THE CARRYING CAPACITY OF SOUTHERN MARYLAND

AN ANALYSIS OF THE INFRASTRUCTURE AND THE PERCEPTUAL CARRYING CAPACITY COMPONENTS OF THE TRI-COUNTY REGION

Tri-County Council for Southern Maryland
P.O. Box 1634
Charlotte Hall, Maryland 20622

February, 1988

TABLE OF CONTENTS

ACKNOWLEDGMENTS

This report was prepared by Lore L. Hantske, Tri-County Council for Southern Maryland. Particular thanks is given to Mr. Steve Magoon and Mr. Ren Serey, Maryland Department of State Planning, and Ms. Doris Frere, Ms. Helen Fassel and Ms. Nancy Babcock, Tri-County Council for Southern Maryland, who assisted in the development and preparation of this report.

The funding for this report was provided by the Coastal Resources Division, Tidewater Administration, Department of Natural Resources through the National Oceanic and Atmospheric Administration, Coastal Zone Management Program.

LIST OF FIGURES

LIST OF TABLES

INTRODUCTION

The concept of carrying capacity has historically been associated with the growth and population dynamics of species in relation to their natural environments. The term carrying capacity refers to the maximum number of individuals of a species that can be supported by the resources of a particular ecosystem. In other words, the population growth of a species will ultimately be limited by the availability of resources. If the population density is low in relation to the abundance of resources, then the population can increase. If the population density exceeds the level that the environment can support, then the population growth rate slows and density decreases. The carrying capacity is the equilibrium point where the population neither grows nor decreases. (Ricklefs, 1976)

This equilibrium state can vary over time due to fluctuating ecological forces. The equilibrium value, therefore, is not a fixed point, but a range over which the system shifts (Figure 1). As a population approaches the carrying capacity range of the ecosystem, three scenarios are possible: (1) the population, through natural processes or management practices, maintains a steady oscillation around the carrying capacity; (2) the population overshoots the maximum carrying capacity for a period of time with a subsequent population decline as the natural resources are depleted; (3) improved technology or management practices artificially sustain the population indefinitely at a higher value than its natural carrying capacity.

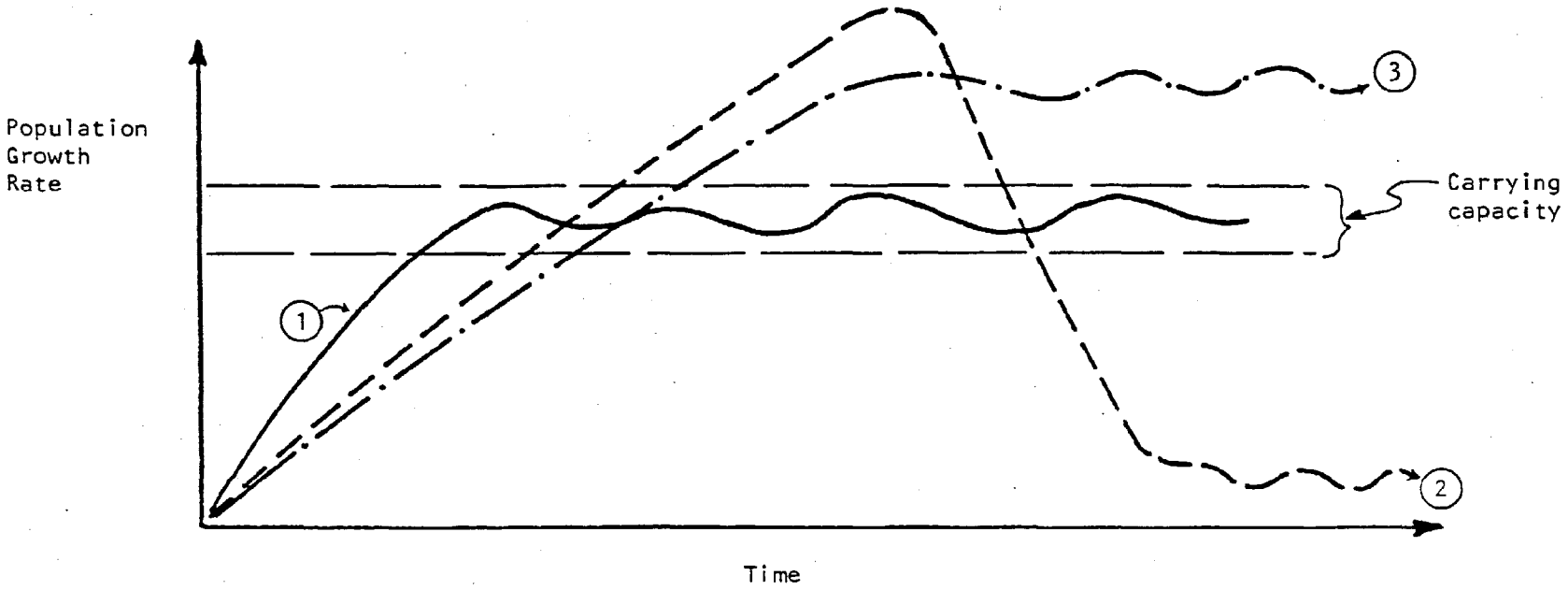
While the concept of carrying capacity has been widely applied to specific ecological systems to analyze population dynamics, it can also be applied as a management tool for human community growth and development. Unlimited growth was once thought of as a benefit to a community by expanding its economic base. However, the congestion, pollution and stress placed on communities and the environment by increased growth and development have prompted many cities, states and regions to readdress development patterns occurring within their jurisdictions. These problems can be viewed as resulting from growing populations overutilizing the natural and man-made resources within an area. In other words, the population growth is such that the carrying capacity of the environment is met or is exceeded.

As a management tool, the theory of carrying capacity is not intended to be used to halt or restrict growth. Rather, it should serve as a guide to ensure the quality of growth and development. A study of the carrying capacity of an area would assess various interrelated natural and man-made systems to identify growth limiting factors. These include assessments of the economic, environmental, infrastructure and perceptual carrying capacities of the study area.

The economic carrying capacity indicates the potential and feasibility of growth based on economics, which can be measured by production diversification, proximity to employment centers, transportation to these centers, the size of the labor force and the extent of environmental pollution limitations. The environmental carrying capacity connotes the amount of natural resources available to a region, which must be protected from exploitation to assure that the quality and quantity of the resources remain available to the population. The infrastructure carrying capacity is the man-

FIGURE 1

REPRESENTATION OF THREE PATTERNS OF POPULATION GROWTH AND THEIR RELATION TO CARRYING CAPACITY



made limits to growth, including the extent of water and sewer services, schools, roads and transportation facilities available to the public. The perceptual carrying capacity or "quality of life value" of an area is the public's perception of changes to the environment's character resulting from growth and development. A region may be able to physically sustain additional growth, but it may be at the expense of how it is perceived. For example, a rural region has the ability to absorb extensive amounts of growth, but it will lose its rural character in the process.

The need to assess the carrying capacity of Southern Maryland is critical. The metropolitan Washington-Baltimore area is experiencing rapid growth, particularly in the adjoining suburbs. As this growth occurs, it is consuming larger and larger tracts of land to sustain itself. The Southern Maryland region, consisting of Calvert, Charles and St. Mary's counties, will soon be overwhelmed by this growth if it is not planned and managed now.

The projected tri-county population is expected to be over a quarter of a million by the year 2000. This would be over a 100% increase since 1970. Between 1970 and 1980, there was a 59% increase in the number of dwelling units in the region (Tri-County Council for Southern Maryland, 1980). The current natural resource base, along with the region's infrastructure will not be able to accommodate this growth unless changes in long range planning strategies begin now. An analysis of the region's carrying capacity would identify areas that are and potentially will be stressed, and what growth management policies need to be developed to avoid these problems (Tri-County Council for Southern Maryland, 1986).

STUDY METHODOLOGY

Each component of a carrying capacity study (economic, natural resource, infrastructure and perceptual carrying capacities) can be researched separately. This paper will examine the infrastructure and perceptual carrying capacity components of the Southern Maryland regional study. It is important to remember, however, that the concept of carrying capacity as a planning tool is dependent on the analysis of all the study components. Each component contains specific elements which overlap with the other phases of the study. For example, the sewer service area (Infrastructure Analysis) and the suitability of soils for septic tanks (Natural Resource Analysis) are both needed to identify developable land based on sewage criteria, although they are included in different phases of the study. If all the elements are not included in the overall analysis, the information will be insufficient to be used in any planning capacity.

Infrastructure Carrying Capacity

The infrastructure of the Southern Maryland region was evaluated by inventorying existing and planned facilities provided by the local governments. The following elements of infrastructure were evaluated for each of the Southern Maryland counties; Calvert, Charles and St. Mary's:

1. Population - Using census data provided by the Maryland Department of State Planning (1985), the current population of each county and the region as a whole was determined. The population projections were also estimated for each five year span to the year 2000;

2. Water Supply - Water is the most essential of all resources and an adequate supply is needed if development is to occur. Portions of each county will be serviced by public/municipal systems. Other areas will be dependent on private wells. Areas which cannot be served by either of these systems will not be able to be developed.

Using the most recent County Comprehensive Water and Sewerage Plans, the following current (most recent available) and projected data for the year 2000 were collected:

(a) County population estimates
(b) Population served by all water supply systems
(c) Average daily per capita demand
(d) Capacity demand
(e) System-wide capacity
(f) Percent of the population served
(g) Percent of the population that the systems can potentially serve
(h) Percent of the systems' capacities available for further use

Those areas which would not be included in municipal systems should be cited in relation to the Natural Resource Analysis as to their ability to sustain wells;

(3) Sewer Services - The tremendous quantities of waste generated by humans as sewage must be handled and treated properly to prevent severe, harmful environmental effects. Populated areas must have adequate sewer systems and treatment plants to manage these wastes, or have soils that are suitable for septic tanks.

Again, the most recent County Water and Sewerage Plans were used to collect data on current and planned wastewater facilities. These included population data, system capacities, average daily per capita and total system demands, percentages of the population that are served and are possible to serve by sewerage facilities and the percentage of the system capacities available for further use.

Those areas that are suitable for septic systems based on soil quality need to be identified in the Natural Resource Analysis. Combined with information gathered in this portion of the study, these data can indicate which areas are appropriate for future development and which areas will not be developable due to sewer and septic tank limitations.

(4) Schools - As development of the Southern Maryland region continues, more strain will be placed on the educational system. The quality of education will be tested by the increased student body and the physical limits of the schools' capacities.

Using Comprehensive and School Facilities Master Plans of the Southern Maryland counties, enrollment data of elementary, junior high and senior high schools were collected. Enrollment trends were analyzed based on population estimates. Data on current and planned capacities of the school facilities were collected and the percentage of the capacities being used was determined. From these findings, school districts which will exceed current or planned capacities were able to be identified. If growth is to continue in these areas, construction of new facilities or expansions of existing facilities will need to occur to accommodate the growing student population.

(5) Transportation - A measurement of the capability of a region's highway network to deliver adequate public service is termed "the level of service (LOS)" by the Highway Research Board (1965) (Figure 2). In this element of the study, the major roadways and intersections of each of the counties were evaluated as to the current level of service. Those whose level of service falls in the marginal to critical range and which are in prime development areas were identified. The level of development in such areas will need to be regulated and/or the modification of these roadways will need to occur to accommodate increased traffic activity.

Perceptual Carrying Capacity

In some cases, the carrying capacity of a region may not be determined by a critical factor such as water supply, but by how the region is perceived by its residents. There are distinct points in a continuum of growth at which the residents of a region perceive that a change is occurring in the overall character of the environment. The perceptual carrying capacity is the amount of growth that can occur before the inhabitants of a region perceive the environment to have changed.

FIGURE 2

LEVEL OF SERVICE DESCRIPTIONS

Level of service(hereafter abbreviated as"LOS")is a term which refers to the overall quality of flow at an intersection. That traffic which flows freely through an intersection without any significant delays or restrictions experiences a High LOS(i.e. the quality of flow is excellent). Conversely,at a congested intersection where stop-and-go conditions prevail,drivers would experience a low LOS(i.e.the quality of flow is poor). In an effort to quantify the various levels of service which can be experienced,traffic engineers have developed the following criteria.1/

SERVICE LEVEL A

- LOS A - The highest level of service which can be achieved. Under this condition, the green time available for any particular movement is never fully utilized, and no vehicle waits longer than one red indication. Typically, the approach appears quite open, turning movements are easily made, and nearly all drivers find freedom of operation (their only concern being the chance that the signal will be red or turn red when they approach). Volumes are generally less than 60 percent of capacity.

SERVICE LEVEL B

- LOS B - Representative of stable operation. An occasional vehicle will be forced to wait through more than one red indication, and many drivers will begin to feel somewhat restricted within groups of vehicles. Volumes are usually between 60 percent and 70 percent of capacity.

SERVICE LEVEL C

- LOS C - Although still representative of stable operation, more drivers are forced to wait through more than one red indication, and backups may develop behind turning vehicles. Most drivers are beginning to feel restricted, but not objectionably so. This is the level typically associated with urban design practice. Traffic volumes under this level of service are generally between 70 and 80 percent of capacity.

SERVICE LEVEL D

- LOS D - Encompasses a zone of increasing restriction approaching instability. Delays to approaching vehicles may be substantial during short peaks within the peak period, but enough slack occurs to permit periodic clearance of long lines, thus preventing excessive backups. Traffic volumes at LOS D are between 80 and 90 percent of capacity.

SERVICE LEVEL E

- LOS E - Represents the capacity of the intersection where there are likely to be long lines of vehicles waiting upstream of the intersection and delays may be great (drivers may have to wait through several red indications). Traffic volumes in excess of 90 percent of capacity are indicative of LOS E.

SERVICE LEVEL F

- LOS F - Represents jammed conditions. Backups from locations downstream or on the cross street may restrict or prevent movement of vehicles out of the approach under consideration; hence, volumes carried are not predictable.

1/Highway Capacity Manual,Highway Research Board Special Reports 87,Ch.6.1965.
2/CLA-Critical Lane Analysis Rango-Peterson,B.G. and McInerney,M.O."Critical Movement Summation as Measures of Intersection Capacity A Planning Tool" Traffic Engineering, January 1971,page 41

Since a perceptual carrying capacity analysis is based on the beliefs of an area's inhabitants, it must be done through the use of a specific public survey. For this element of the study, a survey was developed to identify the Southern Maryland inhabitants' attitudes toward the character of the region and toward future growth and development. The survey covered the following topics:

- The way residents judge the quality of life of their community is based on a variety of features from public services and education provided by local governments to the quality and quantity of available natural resources. The survey prioritized a number of these components as to their degree of importance to the residents of Southern Maryland. It also evaluated the residents' overall view of the quality of life in the region. Those factors determined to be of particular importance to the region should be protected or enhanced to ensure the residents' satisfaction with living in Southern Maryland.

- The type of growth and development strategies preferred by the residents were determined. Those surveyed were asked to choose the type of economic development they would like to see promoted in Southern Maryland. The results, in turn, would indicate the degree and type of overall development preferred by the residents. For instance, if manufacturing and business development were desired, this would indicate that the residents prefer a more urbanized area. If fishing and agriculture were strongly preferred, the residents would most likely prefer a rural living environment. The residents were also asked to choose between future growth being directed to specific areas or modes within the region, or being allowed to disperse throughout the region.

In order to determine citizens' views of these topics, a mail survey form was used (Figure 3). The survey was sent to 18,048 or one-fourth of the Southern Maryland households using random sampling techniques to include Calvert, Charles and St. Mary's counties. In order to increase the rate of return, a short article in the local papers was printed publicizing the survey and inviting citizens who did not receive a survey to obtain one from the Tri-County Council office. Using a program developed by our Systems Analyst, the survey results were correlated and analyzed to determine the citizens' views and preferences concerning growth and development in Southern Maryland.

FIGURE 3 PERCEPTUAL CARRYING CAPACITY SURVEY

August 10, 1987

Dear Fellow Citizens of Southern Maryland:

The Tri-County Council for Southern Maryland is conducting a study to find out how people feel about population growth and development in Southern Maryland. Your opinions on the quality of life in the region, and how you think this quality can be maintained or improved in the future are vital to our study. In addition, it is important for county, regional and State officials to know your opinions when making planning decisions. Please take a minute to answer the following questions, and express your opinions regarding future growth in Southern Maryland.

Please check the appropriate response:

1. How would you describe the community that you live in? __ Urban __ Suburban __ Rural

2. How would you like to be able to describe your community in twenty years?
__ Urban __ Suburban __ Rural

3. What kind of development would you prefer in the Southern Maryland region during the next twenty years?
__ Urban __ Suburban __ Rural

4. There are many factors that determine how we feel about the quality of life of our community. Please evaluate how important EACH of the following is to you.
(1=very important, 2=important, 3=no opinion, 4=unimportant, 5=very unimportant)

__ Schools (public/higher education)
__ Public services
__ Recreational areas
__ Entertainment
__ Shopping
__ Cultural/historical sites/museums
__ Transportation (roads, public transp., etc.)
__ Open space, forestland, waterways
__ Agricultural land
__ Natural resources (wetlands, wildlife, etc.)
__ Other _____

5. How do you rate the overall quality of life in Southern Maryland?

__ Excellent __ Good __ Fair __ Poor __ No Opinion

6. Check the following types of economic development that you would like to see in So. Md.

__ Retail
__ High-tech/office development
__ Manufacturing
__ Tourism
__ Agriculture
__ Other _____
__ Aquaculture (fish farming)
__ Fishing
__ Defense
__ Mineral extraction & forestry
__ None

7. Should future growth be concentrated in areas of existing development or allowed to disperse throughout the region?

__ Concentrated __ Allowed to disperse __ No opinion

8. If you are employed, where do you go to work?

__ Calvert County
__ Charles County
__ St. Mary's County
__ Baltimore
__ Washington, D.C.
__ Other _____

9. What is your trade or occupation?

__ Military
__ Managerial/professional
__ Homemaker
__ Technical/clerical
__ Service occupation
__ Farming/forestry/fisheries
__ Production/craft/repair
__ Operator/laborer
__ Other _____

10. Do you rent or own your home? __ Rent __ Own

11. How long have you lived in Southern Maryland? _____

12. Please check your age range: __ 18-25 __ 26-40 __ 41-55 __ Over 55

13. What is your annual household income? __ Up to $9,999 __ $10,000 to $19,999 __ $20,000 - $29,999 __ $30,000 to $49,999 __ $50,000 or more

THANK YOU FOR YOUR TIME

INFRASTRUCTURE INVENTORY

Population

Table 1 provides the population data for each of the Southern Maryland counties and for the region from 1985 to 2000. The population projections predict that each of the counties will exhibit substantial increases in growth during this period, with an overall 35% population growth for the region. Charles County has and is expected to have the greater number of residents in the region, followed by St. Mary's County and Calvert County. The greatest percentage change in population is predicted to be in Calvert County, with a nearly 50% increase by the year 2000. The percentage increase in population is expected to be 36% in Charles County and 27% in St. Mary's County.

Water Supply

The inventory of the Southern Maryland water supply is shown in Table 2. The inventory takes into account both public/municipal systems and private community systems for each of the Southern Maryland counties. The population data provided by the counties, which differs slightly from those by the Maryland Department of State Planning, were used for calculations in both water and sewerage capacity and demand data.

Groundwater is the primary source of potable water in each of the Southern Maryland counties. Surface water is presently not used as a water source, except in the town of La Plata in Charles County, which contains an impoundment as a standby source. Calvert County has one surface water impoundment that is used for recreational purposes only. St. Mary's County, while not presently using surface water as a water supply source, has identified in its Comprehensive Plan four potential reservoirs to be located near its urban centers. Natural resource studies in each county indicate that groundwater sources should be sufficient to provide private and commercial users with adequate water supply for current demands and those beyond the year 2000, provided reasonable water conservation practices are implemented.

In Calvert and St. Mary's counties, the majority of residents depend on individual wells for their water supply. Only 20% of the residents in Calvert County and 30% in St. Mary's County are served by municipal/community water supplies. This is due to the agricultural and rural residential nature of the counties, in which community water systems cannot be economically provided (Calvert County Department of Planning and Zoning, 1986; St. Mary's County Metropolitan Commission, 1982). On the other hand, approximately 59% of the Charles County residents are supplied by public/quasi-public water systems. Charles County Department of Public Works operates 13 of the 57 community systems, the towns of La Plata and Indian Head operate two municipal systems, and the rest of the systems are operated by utilities/homeowners associations and corporations (Nassaux-Hemsley, Inc., 1985).

By the year 2000, each county intends to at least double the population that is currently served by community water systems. Calvert County and Charles County plan to increase their residential system capacities accordingly, whereas St. Mary's County expects that the current capacity will be more than sufficient to accommodate the additional system demand.

TABLE 1

POPULATION ESTIMATES AND PROJECTIONS FOR SOUTHERN MARYLAND

	1985	1990	1995	2000	% Increase Between 1985 to 2000
Calvert Co.	40,000	46,500	52,700	58,300	46%
Charles Co.	82,800	94,500	104,000	112,500	36%
St. Mary's Co.	64,700	71,000	76,900	82,000	27%
So. Md. Region	187,500	212,000	233,600	252,800	35%

(Maryland Department of State Planning, 1985)

TABLE 2

INVENTORY OF THE RESIDENTIAL WATER SUPPLY
FOR THE SOUTHERN MARYLAND COUNTIES

CALVERT COUNTY	1986	2000
County Population	40,300	66,100
Population Served	8,167	18,632
Residential System Capacity (MGD)	2.8	3.8
Average Daily Per Capita Demand (GPCD)	90	100
System Capacity Used (MGD)	0.64	2.0
% Population Served	20.3%	28.2%
% Population System Able to Serve	77.2%	57.5%
% Capacity Available for Further Use	77.1%	47.4%

CHARLES COUNTY	1980	2000
County Population	72,751	105,907
Population Served	42,771	81,749
Residential System Capacity (MGD)	8.37	11.08
Average Daily Per Capita Demand (GPCD)	90	90
System Capacity Used (MGD)	3.50	7.70
% Population Served	58.8%	77.2%
% Population System Able to Serve	130%	116%
% Capacity Available for Further Use	58.2%	30.5%

ST. MARY'S COUNTY	1981	2000
County Population	61,000	88,828
Population Served	18,017	36,626
Residential System Capacity (MGD)	17.79	17.79
Average Daily Per Capita Demand (GPCD)	78	71
System Capacity Use (MGD)	2.94	5.06
% Population Served	29.5%	41.2%
% Population System Able to Serve	300%	280%
% Capacity Available for Further Use	83.5%	71.6%

(Calvert County Department of Planning and Zoning, 1986)
(Nassaux-Hemsley, Inc., 1985)
(St. Mary's County Metropolitan Commission, 1982 Update)

With the growing population and increasing reliance on community systems, it will be necessary for the counties to guide development to designated growth areas with available or planned multi-use systems to ensure that adequate water resources are maintained. Calvert County intends to follow this philosophy by planning water facilities in its designated town centers and directing new growth to these development areas (Calvert County Department of Planning and Zoning, 1986). Charles County plans to develop water systems in areas targeted for future growth, primarily in the north-western and north-central portions of the county. Future residential development is to primarily occur in the urban centers of Lexington Park and Leonardtown and in seven community centers of St. Mary's County. The designated service areas of the county are expected to provide adequate water supply as these development centers grow.

Each county has identified its own water supply problems. Calvert County indicated in its 1986 Biennial Update that most community systems provide inadequate water flow, storage capacity or pressure for fire protection. There was also a lack of community water at the designated town center of North Beach. Other problems included limited distribution and capacity in certain growth areas. The county plans to alleviate these problems by developing a water system for North Beach, upgrade the Prince Frederick Sanitary Subdivision, and improve and extend other systems to meet new growth demands.

By the year 2005, the Waldorf Service Area alone in Charles County is expected to serve 61,100 residents, as opposed to 30,800 served in 1985. The tremendous growth in the area promises problems in water supply if alternative sources are not provided. The county identified three alternatives to improve the water supply in the area: (1) develop surface water supplies; (2) improve existing wells by increasing the capacity of the present supply or adding new wells; (3) interconnecting with the Washington Suburban Sanitary Commission system. Charles County plans to concentrate on the third alternative by purchasing water from the WSSC as its primary new water source. It is also considering tapping other aquifers to improve existing systems and building impoundments as surface water reserves. The county is also concerned about possible salt water intrusion caused by overpumping of groundwater for residential, commercial and industrial needs (Nassaux-Hemsley, Inc., 1985).

St. Mary's County indicated concern about adequate water supplies for fire protection in certain areas and adequate protection of aquifer recharge areas. The county is planning expansions and extensions of facilities to meet the flow needs for fire protection. Studies to determine the effects of development on aquifer recharge areas and recommendations to prevent problems are also to be undertaken.

Sewerage Services

Table 3 provides the inventory of the sewerage services of the Southern Maryland region. Presently, less than 35% of the Southern Maryland residents are served by community sewerage systems. In each county, most of the population utilizes on-site subsurface disposal sewerage (septic) systems. Some reliance on outdoor toilets also occurs.

TABLE 3

INVENTORY OF THE SEWERAGE SERVICE
FOR THE SOUTHERN MARYLAND COUNTIES

CALVERT COUNTY	1986	2000
County Population	40,300	66,100
Population Served	7,905	24,722
System Capacity (MGD)	0.925	2.23
Average Daily Per Capita Demand (GPCD)	90	90
System Capacity Used (MGD)	0.519	1.72
% Population Served	19.6%	37.4%
% Population System Able to Serve	25.5%	37.5%
% Capacity Available for Further Use	43.9%	22.9%

CHARLES COUNTY	1980	2000
County Population	72,751	105,907
Population Served	38,722	80,982
System Capacity (MGD)	12.8	28.8
Average Daily Per Capita Demand (GPCD)	100	100
System Capacity Used (MGD)	4.81	9.48
% Population Served	53.2%	76.5%
% Population System Able to Serve	175%	270%
% Capacity Available for Further Use	62.4%	67.1%

ST. MARY'S COUNTY	1981	2000
County Population	61,000	88,828
Population Served	12,466	35,438
System Capacity (MGD)	3.66	6.58
Average Daily Per Capita Demand (GPCD)	75	75
System Capacity Used (MGD)	2.21	4.56
% Population Served	20.4%	39.9%
% Population System Able to Serve	80.0%	98.8%
% Capacity Available for Further Use	39.6%	30.7%

(Calvert County Department of Planning and Zoning, 1986)
(Nassaux-Hemsley, Inc., 1985)
(St. Mary's County Metropolitan Commission, 1982 Update)

In general, the community sewerage systems provide adequate treatment for the population serviced. A few treatment plants have problems meeting their effluent permit requirements. Poorly treated waters that are released into surface waters contribute to the decline in the Chesapeake Bay. This is especially true in tidal water where waste is dispersed slowly as it is transported upstream and downstream by tidal action. This results in pollution areas above and below waste discharge points, severely limiting use of streams, particularly for commercial fishing and recreation (Nassaux-Hemsley, Inc., 1985). While the counties are presently addressing these problem areas by planning upgrades of treatment plants and considering alternative disposal methods such as land application treatment, much work needs to be done to ensure compliance with permit limits and prevent further decline in the water quality of receiving streams.

Another major problem in Southern Maryland is failing septic systems. Failure may be due to lack of system maintenance, high groundwater or poor soil percolation, resulting in septic overflows. Such occurrences contribute to water quality degradation and to potential sewage-related public health hazards. Continued maintenance of septic systems must occur to prevent such failures. Where on-site sewage disposal problems persist due to high water tables and poor soil conditions, alternative treatment of inclusion in public service must be considered. To prevent further problems from failing septic systems, future development must be restricted where public service is not provided or planned for, and where natural conditions preclude on-site disposal of sewage.

By the year 2000, each county plans to at least double the population served by community systems, with subsequent demand increases. Most of the residents will still rely on on-site disposal systems in Calvert County and St. Mary's County, with less than 40% of the populations serviced by community systems. Charles County, however, plans to service 77% of its residents with community sewerage systems. The increasing reliance on public sewerage is due to a combination of the growing urban nature in the northern portions of the county and to 85% of the county being identified by the Department of Health and Mental Hygiene as unsuitable for on-site sewage disposal.

With increasing dependence on community systems, the Southern Maryland counties plan to increase system capacities accordingly. The waste treatment plants to be upgraded and expanded are primarily in the high growth areas. In Calvert County, this includes the Prince Frederick, Twin Beaches and Solomons Island Planning areas. Upgrades and expansions are planned in the north-central and north-western growth areas of Charles County, including the Mattawoman Treatment Plant, Bryans Road Sewer System, Cobb Island and Substation Road Sewer Systems. St. Mary's County has identified future growth to primarily occur in the Leonardtown, Lexington Park, Luckland Run, Dukeharts Creek and Indian Creek Sanitary Districts. Of the ten sanitary districts in the county, seven presently have operating wastewater facilities. With the projected population growth, most of these will call for expansions to meet growing sewerage demands. The other service areas are zoned for large lots which will only require community service if permitted development densities increase or the number of septic system failures significantly increase (St. Mary's County Metropolitan Commission, 1982).

Each county provides or plans to provide public sewerage in high density zones of existing and new development. Concentrations of development can be serviced by community sewerage in the least expensive and most efficient manner. In areas that are scheduled to be provided with sewerage service, scattered or low density development should be discouraged to avoid inefficient servicing. This principle, along with the use of alternative technologies such as land application treatment, help control sewerage development, maintenance and operating costs and protects valuable natural resources (Calvert County Department of Planning and Zoning, 1986).

Schools

Tables 4-6 provide the Southern Maryland public schools' yearly enrollment data and projections for the elementary, middle and high school levels of the systems. Figure 4 reveals the overall enrollment trends for each of the counties. These data include regular student and special education student enrollment. Specialized schools, such as vocational and technical education centers, are not included in the data.

Charles County has the largest student enrollment in Southern Maryland, followed by St. Mary's County and Calvert County,. The greatest change in overall enrollment is expected to be in Calvert County, with a 36% increase by 1996. In Charles County, a 27% increase is expected, and in St. Mary's County, a 23% increase in enrollment is projected. These findings are consistent with the overall population data of the region. Within the region, the greatest increase in enrollment is projected to be in the elementary and middle school levels (31% - 60% change). The high school data reveals relatively little change in enrollment throughout the region, including a 1% decrease in high school enrollment in Charles County.

The enrollment changes within the various levels of the school systems are consistent with the findings for the State of Maryland (Department of State Planning, 1986). A general increase in elementary and middle school enrollment is projected for the State between 1985 and 1995. In Southern Maryland, enrollment at these levels of the public schools is projected to exceed the Statewide average of 15% increase. The enrollment trends at these school levels are attributed to recent and anticipated increases in births within the State.

During the second half of the 1980s, Statewide public high school enrollment is projected to decrease from 1985 levels. This has been attributed to smaller elementary school populations of recent years entering high school. After 1990, public high school enrollment is expected to increase, although in 1995, it is still expected to be at or below 1985 enrollment for most of the State. These trends are reflected in the data for the Southern Maryland public schools, except for Calvert County which predicts a 26% increase in high school enrollment by 1996.

TABLE 4

ENROLLMENT DATA AND PROJECTIONS
FOR CALVERT COUNTY PUBLIC SCHOOLS

	Elementary Schools (Grades K-5)	Middle Schools (Grades 6-8)	High Schools (Grades 9-12)	Total
1986	3,930	1,766	2,619	8,315
1987	4,239	1,915	2,540	8,694
1988	4,541	1,987	2,633	9,161
1989	4,840	2,185	2,681	9,706
1990	5,079	2,365	2,760	10,204
1991	5,295	2,558	2,835	10,688
1996	5,186	2,823	3,291	11,300

(Board of Education of Calvert County, 1987)

TABLE 5

ENROLLMENT DATA AND PROJECTIONS
FOR CHARLES COUNTY PUBLIC SCHOOLS

	Elementary Schools (Grades K-5)	Middle Schools (Grades 6-8)	High Schools (Grades 9-12)	Total
1985	6,956	3,705	6,076	16,737
1986	7,311	3,686	5,956	16,953
1987	7,896	3,538	5,561	16,995
1988	8,214	3,711	5,216	17,141
1989	8,580	3,804	5,005	17,389
1990	8,896	4,082	4,892	17,870
1991	9,222	4,298	5,090	18,610
1992	9,580	4,565	5,229	19,374
1993	9,849	4,829	5,483	20,161
1994	10,168	4,877	5,889	20,934
1995	10,467	5,027	5,905	21,399

(Board of Education of Charles County, 1986)

TABLE 6

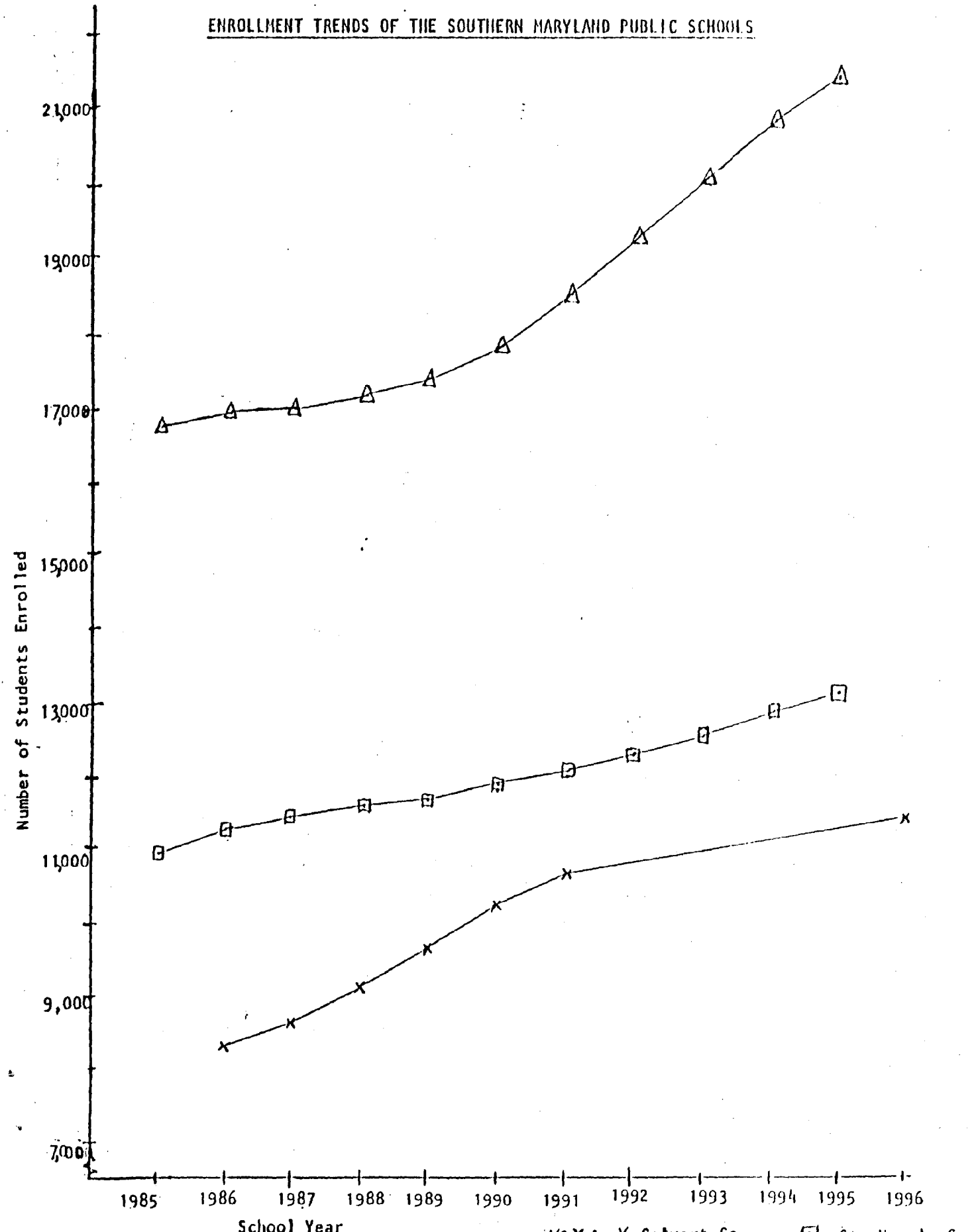
ENROLLMENT DATA AND PROJECTIONS
FOR ST. MARY'S COUNTY PUBLIC SCHOOLS

	Elementary Schools (Grades K-5)	Middle Schools (Grades 6-8)	High Schools (Grades 9-12)	Total
1985	4,888	2,411	3,627	10,926
1986	5,225	2,405	3,618	11,248
1987	5,423	2,479	3,541	11,443
1988	5,557	2,504	3,572	11,633
1989	5,757	2,428	3,517	11,702
1990	5,855	2,659	3,475	11,989
1991	5,915	2,776	3,427	12,118
1992	6,036	2,842	3,479	12,357
1993	6,120	3,116	3,396	12,632
1994	6,263	3,092	3,669	13,024
1995	6,358	3,136	2,721	13,215
1996	6,419	3,183	3,846	13,448

(Board of Education of St. Mary's County, 1987)

FIGURE 4

ENROLLMENT TRENDS OF THE SOUTHERN MARYLAND PUBLIC SCHOOLS



The overall Statewide public school enrollment is expected to increase by 6.8%. The Southern Maryland public schools anticipate substantially greater increases (23-36%) in total enrollment. A major factor in these differences is the overall in-migration to the region. The tremendous population growth within Southern Maryland will be reflected in the schools, since most of the migrating pool consists of families with children (Department of State Planning, 1985).

The growth trends that are occurring in Southern Maryland often lead to stress of overcrowding on school systems. Comparisons between rated capacities of schools and enrollment data are helpful in measuring the magnitude of this stress. Table 7 compares the rated capacities of each level of the school systems to actual and projected enrollment data for each county. The rated capacity, based on State and federal guidelines, is the number of students that a school should ideally hold so that it is large enough to economically support the needs of the students, but small enough to ensure that each student retains his/her identity and feels free to confer with at least one faculty member for personal guidance (Board of Education of St. Mary's County, 1987). The table also provides the percentage of the capacity that is used in a particular year at each school level. The values were obtained by dividing student enrollment by rated capacity. The difference between these values show the actual number of students by which the systems either exceed or fall below the rated capacities.

The 1985/86 findings show that Calvert County's elementary and high school levels and Charles County's high school levels exceeded the rated capacities. The total enrollment in both counties exceeded the rated capacities of the public schools. In 1985, St. Mary's County schools were all below the rated capacities. By 1996, however, all three counties will be experiencing overcrowding in public schools. An exception is the middle school system in St. Mary's County, which is expected to remain approximately 10% under its capacity. The total St. Mary's County enrollment, however, as well as Calvert and Charles counties, are expected to exceed to rated capacities of the public school system.

These findings are also consistent with the population growth data, with Calvert and Charles counties experiencing the greatest stress on the school systems. All three counties, however, will be facing problems of overcrowding by the end of the century, unless steps are taken to alleviate growing school enrollments. These include capital improvements to expand existing school facilities or building additional facilities to accommodate the increasing student population, particularly in the high growth areas of the counties.

Transportation

The concept of levels of service (LOS) qualitatively describes the operational conditions within a traffic stream in terms such as speed, travel time, freedom to maneuvers, traffic interruptions, comfort, convenience and safety. It can be measured by the V/C ratio which compares the volume of traffic actually utilizing a roadway facility to the capacity of the facility. Capacity is defined as the hourly rate at which vehicles can reasonably traverse a point, uniform section of a lane or roadway during a given time period under prevailing roadway, traffic and control conditions. As the LOS ratio approaches one, the facility is being used near or at its capacity.

TABLE 7

PUBLIC SCHOOL FACILITY CAPACITIES AND ENROLLMENT COMPARISONS
FOR THE SOUTHERN MARYLAND COUNTIES

CALVERT COUNTY	Elementary Schools (K-5)	Middle Schools (6-8)	High Schools (9-12)	Total
Rated Capacity	3,565	1,943	2,430	7,938
1986 Enrollment	3,930	1,766	2,619	8,315
% Capacity Used 1986	110.2%	90.9%	107.8%	104.8%
Excess (shortage) 1986	365	(177)	189	377
1996 Enrollment	5,186	2,823	3,291	11,300
% Capacity Used 1996	145.5%	145.2%	135.4%	142.4%
Excess (shortage) 1996	1,621	880	861	3,362
CHARLES COUNTY				
Rated Capacity	7,105	4,591	4,996	16,692
1985 Enrollment	6,956	3,705	6,076	16,737
% Capacity Used 1985	97.9%	80.7%	121.6%	100.3%
Excess (shortage) 1985	(149)	(886)	1,080	45
1995 Enrollment	10,467	5,027	5,905	21,399
% Capacity Used 1995	147.3%	109.5%	118.2%	128.2%
Excess (shortage) 1995	3,362	436	909	4,707
ST. MARY'S COUNTY				
Rated Capacity	5,355	3,519	3,770	12,644
1985 Enrollment	4,888	2,411	3,627	10,926
% Capacity Used 1985	91.3%	68.5%	96.2%	86.4%
Excess (shortage) 1985	(467)	(1,108)	(143)	(1,718)
1996 Enrollment	6,419	3,183	3,846	13,448
% Capacity Used 1996	119.9%	90.5%	102%	106.4%
Excess (shortage) 1996	1,064	(336)	75	804

Traffic facilities are rarely designed to operate at capacity and do so poorly near this range. Six levels of service, designated letters A to F are defined for each type of facility (Figure 2). LOS A represents facilities with the best operating conditions and lowest V/C ratio, and LOS F represents the worst conditions and V/C ratios greater than 1.0 (Transportation Research Board, 1985).

Figure 5 provides the level of service designations of the key road links and intersections in St. Mary's County (Kellerco, 1987b). Most of the roads are operating at LOS A, indicating free flow of traffic in which the operation of a vehicle is essentially unaffected by the presence of other vehicles. Ability to maneuver and to select desired speeds are excellent, as well as comfort and convenience for the motorist.

Several areas of St. Mary's County experience reduced operational conditions from the LOS A rating. The highest average daily traffic occurs on MD 235, just south of St. Andrews Church Road. With this volume of traffic and the designed roadway capacity, the expanse between St. Andrews Church Road and Chancellor's Run Road on MD 235 has been designated LOS B. At this operational level, traffic flow is still stable but the presence of other users becomes noticeable. Maneuverability from LOS A declines slightly, but the ability to select desired speed remains unaffected. Individual behavior of others somewhat affects the comfort and convenience of driving within a traffic stream. The level-of-service in this section of MD 235, however, is considered to still operate under good conditions.

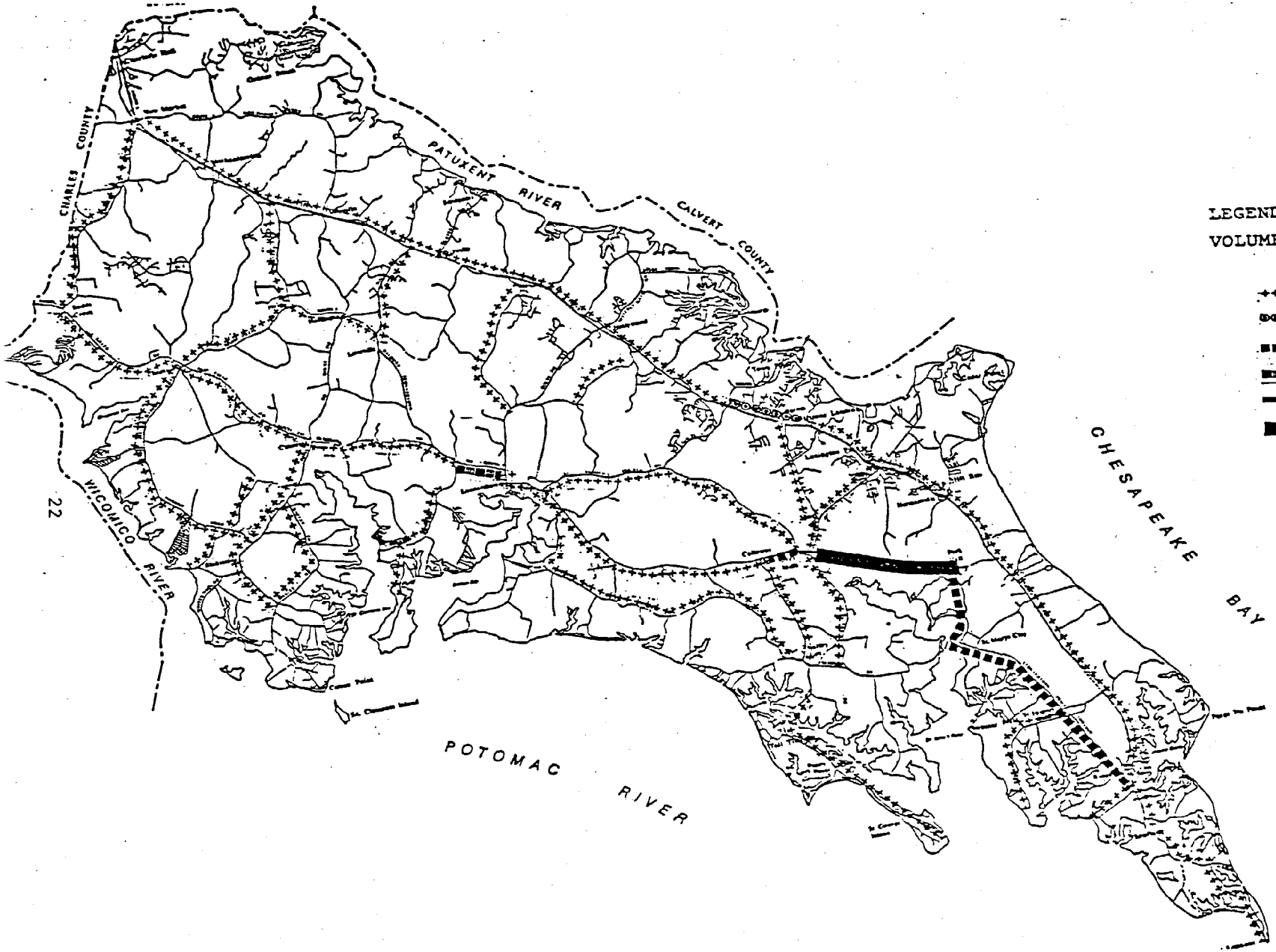
A level-of-service C designation has been assigned to MD 5 in the vicinity of Great Mills Road and St. Mary's City, where traffic density begins to have a marked effect on operations. Traffic remains within the stable range of flow, but most drivers experience restrictions in maneuvering and selecting speeds due to interactions with other users. Disruptions to flow, such as occurs during peak hours between Great Mills Road and Park Hall, result in deterioration of service to LOS E or F. These indicate poor operating conditions, in which queuing causes extensive backups and waves of stop-and-go traffic, particularly in areas of flow-breakdown such as intersections.

Other areas of unstable traffic flow occur on MD 5 west of Leonardtown to Compton Road, designated LOS D, and between New Market and Charlotte Hall, designated LOS E. Traffic congestion severely restricts speeds and ability to maneuver. While speeds are generally uniform, minor disruptions in flow result in deterioration of operations to LOS F.

During peak hours in mornings and afternoons, certain roadways experience deterioration of service from normal operating conditions. Near Lexington Park, such traffic congestion from the Patuxent Naval Air Test Center result in LOS D conditions on Route 235 at Peggs Lane, FDR Boulevard, Route 4 and Chancellor's Run Road. However, these operating conditions near the Naval Center are expected for "rush hour" traffic. Along Route 5 through Leonardtown, traffic problems exist and are expected to deteriorate as development increases 50% within the next twenty years. Increased development will also cause more congestion and delays along Route 246 near Chancellor's Run Road, Tosca, Mattingly Village and Patuxent Park West.

St. Mary's County has a number of improvements planned to alleviate problems

FIGURE 5 LEVEL OF SERVICE DESIGNATIONS FOR ROADWAYS IN ST. MARY'S COUNTY



on stressed roadways. A Leonardtown Bypass is planned, which is to improve peak hour conditions. MD 246 is to be upgraded to a multi-lane roadway from MD 5 to Saratoga Drive in Lexington Park. Traffic lights are to be installed at Great Mills Road and Chancellor's Run Road and at Town Creek Drive and MD 235 where delays and conflicts presently occur. Although not yet funded, plans for new roads in Lexington Park are proposed to alleviate stress near the Naval Center. A number of safety and resurfacing projects are also scheduled for 1987-88 to improve operating conditions (Kellerco, 1987b).

In 1981, a study of the northern Charles County transportation system was undertaken to identify traffic problems, predict future traffic conditions and recommend improvements to alleviate problems. The tremendous growth that is occurring in Charles County is predominantly located in the northern portion of the county. Historical pattern of traffic based on agricultural travel has been replaced by heavy commuter travel to the Washington Metropolitan area and by typical suburban residential travel. These changes in traffic patterns have resulted in congestion due to high volumes of traffic in excess of the roadways' capacities (Maryland Department of Transportation, 1981).

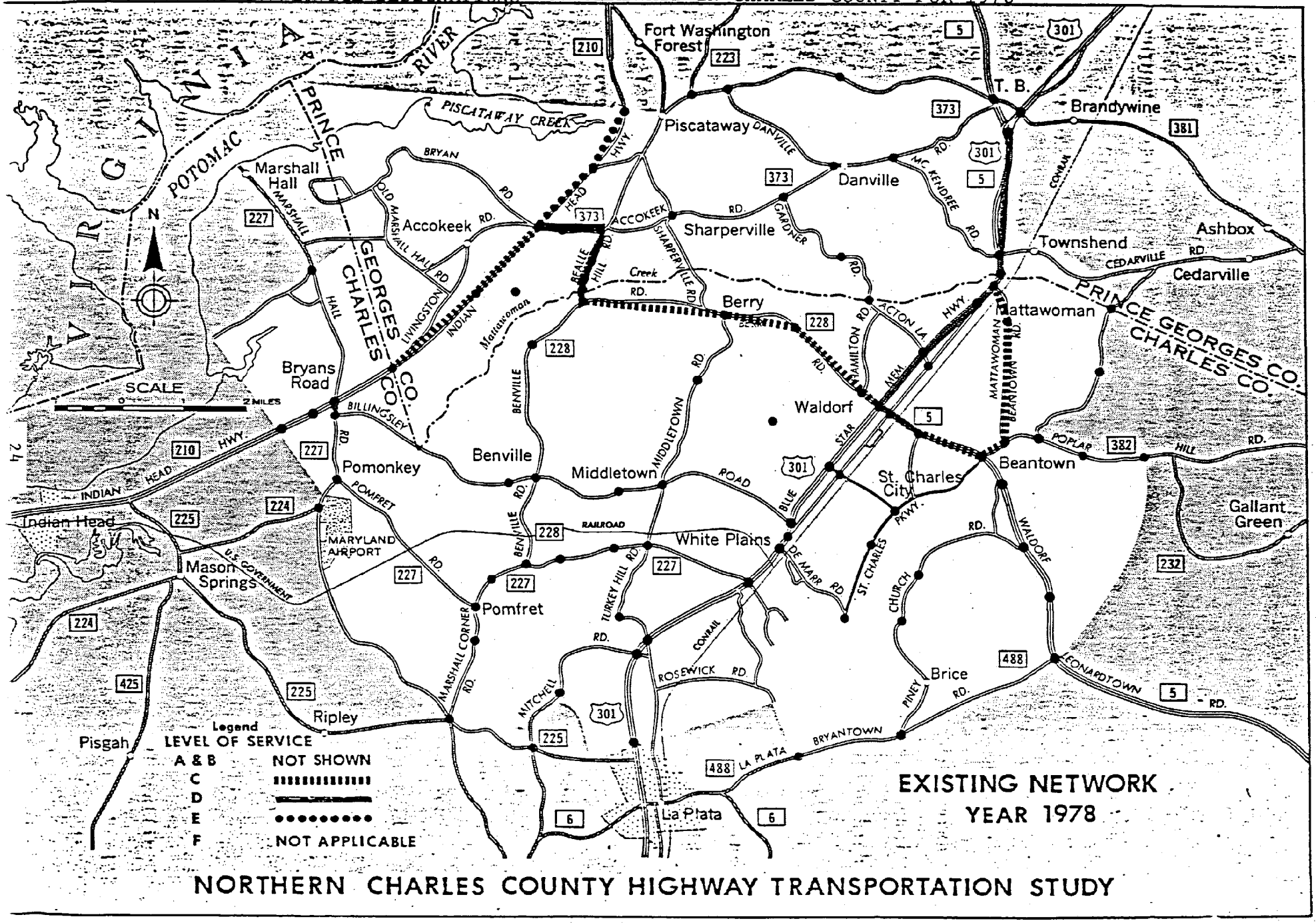
The main roadway serving Charles County is US 301 (Figure 6). A variety of traffic types use this highway from interstate and commuter traffic to local, short distance trips. Due to the volume of traffic, the diversity of uses and the designed capacity, US 301 presently operates at a level-of-service D. Congestion severely restricts maneuverability and speed selection. Disruptions in traffic often result in deterioration of service to LOS F. At the US 301/MD 5/MD 228 intersection in Waldorf, operating conditions are at LOS E. This type of congestion is rarely encountered outside of heavily developed metropolitan areas. Congestion is further intensified along US 301 during peak hours.

Other problem areas due to inadequate highway capacity, particularly during peak hours, occur at MD 5/MD 925, US 301/Mattawoman-Beantown Road, MD 5/Md 382 and US 301/Smallwood Drive. These areas are rated LOS C and D. Deterioration to LOS E and F often occurs during "rush hour."

As reported earlier, future growth is primarily planned for this north-central, north-western portion of Charles County. Increases in residential and commuter traffic will greatly magnify the current problems (Figure 7). If no improvements are made, traffic will greatly exceed the capacities of major roadways and intersections. US 301 will operate at LOS F with severe breakdown flow and congestion. Possibilities for improvements of operational conditions on or near MD 5 through Waldorf are not foreseen due to the nature of traffic and development in this area.

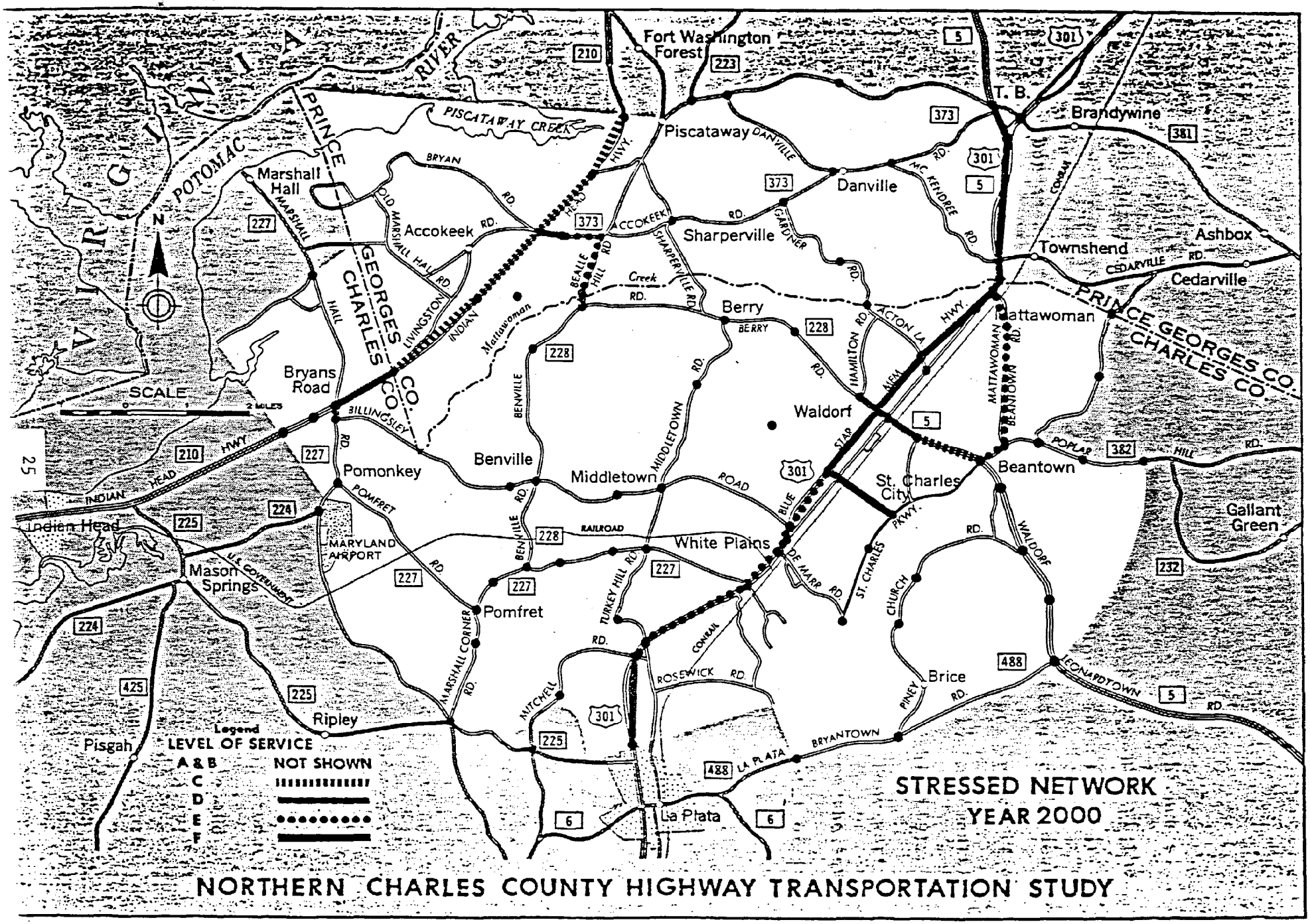
The improvements that are currently being made along Mattawoman-Beantown Road are not expected to increase the capacity of the roadway sufficiently to accommodate the traffic bypassing the congestion at the MD 5/US 301 intersection. Smallwood Drive, the main access road of St. Charles City compounds operational problems by directing traffic into the already stressed US 301 and MD 5 roadways. This road will also be unable to serve the growing

FIGURE 6 - LEVEL OF SERVICE DESIGNATIONS FOR ROADWAYS IN CHARLES COUNTY FOR 1978



NORTHERN CHARLES COUNTY HIGHWAY TRANSPORTATION STUDY

FIGURE 7 LEVEL OF SERVICE DESIGNATIONS FOR ROADWAYS IN CHARLES COUNTY BY 2000



residential traffic from St. Charles without additional access roads being built. Without changes to MD 210, Indian Head Highway, increasing traffic would result in deteriorating conditions to LOS F in Charles County. However, the dualization of the roadway is expected to relieve the congestion along MD 210.

A number of recommendations have been set forth to resolve some of the traffic problems in northern Charles County. Short-term recommendations include improving the US 301/Md 5/Md 228 intersection to increase capacity, constructing a new park 'n ride lot on US 301 at Smallwood Drive to reduce peak hour commuting traffic, and new traffic signals at various stressed intersections for minor improvements. Long-term recommendations to improve present conditions and accommodate future traffic growth have also been made. These include widening MD 5 from US 301 to Post Office Road to relieve congestion through Waldorf, and reconstruction of the US 301/Smallwood Drive intersection to relieve congestion from St. Charles City, particularly from turning traffic. A Waldorf Bypass is being considered to relieve the growing stress along US 301/MD 5. A study of Prince George's and Charles counties is also recommended to establish "a master plan for access and traffic controls along US 301" to coordinate land use needs and traffic capacity with improvements to reduce congestion (Maryland Department of Transportation, 1981).

Formal studies of Calvert county's roadways level-of-service designations have not been undertaken at the present time. Local roads have been rated LOS C due to speed and road design constraints. Operational conditions are stable, although backups occasionally occur behind turning vehicles. Some restrictions in maneuverability and speed selection are felt by drivers to the presence of other vehicles.

Presently, the intersections in Calvert County's town centers along Route 2/4 are operating at levels-of-service A and B. These are the most desirable operating conditions in terms of maneuverability, comfort and convenience. However, in response to the growing population in the county, these intersections are projected to soon reach levels-of-service D and E, with LOS F conditions likely to occur during peak hours. The Department of Planning and Zoning is planning more detailed studies of the county's roadways to identify problem areas and recommend alternatives to alleviate and prevent traffic problems.

PERCEPTUAL CARRYING CAPACITY

The Carrying Capacity Survey (Figure 3), designed to determine citizens' views toward the character of the region and toward future growth and development, was mailed to a quarter (18,048) of the Southern Maryland households. Within three months, 2,689 completed surveys were returned, which is a 15% return rate. The number of responses, along with additional written comments and telephone inquiries regarding the survey, indicate that the residents of Southern Maryland are very interested in these issues and are willing to participate in such study.

In an initial analysis of the survey, a tabulation of the results was performed (see Appendix). A summary of the findings is reported in the following section. This preliminary examination of the survey responses revealed various flaws which must be addressed before final interpretations and conclusions can be drawn. As a supplement to this report, a more detailed and comprehensive analysis will be undertaken, including cross-tabulation between responses.

While some bias or confusion between questions were discovered, the initial analysis indicates that citizens' attitudes will be revealed concerning the issues addressed by the survey. From these findings, general conclusions can be drawn identifying how residents view the quality of life and future growth, or what they perceive the carrying capacity of Southern Maryland to be.

Survey Results

1. How would you describe the community that you live in?

	Urban	Suburban	Rural	Total
Totals	78	753	1809	2640
Percentage	3.0	28.5	68.5	100

2. How would you like to be able to describe your community in twenty years?

	Urban	Suburban	Rural	Total
Totals	104	915	1608	2627
Percentage	4.0	34.8	61.2	100

3. What kind of development would you prefer in the Southern Maryland region during the next twenty years?

	Urban	Suburban	Rural	Total
Totals	160	910	1422	2492
Percentage	6.4	36.5	57.1	100

4. There are many factors that determine how we feel about the quality of life of our community. Please evaluate how each of the following is to you (1 = very important, 2 = important, 3 = no opinion, 4 = unimportant, 5 = very unimportant).

	Percentage				
	V. Imp.	Imp.	Unimp.	V. Unimp.	No Op.
Schools	70.3	16.7	2.9	2.9	4.9
Public Services	34.3	46.4	5.7	2.2	8.6
Recreational Areas	18.3	51.3	11.5	4.2	10.9
Entertainment	8.4	34.3	25.1	11.1	17.4
Shopping	22.7	43.2	15.9	5.7	9.9
Cultural/Hist. Sites/Museums	16.9	41.8	14.0	4.9	18.6
Transportation	48.0	37.1	5.4	2.3	5.0
Open Space/Forests/Waterways	65.0	25.4	1.8	1.3	4.3
Agricultural Land	46.5	31.9	4.5	2.2	11.7
Natural Resources	59.1	26.9	2.5	1.5	7.4
Other	10.1	0.8	0	0.5	0.4

5. How do you rate the overall quality of life in Southern Maryland?

	Totals	Percentage
Excellent	539	20.1
Good	1610	60.1
Fair	452	16.9
Poor	66	2.5
No Opinion	11	0.4
Total	2678	100.0

6. Check the following types of economic development that you would like to see in Southern Maryland.

	Totals	Percentage
Retail	1109	41.2
High-tech/Office Dev.	852	31.7
Manufacturing	431	16.0
Tourism	838	31.2
Agriculture	1577	58.6
Aquaculture (fish farming)	1251	46.5
Fishing	1225	45.6
Defense	443	16.5
Mineral Extraction & Forestry	239	8.9
None	196	7.3
Other	158	5.9

7. Should future growth be concentrated in areas of existing development or allowed to disperse throughout the region?

	Totals	Percentage
Concentrated	1732	66.4
Allowed to Disperse	713	27.3
No Opinion	163	6.3
Total	2608	100.0

8. If you are employed, where do you go to work?

	Total	Percentage
Calvert County	226	8.5
Charles County	528	20.0
St. Mary's County	478	18.0
Baltimore	27	1.0
Washington, D.C.	575	21.7
Other	817	30.8

9. What is your trade or occupation?

	Totals	Percentage
Military	138	5.1
Managerial/Professional	1117	41.5
Homemaker	177	6.6
Technical/Clerical	401	14.9
Service Occupation	252	9.4
Farming/Forestry/Fisheries	89	3.3
Production/Craft/Repair	127	4.7
Operator/Laborer	61	2.3
Other	557	20.7

10. Do you rent or own your home?

	Totals	Percentage
Rent	241	9.0
Own	2430	91.0
Total	2671	100.0

11. How long have you lived in Southern Maryland?

Years	Totals	Percentage
1-5	623	23.7
6-10	445	17.0
11-20	723	27.5
21-88	834	31.8

12. Please check your age range.

Age	Totals	Percentage
18-25	113	4.2
26-40	1058	39.8
41-44	899	33.8
Over 55	590	22.2
Total	2660	100.0

13. What is your annual household income?

Income	Totals	Percentage
Up to $9,999	51	2.0
$10,000-$19,999	236	9.2
$20,000-$29,999	390	15.1
$30,000-$49,999	991	38.5
$50,000 or more	905	35.2

REFERENCES

Board of Education of Calvert County. 1987. School Facilities Master Plan for Fiscal Year 1989.

Board of Education of Charles County. 1986. Comprehensive Plan for School Facilities.

Board of Education of St. Mary's County. 1987. School Facilities Master Plan.

Calvert County Department of Planning and Zoning. 1986. Calvert County Comprehensive Water and Sewerage Plan, 1986 Biennial Update.

Highway Research Board. 1965. Highway Capacity Manual, Special Report 87.

Highway Research Board. 1985. Highway Capacity Manual, Special Report 209.

Kellerco. 1987 (a). St. Mary's County Comprehensive Growth Management Plan, Existing Conditions - Transportation.

Kellerco. 1987 (b). St. Mary's County Short and Long Term (2000) Transportation Plan.

Maryland Department of State Planning. 1985. Population Projections for Maryland Subdivisions.

Maryland Department of State Planning. 1986. Public School Enrollment Projections 1986-1995.

Maryland Department of Transportation (SHA). 1981. Northern Charles County Highway Transportation Study 1981.

Nassaux-Hemsley, Incorporated. 1985. Charles County Comprehensive Water and Sewerage Plan Update - 1983.

Ricklefs, Robert E. 1976. The Economy of Nature. Chiron Press, Inc., New York. pp. 245-249.

St. Mary's County Metropolitan Commission. 1982. St. Mary's County Comprehensive Water and Sewerage Plan - 1982 Update.

Tri-County Council for Southern Maryland. 1980. Managing Change in the 80's: A Challenge for Teamwork. Staff Paper No. 14.

Tri-County Council for Southern Maryland. 1986. Carrying Capacity Design for the Southern Maryland Region.

APPENDIX

TABLE OF SUBUR_1 (ROWS) BY RURAL_1 (COLUMNS)
FOR THE FOLLOWING VALUES:
URBAN_1 = 0

FREQUENCIES

	0	1	TOTAL
0	25	1809	1834
1	753	22	775
TOTAL	778	1831	2609

TABLE OF SUBUR_1 (ROWS) BY RURAL_1 (COLUMNS)
FOR THE FOLLOWING VALUES:
URBAN_1 = 1

FREQUENCIES

	0	1	TOTAL
0	78	0	78
1	2	0	2
TOTAL	80	0	80

TABLE OF SUBUR_2 (ROWS) BY RURAL_2 (COLUMNS)
FOR THE FOLLOWING VALUES:
URBAN_2 = 0

FREQUENCIES

	0	1	TOTAL
0	36	1608	1644
1	915	21	936
TOTAL	951	1629	2580

TABLE OF SUBUR_2 (ROWS) BY RURAL_2 (COLUMNS)
FOR THE FOLLOWING VALUES:
URBAN_2 = 1

FREQUENCIES

	0	1	TOTAL
0	104	1	105
1	4	0	4
TOTAL	108	1	109

TABLE OF SUBUR_3 (ROWS) BY RURAL_ (COLUMNS)
FOR THE FOLLOWING VALUES:
URBAN_3 = 0

FREQUENCIES

	0	1	TOTAL
0	134	1422	1556
1	910	49	959
TOTAL	1044	1471	2515

TABLE OF SUBUR_3 (ROWS) BY RURAL_ (COLUMNS)
FOR THE FOLLOWING VALUES:
URBAN_3 = 1

FREQUENCIES

	0	1	TOTAL
0	160	2	162
1	9	3	12
TOTAL	169	5	174

COUNT	CUM COUNT	PCT	CUM PCT	QUSCHOOL	
64	64	2.4	2.4		0
1891	1955	70.3	72.7		1
449	2404	16.7	89.4		2
133	2537	4.9	94.3		3
74	2611	2.8	97.1		4
78	2689	2.9	100.0		5

COUNT	CUM COUNT	PCT	CUM PCT	QUPUBSER	
77	77	2.9	2.9		0
923	1000	34.3	37.2		1
1248	2248	46.4	83.6		2
231	2479	8.6	92.2		3
152	2631	5.7	97.8		4
58	2689	2.2	100.0		5

COUNT	CUM COUNT	PCT	CUM PCT	QURECARE	
87	87	3.2	3.2		0
505	592	18.8	22.0		1
1380	1972	51.3	73.3		2
293	2265	10.9	84.2		3
308	2573	11.5	95.7		4
114	2687	4.2	99.9		5
1	2688	.0	100.0		6
1	2689	.0	100.0		8

COUNT	CUM COUNT	PCT	CUM PCT	QUENTERT	
104	104	3.9	3.9		0
225	329	8.4	12.2		1
921	1250	34.3	46.5		2
467	1717	17.4	63.9		3
674	2391	25.1	88.9		4
298	2689	11.1	100.0		5

COUNT	CUM COUNT	PCT	CUM PCT	QUSHOPPG	
70	70	2.6	2.6		0
610	680	22.7	25.3		1
1161	1841	43.2	68.5		2
267	2108	9.9	78.4		3
427	2535	15.9	94.3		4
154	2689	5.7	100.0		5

COUNT	CUM COUNT	PCT	CUM PCT	QUMUSEUM	
98	98	3.6	3.6		0
454	552	16.9	20.5		1
1125	1677	41.8	62.4		2
501	2178	18.6	81.0		3
376	2554	14.0	95.0		4
133	2687	4.9	99.9		5
1	2688	.0	100.0		6
1	2689	.0	100.0		7

COUNT	CUM COUNT	PCT	CUM PCT	QUTRANSP	
61	61	2.3	2.3		0
1290	1351	48.0	50.2		1
998	2349	37.1	87.4		2
134	2483	5.0	92.3		3
145	2628	5.4	97.7		4
61	2689	2.3	100.0		5

COUNT	CUM COUNT	PCT	CUM PCT	QUOPENSP	
59	59	2.2	2.2		0
1748	1807	65.0	67.2		1
683	2490	25.4	92.6		2
115	2605	4.3	96.9		3
48	2653	1.8	98.7		4
35	2688	1.3	100.0		5
1	2689	.0	100.0		8

COUNT	CUM COUNT	PCT	CUM PCT	QUAGLAND	
82	82	3.0	3.0		0
1251	1333	46.5	49.6		1
859	2192	31.9	81.5		2
315	2507	11.7	93.2		3
121	2628	4.5	97.7		4
60	2688	2.2	100.0		5
1	2689	.0	100.0		6

COUNT	CUM COUNT	PCT	CUM PCT	QUNATRES	
72	72	2.7	2.7		0
1589	1661	59.1	61,8		1
722	2383	26.9	88.6		2
198	2581	7.4	96.0		3
68	2649	2.5	98.5		4
39	2688	1.5	100.0		5
1	2689	.0	100.0		7

COUNT	CUM COUNT	PCT	CUM PCT	QUOTHERS	
2367	2367	88.0	88.0		0
271	2638	10.1	98.1		1
21	2659	.8	98.9		2
12	2671	.4	99.3		3
1	2672	.0	99.4		4
17	2689	.6	100.0		5

COUNT	CUM COUNT	PCT	CUM PCT	RQUEXL	
2150	2150	80.0	80.0		0
539	2689	20.0	100.0		1

COUNT	CUM COUNT	PCT	CUM PCT	RQUGOD	
1079	1079	40.1	40.1		0
1610	2689	59.9	100.0		1

COUNT	CUM COUNT	PCT	CUM PCT	RQUFAR	
2237	2237	83.2	83.2		0
452	2689	16.8	100.0		1

COUNT	CUM COUNT	PCT	CUM PCT	RQUFOR	
2623	2623	97.5	97.5		0
66	2689	2.5	100.0		1

COUNT	CUM COUNT	PCT	CUM PCT	RQUNOP	
2678	2678	99.6	99.6		Ø
11	2689	.4	100.Ø		1

COUNT	CUM COUNT	PCT	CUM PCT	EDRETAIL	
1580	1580	58.8	58.8		Ø
1109	2689	41.2	100.Ø		1

COUNT	CUM COUNT	PCT	CUM PCT	EDHIGTEC	
1837	1837	68.3	68.3		Ø
852	2689	31.7	100.Ø		1

COUNT	CUM COUNT	PCT	CUM PCT	EDMANUFT	
2258	2258	84.Ø	84.Ø		Ø
431	2689	16.Ø	100.Ø		1

COUNT	CUM COUNT	PCT	CUM PCT	EDTOURSM	
1851	1851	68.8	68.8		Ø
838	2689	31.2	100.Ø		1

COUNT	CUM COUNT	PCT	CUM PCT	EDAGRICU	
1112	1112	41.4	41.4		Ø
1577	2689	58.6	100.Ø		1

COUNT	CUM COUNT	PCT	CUM PCT	EDAQUACU	
1438	1438	53.5	53.5		Ø
1251	2689	46.5	100.Ø		1

COUNT	CUM COUNT	PCT	CUM PCT	EDFISHNG	
1464	1464	54.4	54.4		Ø
1225	2689	45.6	100.Ø		1

COUNT	CUM COUNT	PCT	CUM PCT	EDDEFENS	
2246	2246	83.5	83.5		Ø
443	2689	16.5	100.Ø		1

COUNT	CUM COUNT	PCT	CUM PCT	EDMINERL	
2450	2450	91.1	91.1		Ø
239	2689	8.9	100.Ø		1

COUNT	CUM COUNT	PCT	CUM PCT	EDNONE	
2493	2493	92.7	92.7		Ø
196	2689	7.3	100.Ø		1

COUNT	CUM COUNT	PCT	CUM PCT	EDOTHER	
2531	2531	94.1	94.1		Ø
158	2689	5.9	100.Ø		1

TABLE OF FGRCON (ROWS) BY FGRDIS (COLUMNS)
FOR THE FOLLOWING VALUES:
FGRNOP = Ø

FREQUENCIES

	0	1	TOTAL
0	77	713	790
1	1732	3	1735
TOTAL	1809	716	2525

TABLE OF FGRCON (ROWS) BY FGRDIS (COLUMNS)
FOR THE FOLLOWING VALUES:
FGRNOP = 1

FREQUENCIES

	0	1	TOTAL
0	163	0	163
1	1	0	1
TOTAL	164	0	164

COUNT	CUM COUNT	PCT	CUM PCT	WRKCAL	
2463	2463	91.6	91.6		0
226	2689	8.4	100.0		1

COUNT	CUM COUNT	PCT	CUM PCT	WRKCHR	
2161	2161	80.4	80.4		0
528	2689	19.6	100.0		1

COUNT	CUM COUNT	PCT	CUM PCT	WRKSTM	
2211	2211	82.2	82.2		0
478	2689	17.8	100.0		1

COUNT	CUM COUNT	PCT	CUM PCT	WRKBAL	
2662	2662	99.0	99.0		0
27	2689	1.0	100.0		1

COUNT	CUM COUNT	PCT	CUM PCT	WRKWAS	
2114	2114	78.6	78.6		0
575	2689	21.4	100.0		1

COUNT	CUM COUNT	PCT	CUM PCT	WRKOTH	
1872	1872	69.6	69.6		0
817	2689	30.4	100.0		1

COUNT	CUM COUNT	PCT	CUM PCT	TRADMILT	
2551	2551	94.9	94.9		0
138	2689	5.1	100.0		1

COUNT	CUM COUNT	PCT	CUM PCT	TRADMANG	
1572	1572	58.5	58.5		0
1117	2689	41.5	100.0		1

COUNT	CUM COUNT	PCT	CUM PCT	TRADHOME	
2512	2512	93.4	93.4		0
177	2689	6.6	100.0		1

COUNT	CUM COUNT	PCT	CUM PCT	TRADTECH	
2288	2288	85.1	85.1		0
401	2689	14.9	100.0		1

COUNT	CUM COUNT	PCT	CUM PCT	TRADSERV	
2437	2437	90.6	90.6		0
252	2689	9.4	100.0		1

COUNT	CUM COUNT	PCT	CUM PCT	TRADFARM	
2600	2600	96.7	96.7		0
89	2689	3.3	100.0		1

COUNT	CUM COUNT	PCT	CUM PCT	TRADCRAF	
2562	2562	95.3	95.3		0
127	2689	4.7	100.0		1

COUNT	CUM COUNT	PCT	CUM PCT	TRADOPER	
2628	2628	97.7	97.7		0
61	2689	2.3	100.0		1

COUNT	CUM COUNT	PCT	CUM PCT	TRADOTHR	
2132	2132	79.3	79.3		0
557	2689	20.7	100.0		1

TABLE OF HOMERENT (ROWS) BY HOMEOWN (COLUMNS)

FREQUENCIES

	0	1	TOTAL
0	17	2430	2447
1	241	1	242
TOTAL	258	2431	2689

COUNT	CUM COUNT	PCT	CUM PCT	RESLEN	
64	64	2.4	2.4		0
172	236	6.4	8.8		1
129	365	4.8	13.6		2
115	480	4.3	17.9		3
105	585	3.9	21.8		4
102	687	3.8	25.5		5
60	747	2.2	27.8		6
76	823	2.8	30.6		7
85	908	3.2	33.8		8
68	976	2.5	36.3		9
156	1132	5.8	42.1		10
94	1226	3.5	45.6		11
93	1319	3.5	49.1		12
51	1370	1.9	50.9		13
57	1427	2.1	53.1		14
110	1537	4.1	57.2		15
63	1600	2.3	59.5		16
66	1666	2.5	62.0		17
53	1719	2.0	63.9		18
32	1751	1.2	65.1		19
104	1855	3.9	69.0		20
22	1877	.8	69.8		21

24	1901	.9	70.7	22
26	1927	1.0	71.7	23
19	1946	.7	72.4	24
54	2000	2.0	74.4	25
29	2029	1.1	75.5	26
35	2064	1.3	76.8	27
21	2085	.8	77.5	28
14	2099	.5	78.1	29
56	2155	2.1	80.1	30
18	2173	.7	80.8	31
27	2200	1.0	81.8	32
25	2225	.9	82.7	33
18	2243	.7	83.4	34
36	2279	1.3	84.8	35
12	2291	.4	85.2	36
20	2311	.7	85.9	37
20	2331	.7	86.7	38
11	2342	.4	87.1	39
61	2403	2.3	89.4	40
38	2441	1.4	90.8	41
19	2460	.7	91.5	42
9	2469	.3	91.8	43
9	2478	.3	92.2	44
20	2498	.7	92.9	45
10	2508	.4	93.3	46
6	2514	.2	93.5	47
17	2531	.6	94.1	48
3	2534	.1	94.2	49
12	2546	.4	94.7	50
6	2552	.2	94.9	51
10	2562	.4	95.3	52
4	2566	.1	95.4	53
3	2569	.1	95.5	54
29	2598	1.1	96.6	55
19	2617	.7	97.3	56
7	2624	.3	97.6	57
5	2629	.2	97.8	58
6	2635	.2	98.0	59
5	2640	.2	98.2	60
5	2645	.2	98.4	61
2	2647	.1	98.4	62
4	2651	.1	98.6	63
2	2653	.1	98.7	64
5	2658	.2	98.8	65
2	2660	.1	98.9	66
2	2662	.1	99.0	67
4	2666	.1	99.1	68
2	2668	.1	99.2	69
7	2675	.3	99.5	70
1	2676	.0	99.5	71
2	2678	.1	99.6	72
2	2680	.1	99.7	73
1	2681	.0	99.7	75
1	2682	.0	99.7	76
2	2684	.1	99.8	77
2	2686	.1	99.9	79
1	2687	.0	99.9	80
1	2688	.0	100.0	82
1	2689	.0	100.0	88

COUNT	CUM COUNT	PCT	CUM PCT	AG1825	
2576	2576	95.8	95.8		0
113	2689	4.2	100.0		1

COUNT	CUM COUNT	PCT	CUM PCT	AG2640	
1631	1631	60.7	60.7		0
1058	2689	39.3	100.0		1

COUNT	CUM COUNT	PCT	CUM PCT	AG4155	
1790	1790	66.6	66.6		0
899	2689	33.4	100.0		1

COUNT	CUM COUNT	PCT	CUM PCT	AG55UP	
2099	2099	78.1	78.1		0
590	2689	21.9	100.0		1

COUNT	CUM COUNT	PCT	CUM PCT	INCLT10	
2638	2638	98.1	98.1		0
51	2689	1.9	100.0		1

COUNT	CUM COUNT	PCT	CUM PCT	INC1020	
2453	2453	91.2	91.2		0
236	2689	8.8	100.0		1

COUNT	CUM COUNT	PCT	CUM PCT	INC2030	
2299	2299	85.5	85.5		0
390	2689	14.5	100.0		1

COUNT	CUM COUNT	PCT	CUM PCT	INC3040	
1698	1698	63.1	63.1		0
991	2689	36.9	100.0		1

COUNT	CUM COUNT	PCT	CUM PCT	INC50UP	
1784	1784	66.3	66.3		0
905	2689	33.7	100.0		1

A