, 5 visiting scientists, 250 graduate students, and 335 summer students. (See Table 10) In addition support staff will include 13 secretaries, 8 technicians, and 40 boat crews. All in all this will mean an influx of some 368 persons.

If the assumption is made that faculty, scientific staff, visiting scientists, technicians and boat crews conform to the national average of family size (3.5 persons) this group will swell the Lewes population by 360 persons. Further, if we make the conservative estimate that one-third of the graduate students are married, this also will have a significant impact on Lewes. Many graduate students postpone the starting of a family until after graduation so it would be unrealistic to assign the same family size to this group. However, a family size of 2.5 persons appears to be reasonable. This same 2.5 figure may be applied to the secretarial group. These two groups (married graduate students and secretarial) add another 142 persons to the population. The remaining group, the unmarried graduate students, rounds out the picture by adding 168 persons for a total of almost 670 persons. Recalling now that the current population of Lewes is 2,661 persons and that the projected 1980 population of the town is 3,021, just the direct influence of the projected growth of the College of Marine Studies makes the estimated 1980 population 300 persons low. In other words, if there were no influence other

TABLE 10

PROJECTIONS FOR THE COLLEGE OF MARINE STUDIES

Group	Total	No. in Lewes	Total Persons in Lewes[a]
Faculties	60	42	147
Scientific Staff	12	8	25
Visiting Scientists	7	5	17
Graduate Students	360	252	278[b]
Secretaries	17	13	32
Technicians	12	8	25
Crews	40	40	140
Totals	508	368	664

[a]--excludes 335 summer students but includes families

[b]--number arrived at by calculating a family size of 2.5 persons for 84 married students and adding 168 unmarried graduate students.

than the marine science complex, the 1980 population of the town of Lewes would be 3,331 compared with the projected population of 3,021.

The impact of these data must be apparent. For instance, let us consider the most serious deficiency in Lewes:housing. If we assume that there will be a need for permanent housing for faculty, scientific staff, visiting scientists, secretaries, technicians, boat crews, and the married graduate students, we are talking about 200 additional housing units. It should be borne in mind that this is just the direct impact of the growth of the College of Marine Studies and does not include "normal" growth in the area or the growth that is indirectly attributable to the College functions. Even if the entire supply of townhouses and apartment units in the new Pilot Point project were to be allocated to the University demand, there would still be a shortage of 68 units.

A second critical area of service supply is education. While there is a planned expansion of educational facilities, it may not be adequate to meet the future demand, particularly at the elementary school level. It is probable that the incoming families will have younger children, and it is likely that the lower grades will evidence a significant growth, and crowding may well result.

While the other services of the town (sewer, water, electricity, etc.) appear to be adequate to carry the anticipated greater demands, they should be watched carefully for any possible deficiencies. Traffic and police and fire protection could well become critical, and other services may well be strained.

Another critical factor that might be encountered with the prospective growth pattern is that of entertainment, amusement and recreation. The year-round resident provided by the expansion of the marine facilities operations

will not be satisfied, as the summer resident is, to seek his recreational outlets in the water-oriented area of fishing, swimming, and boating. His permanent status, on a 12-month basis, will dictate a demand for increased recreational services, so a support service group dealing in these types of ventures will have to be provided.

Land Use--Present, Planned, and Projected

The critical factor in any economic expansion is land. The supply of land within corporate boundaries at any given time is completely inelastic, and if growth is to take place, it must either be accommodated within the existing land limits, or annexation (land expansion) must take place.

Perhaps the best method of analyzing land use in Lewes is to look to the current use, then to the proposed or planned use, and then see if this planned use will accommodate the growth that is anticipated for the area. The following lists the use of existing acreage, the planned use of this acreage, and the changes that are anticipated for the future.

From Table 11 it can be seen that there is a planned acreage loss in industrial and rural agricultural land of 937.2 acres, and all of the other land uses are projected to grow to account for this loss.

In view of the critical areas related to the growth of Lewes, it is encouraging to note that 342.8 acres of land within the corporate limits are to be converted to residential use. This conversion will be made possible through the relinquishing of rural agricultural land. While this additional land is more than twice the acreage currently devoted to residential use, the question that looms is--will it be enough? The plan suggests that the following density pattern

TABLE 11

EXISTING AND PLANNED LAND USES

Category	Existing Acreage	Planned Acreage	Acreage Change
Residential	206.6	549.4	342.8
Commercial	23.9	37.0	13.1
Industrial	57.5	0.0	-57.5
Storage	2.6	12.0	9.4
Utilities	8.7	13.6	4.9
Transportation	11.4	18.0	6.6
Community facilities	27.8	105.0	77.2
Open space	378.5	730.2	351.7
Streets	168.5	300.0	131.5
Water	94.7	94.7	0.0
Rural Agricultural land	390.2	10.5	-879.7
Total City	1,870.4	1,870.4	

Source: State Planning Office

be followed:

Density Classification	Percent of Acreage	New Acreage
Low Density	38.7	131.8
Medium Density	41.8	143.2
High Density	19.5	66.9
	100.0	

With the following descriptions of housing density it is possible to calculate the number of units that can be accommodated.

Low Density - 3 to 4 dwelling units per acre, single family units only.

Medium Density - 5 to 6 dwelling units per acre. Single family units and two family apartment type units.

High Density - Over 6 dwelling units per acre, including single family units, town houses, garden apartments, and condominiums.

If we assume on the high side it can be calculated that the 132 acres designated for low density housing use would accommodate 528 families. The 143 acres destined to be used for medium density housing will accommodate an additional 858 families. Finally if we assume a high estimate of 10 units per acre in the high density category an additional 700 families could be housed. Totaled, if the plan is followed by action, an additional 2,000 families could be housed within the city limits of Lewes. The 200 housing unit demand attributable to the growth of the marine studies facilities could easily be met, and it appears that the growth of Lewes would have to be well beyond any projection to strain the planned housing facilities. It must be emphasized here, however, that planned housing units are not enough. The plans must be implemented and the dwelling units must be made available in time for occupancy. The permanent residents will demand permanent residences, not the "seashore" units, and these newcomers will also want all of the amenities that they had

in the area they departed. There is an apparent shortage of adequate housing in Lewes at the present time, and this shortage will become acute if new units are not added in the immediate future.

Concerning residential land use the Delaware State Planning Office in its Comprehensive Development Plan, City of Lewes, Delaware sets forth the following goals and objectives:

Goal

As Lewes is part of the shore region, and attracts people seeking the amenities of pleasant living, residential development is inevitable, and as such it must be planned and controlled.

Objectives

1. To expand the housing supply in order to provide more diversity in choices of housing types.
2. To meet the housing needs of all income and age levels, including those in the low- and moderate-income brackets, and the elderly.
3. To establish residential densities which reflect sound land development concepts, such as planned unit development.

No argument can be found with the goal and objectives, and if implemented the plan could well make Lewes not only attractive to summer residents and tourists, but also to prospective business that is seeking locational sites. It should be emphasized here that site selectors base their decision upon what is, not upon what might be. A site selector looking at the Lewes area at this time would certainly have to list available adequate housing as a negative factor.

Of significance to this report is the land that is in industrial use. It should be recalled that there are currently some 57.5 acres allocated to industrial use, and the comprehensive plan calls for no land within the corporate boundaries in the future.

The following reflects the thinking of the planners with respect to future industrial activity in the Lewes area.

Goal

To attract industrial development that will offer broad employment opportunities to the residents of the community as well as strengthen the economic base.

Objectives

1. To insure that industrial expansion does not injure the amenities of the natural environment which necessitates that industries accommodate themselves in such a way so as not to create air and water pollution, excessive noise, or an alteration in the ecological balance.
2. To offer sites to industries in a planned industrial park.

The Plan

It is recognized that an important factor in Lewes' future growth is the need to create a diversified economic base. If the employment climate is a healthy one, and there is a variety of jobs that can be made available, then the entire community will benefit. Although no industrial development in the traditional sense is planned within the current city limits of Lewes, an area which can be easily annexed is planned as a research complex north-west of New Road.

The 65-acre research complex is located within close proximity of the proposed site of the University of Delaware's marine studies complex;

thus the research complex can accommodate a limited number of research-oriented nonmanufacturing concerns which might be encouraged to settle in Lewes to complement the University's programs.

While the comprehensive plan for Lewes shows a great deal of foresight in setting aside acreage for industrial development, it is felt that this development should not be limited to the Marine Studies-oriented type of endeavor. It will be shown elsewhere in this report that heavy reliance on the "draw" of such an educational facility may be somewhat optimistic. If this type of marine-oriented industry should locate in Lewes it would do much to stabilize the economy, broaden the economic base, and produce a much more viable economic outlook. However, there are many industry types that conform to the requirements of the town with reference to noise, pollution and economic compatability that are not related to the sea. As the megalopolitan corridor between Boston and Richmond fills in, there is going to be an increasing demand for market-oriented sites, i.e., sites that are centrally located so that the vast markets of the East Coast can be served with minimum time and distance friction. These industries need not be dirty or noisy, and before they are rejected, the decision makers should reinforce their knowledge that it is extremely difficult if not impossible to have a firm economic foundation based on a tourist trade operating only one-fourth of the year. This does not and cannot provide the type of employment, earnings, and consumption that are necessary for economic accomplishment and a sound economic base.

The College of Marine Studies and the Linkages

The use of land for one specific purpose will normally dictate the use of adjacent parcels of land. The tying of one land use to another is commonly

known as a "linkage". Linkage uses occur because some land uses dictate or naturally lead to compatible or support operations required for the maximization of economic efficiency.

Linkages are of two basic types, primary and secondary. Primary linkages are a direct outgrowth of some basic economic activity. For instance, we might consider the Beebe Hospital in Lewes. Primary linkages might include a school of nursing, pharmacies, doctor's offices and perhaps a nursing home.

Secondary linkages are independent of and quite different from the primary land use linkages just described. Primary linkages arise from a basic economic activity in an area, while secondary linkages are a result of, and indeed a function of, consumption patterns. There is really no definite connection between primary and secondary linkages; they operate independently of each other, and one may be dynamic while the other is static or declining in importance. Perhaps the best example of secondary linkages is the location of restaurants, specialty shops, and service operations such as tailor shops, shoe repair, dry cleaners and the like in the area of the basic economic activity. These secondary support linkages may well serve the employees of the basic activity, but they would also be available to all comers regardless of the source of income.

It was mentioned earlier in this report that the College of Marine Studies activities may well act as a catalyst in the attraction (primary linkage) of support or ancillary operations. What type of economic activity is likely to be attracted to the Lewes area? It seems feasible and rational that a marine education and research facility would attract the so-called marine industries. Dr. Niels Rorholm, in his landmark investigation of the New England Coast categorized the marine industries as follows:

1. fish catching
2. fresh fish processing
3. frozen fish processing
4. fish wholesaling and jobbing
5. ship and boat building
6. marinas and yards
7. marine wholesaling and retailing
8. marine manufacturing
9. construction, towing, agents
10. research and education
11. marine military
12. charter fishing
13. other marine

A review of the economic activity currently in Lewes reveals that many of the marine industries are already represented. Categories 1, 2, and 4 could well apply to the Doxsee operation. The fin fish industry, except in the sporting sense, ceased to exist in Lewes when the fish products operation closed. However, should the menhaden operation once again become profitable, it is probable that the boats and crews would return to Lewes. While there is no shipbuilding or boat building in Lewes at the current time, marinas and yards (category 6) are in operation. Marine manufacturing (category 8) is represented by Barcroft Industries. This particular industry located in Lewes because of the College of Marine Studies operations, and is an excellent example of a primary linkage tied directly to the educational activities in the area. Barcroft, in their extractive process, has used the University

facility for chemical consulting, and in turn has provided industrial feedback to the University.

Earlier in this report, reference was made to land use in the industrial park complex associated with the operations of the College of Marine Studies. The recommendation of the Governor's Task Force states: "The Marine Science Center would make specific provision to accommodate marine research and light industrial organizations near the site of the College of Marine Studies at Lewes. Typical industries will be those concerned with instrument development, data processing and management, and other activities which would profit by close relation to the intellectual resources of the College of Marine Studies. An additional attraction would be the availability of floating equipment which could be leased for use in applied research and performance evaluation of equipment. This marine-oriented research and industrial park would represent a sound long-term business base for the Lewes area and also provide a stabilizing effect to balance the seasonal tourist industry."

In looking to the influx of activity to the area because of linkage to the College of Marine Studies operations, the possibility of attracting governmental facilities should not be overlooked. The same recommendation of the Governor's Task Force cited above goes on to explore the possibility of a coastal zone laboratory in the Lewes area. "The Coastal Zone Laboratory concept as proposed by the Stratton Commission report, states that 'Coastal Zone Laboratories should be established in association with appropriate academic institutions to engage in the scientific investigation of estuarine and coastal processes and to be prepared to advise the states in managing the estuaries and coastal zones.' This Marine Science Center will be a logical

location for a coastal laboratory in light of the marine science strength of the College of Marine Studies as well as the presence of a strong Sea Grant program in the College."

One possible development deserves mention here, but should not be construed as "crystal balling" the future. A group of consultants has suggested a southern Delaware campus for the University. Should this happen, and should the chosen site be Lewes, all of the town services would be inadequate. Of course this statement would hold true for most of the communities in lower Delaware.

Category 11, marine military, provides another example of a linkage. While the Navy operated prior to any significant marine science activity, there was a strong feeling in favor of closing the Henlopen facilities. Apparently that feeling is not nearly so strong currently. While one should not attempt to attribute this apparent about-face solely to the marine college operations, it should be noted that every major oceanographic and marine education facility has some military link, no matter how remote. The Narragansett operation of the University of Rhode Island is closely affiliated with the Navy, and the military cooperation and coordination has been a factor in the success of the Rhode Island operation. There is no intent here to guess at future Navy locational decisions; however the proximity of the two operations seems to indicate that these could be a tie that would be beneficial to all parties concerned.

The possibility that the University's College of Marine Studies will attract marine-oriented product and service companies is a reality. However, a word of caution must be expressed. The existence of the

University's marine laboratory will not be sufficient to attract industry if other locational requirements are lacking. A survey of marine-oriented companies by Ronald A. Poitras, a University of Rhode Island graduate student, revealed that the availability of transportation is the most highly valued locational requirement.[5] The next two most important considerations are local amenities (e.g., recreation facilities, tax rates, quality of the local environment) and the availability of labor.

The two major attractions which Lewes offers--proximity to the ocean and availability of university faculty for consulting--are relatively unimportant factors. For a large segment of marine-oriented industry, direct ocean access is not necessary to operations. Only those firms involved in manufacturing propulsion systems, submarines and other vessels, buoy systems, and similar marine vehicles and structures are concerned with direct or shared access to the marine environment.

Only when a firm is involved in a considerable amount of research and development is the availability of university faculty important. Most marine-oriented companies use no outside consultants; few rely on university faculty. Faculty consultation ranked as one of the least important locational factors. However, some research and analysis firms (e.g., marine systems research and engineering, computer systems, sonar research and detection systems, and the like) expressed definite interest in locating near a university facility. It is these firms which would find Lewes an attractive potential site.

The Narragansett Bay Campus of the University of Rhode Island

The earlier mention of the Narragansett Bay campus of the University of Rhode Island points to the desirability of examining this operation in

somewhat more depth. The Rhode Island activities in the marine studies area precede the Delaware operations by about ten years, and while it cannot be expected that the Delaware experience will duplicate that of Rhode Island, there are enough similarities to justify using Narragansett as a point of reference.

The University of Rhode Island's interest and involvement in marine science and oceanographic activities began in the 1930's with the establishment of the Narragansett Marine Laboratory. In 1960 the Narragansett Marine Laboratory evolved into the University's Graduate School of Oceanography. During the years 1960-71 the expansion of the Narragansett Bay Campus has been steady. Along with this growth, the Graduate School of Oceanography has established an excellent reputation for oceanographic research and education.

By 1963, the University of Rhode Island had expanded the area of its Narragansett Bay Campus to its present size of 125 acres. Expenditures that year totaled $508,000; in 1967-68 expenditures had risen to $3.57 million; and in 1970 expenditures were an estimated $5 million. The State of Rhode Island pays for one-third of the expenses of the Narragansett Bay Campus and is moving toward paying one-fourth. This state allotment has been increasing by 20% annually. The remainder of the money comes from the Federal Government, government agencies, corporations, individual donations, and student fees.

In addition to research grants and similar subsidies, the Federal Government is also giving aid in the form of equipment and maintenance. The R/V Trident, a 180-foot research vessel worth $1.2 million book value was purchased from the U.S. Navy for $500. Maintenance for this vessel is $600,000 annually. This maintenance is paid for by the Office of Naval Research and the National Science Foundation. The R/V Trident is a valuable asset

which has cost the University and the taxpayers of Rhode Island very little for acquisition and nothing to maintain.

Table 12 summarizes the estimated value of the assets of the University's Graduate School of Oceanography. Please note that most of the estimates are cost values. Replacement costs at today's prices would be much higher.

Estimating the total economic impact of the Narragansett Bay Campus is difficult. Perhaps the best starting point is with the people involved. At present, 228 persons are employed by the University at this facility, and projections call for a steady increase to about 350 employees by 1980. In general, the University personnel receive higher than average wages and salaries. Thus, they spend more, pay higher taxes, and contribute more to the local economy.

The students also are a benefit to the local economy. Approximately 120 graduate students are currently enrolled. Because of the unique program and course offerings, the Graduate School of Oceanography attracts many out-of-state students. These students add to the economy through immediate purchases and may become permanent, income-producing residents of Rhode Island.

Another direct benefit is the attraction of similar research facilities. The Narragansett Bay Campus has attracted research facilities operated by the State and Federal Governments. The following facilities are located on or adjacent to the campus:

Northeast Water Hygienic Laboratory--operated by U.S. Environmental Protection Agency

National Marine Water Quality Laboratory--operated by U.S. Environmental Protection Agency

TABLE 12

VALUE OF NARRAGANSETT BAY CAMPUS, EQUIPMENT AND FACILITIES

Asset	Estimated Value
Land (125 acres @ $3,000/acre)	$ 375,000
Horn Lab	1,000,000
Pell Library	450,000
Aquarium	500,000
Fish Lab	125,000
Misc. Structures	250,000
Physical Facilities (bunkers)	100,000
Equipment (Elec. Microscope, $80,000)	200,000
Ships	2,500,000
Small Boats	50,000
Vehicles	50,000
Dock	250,000
Total	$5,350,000

Source: Stuart Hale, Assistant Dean, Graduate School of Oceanography, University of Rhode Island.

Narragansett Marine Fish Research Laboratory--operated by National Marine Fisheries Service

Rhode Island Nuclear Science Center--operated by State Atomic Energy Commission

The establishment of these research facilities can be attributed, in part, to the University. Again, there is an influx of technical people with above-average incomes.

In addition to University and government facilities, there is a 90-acre industrial park being developed by the Narragansett Industrial Development Corporation. The industrial Marine Research Park is being constructed to attract research and development facilities of marine-related industries. However, there is no evidence as to how successful this venture will be. If successful, the park could expand to 290 acres.

With the construction of these facilities, and the three major buildings built on campus since 1966, the construction industry in the Narragansett Bay area has prospered over the last several years. This is another benefit to the Rhode Island economy, both in terms of increased employment and increased tax revenues.

The Graduate School of Oceanography also provides a source of technical advice for the local business community. Faculty members are involved as consultants to local industry, and as members of advisory boards concerned with marine industries. In 1968, a new associate degree program in commercial fishing, the first of its kind in the United States, was initiated. The objective of this program is to encourage more local residents to remain part of the local fishing industry. If effective, the program will also assist local commercial fishing companies to become more competitive.

To summarize, the University of Rhode Island's Narragansett Bay Campus is a definite asset to the economy. The direct benefits of new construction, employment, and attraction of students are substantial. In addition, the Campus has attracted similar research facilities and may help to bring in marine-related industry. Further, the indirect benefits of technical consulting and advice cannot be overlooked.

Conclusions

The College of Marine Studies Operations in Lewes will certainly have an economic impact upon that local community. Although the operations of the facility to date have not really changed the functioning of the Lewes economy, the indirect factors and the anticipated direct results of the College are already having an influence upon the community.

It is impossible to predict with any degree of accuracy just what the "draw" of the Marine Studies operations will be. The best that can be done here is to indicate the facilities that might most logically locate in the Lewes area to take advantage of the proximity of the education and research function. All suppositions expressed here are simply suppositions, and of course hinge upon the national economic trends that have such a profound effect upon the corporate or governmental decisions to locate, to expand, or otherwise extend activities. With this restriction in mind, the following statements can be made:

1. The Consortium operations will continue to grow. For the Pennsylvania Colleges and Universities, the Lewes location presents the fewest time and distance frictions. It is expected that the current Consortium members will expand both their offerings and their time span in Lewes. As the Delaware operation grows and becomes more sophisticated so will the Consortium

operations grow. It can be reasonably expected that other colleges and universities, not necessarily from Pennsylvania, will either attempt to join the present operation or form their own units. As interest in marine studies and oceanography grows, which it certainly seems destined to do, there is no reason why schools from, say West Virginia and Ohio should not take advantage of the expertise at Lewes. Consortium-type activities then appear to be a good bet for future expansion at Lewes. Close cooperation among the Colleges, the University of Delaware and the State of Delaware could go a long way in making this joint alliance a fruitful one for all concerned. If possible, these operations should avoid the summer concentration that adds to the peak load problems that already plague the resort area.

2. Growth eminating from private sector investment in Lewes is more difficult to estimate than that of Consortium activities. The logical areas to enter and for growth are the marine industries. Yet, the review of the Rhode Island experience shows that growth in this category was not so significant as was expected. However, there is at least one factor that needs to be explored more in depth here. Normally, the private sector lags behind the public sector in what may be termed a "show me" attitude. The private sector, tied as it is to the profit motive, needs to see the pay-outs before any significant investment is made. It is felt that these pay-outs are now in sight and the timing is better now than it was at the inception of the Narragansett operation. Actually, Delaware may well benefit from getting a relatively late start. The recent emphasis upon the environmental factors of our life, the stress placed upon ecological influences, the opening of all of these challenging fields leads naturally to a stronger tie with the research

operations that are so vitally interested in improving man's role in his universe. For these reasons, it is felt that growth from the private sector tied to the Marine Science facilities will occur. To estimate the volume of this growth in jobs created, payrolls generated or land use demands is difficult to do without extensive additional experience.

3. A promising area of growth is that of governmental operations. The Federal Government particularly is engaged in long-range environmental planning. Certainly this planning must encompass the marine environment. Future food supplies, preservation of natural habitats, concerns over water supply, erosion, pollution--all of these have deep-seated roots in marine research. The coastal areas where the research can be accomplished are relatively few, and the laboratory conditions are not available in many areas. If the governments at all levels are sincere in their dedication to improving the life style of the population, then there surely must be a closer alliance with research organizations. For these reasons it seems probable that the Lewes area would provide an excellent avenue for the governments to join in the challenging marine problems that not only loom in the future but that also provide possible solutions to many of our environmental problems. Once again, it would be presumptious to estimate just what governmental facilities might avail themselves of the Lewes site, or what influence they would have upon the economic climate of the area. It is safe to assume however that any operations would have a significant effect upon Lewes. When considering government operations, the impact of the Navy should not be overlooked. The proposed removal of the facilities at Henlopen caused quite a stir in Lewes because of the losses in sales and government revenue that

accrued to the area. If the Navy operations were to be expanded to tie more closely to the College of Marine Studies, the impact of such expansion could not help but be felt in the locality.

For any of the several reasons cited above, it appears that Lewes is destined to undergo economic growth. That growth may come solely from projected expansion of the facilities of the College of Marine Studies (and this is the minimal factor) or from some combination of this basic growth with increased activity in the Consortium area, the private sector, and/or governmental operations. A major question that now must arise centers around whether or not Lewes will or can absorb this growth. Lewes can absorb the growth, and with the proper planning will accommodate the economic upswing that certainly must follow. There are several critical areas that may inhibit local economic expansion. As stated in the body of this report, the housing supply in Lewes is inadequate. Given the alternative of choosing Lewes as a potential site compared with an area that has adequate available housing, one would find Lewes coming out second best. Some persons are prone to look at available adequate housing as a factor that can be postponed until actual demand dictates that it be provided, but persons involved in the location of economic activity recognize this factor as a primary one in site selection. Lewes then must anticipate growth, and prepare for it by providing attractive housing units that will act as a "draw" in attracting industry. This is admittedly not an easy step to take. There is a need for confidence that the area will grow and there is a further need to coordinate the public sector that recognizes this need and the private sector that finances the venture. A bold step in housing is needed, but it is an essential one if the full impact potential is to be recognized.

Just as bold forward thinking is required in the area of housing, so must the school system be geared to accept and deal with growth. The educators and technicians coming into the area will demand quality education for their children and will also demand that the education take place in an uncrowded, aesthetically acceptable, environment.

Economic growth of Lewes seems assured. How much growth and just how rapidly it will take place is a matter for conjecture. However, the co-operative efforts of all parties concerned should allow the growth to be orderly and fruitful.

NOTES

[1]Commission on Marine Science, Engineering and Resources, Our Nation and the Sea: A Plan for National Action (Washington: January 1969), p. 256.

[2]Ibid., pp. 22-23.

[3]J. Thomas Scharf, History of Delaware 1609-1888 Vol. II, pp. 1226-1227.

[4]See Appendix.

[5]Ronald A. Poitras, "Locational Characteristics of Marine-Oriented Products and Services Industries." Unpublished M.A. Thesis, University of Rhode Island, 1970.

[6]Interview with Stuart Hale, Assistant Dean, Graduate School of Oceanography, University of Rhode Island.

APPENDIX

LEWES BUSINESS IMPACT QUESTIONNAIRE

Introduction

Hello, I'm , a research assistant at the University of Delawar
In connection with an economic study of Lewes, we are conducting a survey of loc
businessmen. Would you please assist us by giving me a few minutes of your time
I can assure you that your answers will be held in strictest confidence.

Classification Information

1. Person responding to questionnaire
   Name:
   Position:

2. Type of business:

3. Major products and/or services:

4. Number of employees:

5. Estimated annual sales:

6. Approximately what percentage of your sales are during summer months (June, July, August)?

Economic Evaluation

7. What do you feel is the economic future of Lewes?

8. How much do you expect your business to grow over the next ten years?

9. Do you feel Lewes needs new industry? Yes_____ No _____
   a) If yes, what type of industry is needed?

   b) If no, why not?

10. Are you familiar with the University of Delaware's marine studies facilities'
    Yes _____ No _____

    a) If yes, what, if any, impact has this complex had on your business?

    What do you expect its impact on business to be in the future?

b) If no, do you think an educational and research facility of this type will affect your business?

11. Are you in favor of expanded University-related marine research and educational facilities? Yes _____ No _____

Why or why not?

THANK YOU FOR YOUR COOPERATION.