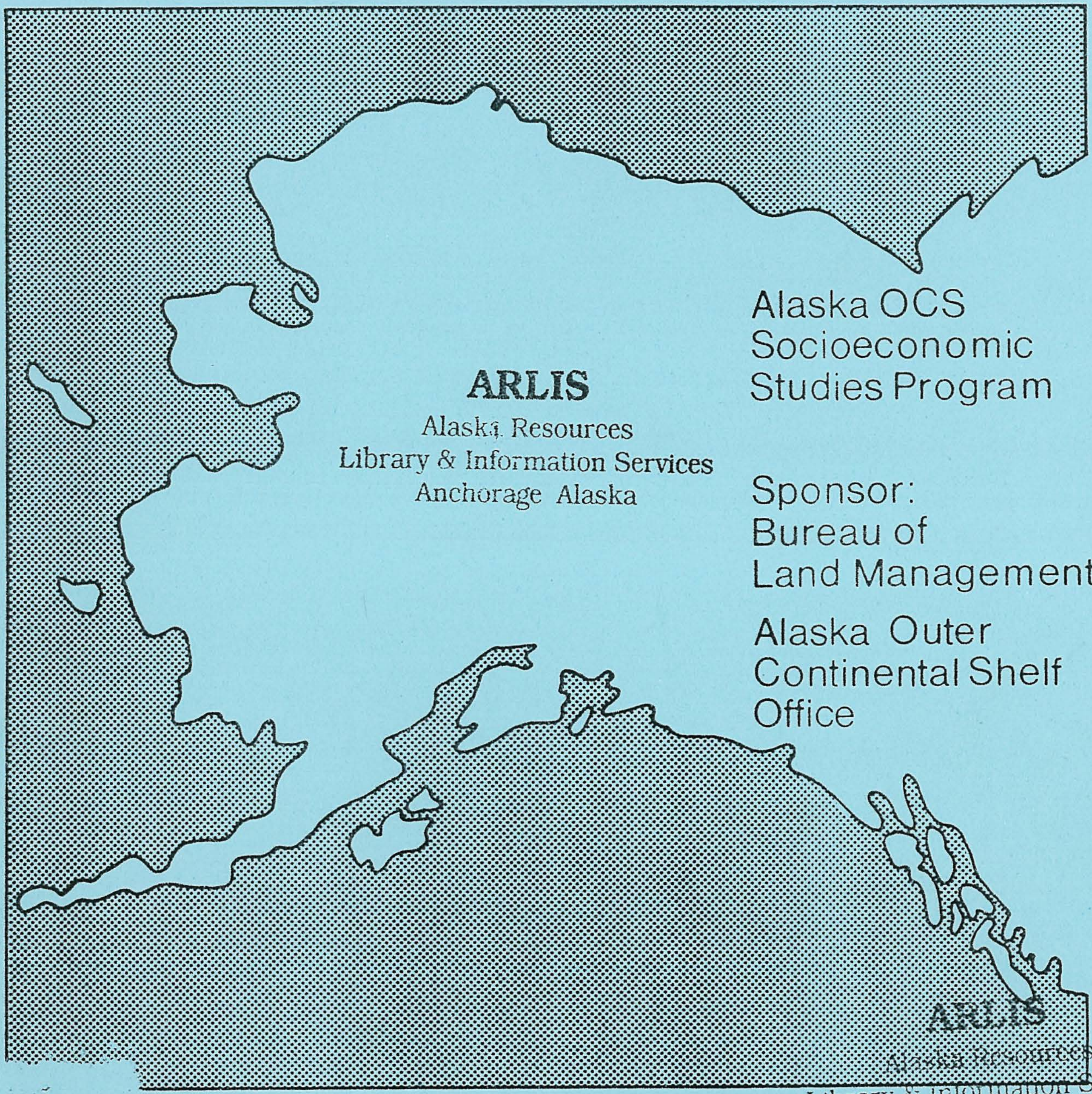
Technical Report Number 34



Alaska OCS Socioeconomic Studies Program

Sponsor:
Bureau of Land Management
Alaska Outer Continental Shelf Office

Northern Gulf of Alaska Petroleum Development Scenarios Economic and Demographic Impacts

The United States Department of the Interior was designated by the Outer Continental Shelf (OCS) Lands Act of 1953 to carry out the majority of the Act's provisions for administering the mineral leasing and development of offshore areas of the United States under federal jurisdiction. Within the Department, the Bureau of Land Management (BLM) has the responsibility to meet requirements of the National Environmental Policy Act of 1969 (NEPA) as well as other legislation and regulations dealing with the effects of offshore development. In Alaska, unique cultural differences and climatic conditions create a need for developing additional socioeconomic and environmental information to improve OCS decision making at all governmental levels. In fulfillment of its federal responsibilities and with an awareness of these additional information needs, the BLM has initiated several investigative programs, one of which is the Alaska OCS Socioeconomic Studies Program (SESP).

The Alaska OCS Socioeconomic Studies Program is a multi-year research effort which attempts to predict and evaluate the effects of Alaska OCS Petroleum Development upon the physical, social, and economic environments within the state. The overall methodology is divided into three broad research components. The first component identifies an alternative set of assumptions regarding the location, the nature, and the timing of future petroleum events and related activities. In this component, the program takes into account the particular needs of the petroleum industry and projects the human, technological, economic, and environmental offshore and onshore development requirements of the regional petroleum industry.

The second component focuses on data gathering that identifies those quantifiable and qualifiable facts by which OCS-induced changes can be assessed. The critical community and regional components are identified and evaluated. Current endogenous and exogenous sources of change and functional organization among different sectors of community and regional life are analyzed. Susceptible community relationships, values, activities, and processes also are included.

The third research component focuses on an evaluation of the changes that could occur due to the potential oil and gas development. Impact evaluation concentrates on an analysis of the impacts at the statewide, regional, and local level.

In general, program products are sequentially arranged in accordance with BLM's proposed OCS lease sale schedule, so that information is timely to decisionmaking. Reports are available through the National Technical Information Service, and the BLM has a limited number of copies available through the Alaska OCS Office. Inquiries for information should be directed to: Program Coordinator (COAR), Socioeconomic Studies Program, Alaska OCS Office, P. O. Box 1159, Anchorage, Alaska 99510.

TECHNICAL REPORT NO. 34

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ALASKA OCS SOCIOECONOMIC STUDIES PROGRAM

NORTHERN GULF OF ALASKA PETROLEUM DEVELOPMENT SCENARIOS: ECONOMIC AND DEMOGRAPHIC IMPACTS

PREPARED FOR

BUREAU OF LAND MANAGEMENT
ALASKA OUTER CONTINENTAL SHELF OFFICE

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NOTICE

ALASKA OCS SOCIOECONOMIC STUDIES PROGRAM
NORTHERN GULF OF ALASKA PETROLEUM DEVELOPMENT
SCENARIOS: ECONOMIC AND DEMOGRAPHIC IMPACTS

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June 1979

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I. INTRODUCTION

Background

The United States, because of the progressive depletion of U.S. petroleum reserves, has become increasingly reliant on foreign energy supplies. Concern over the reliability of these foreign supplies has led the federal government to establish policies aimed at increasing domestic energy supplies. Because of their high potential as a source of oil and gas, the U.S. Outer Continental Shelf (OCS) figures significantly in the future energy program of the United States.

Although Alaska has historically played a small role in the U.S. energy supply, production at Prudhoe and future development of the Alaska OCS will increase its importance. It has been projected that by 1985 over 25 percent of total domestic crude oil production could be from Alaska (Federal Energy Administration, 1976). Through 1974, Alaska had produced only one percent of the total cumulative petroleum production in the United States (U.S. Geological Survey, 1975); however, the development of existing oil and gas reserves and the exploration for additional reserves will center importantly on Alaska. Alaska accounts for over one-fourth of the identified oil and gas reserves in the United States, and an estimated one-third of all undiscovered recoverable domestic oil reserves are in the state. Since over 60 percent of the estimated undiscovered OCS reserves in the United States are in Alaska, Alaska is particularly important to the OCS program (U.S. Geological Survey, 1975).

The development of Alaska's petroleum reserves is also important to the Alaskan economy. Changes produced by past petroleum development in the state have been major. The rapid changes in the Alaska economy and population associated with the development in Upper Cook Inlet and Prudhoe Bay created strains on the Alaskan society and environment. At the same time, these developments generated the most prosperous economic period in the state's history as well as prospects of continued prosperity through the next decade. The development of petroleum reserves in Alaska's OCS will also affect the population and economy of Alaska.

The Purpose of the Study

The nature of the changes which result from Alaskan OCS development will not necessarily resemble those caused by past petroleum development. One objective of the current study being undertaken by the Institute of Social and Economic Research (ISER) for the Bureau of Land Management's OCS Studies Program is to provide the information needed to anticipate the major dimensions of the economic and social impacts of the proposed oil and gas developments in the Northern Gulf of Alaska. To achieve this objective, ISER will provide a series of economic and population forecasts through 2000 under several alternative scenarios for petroleum development in the Northern Gulf. By contrasting these forecasts with a base case forecast, which does not include the proposed development, it is possible to assess the major dimensions of the impacts of OCS development on population, employment, income, and the state's fiscal position.

This study is part of the Bureau of Land Management's Alaska OCS Socioeconomic Studies Program. The objective of this program is to assess the potential impacts of proposed lease sales in the federal offshore areas of Alaska. The study of the impacts of OCS development in the Northern Gulf of Alaska is one of a series of studies describing lease sale impacts. Already completed is a study of the impact of the joint federal-state sale in the Beaufort Sea (ISER, 1978); future studies will be conducted for lease sales in the Western Gulf of Alaska, the Lower Cook Inlet, and the Bering Sea-Norton Sound. The studies program is concerned with many aspects of OCS impact on many different levels. The major objective of this study is to examine only a portion of OCS impact, the statewide and regional economic and demographic impacts.

In order to assess the impact of the proposed Northern Gulf OCS development, the study must accomplish two additional objectives. First, an understanding of the existing state and regional economies must be developed. The important economic relationships need to be understood in order to say anything about future growth and the effect of OCS development on the economy. Secondly, the study will develop a process for economic impact assessment. Rapid growth associated with OCS development will affect most economic variables; a much smaller number is important, and information on these dimensions of impact will describe the effect of rapid growth on the state and regional economies. The process of economic impact assessment will consist of the selection of the major variables to analyze and the appropriate questions to ask about each of these.

Study Design

This study consists of three major parts: a baseline study of the economies of the state and its Gulf of Alaska region, a base case projection describing the future economy without Northern Gulf development, and an examination of the impact of Northern Gulf development. This section describes the relationship of each of these parts to the impact assessment and the methodology chosen to make the necessary projections.

EXAMINATION OF PAST ECONOMIC GROWTH

Examining the past growth of the Alaska economy and the economy of the Gulf of Alaska region provides an understanding of the way the economy works. This type of examination is implicit in the development of economic models. Making this analysis explicit will emphasize those aspects of economic growth which are important. The two aspects of the economy which will be emphasized in such a process are the important causes of growth and the economic relationships which transfer growth between sectors of the economy. An examination of the historical period will provide an indication of the types of response we can expect to OCS petroleum development. In addition, the historical growth and development of these economies provide a point of comparison for future economic growth, both OCS and non-OCS related.

THE BASE CASE

Petroleum development in the Northern Gulf of Alaska will affect both the structure and size of the Alaska economy. Changes in the economy which result from the development of the OCS resources can be defined as the impact of this development. This impact can only be described as changes from a certain pattern of economic growth which would have occurred without OCS development. The non-OCS base case is developed to provide a reference point for the analysis of the impacts of OCS development. Comparing a projection of economic activity with OCS development to the base case will isolate the impacts of development.

THE ROLE OF SOCIOECONOMIC PROJECTIONS

The uncertainty of the future, though it may increase the problems associated with making projections, increases the importance of these projections. Decision makers in both the public and private sectors need information about the future in order to plan their actions. The more uncertain the future events, the more important is some projection of them. Projections serve two important purposes--they serve as a means of determining future demands and needs for services, and they allow policy makers to test the alternative effects of various policies.

Models are used to test the relative efficiency of alternative policy choices. When models explicitly include policy variables, such as tax rates, or variables directly affected by policy, such as the level of petroleum employment, they can be used to test the effects of policies described by these variables. By making separate projections under various assumptions about policy choices, the effects on important variables such as population or employment can be compared. Alternative policy choices can be compared in terms of their relative costs and benefits.

Projections increase the information available to decision makers for making policy choices. Many present policy choices have important future implications which must be considered by policy makers. For example, current policy decisions regarding Northern Gulf OCS petroleum development will have their major effect in the middle of the next decade. By providing descriptions of the most probable future levels of important variables, socioeconomic projections serve as a framework for making policy choices.

METHODOLOGY

This section describes the methodology used to make the projections of Alaskan economic growth in both the base case and OCS development cases. Two econometric models, statewide and regional econometric models, are used to make the projection. This section will describe the models used and their strengths and weaknesses.

The Statewide Econometric Model

The basic model to be utilized in the analysis of the OCS development scenarios is the statewide econometric model of the Alaskan economy developed in the Man-in-the-Arctic Program (MAP) presently being conducted by the Institute of Social and Economic Research of the University of Alaska. There are three components of this model: an economic model, a fiscal model, and a demographic model. The basic structure of the model is shown in Figure 1.

STRUCTURE OF THE BASIC MAP MODEL

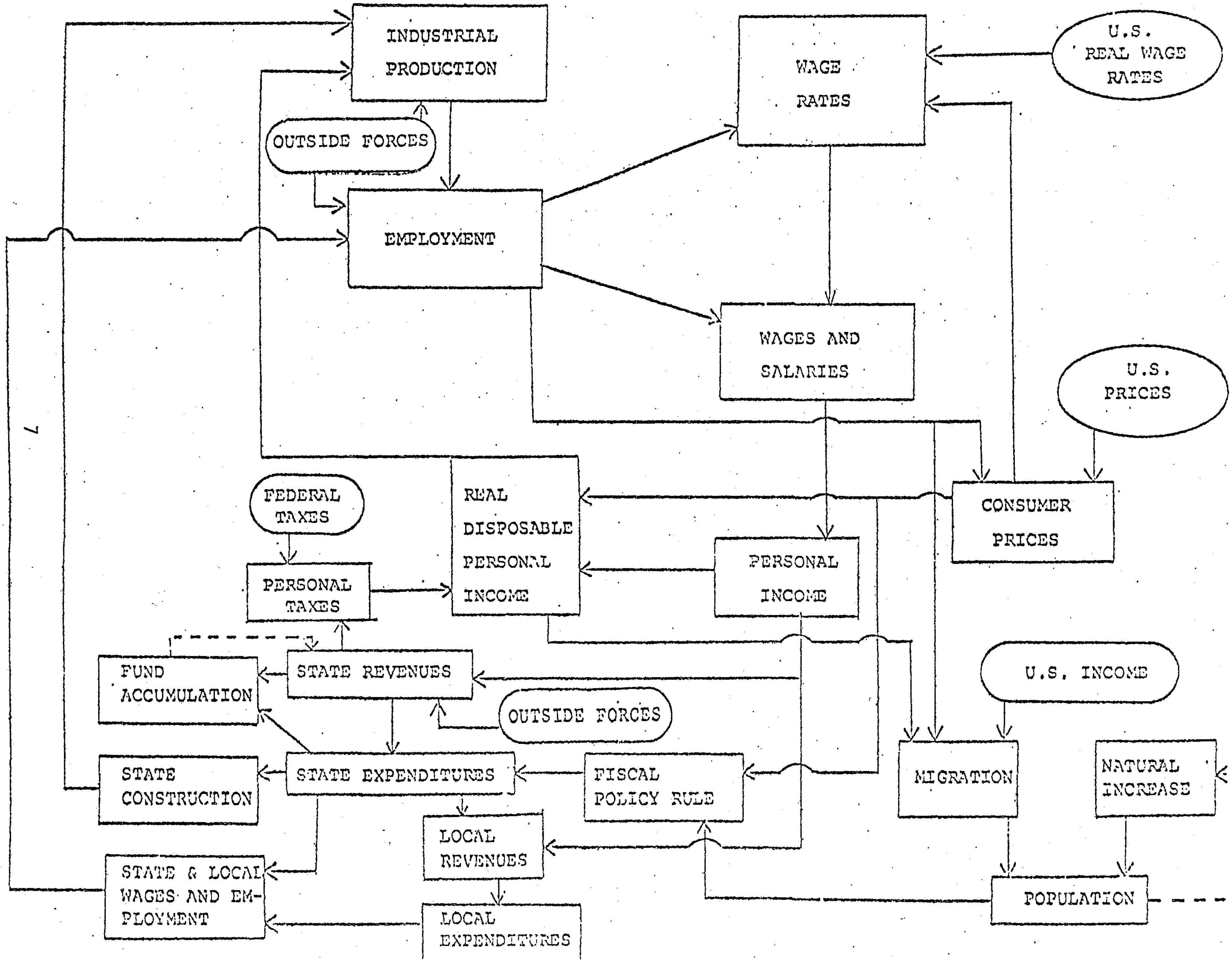

FIGURE 1

The economic model is divided into exogenous or basic sectors and endogenous or nonbasic sectors. The level of output in the exogenous sectors is determined outside the state's economy. The primary reason for the nonbasic sector is to serve local Alaskan markets, so the level of output is determined within the Alaskan economy. The basic industries in the model are mining, agriculture-forestry-fisheries, manufacturing, federal government, and the exogenous component of construction. The nonbasic industries are transportation-communication-utilities, wholesale and retail trade, finance-insurance-real estate, services, and the remainder of construction.

In the model, industrial production determines the demand for labor and employment; employment is that level needed to produce the required output. Employment and the wage rate determine wages and salaries, the most important component of personal income. The Alaskan labor market is an open one with equilibrium achieved through migration of individuals. Because of this, the most important determinant of Alaskan wage rates are U.S. wage rates; wages are also affected by rapid growth of employment in Alaska. An estimate of disposable personal income is made by adding an estimate of nonwage income to wages and salaries and adjusting this by deducting income taxes. The level of real disposable income is found by deflating disposable personal income by a relative price index; the major determinants of Alaskan prices are U.S. prices, the size of the economy, and the growth rate of the economy. Incomes determine the demand for local production; incomes and output are simultaneously determined.

Population is determined based upon a projection of each of its components--births, deaths, and migration. The model uses age-sex-race specific survival rates and age-race specific fertility rates to project births and deaths for the civilian population. Total civilian population is found by adding civilian net migration to the natural increase. Net migration is determined by the relative economic opportunities in Alaska. In the model, these are described by employment changes and the Alaskan real per capita income relative to the real per capita income of the United States. An exogenous estimate of military population is added to determine total population.

The fiscal model, which provides important pieces of information for the economic model, also provides a framework for analyzing the effects of alternate fiscal policies. The fiscal model calculates personal tax payments in order to derive disposable personal income. The fiscal model, based on an assumed state spending rule, also calculates personnel expenditures, state government employment, and the amount spent on capital improvements which determines a portion of employment in the construction industry. All three submodels are linked through their requirement for information produced by the other submodels.

The Regional Econometric Model

The regional model provides an allocation of employment, income, and population in the state to seven regions of the state. These regions are shown in Figure 2. The economic component is similar in each region

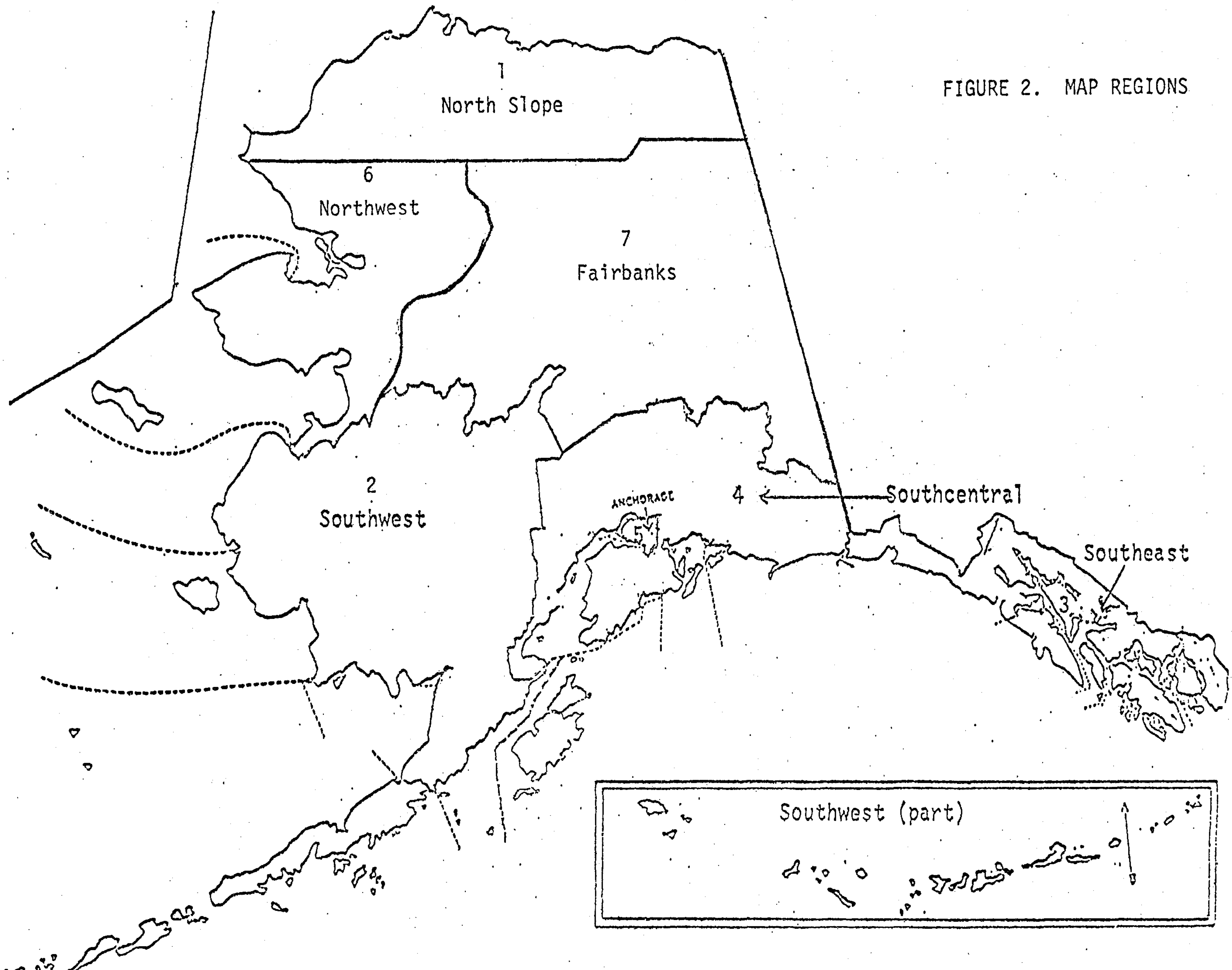

FIGURE 2. MAP REGIONS

to that of the state model. The major difference is that some regional economies are influenced by economic activity in other regions; the most notable of these is Anchorage. The demographic component of the regional model is much simpler than that component of the state model. Regional population is estimated as a function of employment. Regional population is estimated in two components--enclave and nonenclave population. A weighted average of the nonenclave population to nonenclave employment ratio for the state and the lagged value in the region is multiplied by the nonenclave employment to estimate nonenclave population in the current year. The weights used to determine regional population in this study equal the proportion of state population for the lagged regional population to employment ratio and one minus this proportion for the state ratio. Enclave employment is added to nonenclave population to determine total regional population. Enclave employment includes the military and major construction projects such as the trans-Alaska pipeline. The regional model has no fiscal component and must accept an exogenous pattern of wage and salary payments to state and local government workers. Usually the pattern of wage and salary payments used is taken from a similar state model projection. Estimates of regional employment, population, and income in the regional model are constrained to total to equivalent variables from the state model results.

STRENGTHS AND LIMITATIONS

The models used in this analysis have several strengths and weaknesses which must be considered when examining the reported results. The principal strength of these models is that they capture the essence of the

Alaska growth process. Export base industries and government create growth directly through hiring and indirectly through the demand generated by their employees for locally produced goods and services. Incomes earned by these export base workers and the workers who supply the goods and services provide the base of the economy. Compared to two alternative forms, the economic base and input-output models, the econometric specification of this type is preferred, since it captures the dynamics of industry growth. The economic base model is useful for projecting marginal changes but assumes that changes in the support sector are proportional to changes in basic sector employment. This misses both the feedback effect of the growth of the support sector incomes and the change in the responsiveness of the support industries over time. While input-output models more precisely define the interindustry flows of purchases of goods and services, they represent the economy only at a particular point in time. The econometric approach can capture some of the changing relationships over time, and these are described by historic changes or incorporated by the modeler.

The limits on the econometric method define the limits on the acceptance of the resulting projections. No model is able to capture revolutionary changes which violate the assumptions upon which the model is built, unless structural change has been foreseen and incorporated by the modeler. The limitations of the model increase the more the model is extended into the future and the more locationally precise the model is expected to be. In other words, more confidence should be placed in the 1985 results than in those for 1995, and statewide projections are more likely to be "correct" than regional results.

Another important limitation of this model is that the projections should be considered contingent. The accuracy of the projections depends on the continued relevance of the model's historical structure and the accuracy of the assumptions about the level, timing, and distribution of the exogenous variables. One result of this contingency is that the projections may not necessarily agree with the actual levels of the projected variables for any given year. Projections are based on the average historical relationships between the projected variables and important exogenous variables. This leads to two reasons why projections in any year may differ from the actual levels of projected variables. First, estimates of the level of important exogenous variables may differ from the actual levels. Secondly, in any given year, the relation between projected and exogenous variables may differ from the historical average. Cyclical effects may cause yearly divergence from the general trend of economic growth. The relationships described by the model, while they may not predict actual levels in any particular year, describe the general trend of future Alaskan economic growth.

The final limitation of the results concerns the projection of the regional distribution of state growth. These results are merely allocations of the projected statewide totals to the regions. This should not be assumed to be a detailed analysis of the regional economies and should not replace such analysis.

ASSUMPTIONS

Once the model is given, the base case is defined by the assumptions about the future levels of the exogenous variables. There are four major types of assumptions required to define a development scenario. First, there are assumptions about the growth of exogenous industries in both the petroleum and nonpetroleum sectors. Secondly, assumptions about the level of state petroleum revenues are needed. Thirdly, assumptions about the change in certain national variables are needed. Finally, an assumption must be made about the way state expenditures grow in the future.

GENERAL METHODOLOGY FOR ANALYSIS

The general approach to be pursued in the analysis of the impacts of Northern Gulf OCS development will be as follows: A set of scenarios will be developed which contain no Northern Gulf OCS development. These scenarios will be run using the MAP model and will serve as points of comparison for each alternate Northern Gulf scenario. Each of the Northern Gulf development scenarios will then be run. Each of these runs will then be compared to the appropriate base run to examine the impact of this hypothetical development on the major dimensions of the Alaskan economy.

Overview

The remainder of this report will analyze the historical growth of the state and regional economies and the projections of future growth, both with and without OCS activity in the Northern Gulf. The effect of alternative Northern Gulf development scenarios will be examined. Part II describes the historical growth in Alaska and its Gulf of Alaska region. Part III presents the projection of economic activity in a base case which contains no offshore activity in the Northern Gulf. Parts IV-VI then describe the impacts of alternative Northern Gulf development scenarios. Part VII attempts to capture the uncertainty attached to these estimated impacts by examining the sensitivity of the results to several of the uncertain elements of the scenario. Finally, Part VIII summarizes our major findings.

II. THE ALASKAN ECONOMY, 1965-1976

Introduction

The historical period serves as a point of reference for discussing potential future growth. Examining past economic changes provides us with information not only on what happened, but also on how things happened. By understanding how things happened in the past, we can acquire an understanding of the process of growth in the Alaskan economy. Without some specific assumption about how this process would change in the future, we would not expect the future growth to be qualitatively different. Knowledge of the changes in the levels of and the relationships between economic variables in the past allows us to assess the possible future economic effects of potential changes.

In this section, we will examine the Alaskan economy between 1965 and 1976. This was a period associated with tremendous growth and was chosen to provide a long-term look at the changes in the economy. The period contains three significant events: the major Upper Cook Inlet oil development, the Prudhoe lease sale, and the construction of the trans-Alaska oil pipeline. We are interested in the comparative activity in three separate periods: before 1970, after 1970, and the peak years of Trans-Alaska Pipeline System (TAPS) construction, 1973-1975. The Prudhoe Bay lease sale in 1969 marked the beginning of Alaska as a major petroleum economy. Comparing the economy before and after this date will illustrate the effects of this change.

This section has three objectives. The first objective will be to describe what happened during this period in terms of major economic variables. The second objective of this section will be to describe the Alaskan economy's growth process. The growth process includes both the factors causing growth and the response of the economy to these changes. Finally, we will attempt to describe the effects of the past growth on indicators of economic welfare such as unemployment and per capita income. Gaining an understanding of the economy during this period will allow us to understand better the probable effects of future potential OCS activity.

Growth of Aggregate Indicators

Economic growth is a multidimensional process for which there is no single summary measure of either the level of growth or the welfare associated with that growth. Economic growth is usually defined in terms of the change in the level of certain economic indicators. This is only one aspect of growth; the effects of growth on the process of change and the level of economic welfare are also important. This section will describe the change in some major economic variables, while the other aspects of growth will be discussed later. Table 1 describes the change in the level of three aggregate indicators of economic activity: employment, population, and personal income. These do not exhaust all of the possible indicators of economic activity, but they do describe the general economic trends during the period.

TABLE 1. GROWTH OF EMPLOYMENT, POPULATION AND PERSONAL INCOME, ALASKA 1965-1976

	Population[1]	Employment[2]	Personal Income[3] ($ Million)
1965	265,192	70,530	858
1970	302,361	92,476	1,412
1971	312,930	97,584	1,557
1972	324,281	104,243	1,698
1973	330,365	109,851	2,008
1974	351,159	128,178	2,436
1975	404,634	161,313	3,514
1976	413,289	171,714	4,133
Annual Average Percent Change			
1965-1976	4.12	8.43	15.36
1970-1976	5.35	10.87	19.60

[1] All estimates State of Alaska Department of Labor, Research and Analysis Section, Population Estimates by Census Division, except 1970 which is April 1970 Census of Population.

[2] Alaska Department of Labor, Statistical Quarterly, various years.

[3] U.S. Department of Commerce, Bureau of Economic Analysis, Regional Economic Information System, July 1978 printout.

Population grew at an annual average rate[1] of 4.1 percent throughout the period. The state experienced over a one percent greater growth rate in population after 1970. Of the growth in population between 1965 and 1976, over 75 percent occurred after 1970. The most rapid increase occurred during the period of trans-Alaska pipeline construction when total population increased by 15.2 percent between 1974 and 1975.

Growth in population is determined by the growth in employment. Total nonagricultural wage and salary employment grew by almost 150 percent between 1965 and 1976. Employment growth averaged a rate of 8.43 percent per year during the period. After 1970 employment grew at a faster average rate of 10.9 percent per year. More than 78 percent of the growth in employment occurred after 1970.

Personal income is the final measure of aggregate economic growth. Personal income is shown in Table 1 in nominal dollars. Its growth reflects both real economic growth and the increases in prices. Nominal personal income increased at an average rate of 15.4 percent per year throughout the period. As in population and employment, the major growth in personal income occurred after 1970.

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[1]The average annual percent change or average annual rate of growth is used extensively throughout this paper as an indicator of the functioning of the economy. This term is equal to that yearly percentage change which would have to occur to obtain the end-year projection. This indicator is calculated as follows: Let $B = A(1+r)^t$ where A and B are the start and end values of some variable; t is equal to the duration of the period of interest; and r is the average annual percent change. Given A, B, and t, solve for r.

Overall, these aggregate indicators illustrate a rapidly growing economy. The major growth in the period occurred after 1970 when the economy was influenced significantly by the construction of the trans-Alaska pipeline. Growth in the population occurred at a rate which was slower than the growth of either employment or personal income.

The Causes of Growth

Three major events shaped the growth of the state during this period. The first was the development of the Upper Cook Inlet oil and gas fields during the late sixties. The second major event was the Prudhoe Bay lease sale in 1969, which produced a major source of revenue for the state and began an era when the state became a major oil producer. Finally, the construction of TAPS beginning in 1974 led to the most rapid growth during the period. This section will examine the Alaskan growth process in an attempt to relate these events and other factors to the growth of the Alaskan economy.

Traditionally, the growth of regional economies is described by economic base theory; the practical application of this theory is widely used in regional analysis. Economic base theory states that a region grows primarily as a result of increased export activity to other regions. The demand for these exports is not influenced by activity within the region, so the level of economic activity is fixed by external factors. The local support sector exists to serve the basic sector and the population associated with it. Growth occurs as a two-part process; the expansion of the export sector leads to an expansion of the local support sector.

One of the strongest statements in support of this theory was made by North. He argued that the growth of exports was the most important reason for growth in a region; he presented economic base theory as a long-run theory of economic growth (North, June 1955). In response, Tiebout argued this theory was not a theory of economic development and it was only valid in the short run. Tiebout pointed out that nonexport sectors such as government and local investment may generate growth even in the short run. Tiebout argued that the importance of exports as a determinant of regional income is inversely related to the size of the region (Tiebout, 1956). Anything which increases regional income would lead to economic growth through the expansion of the support sector. Tiebout expanded the explanation of the causes of growth. Regional growth may result not only from an expansion of the export base but also from improved technology, an increase in trade within the local economy, and the expansion of nonexport sectors. This section will attempt to assess the role of each of these factors in the growth of the Alaska economy.

BASIC SECTOR GROWTH

The growth of the export base or basic sector is one of the major causes of economic growth. The basic sector was still a major force determining the growth of the Alaskan economy during the period between 1965 and 1976. This section will examine the growth of the various industries which make up the Alaskan basic sector. By examining the growth in each industry, we can see the relative importance of the basic sector to Alaskan economic growth.

A major problem in examining the relation between the economy's basic sector and its growth is determining which industries in a region are basic industries. Traditional multiplier analysis is importantly dependent on this, since the size of the multiplier is determined by this disaggregation. The problem arises because every industry has both basic and nonbasic sectors. An Alaskan example is the construction industry which includes a basic component such as pipeline and federal government-sponsored construction, a nonbasic component such as housing construction, and an investment component which is exogenous in the short run while it is endogenous in the long run. Even an important support sector industry such as services has a relatively large basic component in hotel and motel service which serves the tourist industry.

Many methods exist for defining industries as either basic or nonbasic. Leven suggested that, other than conducting a survey, most traditional methods for separating these sectors incorrectly estimate the importance of the basic sector (Leven, 1964). In this section, we will determine the basic sector by definition. Those industries where the level of activity is affected most significantly by external factors will be considered basic industries. Mining, agriculture-forestry-fisheries, manufacturing, federal government, and construction are basic industries. The demand for the products of both mining and agriculture-forestry-fisheries is determined in national and international markets not within the Alaskan economy. Manufacturing is largely a part of these two industries since food processing and petrochemicals are its major components. The level of federal government activity in Alaska is determined by decisions made outside the state. Construction has both basic and nonbasic components; however, major changes in construction activity are determined by outside agencies and firms. The most important recent example of this is the construction of the trans-Alaska pipeline.

Table 2 illustrates the growth of the Alaskan economy by sector. Industry growth is described by the growth of employment and wages and salaries. Growth of employment illustrates the direct effect of the industry on the growth in the number of jobs. Wages and salaries are an important component of both personal income and industrial output. This measure allows us to estimate the broader effect of the industry on the economy. The growth in wages and salaries can differ from employment growth for three reasons. First, the growth of wage rates can differ between industries. Wage rates are determined by the industrial productivity, as well as differential demand. Secondly, the hours worked in different industries could differ. During the construction of the TAPS, the hours worked increased considerably in construction, raising average wages because of overtime. Finally, wages and salaries can increase at a different rate than employment because the composition of industrial employment changes.

The distinction between employment and wage and salary growth is important when examining the relative growth of the basic sector. Overall employment in the basic sector grew much less rapidly than the remainder of the economy in all but the pipeline years, 1973-1975. Between 1965 and 1976, basic sector employment increased at an average annual rate of only 2.9 percent per year, compared to 6 percent for the entire economy and 10.2 percent

TABLE 2. ALASKA ECONOMIC GROWTH BY SECTOR
1965-1976

	Average Annual Percent Increase					
	1965 - 1976		1970 - 1976		1973 - 1975	
	Employment	Wages & Salaries	Employment	Wages & Salaries	Employment	Wages & Salaries
Basic Sector[1]	2.9	16.7	4.7	23.6	13.8	54.2
Mining	12.5	23.1	4.9	16.3	37.8	68.8
Construction	15.2	29.1	27.9	50.6	82.2	157.8
Manufacturing	4.6	11.1	4.7	13.0	1.1	15.5
Federal Civilian	.3	7.6	.8	8.0	3.5	12.7
Federal Military	-2.7	5.7	-4.1	4.3	-4.1	2.5
Support Sector	10.2	18.6	12.3	24.1	23.7	52.5
Transportation-Comm.-Utilities	7.4	16.9	9.6	22.8	26.0	58.7
Trade	9.7	16.4	10.2	19.3	19.7	38.9
Finance-Insurance-Real Estate	11.2	18.5	14.8	24.4	18.1	30.3
Services	12.6	24.3	16.0	30.9	28.5	68.1
Other						
State Government	6.6	15.7	5.4	15.8	6.0	23.0
Local Government	10.1	18.8	11.1	21.7	11.9	20.5
Total Nonagricultural Wages and Salaries[2]	6.0	17.5	7.8	23.4	16.5	47.5

[1] Agriculture-forestry-fisheries is left out of this table. During the period, changes in the coverage of fisheries employment distorts the real growth in this industry.

[2] Includes military wages and salaries from U.S. Department of Commerce, Bureau of Economic Analysis, Regional Economic Information System, July 1978 printout.

SOURCES: Alaska Department of Labor, Alaska Labor Force Estimates, Estimates of Total Population, various years.

Alaska Department of Commerce and Economic Development, The Alaska Economy: Year End Performance Report 1977.

for the support sector. After 1970 industrial growth rates were much closer; basic sector employment grew at a rate of 4.7 percent, compared to 7.8 percent for the entire economy. The growth rates are much closer when wages and salaries are considered. Between 1965 and 1976, the wages and salaries earned in the basic sector grew only .8 percent less than the economy-wide average of 17.5 percent. After 1970 basic sector wages and salaries grew slightly faster than the economy as a whole.

The effect of pipeline construction on the growth of the economy can be seen in the period 1973 to 1975. Employment in the basic sector grew at 13.8 percent annually, while the economy grew at 16.5 percent. Wages and salaries increased more rapidly, increasing at a rate of 54.2 percent annually in the basic sector, compared to 47.5 percent for the economy as a whole.

One of the major reasons for the overall character of the basic sector was the declining role of the federal government in the state economy. The federal government has played a major role in the economy of Alaska. Between 1965 and 1976, federal government civilian employment increased from 17,400 to 17,900. Employment grew faster between 1973 and 1975 in response to TAPS construction's reaching a peak of 18,300 in 1975. The average growth rate of federal civilian employment was less than one percent per year over the entire period. Military employment actually declined throughout the period with an average growth rate of -2.7 percent per year. Wages and salaries in this sector increased but at rates much less than the growth of the economy in general. Federal government employment continued to supply a stable base for the economy but was not responsible for the tremendous growth in the economy throughout the period.

The most rapidly growing basic industry was construction. Employment grew at an average rate of more than 15 percent throughout the period; this was more than twice the growth rate of the economy. The obvious reason for this growth was the construction of the trans-Alaska pipeline beginning in 1974. The most rapid increase in construction employment came between the period 1973 and 1975 when construction employment increased at a rate of 82.2 percent per year. The state has estimated that in 1976 construction employment connected with the Alyeska project was approximately 15,000, or 50 percent of the total state construction employment (Alaska Department of Labor, 1977). Wages and salaries mirrored the growth in employment, increasing at an average annual rate of 50.6 percent after 1970.

Mining employment also increased at a rapid rate throughout the period; its average annual rate was 12.5 percent. Unlike construction, mining experienced cyclical growth during the period. Mining employment increased between 1965 and 1970 to 3,000, then fell to 2,000 in 1973 before increasing to 4,000 in 1976. The early growth in mining resulted from discovery, development, and production of oil and gas from the Kenai Peninsula and Cook Inlet fields. Oil was discovered in 1957 at the Swanson River; production increased from one million barrels per month in 1966 to a peak in 1970 of 7.5 million barrels per month. Employment associated with these fields grew at an annual rate of approximately 40 percent in the late sixties, causing mining employment to triple between 1965 and 1969 in the Cook Inlet Region (Anchorage, Kenai, Matanuska-Susitna, Seward) (Scott, 1978). Employment associated with this development dropped after this peak production. During the 1970s, the development of the Prudhoe Bay fields resulted in the expansion of the mining industry. This development led to growth in both exploration and production employment and headquarters employment in Anchorage. The most rapid expansion of the mining industry came between 1973 and 1975 when both employment and wages and salaries increased at rates more than three times as great as the economy.

Manufacturing in Alaska has traditionally been associated with the fishing industry because of the large component of food processing employment. The composition of manufacturing changed over the period with food processing becoming less important; this change in composition accounts for the differential growth in employment and wages and salaries, since food processing is a traditionally low-paying sector. Between 1970 and 1976, employment in manufacturing grew at a rate of 4.6 percent annually, while wages and salaries grew at 11.1 percent. Food manufacturing, because of its relation to the fishing industry, showed cyclical growth; employment fell between 1973 and 1974 and did not rise again until 1976. The fastest growing sector of food manufacturing was "other" manufacturing which consists principally of petroleum refining, petrochemical, and printing and publishing. Between 1965 and 1976, employment in "other" manufacturing increased at an average annual rate of 6.5 percent, which meant that this sector was increasing its share of manufacturing employment.

Agriculture-fisheries-forestry depends on the development of the state's renewable natural resources. The growth of these industries depends to some extent upon the natural resource cycles. State Labor Department estimates do not include all of the employment in this industry, since a large proportion of the workers are self-employed. Independent estimates of employment in these industries suggest little growth. Forestry employs only about 22 people statewide; most of the logging employment is accounted for in lumber and wood products manufacturing (Scott, 1979). One indicator of agricultural activity is employment reported in a yearly agricultural survey. This survey reports a decline in total agricultural employment from 900 in 1965 to 750 in 1975 (USDA). The fishing industry has traditionally been important to Alaska. Based on estimates from Fish and Game fish ticket data, employment was estimated to have increased from about 4,340 in 1970 to about 5,720 in 1976. This is an annual growth rate of 1.3 percent (Rogers and Listowski, 1978). Table 3 shows some additional indicators of the growth of the fisheries industry. The catch and value statistics shown in this table illustrate the cyclical nature of the fishing industry. The real value of fisheries catch peaked in 1973 at $117,842 (in 1967 dollars).

TABLE 3. ALASKA FISHERIES ACTIVITY, 1970-1975

	1970	1971	1972	1973	1974	1975
Catch (million lbs)	533.6	471.0	422.5	513.1	454.2	442.4
Value ($.000)	97,497	85,585	92,431	142,353	144,809	129,402
Real Value ($.000)	88,957	75,735	79,751	117,842	108,147	84,965

SOURCE: Alaska Department of Commerce and Economic Development, The Alaska Economy, 1977, 1978.

The major growth in the basic sector was in mining and construction. The traditionally important fishing industry did not keep up with growth in other basic sectors. Federal government employment, while it provided a stable base for the economy, actually declined. Overall, employment in the basic industries grew rapidly but not as rapidly as the total economy. The differential growth in average wages led to increases in basic sector wages and salaries at rates close to state averages.

THE GROWTH OF STATE GOVERNMENT

The growth of nonexport sectors may also be responsible for the growth of a regional economy. An important sector contributing to the growth of Alaska between 1965 and 1976 was the expansion of state government. There are two reasons for selecting state government as a growth-initiating sector. First, state government experienced rapid growth in the early 1970s. Secondly, this growth was funded by the growth in revenues which were exogenous to the economy. The lease bonus from the Prudhoe Bay lease sale in 1969 resulted in the increased state revenues. This placed state government in a position equivalent to the basic sector. Growth in exogenous revenues led to increased expenditures which caused growth in the economy. Because of this, state and local government could be a possible source of economic growth. The growth of state government expenditures will influence the economy in two ways. First, increased state expenditures will lead to increased employment in state and local government. Secondly, state capital expenditures will increase employment in the construction industry. State expenditures on construction of highways and ports provide increased activity in the construction industry. Examining the growth of state expenditures during the period will provide an indication of the state government's contribution to growth.

Since statehood, total state expenditures have increased at an average annual rate of 21 percent (Goldsmith, 1977). Examination of expenditures shows there are three distinct periods of expenditure growth: prior to the 1969 Prudhoe Bay lease sale, between 1970 and 1972 when the initial adjustment to these revenues occurred, and after 1972. The primary interest is in the period after the state received the lease bonus in 1970. In examining expenditures in this period, Scott (1978) found:

1. The constant dollar increase was 62 percent of the nominal dollar increase.

2. The rate of increase was more rapid between 1970 and 1972 than between 1972 and 1977.

3. Operating expenditures have grown more rapidly over the whole period, while capital expenditures grew more rapidly between 1970 and 1972. These suggest that each type of expenditure may be sensitive to different factors, with operating expenditures responding to increases in demand and capital expenditures responding more to available revenues.

The question of whether state expenditures responded to growth or were growth inducing can be examined in Table 4 (from Scott, 1978), which shows the growth of real per capita state expenditures. If expenditures increased but real per capita expenditures remained constant, the growth of expenditures could be assumed to be simply keeping up with the growth in demand. If real expenditures grew faster than population, state government could be contributing to growth. Both real per capita operating and capital expenditures increased between 1970 and 1972. Real per capita operating expenses increased at an average rate of 19.9 percent in this period, while capital expenditures increased at a rate of 32.3 percent per year. After 1972 and the initial response to the expanded fund balance, operating expenditures increased at a rate of 3.4 percent and capital expenditures actually decreased at a rate of -6 percent.

Between 1970 and 1972, state government expenditures expanded much more rapidly than either population or prices. After 1972, expenditures have grown more in line with population and prices. The expansion of service levels between 1970 and 1972 is an indication that state government was a contributing factor to the growth during this period. The growth of the service levels reflected the initial response to the large increase in revenues from the Prudhoe Bay lease sale. State government contributed to growth since it distributed exogenous revenues to the economy. This extra demand resulted in economic growth. The long-term consequences result from the change in the relationship between state expenditures and economic growth as defined by real per capita expenditures.

TABLE 4. STATE REAL PER CAPITA OPERATING AND CAPITAL EXPENDITURES 1970-1977

(Constant 1967 Dollars)

Fiscal Year	Resident Population[1]	Operating Expenditures Per Capita	Capital Expenditures Per Capita	Total Expenditures Per Capita
1970	294,560	$ 722.20	$317.02	$1,039.22
1971	302,361	990.64	374.77	1,365,41
1972	312,930	1,038.74	555.11	1,593.85
1973	324,800	1,108.15	497.07	1,605.22
1974	330,600	1,168.14	475.66	1,643.80
1975	351,159	1,199.92	548.54	1,748.46
1976	404,635	1,156.97	486.57	1,634.54
1977	413,289	1,224.88	409.17	1,634.05
		Average Annual Rate of Increase		
1970-1977	5.0%	7.8%	3.7%	6.7%
1972-1977	5.7%	3.4%	- 6.0%	0.5%
1970-1972	3.1%	19.9%	32.3%	23.8%

[1]State's estimate from Research and Analysis Section, Employment Security Division, Alaska Department of Labor, State of Alaska Current Population Estimates by Census Divisions, July 1 (year). The population as of the beginning of the fiscal year was used.

This historical period illustrates the state's unique financial position. The revenues associated with Prudhoe Bay production will be available to the state to increase economic growth. However, Prudhoe revenues are a fixed flow of resources which will not be affected by economic growth. Since they are fixed, growth will reduce the share of these revenues available to existing residents. This relation makes the ability of the economy to generate revenues to replace Prudhoe revenues an important future consideration.

SUMMARY

Two major factors have been responsible for the growth of the Alaskan economy since 1965. The expansion of basic industries and the growth of state government were the most important growth-initiating factors. Unlike most states, the Alaskan government had an exogenous source of revenues in the early 1970s which it could use to expand government spending in more than a proportionate response to the growth of the economy. The rapid increase in government spending was important as a source of growth in the early 1970s. The most important basic sectors during this period were mining and construction. These industries experienced particularly rapid growth after 1973 with the construction of TAPS and development of Prudhoe Bay. The traditionally important basic sectors of federal government and agriculture-forestry-fisheries expanded at a much less rapid pace.

The expansion of state government and the basic sector was important to growth of the economy, because this expansion led to an increase in incomes. Factors which cause incomes to increase independently of expansion of either the basic sector or state government can also result in the expansion of the economy. Income can increase because of an increase in the productivity of labor or increased demand for labor not associated with an increase in the basic sector. One factor that is important for Alaska incomes is the influence of overall U.S. wage rates. Since Alaska is an open economy, Alaska is part of the U.S. labor market. The Alaska labor market will reflect changes in the U.S. wage rates. Alaska markets will adjust through migration. Higher relative wages outside will lead to out-migration and an increased wage until an equilibrium relationship is reached.

Growth is transmitted from its initiating source through the economy by increased demand for local goods and services. As incomes increase, a portion of this income is spent on goods and services in the local economy. This additional expenditure leads to increasing employment in the support sector. This growth in employment leads to increased incomes which generate new increases in demand. The simultaneous nature of this process can be seen as growth in income leads to increases in demand and further income growth; and the process begins again.

Structural Change in the Alaskan Economy

The relation between the growth-initiating sectors and the remainder of the economy is an important part of the economic growth process. In our analysis of Alaskan growth, one thing was evident: the growth of employment in the basic sectors stimulated a greater-than-proportional response in the remainder of the economy. One measure of this response is the ratio of total-to-basic sector employment; the larger this ratio, the more important is the economy's response to basic sector growth. In 1965, the ratio of total-to-basic employment was 2.25; it had risen to 2.95 by 1973 prior to the trans-Alaska pipeline construction. Even in 1976 with the tremendous amount of basic construction employment, the ratio was 2.69. The change in this ratio shows that along with the rapid growth in the levels of economic activity, there has been a qualitative change in the relationships in the economy. This qualitative change is a change in the structure of the economy which will be described in this section.

STRUCTURAL CHANGE

The economic relationships which determine the flow of income, goods, and services are determined by the structure of the economy. The structure of the economy's productive sector can be defined by the distribution of employment or gross product among industries. The economy's structure influences its overall level of activity, the level of prices, and seasonal and cyclical stability. The structure both affects and is affected by growth.

The growth of the economy leads to changes in its structure. Structural change can result from a change in the structure of demand as changes in incomes and prices affect the structure of consumption. However, changes in demand may only change the distribution of imports unless supply conditions lead to the production of goods locally. If economies of scale are obtained in production, regional growth will alter the production costs. As economies grow and achieve economies of scale, they will substitute local production for imports of goods or services.

The structure of the economy also affects growth. Chinitz suggested that the structure of the export sector influences important determinants of growth such as bank lending patterns and entrepreneurship (Chinitz, 1961). The structure of the export sector may also influence growth through its propensity for backward and forward linkages. The Alpetco project is a recent example of a forward linkage from the Alaska petroleum sector. The structure will influence the economy's response to major exogenous changes. The region's industrial structure will determine how much of the incomes generated by export activity will be spent locally. When the economic change is large relative to the local economy, structural change may result.

ALASKA STRUCTURAL CHANGE

The ratio of total-to-basic employment has steadily increased from the early fifties (Goldsmith and Huskey, 1978B). This growth in the nonbasic or support sector of the Alaskan economy means that equivalent increases in basic employment will lead to greater growth. Table 5 illustrates the

TABLE 5. THE EFFECT OF STRUCTURAL CHANGE, ALASKA, 1965-1976

Year	Total Non-Agricultural Employment	Civilian Total Basic Employment	Ratio of Total/ Basic	Total Employment when using 1965 Ratio	Total Employment when using 1970 Ratio
1965	70,530	31,393	2.25	-	82,879
1970	92,476	35,028	2.64	78,697	-
1971	97,584	35,447	2.75	79,638	93,582
1972	104,243	36,137	2.88	81,188	95,404
1973	109,851	35,849	3.06	80,541	94,643
1974	128,178	45,698	2.80	102,668	120,645
1975	161,313	58,592	2.75	131,637	154,686
1976	171,714	63,732	2.69	143,185	168,256

Basic Employment includes: Mining, Contract Construction, Manufacturing, Agriculture-Forestry-Fisheries, Federal Government, and Military.

SOURCE: Alaska Department of Labor, Statistical Quarterly, various quarters (primarily third), 1966-1977.

effect of structural change on growth. The last two columns show what growth would have been with the given basic sector growth and the maintenance of 1965 and 1970 total-to-basic ratios. In all cases, these ratios underestimate the economy's real growth.

Table 6 provides a detailed description of the structure of Alaska industry in 1965, 1970, and two pipeline years--1975 and 1976. The support industries as a group expanded. Trade and transportation-communication-utilities remained constant after 1970. The service industry grew significantly in this period, increasing from 10.7 percent to 16.1 percent of total employment. Business services increased from 1.97 percent to 5.04 percent and were the major component of service sector change. Finance-insurance-real estate also increased as a proportion of total employment. (The employment levels are found in Appendix A.)

The Extent of Future Structural Change

The Alaska support sector has increased its share of employment since 1965, which is part of a much longer trend. An important question when examining potential future growth is what the extent of future structural change will be. If the support sector were to continue to expand its share of employment at its past rate of about 2.5 percent per year, the support sector would account for 85 percent of employment in 2000 and almost 100 percent six years later. This, of course, cannot happen; however, there are reasons to expect future growth in the support sector. The most important reason is that economic growth will increase market size, which will allow more local production of goods and services.

TABLE 6. DISTRIBUTION OF EMPLOYMENT, ALASKA
1965, 1970, 1975, and 1976

Industry	1965 % of Total Employment	1970 % of Total Employment	1975 % of Total Employment	1976 % of Total Employment
Total Wage and Salary Employment	100.00	100.00	100.00	100.00
Mining	1.54	3.24	2.35	2.31
Contract Construction	9.15	7.45	16.04	17.61
Manufacturing	8.90	8.48	5.98	6.02
Food	4.26	4.04	2.68	2.98
Logging Lumber and Pulp	3.27	2.98	2.09	1.89
Other Manufacturing	1.36	1.45	1.20	1.14
Transportation, Communication, and Public Utilities	10.30	9.85	10.21	9.18
Trucking and Warehousing	1.72	1.79	2.45	1.89
Water Transportation	1.47	.90	.86	.78
Air Transportation	2.72	3.32	2.96	2.70
Other Transportation	.76	.95	1.13	1.08
Communications and Public Utilities	3.63	2.89	2.69	2.73
Trade	14.11	16.61	16.25	16.05
Wholesale	2.63	3.51	3.66	3.55
Retail	11.48	13.10	12.58	12.50
General Mdse. and Apparel	2.69	3.63	2.55	2.48
Food Stores	1.65	1.85	1.62	1.74
Automotive & Service Stations	NA	1.81	1.77	1.68
Eating/Drinking Establishments	2.77	3.02	3.88	3.76
Other Retail	4.36	2.78	2.76	2.84
Finance, Insurance, and Real Estate	3.08	3.35	3.74	4.14
Services	10.65	12.37	15.58	16.11
Hotels, Motels, and Lodges	1.46	1.57	1.96	1.87
Personal	.96	.92	.57	.54
Business	1.97	2.16	4.54	5.04
Medical	2.03	2.35	2.68	2.92
Other	4.22	5.37	5.83	5.75
Government	42.06	38.45	29.22	27.89
Federal	24.72	18.50	11.34	10.45
State	9.87	11.21	9.59	8.22
Local	7.47	8.73	8.30	9.21
Agriculture, Forestry, and Fisheries	.20	.21	.63	.70

SOURCE: Statistical Quarterly, Alaska Department of Labor, various issues.

Tables 7 and 8 give some insight into the limits to the growth of the support sector. Table 7 compares the Alaskan distribution of employment to the United States and some other states. Only in finance-insurance-real estate and transportation does Alaska come close to the employment shares of other states. The shares of trade and services are well below those of other states. If the only thing determining industrial production were scale economies, the structure of a region could be assumed to grow toward similar averages. The average of other states is similar to the U.S. distribution and supports this hypothesis.

Examining Table 7 shows that the variation around the U.S. average cannot be explained simply by scale. Table 8 shows that real personal income may explain some of the differences; when personal income is adjusted to reflect regional cost differences, there is a similarity among states. The ratio of support employment to personal income is close to 30.00 for most states independent of their size, although the ratio is lower for some states larger than Alaska. Alaska's ratio is less than this. Both Tables 7 and 8 indicate that the support sector in Alaska has room for expansion.

What explains the support sector's relative underrepresentation in the Alaska economy? One explanation might be a certain threshold size which Alaska has not yet reached after which the support sectors grow somewhat proportionately. A second explanation could be the composition of the export sector. Large petroleum and mining operations and government provide much of the support activity internally leading to an underdeveloped

Table 7. THE ECONOMIC STRUCTURE OF SMALL STATES

	Total Employment (thousands)	Percent in Services	Percent in Trade	Percent in Finance-Insurance-Real Estate	Percent in Transportation-Communication-Public Utilities	Percent in Government
Alaska	151.7	15.2	17.5	5.1	9.0	34.5
Wyoming	168.7	13.9	21.9	3.4	7.8	22.7
Vermont	179.5	23.4	20.7	4.0	4.7	18.2
North Dakota	227.8	19.3	29.0	4.5	6.1	26.8
South Dakota	227.0	21.1	27.5	4.4	5.4	24.9
Delaware	234.3	16.9	22.0	4.8	5.2	17.8
Montana	263.7	18.4	25.2	4.4	7.8	27.8
Idaho	305.5	17.5	25.1	5.3	6.0	21.8
Nevada	323.7	40.8	19.8	4.2	6.0	16.1
New Hampshire	348.1	18.3	21.5	4.9	3.6	16.1
Hawaii	362.2	24.0	25.4	6.9	7.8	24.2
Rhode Island	383.0	18.8	19.9	5.0	3.5	15.7
Maine	384.3	17.0	21.1	3.9	4.5	21.3
New Mexico	430.9	19.5	22.9	4.4	6.0	26.9
Utah	500.2	17.4	24.0	4.6	6.1	23.8
Nebraska	583.6	17.4	26.5	6.6	7.2	22.2
West Virginia	549.2	15.8	22.1	3.6	6.6	20.9
Arkansas	714.5	14.0	21.3	4.2	5.4	19.0
Mississippi	778.1	14.3	19.7	3.9	4.7	21.2
Arizona	829.8	18.2	24.4	5.6	5.2	23.2
Kansas	878.5	17.5	23.8	4.9	6.6	20.9
Oregon	962.7	17.5	23.7	6.2	5.7	20.3
Oklahoma	1,001.6	16.6	23.4	5.0	6.0	22.4
Colorado	1,008.1	19.4	23.4	6.1	6.5	22.2
Washington	1,405.6	18.4	23.7	5.6	5.7	20.7
Average (excluding Alaska)		19.0	23.3	4.8	5.8	21.5
U.S. Average		18.8	22.1	5.1	5.5	15.9

Source: U.S. Department of Labor, Bureau of Labor Statistics, Employment and Earnings, June 1978.

TABLE 8. ECONOMIC STRUCTURE OF SMALL STATES
1977

	Total Employment Support Industry[1] (Thousands)	Personal Income (Million $)	Support/ Personal Income	Regional Index of Costs (U.S.=1)	Support Employment/ Regionally Deflated Personal Income
Alaska	71,100	4,311	16.5	1.42	23.4
Wyoming	79,100	3,073	25.7	.90	23.1
Vermont	94,700	2,814	33.7	1.02	34.4
North Dakota	136,600	4,044	33.8	.92	31.1
South Dakota	132,700	4,104	32.3	.92	29.7
Delaware	114,700	4,477	25.6	1.02	26.1
Montana	147,300	4,661	31.6	.90	28.4
Idaho	164,600	5,128	32.1	.90	28.9
Nevada	228,800	5,059	45.2	.99	44.7
New Hampshire	168,400	5,547	30.4	1.02	31.0
Hawaii	234,600	6,773	34.6	1.21	41.8
Rhode Island	181,000	6,332	28.6	1.02	29.2
Maine	178,300	6,221	28.7	1.02	29.3
New Mexico	227,400	6,970	32.6	.88	28.7
Utah	256,300	7,510	34.1	.98	33.4
Nebraska	336,500	10,491	32.1	.93	29.9
West Virginia	264,000	11,129	23.7	.85	20.1
Arkansas	321,100	11,878	27.0	.89	24.0
Mississippi	331,800	12,019	27.0	.89	24.0
Arizona	446,600	14,943	29.9	.99	29.6
Kansas	464,700	19,802	23.5	.93	21.9
Oregon	511,500	16,651	30.7	.998	30.6
Oklahoma	510,400	17,839	28.6	.98	28.0
Colorada	558,900	18,752	29.8	.98	29.2
Washington	755,900	27,534	27.5	.998	27.4

[1]Support sector includes: Services, Trade, Finance-Insurance-Real Estate, and Transportation-Communication-Public Utilities.

SOURCES: U.S. Department of Labor, Bureau of Labor Statistics, Employment and Earnings, June 1978.

U.S. Department of Labor, Bureau of Labor Statistics, Monthly Labor Review, April 1978.

support sector. A third reason could be the high cost of doing business in Alaska which dampens the effects of scale and reduces the competitiveness of Alaska production. The extent of the state could be another reason for Alaska's underdevelopment of the support sector. The distribution of population may make it more profitable to serve some areas such as Southeastern and Western Alaska from outside the state. The most optimistic reason would be that it is merely an information problem. If outside investors do not know the Alaska market, they will underinvest. That, coupled with the slow reaction of investment in the support sector to the recent rapid growth, would mean that Alaska could expect future growth in these sectors merely to catch up with the existing growth in the basic industry.

SUMMARY

This section has described the second part of the process of economic growth, the response of the economy to changes in those sectors which initiate growth. This response has changed in the Alaska economy since 1965; an important indicator of this is the increased share of the support sector. Relative to other states, Alaska is underserved by the support sector. Because of this, there is some reason to believe the support sector will continue to expand as a portion of total employment. This understanding of structural change and its relation to economic growth increases our awareness of the effects of the scale and the timing of future economic activity.

Population

Industrial growth and the change in the structure of the economy are not the only aspects of economic growth. Population growth is another component. The level of population is influenced by the level of economic activity. Migration is a major component of population change, and the relative economic opportunities within Alaska determine levels of in- and out-migration. The population of a region also influences the economic activity. The characteristics and size of the population determine the region's local demand for goods and services and its labor force composition. This section will discuss the growth and composition of the Alaska population.

Table 9 shows the growth in population between 1965 and 1976. As would be expected, population increased most rapidly with the construction of TAPS; between 1973 and 1974, population increased 6.29 percent, while it increased by 15.23 percent between 1974 and 1975. Population increased by 148,100, or 55.8 percent, between 1965 and 1976.

The age and sex distribution of the population determines the demand that population places on both public and private services. A population with a large school-age component will have a higher demand for schools than the same population with a different distribution. The age-sex distribution will also influence the size of the labor force produced by a given population. Table 10 describes the age-sex distribution in 1970 and 1976. Comparing the age-sex distribution between 1970 and 1976 shows two observable trends. First, the proportion of males in the population has declined.

TABLE 9. POPULATION GROWTH, ALASKA
1965, 1970-1976

	Number of Births	Number of Deaths	Natural Increase	Estimated Net Migration[1]	Population as of July 1	% Increase over Previous Year
1965	7,063	1,400	5,663	4,538	265,192	3.84
1970	7,560	1,431	6,129	1,672	302,361[2]	2.66[3]
1971	7,312	1,455	5,857	4,712	312,930	3.50
1972	6,948	1,467	5,481	5,870	324,281	3.60
1973	6,611	1,464	5,147	937	330,365	1.88
1974	7,006	1,468	5,538	15,256	351,159	6.29
1975	7,470	1,522	5,948	47,527	404,634	15.23
1976	7,834	1,713	6,121	2,534	413,289	2.14

[1] Difference between change in population and natural increase.

[2] U.S. Department of Commerce, Bureau of Census, 1970 Census of Population.

[3] Average annual percent increase between 1965 and 1970

SOURCE: Alaska Department of Labor and the Division of Economic Enterprise, Department of Commerce and Economic Development, as reported in The Alaskan Economy, Year-end Performance Report, 1977.

TABLE 10. ALASKA POPULATION
AGE-SEX DISTRIBUTION
1970, 1976

	1970			1976		
Age	Males	Females	Total	Males	Females	Total
All ages	54.2	45.7		51.6	48.4	
0-13	16.5	15.7	32.2	14.1	13.2	27.3
14-19	5.7	5.2	10.9	6.6	6.0	12.6
20-29	12.4	8.7	21.1	11.2	10.4	21.6
30-39	7.7	6.5	14.2	7.8	7.8	15.6
40-54	8.1	6.6	14.7	7.7	7.2	14.9
55-64	2.5	2.0	4.5	3.1	2.6	5.7
64 +	1.3	1.0	2.3	1.1	1.2	2.3

SOURCES: U.S. Department of Commerce, Bureau of the Census, <u>1970 Census of Population</u>.

U.S. Department of Commerce, Bureau of the Census, 1976 Survey of Income and Education Microdata Tape.

The second trend is the increase in working-age population relative to the remainder of the population. The surprising observation is that the age-sex distribution has maintained relative stability. The tremendous growth in the population between 1970 and 1976 seems to have affected the distribution only slightly.

Population has grown rapidly since 1965, although the growth has been less rapid than the growth in employment. This differential growth has resulted in a fall in the dependency ratio (population/employment). The ratio of population-to-employment has fallen from 3.76 in 1965 to 2.41 by 1976. TAPS construction may be largely responsible for the low ratio in 1975 and 1976, since the pipeline has attracted single workers. The dependency ratio had fallen substantially before construction on the pipeline began; in 1973 the ratio was 3.01. The dependency ratio has fallen as the proportion of the population which is working has increased. This increase results from a change in the proportion of the population which is of working age; the proportion of the population between 14 and 64 has increased from 65.4 percent in 1970 to 70.4 percent in 1976. The increased labor force participation of this population is also responsible.

Population growth results from the net effect of births, deaths, and in- and out-migration. As would be expected in a region with a small population which is experiencing rapid economic growth, migration was the most important component of population change throughout the period. Migration accounted for 69 percent of the total change in population between 1970 and 1976. In 1975, it accounted for 89 percent of the increase in population.

Unemployment

Unemployment has always been an important problem for the Alaska economy. Table 11 shows the dimensions of the problem. Since 1970, the unemployment rate has remained close to 10 percent; only in 1975 did it fall below 10 percent. The unemployment rate remained constant even though employment was increasing throughout the period. This illustrates a particular Alaska dillema. Increases in employment lead to increases in migration, which increase the labor force and leave the unemployment rate high. This has important welfare effects when skill levels are considered. If migrants are more qualified and take the new jobs, employment growth may do little to increase the welfare of original residents. The other factor which maintained the high unemployment rate was the increase in labor force participation. The labor force participation rate responds, like migration, to economic opportunities. As the employment opportunities expand, more people enter the labor force. The labor force participation rate increased from about 40 percent in 1970 to 53 percent in 1976.

One factor influencing unemployment in Alaska is the seasonality of employment. Economies which are dependent on natural resource production often have seasonal cycles. This has been accentuated in Alaska by the severe winters which limit activity. Since the season decline occurs in the winter months, one measure of seasonality is defined by the ratio of the fourth-quarter employment to the third-quarter employment. The closer this index is to one, the less seasonal is the industry. Table 12 shows the seasonality of Alaska industries. Seasonality has decreased in importance throughout the historical period. In 1960 the overall seasonality

TABLE 11. UNEMPLOYMENT, ALASKA 1965-1976

Year	Total Unemployed	Unemployment Rate (%)	Labor Force Participation Rate (%)
1965	7,700	8.6	38.16
1970	9,700	9.0	39.94
1971	12,100	10.4	40.97
1972	12,900	10.5	41.27
1973	13,900	10.8	42.78
1974	14,900	10.0	46.00
1975	14,900	8.3	47.40
1976	21,000	10.5	52.65

SOURCE: Alaska Department of Labor, Labor Force Estimates, various years.

Alaska Department of Labor, Estimates of Total Resident Population.

TABLE 12. SEASONALITY OF EMPLOYMENT, ALASKA
1950, 1960, 1965, 1970, 1975, and 1976

	1950	1960	1965	1970	1975	1976
Mining	.6267	.7143	.7949	.8556	.9009	.9690
Construction	.7900	.5862	.6460	.7279	.8374	.6906
Manufacturing	.2440	.5137	.6531	.5457	.6886	.6714
Transportation, Communication, and Public Utilities	.8248	.9683	.9125	.8851	.9887	.8871
Trade	.9226	.9718	.9905	.9733	1.0048	.9120
Finance, Insurance, and Real Estate	1.0000	1.0000	.9706	.8942	1.0000	.9270
Services	.9583	.9123	.9664	.9716	.9812	.9387
Government	.9632	.9815	.9617	.9810	1.0049	.9689
Total	.7505	.8313	.8718	.8800	.9402	.8733

SOURCE: State of Alaska, Alaska Labor Force Estimates, various years.

index was .8313. In 1975 the seasonality index for total employment was .9402; the increase in seasonality in 1976 was due to the pipeline construction employment in the summer of 1976. The decrease in seasonality since 1960 has been a result of three factors. First, the increased importance of support sector industries with smaller seasonal components resulted in lowering the average seasonality. The seasonality index of services, trade, and F.I.R.E. has always been close to one. Secondly, the technology became available to work through the winter in construction. Finally, market forces made it profitable to employ these technologies in Alaska.

Personal Income

Growth of personal income increases the demand for goods and services and is an important determinant of the growth of the Alaska economy. Growth in personal incomes is also a measure of the benefits received from economic growth. Personal income has grown at an average rate of more than 15 percent throughout the period. The best measure of the welfare effects of personal income is real per capita income. Increasing incomes will only increase welfare if it is increasing faster than prices and population. Real per capita personal income measures the command of the average individual over goods and services.

Table 13 shows the effect of price increases in Alaska as measured by the Anchorage CPI. By comparing the growth in the Anchorage index to the United States, we can assess one impact of rapid development. Prior to 1974, the Anchorage CPI was increasing at a slower rate than the U.S. CPI,

TABLE 13. ANCHORAGE CONSUMER PRICE INDEX
(1967 = 100)

Year	Anchorage Index	% Change Over Previous Years	United States Index	% Change Over Previous Years
1965	94.2	--	94.5	--
1970	109.6	3.07[1]	116.3	4.23[1]
1971	112.9	3.01	121.3	4.30
1972	115.9	2.66	125.3	3.30
1973	120.8	4.23	133.1	6.23
1974	133.9	10.84	147.7	10.97
1975	152.3	13.74	161.2	9.14
1976	163.3	7.22	170.2	5.58

[1]Average annual rate of price increase 1965-1970.

SOURCE: Alaska Department of Commerce and Economic Development, The Alaska Economy Year End Performance Report, 1978.

which meant the price differential between Alaska and the United States was falling. With the TAPS boom, this trend was reversed. Prices rose relatively faster in Alaska after 1975 because of bottlenecks and the rapid increase in demand. Bottlenecks resulted when the rapid increase in demand was met by the relatively fixed supply system.

Table 14 shows the growth in real per capita personal income. The maximum increases came in 1973 and in 1975 when real per capita income increased by over 10 percent. In all but 1972, the growth of real per capita income was greater in Alaska than in the United States. This shows that an average Alaskan's command over goods and services has increased at a rate much greater than in the United States as a whole.

Summary: The Effects of Economic Growth

During the period between 1965 and 1976, the Alaska economy experienced rapid growth. The expansion of the economy during this period is symbolized by the growth in three aggregate indicators of economic activity: personal income, employment, and population. Personal income, which measures the command of residents over goods and services, expanded by 382 percent during the period from $858 million to $4,133 million. Employment expanded by 144 percent from 70,530 to 171,714 between 1965 and 1976. Population grew from 265,192 in 1965 to 413,289 in 1976, an increase of 56 percent.

Growth did not occur evenly during the period; the most rapid growth occurred after 1970. For each of the aggregate indicators, the growth rate was more rapid after 1970. Population grew at an average annual rate

TABLE 14. ALASKA GROWTH OF REAL PER CAPITA INCOME
1965, 1970-1976

	Real Per Capita Income in Millions			
	Alaska		United States	
Year	Total	% Increase Over Previous Year	Total	% Increase Over Previous Year
1965	3,435	--	2,895	--
1970	4,260	4.40[1]	3,348	2.95[1]
1971	4,407	3.45	3,406	1.73
1972	4,518	2.52	3,585	5.26
1973	5,031	11.35	3,742	4.38
1974	5,180	2.96	3,675	- 1.79
1975	5,701	10.06	3,636	- 1.06
1976	6,124	7.24	3,755	3.27

[1] Average annual percent increase between 1965 and 1970

SOURCES: U.S. Department of Commerce, Bureau of Economic Analysis, Regional Economic Information Center, July 1977 printouts.

U.S. Department of Commerce, Bureau of the Census, Statistical Abstract of the United States, 1966 and 1967.

U.S. Department of Labor, Handbook of Labor Statistics, 1972 and 1977.

of 5.4 percent after 1970 compared to 2.7 percent between 1965 and 1970. Employment grew at an average rate of 10.9 percent per year between 1970 and 1976, compared to 5.6 percent prior to 1970. Personal income grew at almost twice its pre-1970 rate between 1970 and 1976.

Economic growth during the period examined in this section resulted from expansion of the basic sector. The industries which were most important in the basic sector growth were mining and construction. The expansion of these sectors was directly related to petroleum development in the state. Prior to 1970, development of oil fields on the Kenai Peninsula and in Upper Cook Inlet were primarily responsible for growth. The development of the Prudhoe Bay fields after the lease sale in 1969 resulted in mining employment growth both at Prudhoe Bay and in Anchorage. The construction of the trans-Alaska pipeline to transport the oil from Prudhoe Bay was responsible for a 158 percent increase in construction employment between 1973 and 1975. This major petroleum-related growth occurred after 1970, contributing to the more rapid growth in the latter part of the study period.

Two other factors contributed to state economic growth. First, the additional state revenues available after the Prudhoe lease sale in 1969 allowed the state to increase expenditures. The increase in state government employment and capital improvement expenditures were partially responsible for state growth in the early 1970s. Secondly, as the scale of the economy increased, the relation between the support sector and basic sector growth changed. Increased scale allowed more local production of goods and services, which meant that increased basic sector activity resulted in greater growth in the support sector.

Existing Economic Conditions

The existing economic conditions in Alaska reflect the end of work on the TAPS project. The project was completed in 1977, but the peak employment on the pipeline project occurred in 1976. The fall in construction employment between 1976 and 1977 illustrates the significance of this to the economy. Construction employment fell by 35.4 percent from 30,200 to 19,500 in 1977 (Alaska Department of Labor, 1978).

Although the economy experienced a fall in total employment, the drop was not so great as would have been expected given the response the economy experienced during the pipeline buildup. Nonconstruction employment actually rose between 1976 and 1977. Total nonagricultural wage and salary employment fell by only 7,000, or only 65 percent of the fall in construction employment; nonconstruction employment increased by 3,700. This increase was a result of the expansion of both the basic sector and the support sector. The major basic sector to increase was mining, which increased by 1,000 employees. This increase was a result of the continued development of the Prudhoe Bay fields and the preparation for further exploration activity. This included substantial expansion of headquarters employment in Anchorage. Trade and finance-insurance-real estate accounted for 1,500 of the increased employment. This was an unexpected response from the support sector, given decreasing basic sector employment. Local government added significantly to this growth, expanding employment by about 2,000.

Two delayed adjustments took place in the post-pipeline period. The first was a response by the support sector to the larger economy. The full expansion of this sector may have been prevented during the pipeline period because of the high demand for labor. Another factor which may have been responsible for the delayed response was the rapid growth of the economy; the 1977 response was the delayed investment response. The second delayed adjustment which prevented the proportional drop in the economy in the post-pipeline period was the spending of accumulated savings and capital gains. This dissaving lengthened impact of the pipeline beyond the period of direct employment impact.

The economy has adjusted to the end of the pipeline. Future growth can be expected to be at much lower rates than in the past. Future growth will depend on the expansion of the basic sector and whatever structural change may occur. One of the most important basic industries for the future will be mining. With the beginning of production at Prudhoe Bay, Alaska became the third largest oil producing state. Continued development at Prudhoe Bay and exploration in NPRA, as well as the OCS areas, will be responsible for the continued future growth of this industry. The 200 mile fisheries limit will increase the importance of the fishing industry. Alaska's current domestic catch accounts for only 7 percent of the fishery resource (Alaska Pacific Bank, 1979). The near-future growth may be limited because of the investment required to move into bottomfishery. In the near future, construction will be dependent on government projects. The next major project planned is the construction of the ALCAN natural gas pipeline in the early 1980s. If constructed, this project should have impacts similar to the TAPS project.

The Economies of the Gulf of Alaska Region, 1965-1976

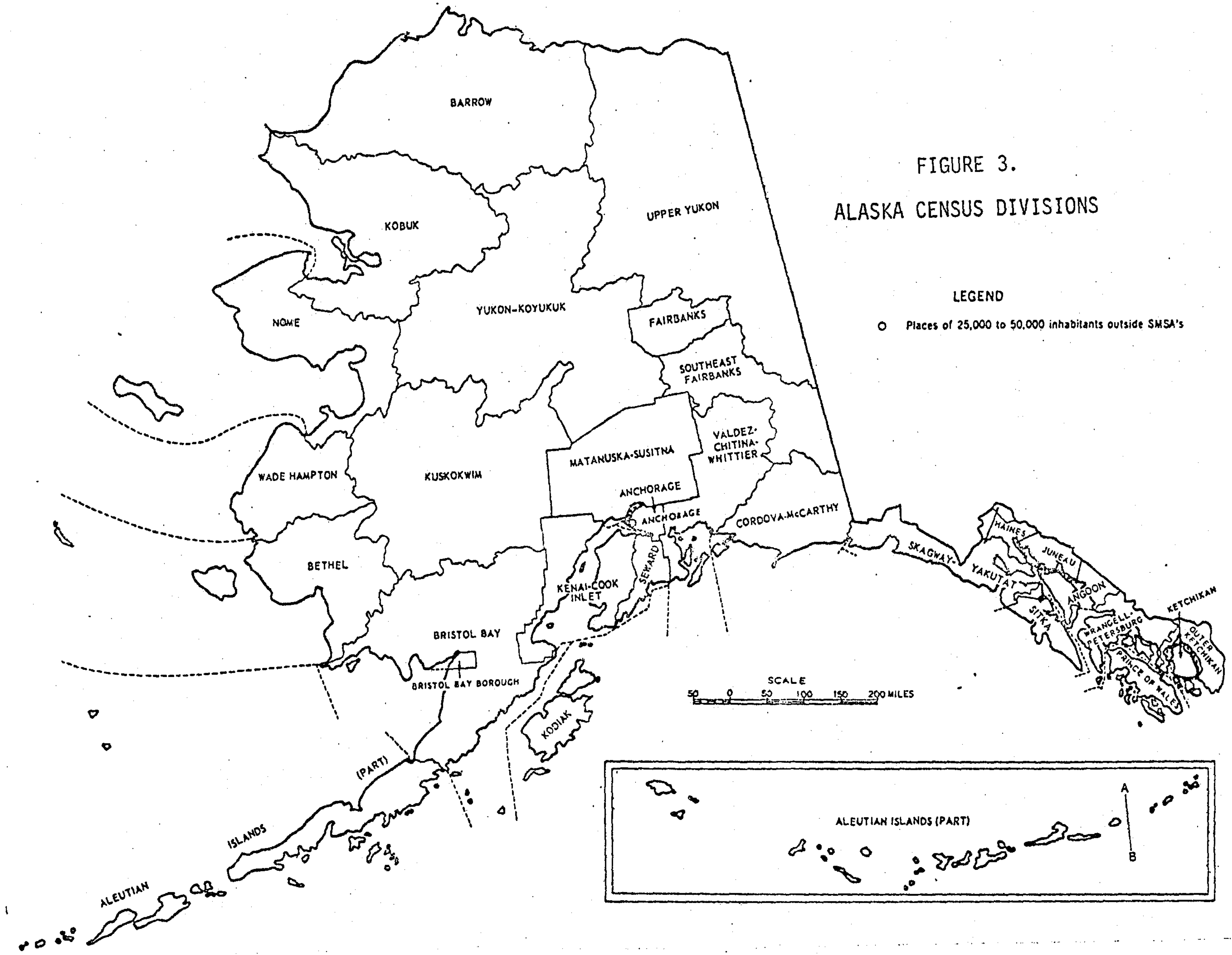
OVERVIEW

The major impacts from OCS development in the Northern Gulf of Alaska are projected to occur in the Gulf of Alaska region of the state. The Gulf of Alaska region contains two major subregions, Anchorage and Southcentral. The Anchorage region consists of the Anchorage Census Division. Southcentral includes six census divisions: Kenai, Seward, Matanuska-Susitna, Valdez-Chitina-Whittier, and Cordova-McCarthy. It also includes the Yakutat portion of the Skagway-Yakutat Division. (Figure 3 shows the Alaska Census Divisions.) The character of each of these subregions differs. Anchorage is the urban center of the state. The Southcentral region consists of a series of small, rural economies.

The Gulf of Alaska region is the most populous region of the state. It contains almost 60 percent of the state's population. Many of the events which have influenced the growth of the state occurred in the Gulf of Alaska region. The Cook Inlet oil and gas fields are located in that region, and the terminus of the trans-Alaska pipeline is also in the Gulf of Alaska region at Valdez. This region also contains one of the major fishing ports in the state at Kodiak. Anchorage, the state's major metropolitan center is in the region. The region and its subregional economies experienced rapid growth between 1965 and 1970. The Gulf of Alaska region grew faster than the state and increased its share of state employment from 53.6 percent to 56.5 percent. This section will examine the growth of the Gulf of Alaska's two subregions during the 1965-1976 period.

FIGURE 3.

ALASKA CENSUS DIVISIONS



ANCHORAGE

The position of Anchorage as the major metropolitan center of Alaska and the administration and distribution center for much of the state means that growth in Anchorage reflects the growth in the rest of the state. This factor explains why Anchorage, while having no actual pipeline construction, experienced rapid growth during the pipeline period. As an urban area, the past and future expected growth in Anchorage differs importantly in its causes and effects from the state as a whole. This section will describe the historical growth of Anchorage as well as try to isolate the important causes of growth which are unique to Anchorage.

Growth of Aggregate Indicators

Table 15 shows the growth of three indicators of aggregate economic activity: employment, population, and personal income. Total employment increased by about 42,440 during the period; over 73 percent of this increase occurred after 1970. After 1970 the average growth rate of employment was 9.7 percent compared to the overall 8.2 percent rate. Between 1973 and 1975, the period of the most rapid TAPS growth, total employment increased by 38 percent.

Population followed the same path as employment, increasing more rapidly in the last six years of the period. Population grew at an average rate of 5.54 percent per year between 1965 and 1970; for the period after 1970, the rate was 6.58 percent. Unlike employment, population grew faster in Anchorage than in the state, which grew at 5.3 percent. This meant

TABLE 15. GROWTH OF EMPLOYMENT, POPULATION, AND PERSONAL INCOME, ANCHORAGE 1965-1976

	Population	Employment	Personal Income ($ Million)
1965	102,337	30,678	371.0
1970	126,333	41,995	634.9
1971	135,777	45,452	732.9
1972	144,215	48,252	800.2
1973	149,440	50,627	883.1
1974	153,112	58,713	1111.6
1975	177,817	69,645	1577.6
1976	185,179	73,113	1799.1
Average Annual Percent Change			
1965-1976	5.54	8.22	15.43
1970-1976	6.58	9.68	18.96

SOURCES: All estimates State of Alaska Department of Labor, Research and Analysis Section, Population Estimates by Census Division, except 1970 which is Census of Population.

Alaska Department of Labor, Statistical Quarterly, various years.

U.S. Department of Commerce, Bureau of Economic Analysis, July 1978.

that population was concentrating in Anchorage even though the pipeline construction had slowed the trend toward employment concentration.

Personal income experienced growth similar to state growth; personal income increased at close to 15 percent annually in Anchorage and the state. For the entire period, the annual rate of growth was slightly higher for Anchorage. After 1970 the higher incomes associated with the pipeline construction led to a slightly faster rate of growth in the state.

The Causes of Growth

The Anchorage economy expands for reasons similar to those causing expansion in the state economy. One cause of growth is the expansion of the basic industries of agriculture-forestry-fisheries, mining, manufacturing, construction, and federal government. For the local economy, state government growth can also be seen as a basic sector, since the factors determining its growth are political decisions external to the region. The growth of the basic industries is shown in Table 16 which describes the growth of all industrial sectors in Anchorage.

Over the period 1965-1976, the fastest growing basic sector was mining. Mining grew at an average annual rate of 12.91 percent over the period. Between 1965 and 1970, mining employment increased by an average rate of 20.9 percent per year. The growth of mining was the result of the development of regional headquarters and administrative staffs to support the

TABLE 16. CIVILIAN EMPLOYMENT GROWTH
ANCHORAGE, 1965-1976

Industry	Average Annual Percent Increase 1965-1976	Average Annual Percent Increase 1970-1976	Average Annual Percent Increase 1973-1975
Total	8.22	9.68	17.29
Agriculture, Forestry, and Fisheries	10.48	11.33	15.82
Mining	12.91	6.63	30.09
Contract Construction	8.39	13.69	29.94
Manufacturing	6.78	8.14	10.58
Transportation, Communication, and Public Utilities	9.92	11.26	26.01
Transportation	10.68	10.77	31.60
Air	11.93	10.29	19.28
Other	9.52	11.29	47.32
Communication	8.60	13.92	16.74
Public Utilities	7.75	8.77	5.22
Trade	10.58	10.82	18.32
Wholesale	11.94	11.39	28.33
Retail	10.13	10.61	15.12
Finance, Insurance, and Real Estate	11.42	13.61	13.56
Services	13.69	15.81	27.23
Hotels	10.96	11.41	28.77
Personal	3.81	2.12	4.97
Business	18.09	26.71	78.67
Medical	13.17	14.17	7.08
Other	13.53	13.51	19.99
Federal Government	.40	.53	3.41
State Government	8.38	8.97	5.61
Local Government	7.97	6.96	13.06

SOURCE: Department of Labor, Statistical Quarterly, various issues.

development of the Cook Inlet and Prudhoe Bay fields. The growth of mining employment in Anchorage, as in the state, was cyclical, falling after 1970 when peak development of Upper Cook Inlet was reached. After 1973 mining employment grew at an average rate of 22.3 percent per year. The growth during this period included headquarters growth necessary for the development of the Prudhoe Bay fields. Over the period, Anchorage averaged more than one-third of the statewide mining employment.

Construction was the second fastest growing major component of the basic sector.[1] Construction grew at an average annual rate of 8.39 percent between 1965 and 1976. Between 1973 and 1975 when the most rapid buildup resulting from the pipeline occurred, the growth rate averaged 29.94 percent. In Anchorage, the construction industry did not include major projects connected with resource development such as TAPS. Construction in Anchorage was largely an investment response to expected future growth and an expansion of the capacity of Anchorage housing and private sectors to meet the rapid growth in population.

The government component of the basic sector experienced minimal growth between 1965 and 1976. Federal government remained almost constant throughout the period, growing at an overall rate of less than one percent per year. State government employment grew at a rate slightly greater than growth in total employment, an annual average rate of

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[1]Agriculture-forestry-fisheries, while experiencing a very rapid rate of growth, had little impact on the Anchorage economy. In 1976, employment in this industry was only 100 people.

8.38 percent between 1965 and 1974. As on the state level, state government is partially responsive to local demands. However, since the determinants of its growth are outside the region and a large component of state government is administrative for programs outside of Anchorage, state government can be considered basic. The most rapid period of growth of state government in Anchorage was in the beginning of the 1970s. Between 1970 and 1972, state government employment grew at a rate of 20.2 percent per year. This reflects the rapid growth of total state government at the time.

The final basic sector is manufacturing which grew at an average annual rate of 6.78 percent between 1965 and 1976. When the period after 1970 is considered, the growth rate increases but it is still less than the growth rate of total employment. Manufacturing experiences a steady increase throughout the period, not a cyclical increase as at the state level. This is because the manufacturing in Anchorage has only a small component of food manufacturing which reflects cycles of the fishing industry.

Anchorage: The Administration and Distribution Center for Alaska

Anchorage serves as the administration and distribution center for Alaska. Because of this, traditional service functions such as trade, services, transportation-communication-utilities, and finance-insurance-real estate have important basic components. These sectors are support sectors at the state levels since they respond primarily to growth in state incomes. The distinction arises because the location of support activities is not spread uniformly with basic activities; economies of scale are one primary reason activities would concentrate in one place. Because a portion of these sectors in Anchorage responds to demands from outside the region, they can be considered part of the Anchorage basic sector. This response of the Anchorage support sector provides a major link between the economies of Anchorage and the state.

There are many ways of distinguishing the basic and nonbasic components of an industry. The most accurate would be by survey. In a survey, a sample of firms in each industry would be asked the portion of their output sold inside and outside the region. A less costly method involves the use of location quotients. A location quotient for industry i is defined as the ratio of the percent of total employment in Anchorage in industry i to the percent of total employment in the state in industry i. The use of location quotients to measure the basic components of support industries requires the assumption that consumption in all parts of the state is similar and that this average consumption is reflected in the proportion of employment in these industries at the state level. Table 17 shows the Anchorage location quotients for the four support industries: transportation-communication-utilities, trade, finance-insurance-real estate, and services.

Table 18 shows the Anchorage basic sector as estimated using location quotients. The portion of support industry employment which is basic

TABLE 17. LOCATION QUOTIENTS, ANCHORAGE
1965, 1970, 1975, 1976

	1965	1970	1975	1976
Transportation, Communication, and Public Utilities	.8284	.9485	1.0323	1.1039
Trade	1.2927	1.2354	1.3191	1.3548
Finance, Insurance, and Real Estate	1.3706	1.4074	1.3877	1.4058
Services	1.1531	1.2326	1.2407	1.3117

$$\text{Location Quotient} = \frac{\dfrac{\text{Total Anchorage Employment in Industry i}}{\text{Total Anchorage Employment}}}{\dfrac{\text{Total State Employment in Industry i}}{\text{Total State Employment}}}$$

SOURCE: Alaska Department of Labor, Statistical Quarterly, various issues.

TABLE 18. ANCHORAGE BASIC SECTOR GROWTH
1965, 1970, 1973, 1975, and 1976

Industry	1965	1970	1973	1975	1976
Agriculture, Forestry, and Fisheries	33	52	82	110	100
Mining	371	958	769	1,301	1,409
Contract Construction	3,127	3,514	4,178	7,054	7,587
Manufacturing	791	1,018	1,286	1,573	1,629
Transportation, Communication, and Public Utilities	- 0 -	- 0 -	- 0 -	230	697
Trade	1,195	1,642	2,239	3,611	4,195
Finance, Insurance, and Real Estate	350	573	825	1,010	1,229
Services	500	1,208	1,323	2,612	3,510
Federal Government	9,395	9,509	9,558	10,222	9,813
Total Civilian Basic Employment	15,762	18,474	20,260	27,723	30,169
Total Military Employment	15,190	12,884	14,049	12,642	12,179
Total Basic Employment	30,952	31,358	34,309	40,365	42,348
Total Basic/ Total Employment	.6748	.5714	.5305	.4905	.4965
Civilian Basic/Total Civilian Employment	.5138	.4399	.4002	.3981	.4126

SOURCE: Alaska Department of Labor, Statistical Quarterly, various issues.

is equal to $\frac{LQ - 1}{LQ}$. The location quotient methodology does not provide an exact description of the basic component of these industries. This method may overestimate the basic component if the assumption of similar consumption is not true. The location quotient may underestimate the true amount of export component, since it considers only the net difference in regional consumption and does not allow for interregional trade (Hoover, 1970). For example, the location quotient method estimates no basic component of transportation prior to 1975. This is surely an underestimate, since the Port of Anchorage serves as the entrance source of supply for approximately 80 percent of the state's population (Municipality of Anchorage, 1978). This analysis is useful in pointing out the relationship of the Anchorage support sector to the state economy. Table 18 shows the trends in this component of the Anchorage basic sector. The component of the basic sector made up of transportation-communication-utilities, trade, finance-insurance-real estate, and services has been increasing. In 1965 this component accounted for 13 percent of the civilian basic sector; and by 1976, it accounted for 31.9 percent. Overall, the importance of the basic sector to the Anchorage economy decreased as it did at the state level. The civilian basic sector decreased from 51 percent of total employment in 1965 to 41 percent in 1976.

The Economic Structure

The growth of the Anchorage economy has resulted not only in a change in the levels of economic indicators but also in a change in the process by which growth is transmitted. This change is similar to that experienced in the state economy. The decreasing proportion of basic employment is one result of this change. The increase in the support sector means the economy will have a greater response to growth in the basic sector. Table 19 details the change in the economy's structure as measured by employment distribution.

The growth of the support sector in Anchorage can easily be observed from this table. The support sector industries increased their share of total employment from 42.2 percent in 1965 to 58.9 percent in 1976. This is a result of the increased importance of the support sector in both the state and Anchorage economies. The share of government has decreased. This is primarily because of the limited growth of federal government. The share of federal government fell from 30.6 percent in 1965 to 13.4 percent in 1976. Total government's share fell from 43.7 percent in 1965 to 26.4 percent in 1976. The share of employment in construction increased between 1970 and 1976, reversing the trend between 1965 and 1970. This reversal may be a short-run phenomenon reflecting only the increased activity connected with TAPS construction.

Anchorage, like the state, has been experiencing and should continue to experience an increased importance of the support sector. This structural change is a result of the increased size of the economy which allows the production of more goods and services for local consumption. This process affects Anchorage in a twofold manner, since it provides support sector goods and services for the state as well as the region.

TABLE 19. ANCHORAGE DISTRIBUTION OF EMPLOYMENT
1965, 1970, AND 1976

Industry	% of Total Non-Agricultural Wage & Salary Employment 1965	1970	1976
Agriculture, Forestry, and Fisheries	.11	.12	.14
Mining	1.21	2.28	1.93
Contract Construction	10.19	8.37	10.38
Manufacturing	2.58	2.42	2.23
Food	.59	.47	.46
Lumber	.06	.11	.19
Paper	.01	.01	.03
Other	1.92	1.83	1.56
Transportation, Communication, and Public Utilities	8.53	9.30	10.13
Transportation	5.52	6.67	7.07
Communication	2.20	1.82	2.28
Public Utilities	.81	.82	.78
Trade	17.21	20.52	21.83
Wholesale	4.00	5.29	5.80
Retail	13.21	15.23	16.03
Finance, Insurance, and Real Estate	4.22	4.71	5.82
Services	12.28	15.25	21.13
Hotels	1.50	1.80	1.97
Personal	1.31	1.27	.83
Business	2.57	2.83	6.72
Medical	2.22	2.85	3.63
Other	4.71	6.49	7.97
Federal Government	30.62	22.64	13.42
State Government	5.45	5.77	5.54
Local Government	7.59	8.61	7.40

SOURCE: Alaska Department of Labor, Statistical Quarterly, various issues.

Population

Table 20 shows the growth of population in the Anchorage region. Anchorage experienced major population growth since 1965. Of the 82,842 population increase since 1965, 71 percent occurred after 1970. Migration accounted for 70.6 percent of the increase between 1970 and 1976. The major migration increase occurred in 1975 at the height of pipeline activity when the state estimated migration of 22,222 to Anchorage. As in the state, migration was the most important component of population growth.

The dependency ratio in Anchorage fell during this period, although the fall was not so great as at the state level. The dependency ratio in Anchorage fell from 3.01 in 1970 to 2.53 in 1976, a drop of 16 percent, compared to a 36 percent drop at the state level. The reason for the fall was the same as at the state level, an increased proportion of the population in the labor force. Since Anchorage serves as home to many workers in other areas of the state, the ratio will be higher.

Anchorage does have comparative age distributions of the population in 1970 and 1975. These illustrate the reasons the population-to-employment ratio has fallen.

Comparing these figures shows a relatively stable age distribution when the major growth which took place is considered. However, the proportion of nonworking-age population has fallen. The population under fifteen accounted for 33.9 percent of the population in 1970 and for 29.3 percent in 1975. This reflects a relative decrease in family size and a decreased

TABLE 20. ANCHORAGE POPULATION GROWTH
1965, 1970-1976

	Number of Births	Number of Deaths	Natural Increase	Estimated Net Migration	Population as of July 1	% Increase over Previous Year
1965					102,337	
1970	3,285	489	2,796		126,333[1]	4.30[2]
1971	3,192	473	2,719	6,725	135,777	7.48
1972	3,119	490	2,629	5,809	144,215	6.21
1973	4,247	424	3,823	1,402	149,440	3.62
1974	3,123	481	2,642	1,030	153,112	2.46
1975	2,990	507	2,483	22,222	177,817	16.14
1976	3,472	519	2,953	4,409	185,179	4.14

[1] U.S. Department of Commerce, Bureau of the Census, 1970 Census of Population.

[2] Percent average annual increase.

SOURCE: Alaska Department of Labor, Estimates of Total Resident Population and Estimates of Civilian Population, various years.

Alaska Department of Health and Social Statistics, in communication with the Municipality of Anchorage.

demand for services such as schools. The percentage of the population available for the labor force, ages 15-64, increased from 64.6 percent in 1970 to 68.6 percent in 1975. This is one reason for the decreased dependency ratio. Table 21 compares the age distribution in the two periods.

Unemployment

Anchorage, like the state, has a serious unemployment problem, although the unemployment rate is less than the state. The unemployment rate has remained less than 10 percent through the period. The unemployment rate rose to a high of 9.7 percent in 1973 prior to the construction of the pipeline; the rate then fell to a low of 6.7 percent in 1975 and rose again in 1976 as pipeline construction came to an end. Except for 1975, the total number of unemployed increased throughout the period. Increases in employment opportunities encourage increases in the labor force in a corresponding manner. The increased labor force results from two forces: increases in the population from migration and increases in the proportion of the population in the labor force. Table 22 shows the increased labor force participation throughout the period. This increased labor force participation rate is partially an effect of the increase in the age group available for work.

Seasonality has not been a major factor in the Anchorage economy. Anchorage is less dependent on traditionally seasonal industries and has a larger proportion of the less seasonal support sector employment.

TABLE 21. ANCHORAGE AGE DISTRIBUTION OF NONMILITARY BASE POPULATION

Age	% of 1970 Population	% of 1975 Population
0 - 4	10.40	9.50
5 - 14	23.50	19.80
15 - 30	28.10	34.10
30 - 40	15.50	15.30
40 - 50	12.40	11.90
50 - 64	8.60	7.30
65 +	1.50	2.10

SOURCE: Patricia L. Dolezal and Richard L. Ender, 1976 Population Profile, Municipality of Anchorage, September 1976. 1970 Census of the Population PC(1)-B3 Table 35.

TABLE 22. ANCHORAGE UNEMPLOYMENT AND SEASONALITY
1965, 1970-1976

Year	Total Unemployment	Unemployment Rate (%)	Labor Force Participation Rate (%)	Seasonality Index
1965	2,249	6.2	41.44	.9406
1970	3,267	6.7	43.21	.9526
1971	4,418	8.2	44.43	.9680
1972	5,140	8.9	44.68	.9738
1973	5,818	9.7	44.40	.9281
1974	5,980	8.6	49.66	.9914
1975	5,279	6.7	47.85	.9818
1976	7,372	8.4	50.56	.9920

SOURCE: Alaska Department of Labor, Alaska, Labor Force Estimates.

Only in 1973 is the seasonality index less than .95, which may reflect more cyclical than seasonal problems. Since the beginning of pipeline construction, the seasonality index has remained above .98 which reflects the technology and profit factors on Anchorage's most highly seasonal industry, construction.

Personal Income

Personal income increased at an average annual rate of approximately 15.4 percent between 1965 and 1976. The growth of personal income is only one determinant of the command over goods and services. In order to increase the command over goods and services, personal income must increase faster than both population and prices. Real per capita income reflects the effects of population and prices on incomes.

Table 23 shows the growth of real per capita income over time. The growth has been about 4 percent per year over the entire period. At the height of pipeline activity between 1973 and 1975, real per capita personal income increased at a rate of 9.12 percent per year.

Summary

Anchorage experienced rapid growth between 1965 and 1976. During this period, the proportion of state population in Anchorage increased. Employment grew more rapidly outside of Anchorage. The differential growth was a result of the rapid employment growth associated with TAPS construction outside of Anchorage. Expansion of the traditional basic sector was an important cause of the growth of the Anchorage economy.

TABLE 23. ANCHORAGE GROWTH OF REAL PER CAPITA INCOME
1965, 1970-1976

Year	Personal Income Thousands	Real Personal Income Thousands	Real Per Capita Personal Income
1965	371,037	393,882	3,849
1970	634,884	579,274	4,585
1971	732,881	649,142	4,781
1972	800,201	690,424	4,788
1973	883,144	731,079	4,892
1974	1,111,635	830,197	5,422
1975	1,577,614	1,035,859	5,825
1976	1,799,125	1,110,173	5,950
% Annual Average Increase			
1965 - 1976	15.43	9.88	4.04
1970 - 1976	18.96	11.45	4.44
1973 - 1975	33.65	19.03	9.12

SOURCE: U.S. Department of Commerce, Bureau of Economic Analysis, Regional Economic Information System, July 1978 printouts.

Alaska Department of Labor, Estimates of Total Resident Population.

However, the support sector in Anchorage also has an important basic component. The support sector industries in Anchorage have a basic component responding to growth outside of Anchorage. This relationship, along with the increased scale of the economy, was responsible for the change in the structure of the economy which took place.

The population of Anchorage expanded rapidly during this period. The major component of growth was migration which was induced by increased economic opportunities. As at the state level, the increased economic activity had little effect on the Anchorage unemployment problem; only in the peak TAPS year did the unemployment rate fall below 8 percent. Real per capita did expand during this period as a result of the increased activity.

SOUTHCENTRAL

Anchorage, because of its link to the rest of the state through the support function, is indirectly affected by resource development; the remainder of the Gulf of Alaska region is directly affected by resource development. The Southcentral region contains both the historically important natural resource industries and the new natural resource industries. Fisheries of Southcentral are some of the most important in the state, accounting for close to half the catch of the state's fishing industry. The Upper Cook Inlet region was the state's first major oil producing region and contributed to the development of the petrochemical industry in Kenai. The oil port built as the terminus of the trans-Alaska pipeline at Valdez contributed to the economic growth of the Southcentral region during construction and will contribute to its growth in the future. This section will examine the historical growth of the region.

Growth of the Aggregate Indicators

The aggregate indicators of economic growth illustrate the importance of TAPS construction to the economy of this region. (See Table 24.) Between 1973 and 1976, the population of the region increased by almost 20,000; employment, by more than 10,000; and personal income, by $330 million.

Population grew at an overall average rate of 6.34 percent per year during this period. Population in the region grew by almost 29,196 between 1965 and 1976. Over 67.5 percent of this growth occurred after the beginning of the pipeline construction in 1974.

Population growth followed a pattern established by employment growth. Employment grew at an annual average rate of 11.26 percent during the period; in the post-1970 period, the rate increased to 15.7 percent. The employment growth rates are greater than the population growth rates. This reflects the type of employment growth in the region at this time. Employment connected with mining and construction is more transient than employment in other sectors and does not bring dependents to the area. This pattern also results from shift schedules which allow workers, particularly in mining, to live in other regions. The short-term enclave nature of the employment, such as construction of the TAPS line, was another reason for the decreased dependency ratio in the region.

TABLE 24. GROWTH OF EMPLOYMENT, POPULATION, AND PERSONAL INCOME, SOUTHCENTRAL REGION 1965-1976

	Population	Employment	Personal Income ($ Million)
1965	30,235	7,124	90.1
1970	37,809	9,582	157.3
1971	39,227	10,127	165.1
1972	39,148	10,735	172.9
1973	39,716	12,131	210.2
1974	41,986	13,645	264.4
1975	51,923	18,300	414.0
1976	59,431	23,030	548.7
Annual Average Percent Change			
1965-1976	6.34	11.26	17.85
1970-1976	7.83	15.74	23.15

SOURCES: All estimates State of Alaska Department of Labor, Research and Analysis Section, Population Estimates by Census Division, except 1970 which is Census of Population.

Alaska Department of Labor, Statistical Quarterly, various years.

U.S. Department of Commerce, Bureau of Economic Analysis, July 1978.

Personal income grew at an average annual rate of 17.9 percent between 1965 and 1976. Most of this growth came after 1973 with pipeline construction. Personal income increased at an annual rate of 37.7 percent after 1973. There are two reasons the economies of Southcentral did not feel the full impact of this growth in income. First, the transient and enclave nature of pipeline construction and mining employment means that less of the income is spent in the region. Secondly, because they are smaller economies, the leakages from the economy are greater and there is less induced response to growth in incomes.

Causes of Growth

The major cause of growth in the Southcentral region was the expansion of the traditional basic industries. Table 25 provides information on employment growth by industry and on the basic sector.

The three major industries affecting the growth of Southcentral Alaska are mining, construction, and fisheries. The fisheries industry includes both actual harvesting and food processing. The growth rate of mining averaged 8.27 percent over the entire period. Mining experienced cyclical growth, declining after 1970 and rising again after 1973. The recent growth of the industry is a result of exploratory activity and increased petrochemical activity (Kenai Borough, 1977).

The major mining development occurred early in the period with the development of the Kenai-Upper Cook Inlet fields. Petroleum activity in the Kenai fields can be described in two periods: Field development occurred

TABLE 25. EMPLOYMENT BY INDUSTRY SOUTHCENTRAL ALASKA

Industry	1965 - 1976	1970 - 1976	1973 - 1975
	Annual Average Percent Increase		
Agriculture, Forestry, and Fisheries	38.44	37.87	5.16
Mining	8.27	1.37	18.59
Contract Construction	20.71	85.19	131.70
Manufacturing	9.53	11.90	.55
Food	6.30	8.65	.20
Transportation, Communication, and Public Utilities	9.51	2.09	32.62
Transportation	9.15	34.50	49.33
Communications	22.71	19.69	2.86
Public Utilities	5.90	8.38	12.66
Trade	10.88	11.22	31.72
Wholesale	11.95	10.59	60.82
Retail	10.47	11.46	23.95
Finance, Insurance, and Real Estate	10.57	14.68	25.86
Services	12.12	16.72	21.56
Hotel	11.61	20.09	24.77
Personal	3.37	4.28	-1.01
Business	18.49	37.07	78.12
Medical	11.60	9.15	-6.89
Other	9.64	11.54	24.90
Government			
Federal	-3.80	-4.28	5.65
State and Local	8.49	7.50	6.33
Total	11.26	15.74	22.82

SOURCE: Estimated from Alaska Department of Labor, Research and Analysis Section worksheets.
Alaska State Housing Authority, Alaska, Yakutat, Comprehensive Development Plan, Anchorage 1971.
Alaska Consultants, Inc., Anchorage, Alaska, Yakutat, Comprehensive Development Plan, December 1976.

between 1961 and 1968; this phase included the development of both onshore and offshore fields. During this phase, mining employment increased by over 600 percent. Major construction of petrochemical facilities also took place during this period. Three petrochemical plants and seven pipelines were completed between 1961 and 1968. The second major phase was production. By 1970, all the major components of the petroleum industry had begun production (Math Sciences, 1976).

Construction employment increased at an annual average rate of 20.7 percent throughout the period. The major increase occurred between 1973 and 1975 when construction employment increased at an annual rate of 131.7 percent. This increase was a result of the construction of the trans-Alaska pipeline and the Valdez Port facility. Construction activity in Valdez accounted for almost 70 percent of total regional employment in 1975 and 78 percent in 1976. Although this is not all TAPS-connected employment, it shows the magnitude of the effect of this project on the region. Regional construction employment prior to 1970 was influenced importantly by petrochemical development in Kenai. Construction of five petrochemical facilities and seven pipelines increased Kenai's construction employment to a peak of 1,209 in 1968 (Math Sciences, 1976). By 1970 construction employment had decreased until its regional total was 583.

The final basic industry in the Southcentral region is the fisheries industry. This industry consists of fish harvesting employment and fish processing employment. Fish processing is a major component of manufacturing. The full impact of fisheries cannot be observed from employment data. Employment reported in nonagricultural wage and salary employment excludes self-employed which is a major component of fishery employment. (The rapid growth in agriculture-forestry-fisheries employment is primarily a result of a redefinition of the employment category in 1972.) Employment itself may not be a good indicator of the industry's health; in most industries, employment may be a good indicator of income, but fisheries' incomes depend upon the catch and its market value.

Independent estimates of fishery employment have been made based on catch and gear statistics. The totals for three regions--Prince William Sound, Cook Inlet, and Southwest--are shown in Table 26.

TABLE 26. ESTIMATED FISH HARVESTING EMPLOYMENT

	1970	1971	1972	1973	1974	1975	1976
Employment[1]	2,193	2,052	1,853	2,235	1,998	2,031	2,388
Catch[2] (million lbs.)	269.3	256.6	233.8	362.6	254.5	256.8	245.4
Value[2] (thousand $)	40,681	36,658	44,773	73,496	65,912	60,971	93,668
Real Value (thousand $)	37,117	32,469	38,631	60,841	49,225	40,033	57,080

[1]Rogers and Listowski, 1978.

[2]Alaska Department of Commerce and Economic Development, 1977. Value is deflated by the Anchorage CPI.

These regions include more than Southcentral; however, the figures provide an indication of the probable pattern of industry growth in the Southcentral region. Employment in 1976 was only 9 percent higher than in 1970. These figures show the cyclical behavior of fishery employment. Employment fell until 1972. After that, it peaked at 2,235 in 1973. After falling slightly, employment then rose to its present level of 2,388. Information on the value and catch show a similar cyclical growth. Since 1970, catch in the Central region peaked at 362.6 million pounds in 1973 and fell to 256.8 million pounds in 1975. Except for the bonanza year in 1973, catch has varied relatively little from an average of 253 million pounds. The real value of this catch was only 7.8 percent higher in 1975 than in 1970; its peak was $60.8 million in 1973. The catch statistics provide an indication of the importance of the region to Alaska fisheries. In 1975, the Central region accounted for 47.1 percent of the total value of fish caught in the state.

The manufacturing sector, because of the large fish processing component, was affected by the fish harvesting activity in the region. Manufacturing increased at an average annual rate of 9.5 percent per year. This was well over the average rate of increase in the state. Manufacturing has experienced cycles similar to fisheries, but they have not been as pronounced. The main reason for this is that manufacturing includes components of the petrochemical industry in Kenai. The petrochemical industry is not cyclical, so it stabilizes the Southcentral manufacturing industry.

The final basic sector is federal government employment. Federal government employment actually fell during the period from 975 in 1965 to 637 in 1976. The lowest point was in 1974 when employment was 595. Military employment in the region also followed the same pattern. Military employment in 1976 was 1,660 less than in 1965. The primary reason for this was the closure of the Kodiak Naval Station.

Table 27 summarizes the basic sector in the Southcentral region. The basic sector more than doubled between 1965 and 1976. (The year 1973 has been included in order to observe the non-TAPS trend.) While the total basic sector (including the military) remained constant between 1965 and 1973, the civilian basic sector grew by approximately 1,600 employees. The growth of the civilian basic sector replaced the lost military and federal government employment.

The Economic Structure

Table 27 shows the basic-to-total employment ratios; between 1965 and 1973, this ratio fell. During this period, the support sector increased its importance relative to the basic sector. With the construction of TAPS, the support sector did not expand as rapidly as the basic sector. The enclave nature of pipeline employment meant that the suport services were mostly provided by the enclave sector. This limited the necessary expansion of the support sector to accommodate pipeline employment and reversed the trend of decreased basic sector importance.

TABLE 27. BASIC SECTOR GROWTH, SOUTHCENTRAL ALASKA
1965, 1970, 1973, 1975, and 1976

Industry	1965	1970	1973	1975	1976
Agriculture, Forestry, and Fisheries	19	99	491	543	680
Mining	345	762	640	900	827
Contract Construction	880	583	681	3,656	6,978
Manufacturing	1,188	1,647	2,627	2,656	3,234
Federal Government	975	828	602	672	637
Total Civilian Basic Employment	3,407	3,919	5,041	8,427	12,356
Total Military Employment	2,651	2,110	1,039	747	991
Total Basic Employment	6,058	6,029	6,080	9,174	13,347
Total Basic/ Total Employment	.6197	.5157	.4617	.4817	.5556
Civilian Basic/Total Civilian Employment	.4782	.4090	.4155	.4605	.5365

SOURCES: Estimated from Alaska Department of Labor, Research and Analysis Section worksheets.

Alaska Department of Labor, Estimates of the Population.

Alaska State Housing Authority, Alaska, Yakutat, Comprehensive Development Plan, Anchorage, 1971.

Alaska Consultants, Inc., Yakutat, Comprehensive Development Plan, Anchorage, Alaska, 1971.

Table 28 illustrates the structure of the Southcentral economy as defined by its employment distribution. The non-TAPS trend can be seen by examining the change between 1965 and 1970. Between these periods, the support sectors either increased their share of employment or remained constant; the overall change was not so great as in the state or Anchorage. Only trade expanded its share significantly from 11.4 percent to 14 percent. One interesting trend is the reduction of importance of food manufacturing. The 1976 figures are skewed because of the pipeline construction; in 1976, construction accounts for over 30 percent of the total civilian employment.

Population

Population in the Southcentral region increased by over 28,000 between 1965 and 1976; over half of this increase came after 1973. The major growth in the Southcentral region was a direct result of the construction of the trans-Alaska pipeline beginning in 1974. Such rapid growth in the relatively small region meant that migration was the most important component of growth. Between 1973 and 1974, migration accounted for 90 percent of the increase in population. Table 29 shows the employment growth in Southcentral.

The dependency ratio in Southcentral fell dramatically from 1965 to 1976. The ratio dropped from 4.24 in 1965 to 2.58 in 1976, a 40 percent decrease. The enclave nature of the TAPS construction affected this significantly; the ratio fell 22 percent after 1973. The trend had been established prior to this. Increased labor force participation is primarily responsible for

TABLE 28. EMPLOYMENT DISTRIBUTION BY INDUSTRY
SOUTHCENTRAL ALASKA
1965, 1970, AND 1976

Industry	Percent of Total Employment 1965	1970	1976
Agriculture, Forestry, and Fisheries	.27	1.03	2.95
Mining	4.84	7.95	3.59
Contract Construction	12.35	6.08	30.30
Manufacturing	16.68	17.19	14.04
Food	15.24	13.49	9.24
Transportation, Communication, and Public Utilities	7.61	7.93	6.39
Transportation	5.24	5.44	4.24
Communication	.36	.89	1.07
Public Utilities	1.85	1.61	1.08
Trade	11.41	13.96	11.00
Wholesale	1.43	2.01	1.53
Retail	9.99	11.95	9.47
Finance, Insurance, and Real Estate	2.23	2.20	2.08
Services	10.36	10.72	11.28
Hotel	1.94	1.61	2.01
Personal	.35	.29	.16
Business	1.64	1.19	3.28
Medical	1.95	2.87	2.02
Other	4.48	4.76	3.81
Federal Government	13.69	8.64	2.77
State and Local Government	20.56	24.29	15.60

SOURCE: Estimated from Alaska Department of Labor, Research and Analysis Section worksheets.
Alaska State Housing Authority, Yakutat Alaska, Comprehensive Development Plan, Anchorage 1971.
Alaska Consultants Inc., Anchorage, Alaska, Yakutat Comprehensive Development Plan, December 1976.

TABLE 29. POPULATION GROWTH, SOUTHCENTRAL ALASKA, 1965, 1970-1976

	Number of Births	Number of Deaths	Natural Increase	Estimated Net Migration	Population as of July 1	% Increase over Previous Year
1965					30,235	
1970	863	215	648		37,540[1]	4.4[2]
1971	505	139	366	926	38,832	3.4
1972	505	138	367	-406	38,739	-0.2
1973	718	173	545	- 31	39,253	1.3
1974	768	231	537	1,667	41,457	5.6
1975	634	244	390	9,828	51,675	24.6
1976	993	227	766	6,436	58,877	13.9

[1]Data is from April Census.

[2]Annual average increase from 1965 to 1970.

SOURCE: State of Alaska, Department of Health and Social Services, Health Information System Section.

this change. An increase in the proportion of employment covered in these employment statistics was also responsible for the decrease in this ratio as fishing became less important.

<u>Unemployment</u>

The unemployment rates were high even during the period of rapid employment growth in connection with TAPS. Unemployment was highest in 1972 when the unemployment rate reached 15.0 percent. With the beginning of pipeline construction, the unemployment rate began to fall, reaching its lowest point in 1975 at 12.4 percent. Even though the percentage of unemployed fell throughout the period, the number of unemployed grew.

As in the state, the seemingly contradictory growth in employment and unemployment is a result of two factors. First, the increased employment opportunities led to increased migration. Secondly, the increased employment opportunities were responsible for increased labor force participation. As can be seen from Table 30, the labor force participation rate increased from 38.2 percent in 1970 to 54.8 percent in 1976. This increase resulted from an increased participation among existing population and a high rate of participation among migrants.

The seasonality index remained close to .80 throughout the period. Only during 1974 and 1975, did the index rise, indicating a fall in seasonality. The fall in the seasonality index in 1976 is a result of peak employment on the pipeline being reached in the summer of 1976.

TABLE 30. UNEMPLOYMENT AND SEASONALITY
SOUTHCENTRAL ALASKA
1965, 1970-1976

Year	Total Unemployment	Unemployment Rate (%)	Labor Force Participation Rate (%)	Seasonality Index
1965	1,172	10.30	41.38	.8322
1970	1,835	13.44	38.24	.7959
1971	2,135	14.66	38.90	.8375
1972	2,257	15.03	39.17	.7815
1973	2,336	14.07	42.94	.8242
1974	2,744	14.80	45.09	.9481
1975	3,094	12.42	48.68	.9971
1976	4,502	13.83	54.78	.7722

SOURCES: Alaska Department of Labor, Labor Force Estimates, various years.

Alaska Department of Labor, Estimates of the Population.

Alaska State Housing Authority, Yakutat, Alaska Comprehensive Development Plan, Anchorage 1971.

Alaska Consultants Inc., Anchorage, Alaska, Yakutat Comprehensive Development Plan, December 1976.

Personal Income

Personal income is an important economic indicator since it influences demand and growth of the support sector. It is also a measure of the growth of residents' economic welfare. The effect of price increases (measured by the Anchorage CPI) and population increases on the real per capita income of residents is shown in Table 31. The real per capita incomes of the Southcentral region increased at an overall average yearly rate of 5.42 percent; this is less than one-third the rate of increase of personal income. The most rapid growth occurred between 1973 and 1975, the period of peak TAPS construction.

Summary

The construction of the trans-Alaska pipeline was the most important factor determining the economic growth of the Southcentral region. The majority of the growth in employment, population, and personal income occurred after 1973. Prior to the construction of the pipeline, Southcentral was experiencing a structural change similar to the state. The basic sector was playing a less important role in the Southcentral economy. The magnitude of pipeline employment and its enclave nature reversed this trend. The growth of employment was much greater than population, indicating an increased labor force participation of the population. Per capita incomes rose with growth. Growth in employment did not dramatically affect the Southcentral unemployment rate.

TABLE 31. GROWTH OF REAL PER CAPITA INCOME
SOUTHCENTRAL ALASKA
1965, 1970-1976

Year	Personal Income (Thousands $)	Real Personal Income (Thousands $)	Real Per Capita Personal Income ($)
1965	90,128	95,677	3,164
1970	157,316	146,234	3,796
1971	165,099	143,536	3,728
1972	172,916	149,194	3,811
1973	210,235	174,036	4,382
1974	264,428	197,482	4,704
1975	414,045	271,861	5,236
1976	548,661	335,983	5,653
Annual Average Percent Increase			
1965 - 1976	17.85	12.10	5.42
1970 - 1976	23.15	14.87	6.86
1973 - 1975	40.34	24.98	9.31

SOURCES: U.S. Department of Commerce, Bureau of Economic Analysis, Regional Economic Information System, July 1978 printouts.

Alaska Department of Labor, Labor Force Estimates, various years.

Alaska Consultants, Inc., City of Yakutat, Comprehensive Development Plan, December 1976,

U.S. Department of Labor, Bureau of Labor Statistics.

Alaska State Housing Authority, Alaska, Yakutat, Comprehensive Development Plan, Anchorage, 1971.

The Regional Economy in the Southcentral Alaska Region

Southcentral Alaska is made up of a number of local economies. These economies differ in their size and economic structure. The economies range from the largest, Valdez with a 1976 employment of 7,818, to the smallest, Yakutat with employment in 1976 equaling 241. The economies not only differ in size but also in the factors determining their growth. A question of some interest is whether the region can be treated as a single economy. This is important because in our projections Southcentral is treated as a single economy. In this section, we will examine the small economies which make up Southcentral and show why Southcentral can appropriately be treated as a single region.

In Alaska, the spatial order of the economy is that all local economies have a position in a regional structure. The link through transportation and support services in Anchorage makes a large portion of Alaska a region centered on Anchorage. Our aim in defining economic regions is to provide some spatial disaggregation of this major region. There are two approaches which have been taken to define regions. The first approach is based on the principle of functional integration. This notion would group economies which are interrelated and integrated. The second approach is based on the principle of homogeneity. This approach forms regions which are as much alike as possible and different from other regions (Nourse, 1968). This section will investigate the Southcentral subregions in terms of these principles.

The Local Economies

This section will describe the local economies in terms of their size and growth since 1970. Although each census division is not an individual economy, the analysis must concentrate on census divisions because of data limitations. Table 32 shows the employment, population, and personal income of each subregion in 1965, 1970, and 1976.

Table 32 shows that the growth in the region has been concentrated in three areas: the Kenai Census Division, the Matanuska-Susitna Census Division, and Valdez. Between 1965 and 1970, the major growth in the region was centered in Kenai with the petroleum development in Cook Inlet. Between 1965 and 1970, employment in Kenai grew at an annual average rate of 15.3 percent per year. Kenai increased its share of regional employment from 31.9 percent in 1965 to 36.6 percent in 1970.

After 1970, Valdez was the fastest growing region. Between 1970 and 1976, employment in Valdez increased by over eight times. The construction of TAPS was responsible for this growth. The fastest growing economy after Valdez was Matanuska-Susitna which increased employment at a 12.1 percent rate. Kenai grew at an average annual rate of 10.4 percent after 1970. During this period, Kodiak and Seward also experienced rapid average annual growth rates of close to 9.0 percent.

One noticeable trend was nonproportionate growth in population in Matanuska-Susitna and Kodiak. In Matanuska-Susitna, population was determining the growth of employment. Matanuska-Susitna experienced suburbanization from

TABLE 32. GROWTH OF AGGREGATE INDICATORS
SMALL ECONOMIES
1965, 1970, AND 1976

	Population	Employment[1]	Personal Income (Million $)
Cordova-McCarthy			
1965	1,991	604	7.5
1970	1,857	702	9.8
1976	2,353	1,041	17.7
Valdez-Chitina-Whittier			
1965	2,396	452	6.1
1970	3,098	831	9.7
1976	13,000	7,818	163.0
Matanuska-Susitna			
1965	6,125	1,083	13.4
1970	6,509	1,145	24.3
1976	14,010	2,269	108.9
Seward			
1965	2,213	620	5.7
1970	2,336	692	8.4
1976	3,395	1,136	25.9
Kenai			
1965	8,446	1,753	26.7
1970	14,250	3,576	57.2
1976	16,753	6,465	156.0
Kodiak			
1965	9,064	2,310	30.6
1970	9,409	2,469	45.0
1976	9,366	4,153	72.9
Yakutat			
1965	--	--	--
1970	350	193	3.0
1976	550	241	4.2

[1] Civilian nonagricultural wage and salary employment.

SOURCES: Alaska Department of Labor. Population Estimates by Census Divisions, various years.

Alaska Department of Labor, Statistical Quarterly, various years.

U.S. Department of Commerce, Bureau of Economic Analysis, Regional Economic Information System Printouts, July 1978.

Anchorage which actually encouraged growth of employment to serve the suburban population. The population of Kodiak fell slightly between 1965 and 1976; this was a result of the closure of the Kodiak Naval Station during the period. Civilian employment growth actually replaced the decline in military employment. The three major economies in terms of personal income were Valdez, Kenai, and Matanuska-Susitna, all with more than $100 million in personal income in 1976.

Functional Integration

Economies can be functionally integrated even though they are physically separate if they interact in the production and distribution process. Any set of economies which are open, allowing the exchange of goods and the flow of productive factors, are functionally integrated. The extent of this integration depends on the importance of these flows to the individual economies. The Southcentral Alaskan economy will not have perfect functional integration, the smallness of these economies and their separation in distance will assure this. In this section, we will attempt to determine the degree of integration of these economies.

Transportation links and trade flows are measures of the degree of exchange between economies. The Southcentral region, relative to the rest of the state, has highly developed transportation links. Most larger communities in the region are linked by roads and/or ferry and by a highly developed communications system. There are numerous deepwater ports and commercial marine freight service. The communities of the Kenai, Seward, Matanuska-Susitna Census Divisions, and Anchorage are linked by the Seward, Sterling, and Glenn Highways. Valdez is linked through the Richardson Highway. Ferry service connects Cordova, Valdez, Kodiak, Seward, Whittier, Homer, and Seldovia. Van container service is available in Cordova, Valdez, Kodiak, and Seward (ISER, 1978).

The trade flows between these areas were described in a census of transportation conducted by the Institute of Social and Economic Research (ISER, 1976). Table 33 shows the distribution of intrastate freight from Southcentral points of origin. This is not a pure measure of trade flows since it includes transshipments of goods, but it does provide an indication of the trade links between the economies of the region. Of all the census divisions, Skagway-Yakutat is the least tied to the Southcentral region; only 30 percent of the freight leaving Skagway is shipped to other areas of Southcentral Alaska. For a number of the divisions (Valdez, Kodiak, Kenai, and Cordova), Anchorage is the destination for major portions of their flows; while, as an illustration of the role of Anchorage in the statewide transportation system, less than 30 percent of Anchorage goods flows to other regions of Southcentral. The existing transportation links and the flows of freight show that the economies of Southcentral Alaska, when Anchorage is included, do exhibit a degree of functional integration. The integration described by the trade flows means that changes affecting one area will have corresponding effects in the other economies of the region.

TABLE 33. DISTRIBUTION OF INTRASTATE FLOWS OF FREIGHT AND MAIL FROM SOUTHCENTRAL ORIGINS, 1973

(Percent of flows from Southcentral origins)

ORIGIN \ DESTINATION	Anchorage	Cordova	Kenai	Kodiak	Matanuska-Susitna	Seward	Skagway-Yakutat	Valdez-Chitina-Whittier
Anchorage	5.84	.86	6.04	4.14	1.32	1.03	.07	2.63
Cordova	63.88	13.54	.38	7.17	.48	0	.65	1.17
Kenai	39.90	.62	15.50	2.64	.17	.15	.15	23.20
Kodiak	76.96	.02	11.87	6.73	0	.01	0	.26
Matanuska-Susitna	10.59	0	32.46	0	.50	25.91	0	5.71
Seward	12.36	.08	5.53	0	0	0	0	68.60
Skagway-Yakutat	.14	.02	28.80	0	0	0	.67	0
Valdez-Chitina-Whittier	41.14	7.77	15.05	5.46	.73	7.97	2.93	.60

SOURCE: ISER., Census of Alaska Transportation, September 1976.

Homogeneity

The economies of the Southcentral region vary in two ways which significantly affect their structure--size and basic sectors. Size will determine the economies of scale which can be reached in a region and the structure of the support sector. Larger economies can support larger, more diverse support sectors. The basic sectors also provide an influence on the support sectors and the economic structure. The economies of the Southcentral region can be separated into groups based on size and the basic sector. Kenai, Matanuska-Susitna, and Valdez are relatively large economies with nonfishing basic sectors. Mining and manufacturing are important for Kenai; construction and transportation, for Valdez; and the suburban phenomenon, for Matanuska-Susitna. The growth of these economies will not be affected by natural resource cycles. The remaining economies are significantly influenced by fisheries, and their attendant cyclical behavior. These classifications are not distinct. Kodiak and Yakutat may experience significant petroleum development in the future which will change their economic base.

Table 34 describes a measure of the structure of these local economies. The per capita employment in the support sector measures the relative size of the support sector (transportation-communication-utilities, trade, finance-insurance-real estate, services, and state and local government). This ratio provides an indication of how the economy would respond to exogenous changes in its population caused by expansion of the basic sector. The similarity among the structures of the local economies can be seen. Except for Valdez and Matanuska-Susitna, the

TABLE 34. THE STRUCTURE OF LOCAL ECONOMIES

(The per capita level of support sector employment, 1976)

Census Division	Population	Support Sector Employment	Per Capita Support Employment
Kenai	16,753	3,521	.21
Seward	3,395	681	.20
Cordova-McCarthy	2,353	522	.22
Valdez-Chitina-Whittier	13,000	2,327	.18
Matanuska-Susitna	14,010	1,888	.13
Kodiak	9,366	1,870	.20
Yakutat	550	122	.22
Anchorage	185,179	52,540	.28

SOURCES: Alaska Department of Labor, worksheets, except for Yakutat which is from Alaska Consultants, Yakutat, Comprehensive Plan, 1976.

ratio is close to .2. Valdez has a lower value because a large proportion of the population was enclave construction employment associated with TAPS which did not make full demand on the support sector. The low level of the ratio in Matansuka-Susitna results because of its suburban link to Anchorage. Comparison of the per capita support sector levels to the Anchorage level of .28 shows that the support sector, at least by this measure, is relatively undeveloped. The similarity of per capita support sector levels means that these economies may respond to future expansion of their populations in a similar manner.

The above analysis provides the evidence to support treating Southcentral as a regional economy. Although the area is not fully integrated, there is a similarity of structure and existence of trade links between the local economies. The importance of Anchorage as a regional center should not be understated; Anchorage serves the region as a center for administrative, distributive, and financial services which ties the region together, as well as limits the growth of local support sectors. The trade links and structural similarity mean that the region will experience similar response to a given exogenous change irregardless of where the change takes place. By making the additional assumption that these changes will follow patterns similar to historical changes, Southcentral can be used as a region for projection.

Summary

The economy of Alaska expanded rapidly during the period 1965 to 1976. The major industries responsible for this growth were construction and mining. Development of the Cook Inlet fields was important to growth in the early part of the period, while the development of Prudhoe Bay influenced economic growth significantly during the latter part of the period. The expansion of state government between 1970 and 1972 was also responsible for a portion of the economy's growth. The construction of the trans-Alaska pipeline was the most important factor influencing growth during the period. The economy experienced its fastest growth during the period of peak pipeline employment.

The Alaska growth process consists of growth-initiating factors and the response of the economy to these factors. The major cause of growth was expansion of the basic sector industries--mining, construction, manufacturing, agriculture-forestry-fisheries, and federal government. The response to change in these sectors occurs with the expansion of activity in the support sectors. Over the historical period, the response of the support sector has been nonproportional to the growth in the basic sector. The support sector has expanded its share of the economy as a result of the increased scale of the economy which allows a more local production of the goods and services consumed. This type of structural change can be expected to continue in the future.

The growth associated with this period affected population, unemployment, and personal income. Population increased primarily because of in-migration in response to the increased economic opportunities. Population did not respond as rapidly as employment growth; this was a result of a change in the character of the population. The increase in the population occurred mostly in the working ages. Unemployment was only minimally affected during the period, and the unemployment rate fell only during the period of most rapid growth in 1975. The seasonality component of unemployment fell throughout the period primarily as a result of the increased importance of the less seasonal support industries. Growth increased real personal incomes; so that for most of the period, it increased faster than the U.S. average. Finally, prices exhibited a trend toward the U.S. level as the scale of the economy expanded. The rapid expansion with the TAPS caused this trend to be reversed.

III. THE ALASKAN ECONOMY IN THE BASE CASE

This chapter will describe the projected growth of the Alaskan economy without the development of the Northern Gulf of Alaska Outer Continental Shelf (sale no. 55). In order to examine the effect of previous OCS activity on the impacts of Northern Gulf development, three alternative base cases will be examined. Each of these cases will have similar assumptions concerning future non-OCS developments, but they will have different assumptions about the development of OCS activity in Lower Cook Inlet and the Beaufort Sea.

The Purpose of the Base Case

Petroleum development in the Northern Gulf of Alaska may affect both the structure and the size of the Alaska economy. Changes in the economy which result from the development of OCS resources can be defined as the impact of this development. The impact can only be described as changes from a certain pattern of economic growth which would have occurred without OCS development. The base case describes the projected growth of the economy without the development for which the impact is to be measured. Comparing two projections of the economy, the base case and the OCS case will define the impact of OCS development.

The base case scenarios described below are consistent, plausible patterns of development; however, they should not be mistaken for best-guess patterns of development in any sense. The actual pattern likely to occur is subject to an enormous amount of uncertainty determined by technology, market prices, federal policies, and other uncertain events. To project any one economic future would be little more than idle speculation, since at this point many major events and decisions affecting Alaska are uncertain. The MAP model is designed to permit the formulation of ranges of scenarios which reflect these uncertainties in order to trace out the range of possible outcomes. This study does this in respect to various alternative OCS scenarios. The same approach could be used to determine the range of alternative non-OCS assumptions. To estimate the impacts of OCS development, a single base case is needed. This must be selected on the basis of the consistency and plausibility of the assumptions, consistency with historical growth, and consistency with assumed future patterns of economic relations. The effect of this base case choice will be measured by testing the sensitivity of the results to certain of the more important assumptions.

The purpose of establishing a base case must be kept in mind when examining the results. The base case is run in order to isolate the changes resulting from OCS development; this should influence the variables we examine. Rapid growth associated with OCS development will affect most economic variables. Although many variables will be affected, a much smaller number is important, and information on these dimensions of impact will describe the effect of rapid growth on state and regional economies. The base case will be analyzed to provide a point of reference for these dimensions.

Base Case Assumptions

The base case is defined by assumptions about the future levels of certain exogenous variables; this set of assumptions describes the base case scenario. The set of assumptions necessary for a base case scenario includes three important components. The first involves assumptions about the level of employment in those industries whose level is assumed to be influenced by factors outside the economy, the exogenous industries. Those industries include manufacturing, agriculture-forestry-fisheries, federal government, mining, and a portion of the construction industry. The second set of assumptions involves the level of certain exogenously determined revenues which result from the production of the petroleum industry. These include royalties, production taxes, property taxes, and corporate income tax. The final assumption concerns the rule which defines an assumed spending pattern for the state.

The uncertainty surrounding the future petroleum and world energy markets, as well as state economic decisions which influence economic growth, means that any assumption about the appropriate base case scenarios is subject to criticism. An extensive development of a base case scenario which required considerable time and research would, because of the uncertainty, be subject to the same type of criticism. The uncertainty involves such major factors as the construction and timing of the ALCAN gas line and future state spending policy. Because of this, an extensive development of the base case scenario was not undertaken in this study; instead, a reasonable set of assumptions was developed which placed emphasis on consistency of assumptions and reasonableness of approach. This section describes the set of assumptions used in the base case.

NON-OCS ASSUMPTIONS

Industry Assumptions

There are two special groups of industry assumptions which are required. First, assumptions about employment connected with special projects, mainly resource development projects, are needed. Secondly, assumptions about the growth of the major exogenous industries--manufacturing, agriculture-forestry-fisheries, and federal government--are required.

Special projects include petroleum projects, major construction projects, and the operations of these projects. Petroleum activity is assumed to continue at Prudhoe Bay with further exploration and development of the Kuparak and Lisburne formations. Mining employment peaks in this area at 1,783 in 1980. The Upper Cook Inlet fields are the other major area of petroleum activity. Employment is assumed to increase from its present level between 1985 and 1990 as the oil fields are shut down. Gas production continues after 1990 but with a reduced work force. There is little other new mining activity in the state with other mining maintaining current levels throughout the projection period.

Major construction projects in the state during the projection period include the Trans-Alaska Pipeline Service (TAPS) and the ALCAN gasline. TAPS is completed in 1977, after which the line's capacity is assumed to be increased by the addition of four pump stations between 1979 and 1982. The ALCAN gasline is assumed to be built between 1981 and 1984 with peak employment of 4,800 in 1982. The only other special construction project in the state during the projection period is the construction of the Pacific LNG plant between 1980 and 1983; this project employment peaks in 1982 with 1,300 employees.

TAPS is assumed to require 850 workers per year for its long-term operations. ALCAN operations employment is assumed to be 96 beginning in 1985. TAPS' higher operations employment can be accounted for since TAPS has more pipeline in Alaska, Valdez port employment is part of TAPS employment, and TAPS has substantial Alaska headquarters employment. Operations employment for the Pacific LNG plant is 60 beginning in 1984.

The level of employment in federal government and agriculture-forestry-fisheries and output in manufacturing is set exogenously. Federal government employment is assumed to follow its general historical trend and remain constant at the 1976 level throughout the forecast period. The trend in the historical period reflected increases in civilian employment, offsetting decreasing military employment. Employment in agriculture-forestry-fisheries is assumed to be dominated by increases in fisheries. Given favorable conditions, employment in Alaska fisheries has been projected to increase by almost four times between 1975 and 2000. This will result with the establishment of an American trawl fishery which completely replaces foreign fishing off Alaska (ISER, 1979). The opposite extreme would be an assumption of no employment growth without bottomfish development. In this study, we assume an average rate of growth of 3 percent per year. This is consistent with moderate replacement of the foreign fishery by Alaskans (Scott, 1979).

Output in manufacturing is assumed to increase at an average annual rate of 4 percent, which is consistent with both the historical trend and the assumed growth in the fisheries industry.

National Variables

Alaska is part of the larger U.S. economy, and it is affected by changes in the national economy. Three assumptions about the future growth of the U.S. economy are needed. These assumptions are based upon the long-term projections of the consumer price index by Data Resources, Inc. Assumed U.S. rates were those from DRI's TRENDCONG0678 forecast (DRI, 1978). This assumption assumes the continuation of long-term trends in important exogenous variables. The average annual rate over the period of the forecast was used as our assumption. The consumer price index was assumed to grow at 5.5 percent per year. The U.S. real per capita disposable income, adjusted to reflect consistent tax assumptions, was assumed to grow at 2.2 percent per year. Finally, DRI does not provide a projection of U.S. weekly compensation. U.S. weekly compensation was assumed to increase at a rate of 6.8 percent per year.

Petroleum Revenues

The petroleum revenues received by the state consist of royalties, production taxes, property taxes, and the corporate income tax. The major source of these revenues in the projection period is the Prudhoe fields. The revenues are determined by the assumed rate of production of oil and gas and its wellhead value. Prudhoe oil production is assumed to peak in 1985 at 641.5 million barrels, while gas production is assumed to maintain its peak production of 912 billion cubic feet per year once this is reached in 1987. The wellhead value of Prudhoe oil is determined by the following assumptions: constant real West Coast market price of $12 per barrel, constant real vessel and processing costs of $1.75 per barrel, and a TAPS tariff of $5.25 in 1978. The nominal TAPS tariff is assumed to remain constant until 1990 when increasing operating costs are assumed to dominate decreasing capital costs; after 1990, the real tariff is assumed to remain constant. The wellhead value of gas was assumed to equal $1.00 per MCF in 1978; this assumes the producers pay a $.45 per MCF processing cost.[1] These wellhead values are only part of an array of many possible wellhead values. The range of wellhead values is a function of the uncertainty about the future levels of those factors influencing these values. Revenues are determined by existing state laws describing royalties, production taxes, property taxes, and corporate income taxes.

THE STATE EXPENDITURE RULE

Because of the central role of state and local government in the Alaska economy and because the behavior of these governmental units depends largely on policy choices to be made over the next several years within

[1]These base case assumptions were selected prior to the passage of the 1978 Energy Bill which sets a ceiling of $1.68 per MCF on Prudhoe gas.

a framework far different from the past, the treatment of expenditures by state and local governments is a central feature of any development scenario.

Over the projection period, the state government is assumed to receive revenues from oil development which far exceed current levels of expenditures. The rate at which state government chooses to spend these revenues and the composition of these expenditures will serve to determine not only direct employment in the government sector but will also impact all endogenous sectors.

Two factors determine the current framework in which state expenditure policy will be determined. First, revenues to the state will increase tremendously with the completion of the trans-Alaska oil pipeline. These revenues will follow closely the pattern of production from Prudhoe Bay. Secondly, the establishment of the Permanent Fund will place new constraints on the use of certain petroleum revenues. The Permanent Fund was adopted in 1976 as a constitutional amendment. It established that a minimum of 25 percent of all mineral lease rentals, royalties, royalty sale proceeds, federal mineral revenue sharing payments, and bonuses received by the state would be placed in the fund. This forced savings is only a portion of the revenues available to the state. Revenues accumulating in the General Fund will be greater than in the Permanent Fund for most of the period.

These changes in the structure of state spending limit the usefulness of past spending policies in determining the spending rules to be used. The rate of state expenditures, because it is a matter of policy choice to be made within a framework far different from past experience, cannot be modeled simply from past experience. However, past experience can provide a guide for developing the hypothetical spending rule used in the simulation. Scott, in his paper "Behavioral Aspects of the State of Alaska's Operating Budget FY 1970 - FY 1977," found two major factors responsible for the growth of state expenditures. First, real per capita state expenditures increased in response to real per capita income growth, a demand effect. Secondly, expenditures increased in relation to the available funds for state expenditures. The pattern between capital and operating expenditures differed. Capital expenditures increased strongly in response to available fund growth but the higher levels were not maintained. The higher levels of operating expenditures were maintained. Adjustments to available funds seemed to provide a new base for the growth of these expenditures.

Based on this analysis, the following pattern of state expenditures was assumed. Expenditures were assumed to increase in response to increases in personal income. The income elasticity of both capital and operating expenditures was less than one to reflect assumed increases in scale economies associated with the production of state services. The major difference was that the real level of state operating expenditures was assumed to be maintained while the level of capital expenditures could fall.

The response to fund availability was composed of two parts. Expenditures responded to changes in the general fund balance. The response was weighted depending on the existing surplus; the weight equalled the previous-year fund balance divided by general fund expenditures. In other words, the response to a change in the general fund was weighted by the number of years of existing expenditures which could be taken out of the general fund. The response of capital expenditures was greater than the operating expenditure response.

Most relationships in the model are derived from historical relations. The elasticities in the operating and capital expenditure equations cannot be derived in this manner since the structure will be uniquely different in the future. Assumptions about these elasticities must be made. The elasticities in both sets of equations are chosen so that the elasticity of real per capita income equals .5. Real per capita expenditures increase at half the rate that real per capita incomes increase. This rate was chosen both to reflect economies of scale in production of government services and to reflect a decreased importance of state government in the Alaskan economy. Alaska has a much higher ratio of state expenditures to personal income than other states, and it was assumed that this ratio should fall toward the other states. The elasticities for the supply-affected portion of growth were determined by examining the changes in the period 1970 to 1971, which was the last period of rising general fund balance. Based on examining changes in this period, elasticities on the weighted increase in the general fund of 2 percent for the operating budget and 10 percent for the capital budget were used.

Admittedly, these expenditure rules are highly speculative, but they seem to reflect the wide range of policy choices open to state government as a consequence of new oil revenues. It is impossible to predict the specific expenditure path. Because of this, we assume a hypothetical rule which is reasonable. The sensitivity of the impacts measured with this rule will be tested.

ALTERNATIVE OCS SCENARIOS

Three alternative scenarios describing OCS activity prior to the Northern Gulf lease sale will be described in this section. Two lease sale areas, the Lower Cook Inlet and Beaufort Sea, are involved. The first Lower Cook lease sale took place in 1977, and the Beaufort sale is scheduled for 1979. The three alternative scenarios describe low, moderate, and high levels of activity in each area. The employment levels in each of these scenarios are described in Tables 35 and 36.

These scenarios differ in timing as well as magnitude. The Lower Cook scenarios range from an exploration-only case to a high case with peak employment of almost 2,500. The timing differs significantly between the moderate and high scenarios, with the moderate scenario reaching peak employment three years prior to the high scenario. The high Lower Cook scenario also contains the development of an LNG plant with 60 employees during its operation.

TABLE 35. LOWER COOK INLET EMPLOYMENT SCENARIOS

	Low[1]	Moderate[2]		High[1]		
	Mining	Mining	Construction	Mining	Construction	Manufacturing
1978	84	70	0	84	0	0
1979	126	321	88	126	0	0
1980	252	664	162	252	0	0
1981	210	804	108	486	213	0
1982	126	572	38	776	213	0
1983	84	523	0	1,285	543	0
1984	42	622	0	1,590	858	0
1985	42	604	0	1,548	317	0
1986	0	545	0	1,347	0	60
1987	0	411	0	1,139	0	60
1988	0	417	0	1,139	0	60
1989	0	417	0	1,139	0	60
1990	0	417	0	1,139	0	60
1991	0	417	0	1,139	0	60
1992	0	417	0	1,139	0	60
1993	0	417	0	1,139	0	60
1994	0	417	0	1,139	0	60
1995	0	417	0	1,139	0	60
1996	0	417	0	1,139	0	60
1997	0	417	0	1,139	0	60
1998	0	417	0	1,139	0	60
1999	0	417	0	1,139	0	60
2000	0	417	0	1,139	0	60

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[1]Based on scenarios in Lower Cook Inlet, Final Environmental Impact Statement, 1976.

[2]Based on Lower Cook Inlet scenario in Beaufort Sea Petroleum Development Scenarios. Economic and Demographic Impacts, Technical Report No. 18, Alaska OCS Socioeconomic Studies Program, 1978. Distribution between offshore/onshore and industry was based on the distribution in the Lower Cook EIS.

TABLE 36. BEAUFORT SEA OCS EMPLOYMENT SCENARIOS

	Low		Moderate		High	
	Mining	Construction	Mining	Construction	Mining	Construction
1981	67	49	67	49	67	49
1982	198	198	198	198	198	198
1983	198	247	198	247	198	247
1984	232	247	232	247	232	247
1985	67	99	67	99	67	99
1986	70	281	112	304	70	403
1987	123	331	276	333	148	642
1988	228	395	479	466	321	810
1989	345	395	616	466	583	761
1990	387	132	595	155	710	254
1991	434	132	524	155	758	254
1992	388	66	503	77	748	127
1993	355	132	432	155	681	254
1994	333	132	535	155	647	254
1995	334	59	438	77	616	127
1996	333	18	440	22	572	36
1997	332	0	417	0	551	0
1998	330	0	393	0	547	0
1999	327	0	393	0	548	0
2000	325	0	394	0	542	0

SOURCE: BLM-Alaska OCS Office.

All three Beaufort scenarios contain production of oil and gas. There is less variation in the Beaufort scenarios than in Lower Cook. In all cases, peak employment occurs in 1989; it ranges from 740 in the low scenario to 1,344 in the high scenario. Since the Beaufort is a joint state-federal lease sale, it also provides increased revenues to the state. These include bonus, royalty, severance tax, property tax, and corporate income tax revenues. They are described in Appendix B.

Developing these alternative base case scenarios allows us to assess the effects of the level of previous OCS activity on the impacts of the sale under consideration. The uncertainty of the level of OCS activity makes this necessary. By comparing the impact of a Northern Gulf scenario with different base case scenarios, we can assess the sensitivity of development to previous OCS activity.

The Causes of Economic Growth

The growth of the Alaskan economy is determined by three separate but interrelated factors: changes in the level of employment in the exogenous sectors of the economy, changes in the level of personal income, and changes in state expenditures. If we define economic growth as the expansion of employment, the effect of these factors can be seen.

Growth of the exogenous sector directly affects economic growth by the employment it creates. The growth of this sector is determined by external demand for Alaskan products. The most obvious example of this type of growth is the employment associated with the construction of the trans-Alaska pipeline. The employment generated by this project was determined by demand for Alaska's petroleum resources.

The growth of state expenditures is another source of economic growth. State expenditures are a source of growth, since they translate revenues raised outside of the Alaskan economy, such as petroleum-related revenues, into demand for Alaskan products. State expenditures influence employment growth in two ways. First, state capital expenditures on projects such as ports and highways increase the output of the construction industry. This increases the demand for construction employment. Secondly, state operating expenditures are partially spent on personnel expenditures. This determines the level of state government employment.

State spending will be determined by two influences which are proxies for demand and supply effects. The demand for state government services, as measured by expenditures, has been shown to be income elastic. Growth of income will generate demand for increased government services. The second influence on expenditures is a supply influence. With the flow of revenues from Prudhoe Bay oil and gas, Alaska will begin to accumulate a surplus in its General Fund. This surplus, unlike the surplus in the Permanent Fund, can be used for state government expenditures. This fund balance is assumed to have a supply effect on expenditures, causing them to be increased as funds accumulate in the balance. This is an assumption which is required about future state spending patterns.

The effect of state expenditures on employment is determined by the wage rate of state employees. Once state personnel expenditures are determined, the wage rate determines the number of state employees.

Employment in each of these sectors influences the growth of the economy through the increased demand for goods and services produced in Alaska. For endogenous sectors, employment is determined by the demand for labor needed to produce a desired level of output. The demand for output is a function of real disposable income. Demand is income elastic, so that increases in personal income lead to increased demand. This effect is simultaneous; increased incomes lead to increased demand which increases employment. This increased employment generates its own demand, and the process continues. The process stops when leakages outside the economy dominate the flow of income.

Income increases with increases in the average income per worker and with increases in the number of workers in the economy. The average income is substantially determined by wages and salaries, so it reflects changes in the wage rate. The real wage rate is determined by changes in prices, bottlenecks in the economy associated with rapid growth, and changes in outside wages. The U.S. labor market affects the Alaskan real wage rate because of the small size of the Alaskan labor market and the mobility of Alaskan workers. Because of these factors, migration becomes the equilibrating factor maintaining the relation between Alaska and U.S. wages. Slow growth leads to out-migration and a reduction in the supply of labor, not a reduction in the relative wage differential.

Changes in the sectoral composition of employment will also affect the average wage. As high wage sectors such as construction and mining increase in importance, wages and salaries will increase more than proportionally to employment growth.

The response of the economy to increases in income will be determined by the structure of the economy. Larger economies provide more of their own goods and services, there are fewer leakages, and the multiplier is larger. This results because economies of scale allow lowered production costs and import substitution. Growth by affecting the structure of the economy will influence the response of the economy to increases in income.

The effect of an increase in personal income on growth will also depend on the increase in prices resulting from growth. Real income determines the demand for goods and services. The price level of the Alaskan economy is determined by U.S. prices, since Alaska imports most of its goods. The size of the economy also affects the price level; larger economies provide economies of scale which reduce the cost of production and reduce prices. The rate of growth also affects prices. Rapidly growing regions are more subject to bottlenecks and supply constraints which lead to price increases.

Employment and income growth influence the growth of population in the state. Population grows as a result of natural increase and migration. Natural increase (the excess of births over deaths) is a function of the age distribution of the population. Migration is determined by the relative economic opportunities available in Alaska. Changes in employment opportunities and the relative per capita income between Alaska and the rest of the United States will determine migration. Migration has a considerable effect on the age-sex distribution of the population. Migration, which is determined by economic opportunities, primarily affects the age group under forty. Migration after forty years of age is a response to other factors such as retirement and the high cost of living (Seiver, 1975). Because of this, migration is a response to changing economic opportunities and will affect the proportion of the population under forty.

State economic growth does not occur uniformly throughout the state but varies by region. Regional growth depends on the factors causing growth. Factors which have a similar influence on state growth may affect the growth in each region differently. For example, equal growth in state government employment and exogenous employment, although they may affect state growth the same, will differ in their regional impacts, depending on the concentration of exogenous employment and the dispersion of state government expenditures.

The causes of regional growth are the same as those at the state level: increases in exogenous employment, increases in personal income, and increases in state expenditures. Growth of any of these factors within the region will lead to growth in the region. The economies of Alaskan regions are not independent; they are interdependent. Because of this, growth in one region will affect growth in other regions. Four processes reflect this interaction; the strength of the interdependence of the Alaskan regional economies depends on the strength of these processes. First, government spending works to distribute growth between the regions. Increases in state revenues which result from growth in one region will be translated into growth in other regions through the distribution of state expenditures. State expenditures are distributed to a region in relation to its population. However, government centers such as Anchorage and Juneau receive a greater-than-proportionate share of state expenditures because of the administrative and headquarters functions they serve. Second, changes in state wage rates will affect growth in the regions. Increases in wage rates increase personal incomes in each region and the demand for goods and services in each region. Wage rate increases throughout the state can result from increases in construction employment in one region. Third, regions which serve as regional centers will reflect growth in other regions, since they provide goods and services to other regions. The growth of Anchorage which serves as the financial, distributional, and adminstrative center of the state is the most obvious example of this, although smaller centers such as Fairbanks also experience this type of relation. Finally, migration between regions illustrates interaction of the regional economies. Residents of one region respond to employment opportunities in another region by migrating to it, so that employment growth in one region determines the population of other regions.

The Alaskan Economy
Moderate Base Case Growth

The base case describes the general pattern of Alaska economic growth without development in the Northern Gulf of Alaska OCS. The impact of Northern Gulf development will be measured as changes from this base case pattern of growth. In analyzing the projected base case growth, we will examine the change in the magnitudes of the important economic variables, as well as changes in the economic structure or process of growth.

The historical economic growth serves as a reference for describing future projected growth. Between 1965 and 1976, the Alaska economy experienced rapid growth. Employment grew at an annual average rate of 8.4 percent throughout the period. Expansion of the mining and construction was largely responsible for this growth. Economic growth also produced some structural changes. The most significant of these were the increased importance of the support sector and the aging of the population. Population grew at an annual rate of 4.1 percent over the period; migration was responsible for the large proportion of this growth. Growth had little effect on unemployment but did improve real per capita incomes of Alaskans relative to the U.S. average. Historical growth had opposite effects on prices. As the scale of the economy grew, the price level relative to the United States fell; however, the rapid growth connected with the impact of TAPS reversed this trend.

The overall growth of the state economy in the future will be affected by growth in its basic sector. Rapid increases or declines in this sector provide interesting periods for our analysis. The early 1980s are important for basic sector growth. Two special construction projects, the ALCAN gas line and the Pacific LNG plant, have peak construction years between 1981 and 1983. Mining activity is also important. Prudhoe employment is assumed to fall from about 1,800 in 1980 to about 900 in 1983 and then begin to rise; Lower Cook OCS activity peaks in 1981; and Beaufort OCS development begins in 1981. Another event of importance is the shutdown of the Upper Cook Inlet oil production in 1990. This reduces mining employment by 450, an 11 percent fall. Peak Prudhoe oil production occurs in 1985; the effect of this on revenues to the state government makes this an important point in time to consider.

THE STATE

The General Pattern of Development

Economic growth is a multidimensional process which no one indicator can describe. While population, employment, and personal income do not describe the full range of growth, they can be used to describe the general pattern of growth. Employment measures the ability of the economy to create jobs; personal income measures the effect of the economy on residents' command over goods and services; and population growth describes the response of people to these changing economic opportunities. Table 37 shows the projected levels of population, employment, and personal income. Overall, there is substantial growth, although it is not so rapid as in the period between 1965 and 1976.

TABLE 37. AGGREGATE INDICATORS OF ECONOMIC GROWTH
MODERATE BASE CASE, ALASKA
1977-2000

	Population	Employment	Personal Income (Millions of Nominal $)
1977	410,660	185,508	4,072
1978	406,667	178,526	4,236
1979	418,656	185,225	4,743
1980	434,173	194,054	5,395
1981	455,563	206,479	6,401
1982	486,359	224,637	7,916
1983	502,802	230,228	8,571
1984	501,479	223,159	8,276
1985	509,057	224,931	8,810
1986	523,083	231,906	9,763
1987	539,029	240,132	10,854
1988	556,942	249,550	12,146
1989	575,352	259,033	13,531
1990	591,580	266,632	14,836
1991	606,771	273,502	16,226
1992	622,686	280,902	17,781
1993	640,335	289,580	19,613
1994	658,298	298,329	21,602
1995	677,649	308,016	23,829
1996	698,466	318,616	26,434
1997	719,126	328,881	29,095
1998	740,455	339,495	32,116
1999	764,593	352,046	35,661
2000	789,287	364,721	39,559

SOURCE: MAP Model

Population is projected to be approximately 789,000 by 2000. Between 1978 and 2000, the population grows at an annual rate of almost 3.1 percent. This rate is approximately 25 percent less than the average annual growth rate experienced between 1965 and 1976 but faster than the average rate of 2.8 percent experienced prior to the construction of TAPS. Population falls after the completion of both TAPS in 1977 and ALCAN in 1983. In each case, population declines by less than one percent, and the peak population is exceeded the following year. The most rapid period of population growth occurs between 1978, the year TAPS is completed, and 1982, the peak year of ALCAN construction. During this period, population increases at a rate of 4.6 percent per year.

Employment is projected to grow at an average annual rate of 3.3 percent, reaching approximately 365,000 by 2000. Like population, employment experiences its greatest growth between 1978 and 1982 when it grows at a rate of 5.9 percent per year. These projected growth rates are not so great as the 8.4 percent rate of growth experienced between 1965 and 1976. Employment is projected to decline after completion of both the TAPS and ALCAN projects. The decline is more substantial than the decline in population, being approximately 4 percent in each case. The 1983 employment level is not reached until 1986. Employment is projected to grow faster than population throughout the forecast period; this supports the trend observed in the historical period. By 2000 the dependency ratio has fallen to 2.2.

The growth in personal income is related to the growth in employment, since wages and salaries are a major component of personal income. Changes in the composition of employment, changes in the productivity of labor, and changes in the level of prices will result in differential rates of growth between personal income and employment. Personal income is in nominal dollars, so it reflects both the real growth of the economy and increases in prices. Personal income grows at an annual average rate of 10.6 percent. Personal income grows faster in the period prior to the 1983 ALCAN peak construction. Between 1978 and 1983, personal income grows at a rate of 15.1 percent per year; this is 4.8 percent greater than the average yearly rate between 1984 and 2000. This illustrates the importance of the high-wage pipeline construction employment to growth in personal income. Between 1978 and 2000, personal income grows at an annual average rate of 10.7 percent, which is less than the 15.4 percent rate experienced between 1965 and 1976.

Although population, employment, and personal income do not experience growth at so rapid a rate as they experienced between 1965 and 2000, economic growth is projected to be substantial. Employment is projected to increase by 104 percent, population by 94 percent, and personal income by 834 percent between 1978 and 2000. The difference between the projection and the historical period is caused by the major role pipeline construction played in the historical period.

Employment and the Structure of the Economy

The increased demand for industrial output will result in growth of Alaska employment. Total Alaska employment is projected to more than double by the end of the projection period. We saw in the historical period that growth does not occur in all industrial sectors evenly. Between 1965 and 1976, we observed structural change which increased the importance of the support sector in the economy. The projected economic growth continues the structural change observed in the historical period.

Table 38 illustrates the changing structure of the Alaska economy. This table shows the growth of three sectors of the Alaska economy--the support sector which includes transportation-communication-utilities, trade, finance, and service employment; the government sector which includes state, local, federal civilian, and federal military employment; and the basic sector which includes mining, manufacturing, agriculture-forestry-fisheries, and construction.

The sector which is projected to grow most rapidly is the support sector. This sector grows at an annual average rate of approximately 5 percent between 1978 and 2000; this is 1.7 percent faster than the growth of total employment. The support sector expands more rapidly in all parts of the period. This sector expands its share from approximately 37 percent of total employment in 1978 to 53 percent by 2000. Expansion of this sector is consistent with past trends in the Alaska economy. This projected expansion of this sector does not exceed the limits suggested by national comparisons. The projected share is close to the average share of this

TABLE 38. THE STRUCTURE OF EMPLOYMENT
MODERATE BASE CASE, ALASKA
1978, 1980, 1985, 1990, 2000

	Support Sector		Government		Basic Sector	
	Employment	% of Total	Employment	% of Total	Employment	% of Total
1978	66,504	37.3	68,862	38.6	43,159	24.2
1980	76,658	39.5	69,783	36.0	47,612	24.5
1985	95,975	42.7	74,472	33.1	54,484	24.2
1990	123,176	46.2	78,919	29.6	64,536	24.2
1995	152,850	49.6	81,743	26.5	73,424	23.8
2000	193,506	53.1	84,417	23.1	86,798	23.8

Support Sector includes transportation-communication-public utilities, trade, finance, and service employment.

Government includes state, local, and federal employment.

Basic Sector includes mining, manufacturing, agriculture-forestry-fisheries, and construction employment.

SOURCE: MAP Model

sector in the U.S. economy and several small states described in Table 7. The support sector expands because of increased demand for goods and services. Demand increases as incomes increase. The nonproportional response of this sector occurs as the scale of the economy expands and allows more local production of these goods and services.

The nongovernment basic sector maintains a relatively constant share of total employment throughout the projection period. Its share is close to 24 percent in all years except those connected with large special projects. The share of total employment is between 25 and 26 percent in the period with ALCAN construction. Employment in the nongovernment basic sector expands at an average annual rate of 3.2 percent between 1978 and 2000. Employment in this sector reaches a peak of approximately 58,000 in 1982 and 1983 when both the ALCAN and Pacific LNG projects are at their peak. After completion of these projects in 1983, basic sector employment falls by almost 8 percent. The peak level is not reached again until 1987. Growth in this sector after the ALCAN project averages an annual rate of 3.0 percent. Growth is primarily a result of the expansion of manufacturing and construction since there is only limited expansion of special project construction and mining.

The growth of the government sector is a result of the expansion of state and local government since federal employment is assumed to follow its historic trend and remain constant. State and local government employment increases by almost 16,000 between 1978 and 2000. The growth of state and local government is not strong enough to maintain the share of the government sector. The share of government employment falls from almost 39 percent in 1978 to 23 percent in 2000.

Population

Population grows through natural increase and net in-migration. Natural increase occurs when there is an excess of births over deaths. Migration results in population increases when in-migrants outnumber out-migrants, and population decreases when the opposite is true. Each of these factors affects not only the size of the population but the age and sex distribution as well. The projected population increase of 382,620 between 1978 and 2000 is significantly affected by migration. Population growth in the base case also continues the aging of the population. Table 39 shows the components of population change.

As in most small regions experiencing rapid growth, migration is the most important component of population change. Table 39 shows net migration from the previous year. Between 1978 and 2000, almost half of the population growth is net in-migration. Net in-migration occurs in all but four years of the projection period; net out-migration occurs in 1978, 1984, and 1985--years following the completion of major TAPS and ALCAN construction. The economic opportunities associated with ALCAN and Pacific LNG construction are also responsible for major in-migration in 1981 when migration is responsible for 67 percent of the population growth, and in 1982 when migration accounts for 75 percent of the population growth. In other years, population increase is divided almost evenly between net in-migration and natural increase.

TABLE 39. THE COMPONENTS OF POPULATION CHANGE
MODERATE BASE CASE, ALASKA
1977-2000

	Net Migration	Natural Increase
1977	-24,935	6,383
1978	-11,241	7,202
1979	5,268	6,697
1980	8,650	6,870
1981	14,253	7,144
1982	23,180	7,633
1983	8,014	8,460
1984	-9,943	8,626
1985	-0,528	8,082
1986	6,046	7,971
1987	7,828	8,120
1988	9,585	8,332
1989	9,802	8,614
1990	7,336	8,900
1991	6,111	9,082
1992	6,694	9,220
1993	8,264	9,386
1994	8,349	9,616
1995	9,508	9,845
1996	10,701	10,120
1997	10,228	10,438
1998	10,603	10,729
1999	13,110	11,031
2000	13,274	11,429

SOURCE: MAP Model

Population growth results in changes to the age-sex distribution of the population. Table 40 compares the age-sex distribution of the population in 1980 and 2000. The aging of the population is projected to continue with the cohorts over 30 gaining as a proportion of the population. The proportion of the population over 30 increases from 37.6 percent in 1980 to 43 percent in 2000. One reason for the fall in the dependency ratio can be easily seen; between 1980 and 2000, the proportion of children (0-14) falls from 29.6 percent to 28.0 percent.

Personal Income

Personal income is projected to increase at an average rate of 10.6 percent per year. Increase in personal income is one of the benefits of growth; it measures the command of residents over goods and services. The full effect of increases in personal income is diminished by increases in prices; as prices of goods and services increase, a dollar can buy less. Economies which increase real personal income may not be increasing benefits if it does not increase as fast as population. Increases in real per capita income measure real increases in the command of the average resident over goods and services. Table 41 shows the projected change in the price level (RPI) and real per capita income.

The Alaska relative price index measures the increase in Alaska prices relative to a 1957 U.S. average. RPI increases at an average annual rate of 4.7 percent. Over the period, RPI moves toward the U.S. average since U.S. CPI is assumed to increase faster, at a rate of 5.5 percent per year. This supports the pre-pipeline trend; as the scale of the

TABLE 40. AGE-SEX STRUCTURE OF THE POPULATION
MODERATE BASE CASE, ALASKA
1980 and 2000

	1980		2000	
Age Cohorts	Males	Females	Males	Females
0 - 14	15.08	14.56	14.25	13.79
15 - 29	18.47	14.33	15.92	13.14
30 - 49	13.35	12.12	14.67	13.27
50 - 59	3.31	2.92	3.84	3.72
60 +	3.06	2.81	3.43	3.97

SOURCE: MAP Model.

TABLE 41. REAL PER CAPITA INCOME
MODERATE BASE CASE, ALASKA
1977-2000

	Real Per Capita Income	Alaska Relative Price Index
1977	3,924	252.71
1978	3,724	279.75
1979	3,862	293.36
1980	4,029	308.40
1981	4,317	325.47
1982	4,711	345.51
1983	4,720	361.12
1984	4,431	372.44
1985	4,463	387.79
1986	4,598	405.92
1987	4,732	425.53
1988	4,886	446.35
1989	5,024	468.12
1990	5,119	489.91
1991	5,221	512.19
1992	5,330	535.75
1993	5,462	560.82
1994	5,590	587.03
1995	5,720	614.78
1996	5,875	644.16
1997	5,997	674.62
1998	6,139	706.48
1999	6,297	740.64
2000	6,456	776.37

SOURCE: MAP Model

economy increases and more goods and services are produced locally, the price level falls relative to the U.S. average. During the buildup of the ALCAN and Pacific LNG, RPI increases faster than the U.S. CPI. This diverging price level is a result of the rapid growth connected with development. Overall, the price level follows trends similar to the historical growth.

Real per capita income expands by 73 percent between 1978 and 2000. The average rate of growth is 2.5 percent per year. This is less than the 5.4 percent growth in real per capita income between 1965 and 1976 and the 3.5 percent annual growth rate prior to TAPS construction between 1965 and 1973. This rate is slightly greater than the 2.2 percent increase assumed for the United States in general. The high wage of special project construction workers affects real per capita incomes--real per capita income peaks in 1982 and 1983 and falls by 6 percent after the peak ALCAN year. The rise in real per capita incomes shows an increase in benefits of growth; however, this does not address distributional questions concerning personal income.

The State Fiscal Position

Over the projection period, state government will receive revenues from petroleum development which exceed current levels of expenditure. State government's decision on the expenditure of these revenues will influence the growth of the Alaska economy. In the historical period, we observed state government's role in the growth process. State government contributes to growth by the expenditure of revenues directly through state government employment and indirectly through capital expenditures, which influences the level of activity in the construction sector. When revenues from outside the economy such as exogenous petroleum revenues are spent, this extra demand causes growth. This section describes the projected revenues to the state, the state's projected expenditures, and the overall fiscal position of the state in the projection period.

State Revenues. The State of Alaska has two major sources of revenue, exogenous petroleum revenues which are determined by the flow of oil and gas on state lands and endogenous tax revenues which are determined by the state's economic activity. Endogenous tax revenues include income tax, business taxes, and other revenues determined by the growth of the economy.[1] Table 42 shows the growth of state government revenues between 1977 and 2000. Total revenues are almost $6.9 billion larger in 2000 than in 1977. Overall, these revenues increase at a rate of 10.3 percent per year. Prudhoe oil revenues peak in 1985. Prior to 1985, the rate of increase in revenues averages 20.9 percent per year, while this slows to 5.1 percent following 1985. The pattern of revenues follows the pattern of petroleum revenues received by the state.

The most important source of revenues to the state during the period between 1977 and 2000 are petroleum revenues. Petroleum revenues include royalties, production taxes, property taxes, and petroleum corporate

[1]Other tax revenues include revenues from the personal income tax, nonpetroleum corporate income tax, business license tax, motor fuels tax, alcohol tax, cigarette tax, school tax, ad valorem tax, and other miscellaneous taxes.

TABLE 42. STATE REVENUES
MODERATE BASE CASE, ALASKA
1977-2000

(Millions of Nominal Dollars)

	General Fund Revenues	Petroleum Revenues	Other Tax Revenues
1977	796	197	214
1978	1,054	471	207
1979	1,441	861	274
1980	1,625	996	313
1981	1,988	1,278	355
1982	2,329	1,476	437
1983	2,651	1,643	552
1984	3,224	2,122	650
1985	3,629	2,422	682
1986	3,811	2,431	737
1987	4,058	2,480	793
1988	4,312	2,521	872
1989	4,583	2,563	955
1990	4,712	2,459	1,035
1991	4,880	2,406	1,108
1992	5,129	2,430	1,208
1993	5,402	2,459	1,324
1994	5,637	2,427	1,445
1995	5,864	2,374	1,578
1996	6,162	2,366	1,750
1997	6,494	2,367	1,944
1998	6,840	2,365	2,159
1999	7,234	2,371	2,415
2000	7,678	2,372	2,718

SOURCE: MAP Model

income taxes from petroleum production. Petroleum revenues are earned from production on state lands in Upper Cook Inlet, Prudhoe Bay, and the Beaufort Sea. Because of their importance, Prudhoe Bay production dominates these revenue flows. Petroleum revenues increase until 1989, after which their general pattern is declining revenues. The decrease in revenues reflects declining production at Prudhoe Bay. Between 1977 and 1989, yearly petroleum revenues increase at an average rate of over 23.8 percent a year. After 1989 petroleum revenues fall, falling 7.5 percent by 2000. Other tax revenues, which include personal and business taxes, increase throughout the projection period. The increase in these revenues results from the growth of the economy. These revenues grow at an average rate of 11.6 percent between 1977 and 2000. Other tax revenues fall after completion of TAPS in 1977. The increase in these revenues after 1990 counteracts the decline in petroleum revenues.

State Expenditures. State government expenditures increase during the projection period; they are shown in Table 43. The increase in state expenditures is a result of two forces. First, expenditures grow as a response to the general growth of the economy. Increased population and prices result in increasing expenditures to provide the same level of services as measured by real per capita expenditures. The growth of income is assumed to increase the demand for the level of services provided. The second force operating on state expenditures is the accumulation of unspent revenues. These revenues will place pressure on the government to increase expenditures.

TABLE 43. STATE EXPENDITURES
MODERATE BASE CASE, ALASKA
1977-2000

	Total Expenditures (Millions of Nominal Dollars)	Real Per Capita Expenditures
1977	1,161	1,119
1978	1,311	1,152
1979	1,415	1,152
1980	1,567	1,170
1981	1,744	1,176
1982	2,015	1,199
1983	2,371	1,306
1984	2,580	1,381
1985	2,748	1,392
1986	3,062	1,442
1987	3,382	1,475
1988	3,750	1,509
1989	4,145	1,539
1990	4,557	1,572
1991	4,904	1,578
1992	5,284	1,584
1993	5,705	1,589
1994	6,179	1,599
1995	6,667	1,600
1996	7,201	1,601
1997	7,809	1,610
1998	8,473	1,620
1999	9,198	1,624
2000	10,029	1,637

SOURCE: MAP Model

State expenditures increase more than eight times between 1977 and 2000. The average annual growth rate during this period is 9.8 percent per year. After 1989 when petroleum revenues peak, the growth of expenditures is at a rate of only 8.4 percent per year. The projected growth in state expenditures repeats the experience of the state after the Prudhoe lease sale over a much longer period. The Prudhoe Bay experience may provide an indication of how the state will expand services in the future. Despite the rapid growth of expenditures during the historical period, the functional distribution of expenditures remained fairly stable. From this, we may be able to infer that the state will continue to distribute expenditures, as in the past, between the nine functional categories (education, social services, health, natural resources, public protection, justice development, transportation, and general government) (Goldsmith, 1977).

Real per capita expenditures can be considered a measure of the level of state services received by an individual. Increases in state expenditures are of two types: providing additional services and providing the same level of services to an increased population. Increases in services occur throughout the period. Real per capita expenditures increase by 46.3 percent between 1977 and 2000. This is a modest expansion when it is compared to the rise in real per capita expenditures of 118 percent between 1969 and 1973 (Goldsmith, 1977). The growth in real per capita expenditures is not even throughout the period; almost 81 percent of the increase occurs between 1977 and 1989 when oil revenues peak.

Balances. The huge increases in revenues which result from the production of oil and gas place the State of Alaska in a unique position. The excess revenues available allow the state to build up its fund balance. These funds not only provide a source of future revenues; they also generate interest earnings which increase yearly revenues. There are two types of fund balances: the permanent fund and the general fund. (See Table 44.)

The permanent fund is a legislated savings account for the state. In 1976, Alaska adopted a constitutional amendment which established the permanent fund. The relevant section of the constitution is Article IX, Section 15, which reads:

> ALASKA PERMANENT FUND. At least twenty-five percent of all mineral lease rentals, royalties, royalty sale proceeds, federal mineral revenue sharing payments, and bonuses received by the State shall be placed in a permanent fund, the principal of which shall be used only for those income producing investments specifically designated by law as eligible for permanent fund investments. All income from the permanent fund shall be deposited in the general fund unless otherwise provided by law.

This establishes the permanent fund as a minimum amount of petroleum revenues which cannot be spent. The permanent fund grows continually throughout the projection period. By 2000, there are $4.9 billion in the permanent fund. The general fund includes the remainder of the state's unspent revenues. For most of the period, the general fund is more important than the permanent fund. At its peak in 1996, the general fund has $12 billion, which is greater than three times the amount in the permanent fund. The decline in petroleum revenues after 1989 reduces the rate of increase in the general fund. Beginning in

TABLE 44. STATE FUND BALANCES
MODERATE BASE CASE, ALASKA
1977-2000

(Millions of Nominal Dollars)

	General Fund Balance	Permanent Fund Balance	Fund Balance Interest
1977	668	2	35
1978	617	49	47
1979	815	153	47
1980	1,054	275	69
1981	1,500	411	94
1982	2,056	563	136
1983	2,630	732	186
1984	3,558	949	239
1985	4,748	1,188	320
1986	5,872	1,437	421
1987	6,983	1,684	519
1988	8,044	1,936	615
1989	9,044	2,193	708
1990	9,837	2,445	798
1991	10,504	2,689	872
1992	11,096	2,937	937
1993	11,604	3,188	997
1994	11,956	3,437	1,051
1995	12,128	3,681	1,095
1996	12,150	3,924	1,125
1997	11,996	4,168	1,145
1998	11,642	4,413	1,152
1999	11,086	4,660	1,146
2000	10,293	4,907	1,126

SOURCE: MAP Model

1997, the general fund is drawn down to make expenditures. Between 1997 and 2000, the general fund is reduced by almost $2 billion. The cyclical nature of petroleum revenues and their importance as a part of state revenues mean that when expenditure policies are tied to revenues, they will eventually lead to expenditures in excess of revenues. Since the increase in services cannot be supported by normal revenues, the fund balance must be drawn on. Changes in the rate of spending out of revenues will only affect the timing of this, not its eventuality (Goldsmith, 1977). These fund balances provide an additional source of revenue to the state; the general fund is assumed to earn interest at a rate of 7 percent per year, while the permanent fund earns a slightly higher rate of 7.5 percent. These rates reflect the diverse portfolio held by the state which includes both long- and short-term bonds as well as in-state loans. At their peak in 1997, these revenues are about 18 percent of the state's general fund revenues. The interest revenues fall as the general fund is decreased.

State Fiscal Position. The state's fiscal position is determined by two factors. First, the Prudhoe Bay petroleum revenues are the major portion of state revenues, which are a fixed flow through time. Growth in the economy will not affect the level of these revenues. Secondly, economic growth increases expenditures without the same response in nonpetroleum revenues. These factors lead to the pattern of the fund balances shown in the previous section.

Table 45 contains two indicators which illustrate the state's fiscal position. The first is the excess of general fund revenues over general

TABLE 45. STATE FISCAL POSITION
MODERATE BASE CASE, ALASKA
1977-2000

	General Fund Revenues Minus General Fund Expenditures (Millions of Nominal Dollars)	Fund Balance (Millions of 1977 Constant Dollars)
1977	-137	671
1978	- 4	602
1979	302	835
1980	361	1,090
1981	583	1,486
1982	708	1,918
1983	742	2,355
1984	1,145	3,062
1985	1,429	3,873
1986	1,373	4,556
1987	1,358	5,153
1988	1,313	5,657
1989	1,257	6,073
1990	1,044	6,342
1991	912	6,517
1992	840	6,627
1993	760	6,673
1994	600	6,634
1995	416	6,506
1996	264	6,313
1997	91	6,062
1998	-109	5,750
1999	-309	5,379
2000	-546	4,953

SOURCE: MAP Model

fund expenditures. As long as this is positive, the general fund balance will increase; when it is negative, the fund balances must be drawn down to meet expenditures. The excess of revenues over expenditures increases until 1985, after which it falls. After 1985, expenditures are increasing faster than revenues. After 1998, expenditures are greater than revenues; and the fund balance must be drawn down. This pattern has long-range effects since it affects not only the level of the general fund but also the interest earned on the fund balances. This interest is an important part of revenues to the state.

The other factor affecting the value of the fund balances to the state is prices. As prices increase, the purchasing power of the fund will decrease. Table 45 shows the value of the fund balances in constant 1977 dollars. The effect of prices is to reduce the real value of the fund earlier. The real value of the fund peaks in 1993 at $6.7 billion; this is four years before the nominal fund balance peaks. By 2000, the real fund balance has fallen 26 percent from its peak; this compares to the 6 percent fall the nominal fund balance experiences by 2000. The real fund balance illustrates the effect of price increases on the fixed flow of revenue which is included in the fund.

GROWTH OF THE REGIONAL ECONOMIES

The regions of Alaska do not uniformly reflect state growth. Differences reflect the location of exogenous employment growth as well as the size and structure of the regional economy. This section will describe the distribution of state growth in the base case between two of the state's regions--Anchorage and Southcentral. As we have seen in the historical analysis, Anchorage and Southcentral, while closely related, are different types of economies. Anchorage is the state's major region. Its growth is largely affected by its role as the administration and distribution center for the state. This provides an indirect link between the Anchorage economy and the state's resource industries. Because of this role, growth in other parts of the state is reflected by growth in Anchorage. Southcentral is a combination of many small, local economies which are significantly dependent on the resource industries; both petroleum development and fisheries are important to these economies. These small economies, while physically separated, form a regional economy with similar structure and important trade and transportation links.

Anchorage

Aggregate Indicators. Table 46 shows three indicators of the growth of the Anchorage economy during the projection period. Employment, population, and real disposable income show that the state growth is reflected in Anchorage even though there is no major exogenous resource development. Population grows at an annual average rate of 3.5 percent during the period. Anchorage grows faster than the state, and the concentration of population in Anchorage continues throughout the projection period. In 1977, 46.3 percent of the state's population is in Anchorage; by 2000, that has increased to 52.5 percent. Population does not fall after completion of TAPS but experiences a slight decrease in 1984 after the peak ALCAN

TABLE 46. AGGREGATE INDICATORS OF ECONOMIC GROWTH
MODERATE BASE CASE, ANCHORAGE
1977-2000

	Population	Employment	Real Disposable Personal Income (Millions of Constant $)
1977	190,188	85,523	573
1978	197,348	84,128	586
1979	201,235	87,606	626
1980	207,323	91,938	677
1981	218,413	98,363	741
1982	235,032	107,329	825
1983	244,804	111,220	870
1984	243,808	108,713	862
1985	248,194	110,055	887
1986	256,190	114,113	935
1987	265,322	118,863	992
1988	275,583	124,228	1,054
1989	286,278	129,727	1,120
1990	295,590	134,221	1,177
1991	305,641	138,703	1,238
1992	315,565	143,318	1,298
1993	326,780	148,754	1,371
1994	338,200	154,245	1,442
1995	350,467	160,260	1,524
1996	363,718	166,870	1,614
1997	377,150	173,444	1,702
1998	391,303	180,343	1,796
1999	407,125	188,369	1,907
2000	422,609	196,092	2,015

SOURCE: MAP Model

year. Between 1984 after the ALCAN is completed and 2000, the population grows at an average annual rate of 3.5 percent.

Population follows the pattern of employment growth. Employment grows at an average annual rate of 3.7 percent during the projection period. As with population, employment experiences a slight decrease in 1984 when the ALCAN construction is in its final year. After 1984 employment grows at an average of 3.8 percent per year. Throughout the projection period, the dependency ratio (the ratio of population to employment) falls; this ratio is 2.22 in 1977 and 2.16 by 2000. This small decline results from the aging of the population and the increased participation in the labor force of the working-age population.

The final indicator of regional economic growth in the projection period is the total regional real disposable income. This accounts for the effect of prices and taxes on incomes. Total real disposable income increases at an average of 5.6 percent per year over the projection period. It experiences a slight peak in 1983, the final peak ALCAN year.

The Economic Structure. Table 47 shows the changes in structure of the Anchorage economy as measured by the distribution of employment. The major exogenous industries of mining and exogenous construction grow only slightly after completion of TAPS; this employment is made up of headquarters mining employment. Growth over this sector occurs with the expansion of headquarters employment for the development of Lower Cook

TABLE 47. ECONOMIC STRUCTURE
MODERATE BASE CASE
ANCHORAGE

	Support Sector I		Support Sector II		Government		Basic Sector	
	Employment	% of Total	Employment	% of Total	Employment	% of Total	Employment	% of Total
1978	36,835	43.9	12,153	14.5	31,427	37.4	3,439	4.1
1980	42,516	46.4	13,652	14.9	31,763	34.6	3,746	4.1
1985	54,003	49.4	17,245	15.8	33,500	30.6	4,581	4.2
1990	70,106	52.8	21,890	16.5	35,166	26.5	5,548	4.2
1995	87,903	55.8	26,785	17.0	36,273	23.0	6,625	4.2
2000	112,644	58.7	33,924	17.7	37,334	19.5	7,952	4.1

Support Sector I includes trade, services, and finance-insurance-real estate employment.

Support Sector II includes transportation-communication-public utilities and other construction employment.

Government includes state, local, and federal employment.

Basic Sector includes manufacturing, agriculture-forestry-fisheries, mining, and exogenous construction employment.

SOURCE: MAP Model

and Beaufort OCS. The major growth occurs in the local support sector. This sector is composed of two components: 1) local construction and transportation-communication-utilities and 2) trade, services, and finance-insurance-real estate. Each component of the support sector increases its share of total employment during the projection period. Local construction and transportation-communication-utilities increases from 14.5 percent in 1978 to 17.7 percent by 2000; while trade, services, finance-insurance-real estate increases from 43.9 percent to 58.7 percent. These changes are a continuation of historical changes in the structure of the Anchorage economy. These shares are greater than the shares of similar industries on the state level because of the important administrative and distributive role of Anchorage.

Southcentral

Aggregate Indicators. Unlike Anchorage, the growth of Southcentral depends largely upon the growth of the regional exogenous sector. The exogenous sector is influenced significantly by three events: the construction of the Pacific LNG plant between 1980 and 1983, the development of the Lower Cook OCS, and the shutdown of the Upper Cook oil fields in 1990. Three aggregate indicators--population, employment, and disposable real income--are shown in Table 48. Population falls after the completion of the trans-Alaska pipeline in 1977. Between 1978 and 2000, population is projected to grow at an average annual rate of 1.9 percent. Population falls slightly (less than one percent) in 1991 when the Upper Cook Inlet oil fields are closed.

TABLE 48. AGGREGATE INDICATORS OF ECONOMIC GROWTH
MODERATE BASE CASE, SOUTHCENTRAL
1977-2000

	Population	Employment	Real Disposable Personal Income (Millions of Constant $)
1977	58,958	23,117	180
1978	53,826	20,898	145
1979	55,799	21,946	159
1980	59,054	23,745	184
1981	61,533	25,452	212
1982	62,582	26,520	232
1983	61,933	25,863	216
1984	63,292	26,030	213
1985	63,915	26,323	219
1986	64,866	26,923	229
1987	65,675	27,500	238
1988	67,012	28,318	250
1989	68,418	29,173	264
1990	70,015	30,054	277
1991	69,574	30,002	279
1992	70,713	30,647	290
1993	71,825	31,316	303
1994	73,076	32,029	315
1995	74,402	32,810	330
1996	75,849	33,657	345
1997	77,095	34,375	359
1998	78,319	35,084	373
1999	79,791	35,958	390
2000	81,385	36,886	407

SOURCE: MAP Model

Employment grows faster than population in Southcentral during the projection periods. Employment falls after TAPS is completed in 1977. After this, it grows at an average rate of 2.6 percent per year. The ratio of population-to-employment was much higher in 1978 in Southcentral (2.58) than in the state (2.27). The Southcentral ratio falls toward the state ratio by 2000 (2.21 for Southcentral and 2.16 for the state). This trend was experienced in the historical period; the population-to-employment ratio fell from 4.24 in 1965 to 3.07 prior to the TAPS construction in 1974. The declining dependency ratio results from a change in the character of the population. As at the state level, the population is aging and the labor force participation is increasing. These factors account for the greater proportion of employed in the population.

Disposable real income grows throughout the period after falling with the completion of the trans-Alaska pipeline; in 1978 it is almost 20 percent lower than in 1977. Between 1978 and 2000, disposable real income increases at an annual average rate of 4.8 percent.

The Economic Structure. Table 49 shows the changes in the structure of the Southcentral economy during the projection period as described by changes in the distribution of employment. Two important trends can be observed from this table. First, those exogenous sectors which have recently been important to the region's growth, construction and mining, decrease their importance throughout the projection period. After completion of TAPS, this exogenous construction decreases, then increases

TABLE 49. ECONOMIC STRUCTURE
MODERATE BASE CASE
SOUTHCENTRAL

	Support Sector I		Support Sector II		Government		Basic Sector	
	Employment	% of Total	Employment	% of Total	Employment	% of Total	Employment	% of Total
1978	8,134	38.6	3,101	14.7	4,717	22.4	5,146	24.4
1980	9,173	38.2	3,515	14.7	4,837	20.2	6,462	26.9
1985	10,452	39.2	3,997	15.0	5,402	20.2	6,799	25.5
1990	12,293	40.3	4,583	15.0	5,923	19.4	7,729	25.3
1995	14,046	41.9	4,991	14.9	6,234	18.6	8,258	24.6
2000	16,440	43.2	5,663	14.9	6,517	17.1	9,438	24.8

Support Sector I includes trade, services, and finance-insurance-real estate employment.

Support Sector II includes transportation-communication-public utilities and other construction employment.

Government includes state, local, and federal employment.

Basic Sector includes manufacturing, agriculture-forestry-fisheries, mining, and exogenous construction employment.

SOURCE: MAP Model

to a peak of 2,578 in 1982 with construction of the Pacific LNG plant and development of the Lower Cook OCS. After the Cook Inlet oil fields are shut down in 1980, this mining includes only 780 employees. The second trend is the increasing importance of the support sector in the region. Trade, services, and finance-insurance-real estate increase their share of total employment from 38.6 percent in 1978 to 43.2 percent in 2000. This follows a historical trend. The increased scale of the Southcentral economy during the projection period leads to a greater-than-proportional increase in support sector employment.

Alternative Base Cases

Two additional base case projections were made. These base cases differ in the assumed level of OCS activity in the Lower Cook Inlet and Beaufort Sea. The major difference between these base cases is one of magnitude; the high base case assumes a higher level of Beaufort and Lower Cook OCS activity than the moderate base case. The low base case assumes only exploration activity in the Lower Cook and lower development activity in the Beaufort. The major difference between the projected growth of the base cases in these three scenarios will also be in magnitude. Each alternative base case will be described by four major variables: employment, population, total state expenditures, and the fund balance. These cases affect the structure of the economy in a manner similar to the moderate case. (The detailed scenarios are shown in Appendix D.)

LOW BASE CASE SCENARIO

The minimum base case scenario includes the same non-OCS assumptions as the moderate scenario. The difference between these cases involves the assumptions about OCS activity in the Lower Cook Inlet and Beaufort. The minimum development scenario assumes only exploration activity in the Lower Cook. Lower Cook OCS employment occurs between 1978 and 1985 with a peak of 252 in 1980. In contrast, the moderate case has a Lower Cook OCS employment peak of 912 in 1981 and operations employment of 417 remains throughout the period. The level of activity assumed in the low Beaufort scenario is much closer to the moderate scenario. The low Beaufort scenario contains production and has employment through the entire projection period. Peak employment of 740 occurs in 1989; this is 68 percent of the peak in the moderate Beaufort scenario. Operations employment is approximately 82 percent of the moderate case by the end of the period. Since Beaufort OCS production occurs in state waters, Beaufort will also generate tax, bonus, and royalty revenues to the state.

General Pattern of Growth

Table 50 describes four indicators of the magnitude of economic growth projected for the low base case. Population is projected to increase at an annual average rate of growth of 3.0 percent between 1978, the year after the TAPS project is complete, and 2000. The most rapid period of growth is between 1978 and 1982, the peak ALCAN year; growth averages 4.4 percent per year during this period. Population falls after completion of TAPS in 1977 and the last peak ALCAN year in 1983; in both cases,

TABLE 50. AGGREGATE INDICATORS OF ECONOMIC GROWTH
LOW BASE CASE, ALASKA
1977-2000

	Population	Employment	State Expenditures (Millions of Nominal Dollars)	Fund Balance (Millions of Nominal Dollars)
1977	410,660	185,508	1,161	671
1978	406,709	178,557	1,311	666
1979	417,661	184,486	1,415	967
1980	431,495	192,187	1,559	1,330
1981	451,557	203,886	1,723	1,921
1982	482,344	222,330	1,988	2,640
1983	498,942	228,242	2,348	3,393
1984	497,291	221,077	2,559	4,548
1985	504,710	222,880	2,727	5,986
1986	518,422	229,756	3,044	7,366
1987	534,266	238,040	3,362	8,732
1988	551,407	246,998	3,731	10,049
1989	569,207	256,188	4,115	11,306
1990	585,921	264,313	4,520	12,336
1991	601,605	271,644	4,871	13,216
1992	617,354	278,970	5,252	14,033
1993	635,153	287,806	5,671	14,769
1994	653,018	296,515	6,145	15,339
1995	671,975	305,943	6,628	15,725
1996	691,018	315,281	7,154	15,948
1997	712,023	325,984	7,722	16,008
1998	733,658	336,919	8,404	15,857
1999	757,817	349,551	9,134	15,500
2000	782,438	362,225	9,965	14,900

SOURCE: MAP Model

the decrease is less than one percent. The rate of population growth is slightly less than the 3.1 percent rate in the moderate base. By the peak ALCAN construction year, 1983, population is almost 4,000 greater in the moderate base case. This is mainly a response to the more rapid Lower Cook development in the moderate case. By 2000 population is 7,000 less in the low base case.

Employment is projected to be 362,225 by 2000 in the low base case. This is 2,500 less than in the moderate base case. Employment falls from 185,500 in 1977 to 178,560 in 1978 with the completion of TAPS in the low base case. After 1978 employment grows at an annual rate of 3.27 percent. Like population, employment is projected to grow most rapidly with the buildup before the ALCAN. Between 1978 and 1982, employment increases at the average rate of 5.6 percent per year. The overall growth is only slightly less than the growth in the moderate base case. The difference in employment is almost 2,600 in 1981 when Lower Cook development is at its peak in the moderate scenario. As in the moderate base case, population is projected to increase less rapidly than employment.

Throughout the projection period, state expenditures in the low base case are only slightly less than in the moderate base case. By 2000 expenditures in the low base case are $9,965 million, which is less than one percent lower than in the moderate base case. In 1981 at the peak of Lower Cook moderate development, moderate case expenditures are only slightly more than one percent higher. The lower base case also has a similar effect on the fund balances. The fund balance in the low base case is $300 million less than the fund balance in the moderate case. This is a difference of only 2 percent. The moderate base case has a larger fund balance even though it has larger expenditures because of the greater revenues received from the Beaufort OCS. The pattern of the fund balance is similar in both cases. In the low base case, the fund balance increases at an annual average rate of 17.2 percent until 1997, when it peaks. Between 1997 and 2000, the fund falls by 7 percent in the low case because fund balances are drawn down to meet state expenditures. This is similar to the pattern found in the moderate base case.

The growth projected for the low base case is similar in magnitude to that projected in the moderate base case. The difference in the major variables is small. By the end of the period, the difference varies from the fund which is 2 percent smaller to state expenditures which is only .63 percent smaller. The major differences occur early in the projection period because the major difference in the scenarios is in the Lower Cook OCS assumption which peaks by 1981.

Structural Differences and Similarities. The main difference between the low and moderate base cases involves the magnitude of the variables. The effect of economic growth on the process of change is similar in both base cases. Four major structural changes were observed in the moderate base case. These were measured by changes in the employment distribution, the dependency ratio, the regional distribution of the population, and the fund balance. The change in the employment distribution measures the increased importance of the support sector in the Alaska economy. As the economy grows larger, the support sector experiences a greater-than-proportional growth because more goods and services are produced locally. The dependency ratio decreases as a greater proportion of the population is employed. This results from increases in the proportion of the population of labor-force age and increased labor-force participation of this population. The concentration of population in Anchorage was also observed in the moderate base case. Anchorage's role as the administrative and distribution center for Alaska assures the continuing growth of Anchorage even if the major cause of growth continues to be resource development outside the region. The final structural characteristic observed in the moderate base case concerns the state fiscal sector. The influence of petroleum revenues on state expenditures leads to expenditures which increase faster than revenues. Eventually, the fund balances must be drawn down to meet expenditures.

Table 51 compares these structural characteristics in the low and moderate scenarios. This table shows that, while the base cases differ slightly in magnitude, they are quite similar in the important structural characteristics. The support sector expands to about 53 percent of total employment in both cases. The dependency ratio (population/employment) falls by about 4 percent between 1980 and 2000 in both cases. Similarly, Anchorage is projected to contain almost 54 percent of the state's population by 2000. General fund revenues net of general fund expenditures are projected to follow a similar pattern in both cases. In the early part of the period, revenues exceed expenditures; the fund is being built up. By the end of the period, expenditures are greater than revenues and the fund must be drawn down to make up the difference in expenditures.

TABLE 51. STRUCTURAL CHARACTERISTICS
LOW AND MODERATE BASE CASES

		1980	1990	2000
Percent of Total Employment in Support Sector	low base case	39.4%	46.1%	53.0%
	moderate base case	39.5%	46.2%	53.1%
Dependency Ratio	low base case	2.25	2.22	2.16
	moderate base case	2.24	2.22	2.16
Percent of Total Population in Anchorage	low base case	47.8%	50.0%	53.5%
	moderate base case	47.8%	50.0%	53.5%
General Fund Revenues Minus General Fund Expenditures (Millions of Nominal Dollars)	low base case	363	1,029	-599
	moderate base case	361	1,044	-546

HIGH BASE CASE SCENARIO

The high and moderate base case scenarios differ only in the assumption made about OCS development in the Lower Cook and Beaufort Sea. The Lower Cook development scenarios differ in both magnitude and timing between the two cases. Peak employment does not occur in the high case until 1984; the peak level of employment is 2,448. Peak employment occurs in the moderate case in 1981; moderate case employment is greater than high case for the first four years of the period. Operations employment in the high case is almost three times as high as in the moderate case; it includes operation of an LNG plant. The Beaufort high scenario peaks in 1989 at 1,344 which is 24 percent greater than the moderate Beaufort peak. By 2000 employment is 38 percent greater in the high case. The higher Beaufort production also means greater revenues from production in state waters.

General Pattern of Development. Table 52 shows four indicators of the magnitude of economic growth in the high base case. Population is projected to be 801,117 in 2000. This is 11,830, or 1.5 percent, greater than in the moderate base case. The population falls after TAPS is completed in 1978 but does not experience a similar fall after ALCAN in 1984. The moderate base case experiences a fall of .3 percent between 1983 and 1984, while the high base case increases by one percent. This increase is a result of development activity in the Lower Cook which increases employment from 989 in 1982 to its peak of 2,448 in 1984. This increase counteracts the fall in population after ALCAN is complete. The growth rate of population between 1978 and 2000 is an average of 3.1 percent per year which is slightly higher than in the moderate base case.

The assumed growth of employment in the Lower Cook between 1982 and 1984 is not great enough to prevent a fall in employment after ALCAN is complete. Employment falls by almost 3,000 between 1983 and 1984; this is less than half the fall experienced in the moderate base case. Because

TABLE 52. AGGREGATE INDICATORS OF ECONOMIC GROWTH
HIGH BASE CASE, ALASKA
1977-2000

	Population	Employment	State Expenditures (Millions of Nominal Dollars)	Fund Balance (Millions of Nominal Dollars)
1977	410,660	185,508	1,161	671
1978	406,709	178,557	1,311	666
1979	417,661	184,486	1,415	967
1980	431,495	192,187	1,559	1,330
1981	453,534	205,348	1,723	1,923
1982	484,460	223,675	2,005	2,635
1983	507,184	233,949	2,363	3,391
1984	512,160	231,000	2,634	4,525
1985	519,471	231,560	2,824	5,937
1986	531,137	236,106	3,112	7,302
1987	546,488	243,560	3,400	8,673
1988	564,654	252,890	3,768	10,004
1989	583,731	262,615	4,166	11,334
1990	600,285	270,213	4,601	12,460
1991	616,303	277,510	4,954	13,467
1992	632,719	285,074	5,352	14,403
1993	651,220	294,189	5,784	15,270
1994	669,835	303,200	6,279	15,981
1995	689,377	312,806	6,782	16,518
1996	708,660	322,086	7,323	16,910
1997	729,940	332,789	7,898	17,159
1998	751,675	343,616	8,557	17,225
1999	776,143	356,320	9,290	17,091
2000	801,117	369,105	10,129	16,724

SOURCE: MAP Model

of the earlier Lower Cook development in the moderate base case, employment in the high case is less than in the moderate case until 1983. Employment grows at an annual average rate of 3.4 percent between 1978 and 1983. By 2000 employment is almost 4,400 greater than in the moderate base case.

The state's fiscal position is affected in two ways by the different base cases. First, different rates of growth in population, prices, and personal income will affect the level of expenditures. Secondly, differential production in the Beaufort Sea will mean different revenue streams to the state. By 2000 state expenditures are projected to have reached $10.1 billion in the high base case. This is one percent greater than the projected state expenditures in the moderate base case. Expenditures are greater in the moderate base case until 1984 because of the earlier Lower Cook OCS activity. Overall, expenditures increase at an average rate of 9.9 percent per year. The fund balance is greater in the high base case by $1.5 billion in 2000. The larger fund balance is due to larger Beaufort Sea OCS revenues and the larger expenditures early in the period in the moderate case. These early expenditures reduce the fund and the interest earned on the fund. The fund experiences the same pattern of growth in the high as in the moderate base case, rising to a peak and then falling. The peak in fund balance is reached in 1998 which is one year later than in the moderate base case.

Structural Similarities and Differences. Table 53 shows the indicators of the major structural characteristics of the high and moderate base cases. The structural changes which occur because of the projected growth are similar in both the high and moderate cases. The support sector will include over 53 percent of total employment; the dependency ratio will fall to about 2.16 people per employee; and Anchorage will contain about 54 percent of the state's population. General fund revenues net of general fund expenditures are slightly higher in the high case, although the difference is still negative in 2000. The pattern of the fund balance is similar in both cases.

TABLE 53. STRUCTURAL CHARACTERISTICS
HIGH AND MODERATE BASE CASES

		1980	1990	2000
Percent of Total Employment in Support Sector	high base case	39.4%	46.3%	53.1%
	moderate base case	39.5%	46.2%	53.1%
Dependency Ratio	high base case	2.25	2.22	2.17
	moderate base case	2.24	2.22	2.16
Percent of Total Population in Anchorage	high base case	47.8%	50.0%	53.5%
	moderate base case	47.8%	50.0%	53.5%
General Fund Revenues Minus General Fund Expenditures (Millions of Nominal Dollars)	high base case	362	1,127	-368
	moderate base case	361	1,044	-546

SUMMARY AND CONCLUSIONS

The growth of the Alaska economy between 1977 and 2000 is projected to be substantial, although the economy is not projected to grow so rapidly as it did between 1965 and 1976. This section presented three alternative base cases, each with different assumptions about the level of OCS activity in the Beaufort Sea and Lower Cook Inlet. By 2000, population is projected to be between 782,400 and 801,120, depending upon the level of OCS activity assumed. Employment is projected to be between 362,225 and 369,105.

The three base case scenarios differ only in magnitude; they exhibit similar patterns of development. This pattern was illustrated by the growth in the moderate base case. The economy's growth is not projected to be constant throughout the period. The most rapid period of growth occurs during the construction of the ALCAN gasline between 1978 and 1982. During this period, the average annual growth of employment is 5.9 percent, compared to 3.3 percent for the whole period. Population grows 48 percent faster than over the entire period when ALCAN is constructed.

Economic growth provides increases in two measures of individual benefits: real per capita income and real state expenditures. Real per capita income increases by 65 percent between 1977 and 2000. This means that the real purchasing power of the average Alaskan increases with economic growth. Real per capita expenditures is a proxy for the level of services provided by the state government. Real per capita state expenditures increase by 46 percent over the projection period. Over 80 percent of the increase occurs prior to 1989 when petroleum revenues peak.

Economic growth in all three base case scenarios results in similar structural characteristics. Structural changes caused by growth affected each scenario in a similar fashion. In all scenarios, the importance of the support sector is projected to grow throughout the period. The proportion of the population which is employed is also projected to increase over the period. Population is projected to concentrate in Anchorage in all scenarios. The final structural pattern which is similar in all cases is the relationship between state revenues and expenditures. In all cases, expenditures exceed revenues by the end of the period, necessitating the reduction in the fund balance.

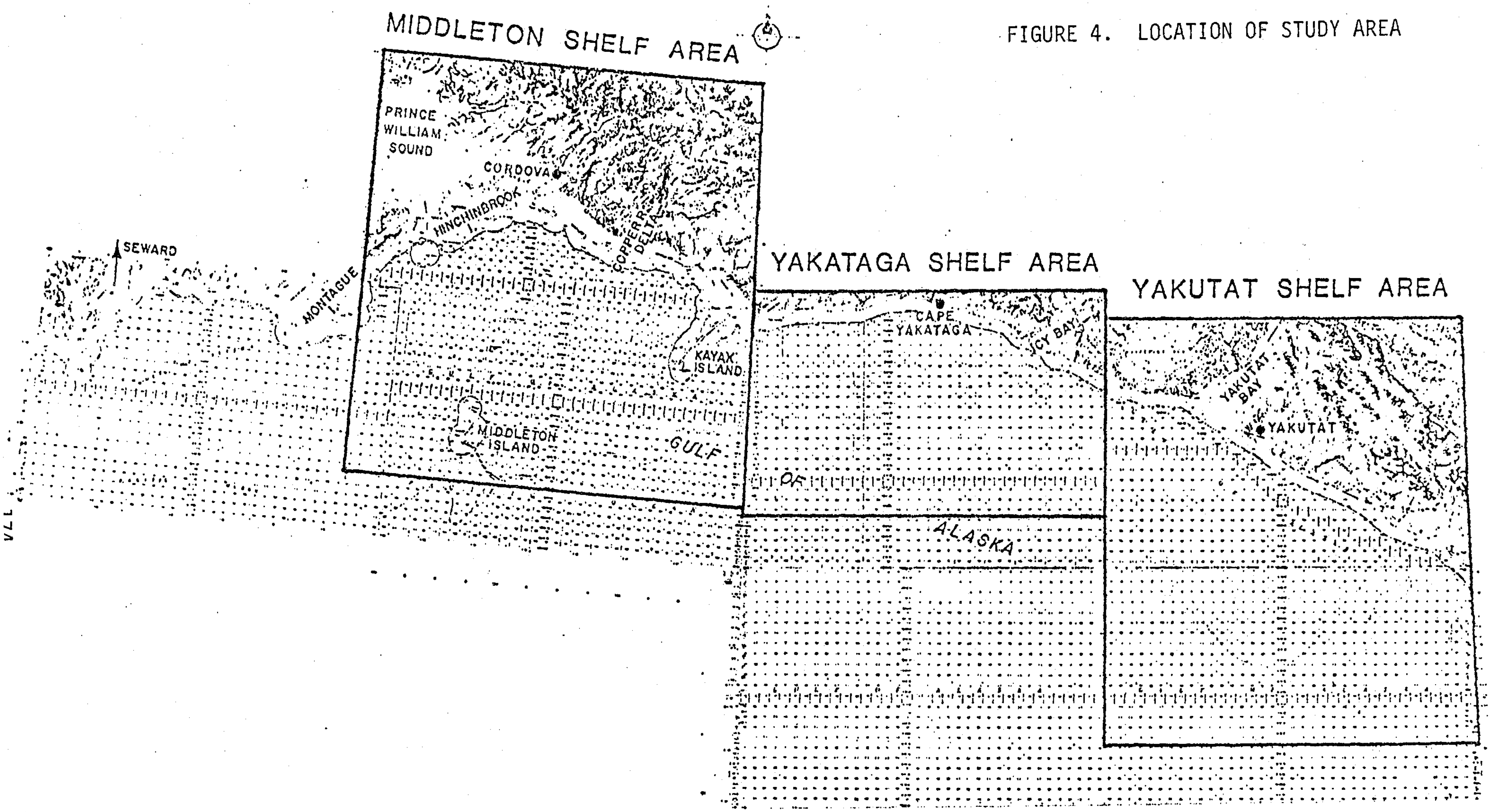
IV. THE IMPACT OF NORTHERN GULF OCS DEVELOPMENT ON THE ALASKAN ECONOMY: THE MODERATE BASE CASE

In order to capture the important dimensions of uncertainty surrounding oil and gas development in the Northern Gulf of Alaska, the development patterns implied by three alternative resource discovery scenarios were examined and contrasted with the base case projections presented above. Figure 4 shows the location of the development area. The alternate OCS scenarios were designed to capture differences in resource quantities, transport requirements, and technology, all of which will affect the impacts of any development which actually occurs. The three scenarios which were examined included the level of development which would occur if the mean, 95 percent, and 5 percent probability resource levels were discovered in the Northern Gulf lease sale area. This chapter will describe the impacts of each of these scenarios relative to the moderate base case. The impact of the 95 percent discovery relative to the low base case and the 5 percent discovery relative to the high base case will be discussed in the following chapter. The first section of this chapter examines the petroleum development scenarios, and the next section presents the economic impacts implied by each of these scenarios.

The Development Scenarios

Three offshore development scenarios were examined, based upon geological, technical, and employment data prepared by Dames and Moore (Dames and Moore, 1978). The petroleum development scenarios are for the proposed Gulf of Alaska OCS lease sale no. 55, currently scheduled for June 1980.

FIGURE 4. LOCATION OF STUDY AREA



SOURCE: Dames and Moore

This is the second sale in the Gulf; eleven unsuccessful exploratory wells were drilled on leases from the 1976 sale. There are no current plans for drilling on these leases (Dames and Moore, 1978). The scenarios discussed below are for the 5 percent, 95 percent, and statistical mean levels of U.S.G.S. resource estimates. The 95 percent scenario contains no economic reserves, so it is the same as the exploration scenario. These scenarios will affect the Alaska economy through the direct employment associated with the field development and production and the additional revenues earned by the state.

DIRECT EMPLOYMENT

The development of the Northern Gulf OCS will have two types of employment effects, direct employment in the field and headquarters employment. Headquarters employment is assumed to increase with development to provide the engineering support, coordination, and administration necessary for the level of activity in the field. All headquarters employment is assumed to be located in Anchorage.

The effect of direct OCS employment on the Alaska economy will depend on the extent the incomes earned in OCS development are spent in Alaska. Two factors limit the impact. First, the probable enclave nature of the development will limit the extent of the interaction with the economy when workers are on the job. Secondly, the international character of many offshore petroleum firms means they have regular, experienced crews which are dispatched to jobs around the world (Dames and Moore, 1978). The international character of these crews may mean that when they are not working, they will be outside Alaska. The first step in estimating the overall impact of Northern Gulf OCS development is to estimate the share of direct employment which will reside in Alaska and interact with the economy. Figure 5 illustrates the process used to derive the direct OCS employment impact on the Alaska economy.

Table 54 shows estimates of the share of direct employment to Alaska residents (SEAR) which were used to adjust the direct employment estimates provided by Dames and Moore (Dames and Moore, 1978).[1] In this context, Alaska resident means any employee who resides in Alaska and interacts with the economy during the duration of the project task. SEAR adjustments were made to the direct field employment only; headquarters employment is all assumed to reside in Alaska. The SEAR-adjusted employment is used in the scenarios provided to the MAP model to generate impacts.

SEAR coefficients were determined by the characteristics of the task and considerations of labor supply and demand. Such task characteristics as rotation, duration of the job, and specialized skills requirements were considered. It was assumed that the longer the task's off-duty rotation, the smaller was the probability that an employee would be an Alaska resident since he could travel from the site to a residence outside the state. For the short-duration jobs, it was assumed there was little reason for workers to reside in Alaska or for Alaskans to move into these jobs.

[1]Final estimates of direct OCS employment may vary slightly in the Dames and Moore report. This difference results from a change in the gas production scenarios to account for lower productivity in gas production than originally assumed.

FIGURE 5. DETERMINATION OF OCS EMPLOYMENT ESTIMATES USED IN THE MAP MODEL

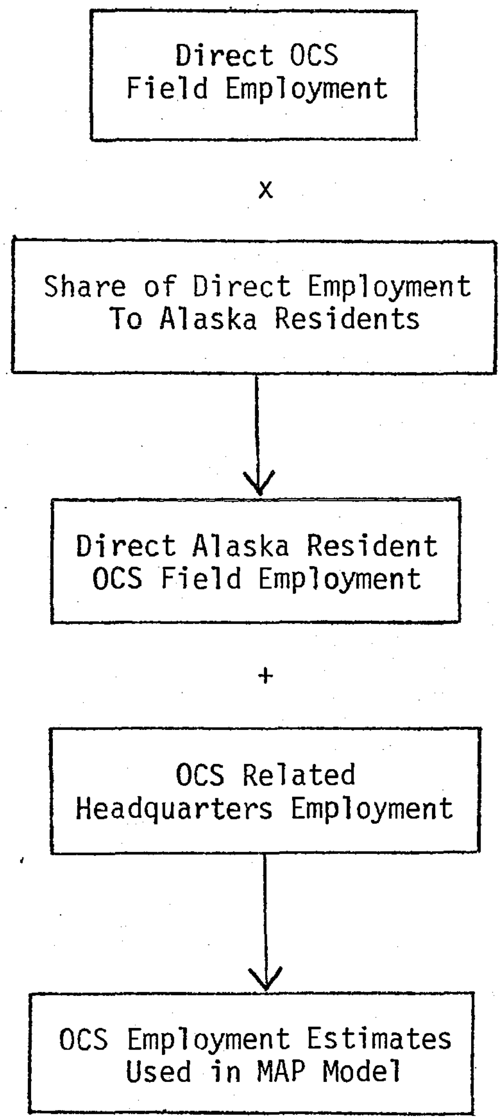


TABLE 54. ESTIMATED SHARE OF ALASKA RESIDENT EMPLOYMENT BY OCS TASK

Task	Phase	Time Period		
		1979-1984	1985-1989	1990-2000
Onshore				
1. Service Base	all phases	1.00	1.00	1.00
2. Helicopter Service	exploration & development	.50	.53	.58
	production	1.00	1.00	1.00
3. Service Base Construction	development	.50	.53	.58
4. Pipe Coating	development	.20	.21	.23
5. Onshore Pipeline Construction	development	.20	.21	.23
6. Oil Terminal Construction	development	.50	.53	.58
7. LNG Plant Construction	development	.50	.53	.58
8. Oil Terminal Operations	production	1.00	1.00	1.00
9. LNG Plant Operations	production	1.00	1.00	1.00
Offshore				
1. Surveys	exploration	.20	.21	.23
2. Rigs	exploration	.20	.21	.23
3. Platforms	development	.10	.30	.33
	production	1.00	1.00	1.00
4. Platform Installation	development	.10	.105	.116
5. Offshore Pipeline Construction	development	.10	.105	.116
6. Tugboats	exploration	.40	.42	.46
	development	.80	.88	.97
	production	.80	.88	.97

Finally, the more specialized the skills required, the greater the chance the skills would not be available in Alaska and outside workers would be hired. This meant a smaller probability that the worker would reside in Alaska. These factors change in a systematic fashion through the phase of development so that the probability of workers residing in Alaska increases from the exploration to the production phase. The final factor considered was time. It was assumed that over time, as more OCS projects occur and present non-OCS petroleum projects wind down, the supply of labor for each of these tasks within Alaska will increase. This will increase the probability that workers will reside in Alaska. This is reflected by the increase in SEAR coefficients through time. Appendix C describes the detailed assumptions behind the SEAR coefficients.

REVENUE

Unlike the OCS activity proposed for the Beaufort Sea, production in the Northern Gulf OCS occurs only in federal waters. Because of this, the state will not earn royalty, bonus, or severance tax revenues from the project. The major source of additional revenues will be the property tax revenues from onshore facilities. The property tax revenues earned by the state were based on the estimates of construction cost provided by Dames and Moore (Dames and Moore, 1978). The property tax which the state receives is 20 mills on certain oil and gas properties. The property tax specifically excludes such property as oil refining property, gas processing property, and interest or rights to produce oil. The property value taxed is depreciated over the life of the field and increased with inflation (Alaska Department of Revenue, 1977).

ALTERNATIVE NORTHERN GULF SCENARIOS

The Mean Probability Resource Level Scenario

The mean scenario represents activity surrounding exploration and development of tracts assumed to be leased in the 1980 sale. It is assumed that 1.4 billion barrels of oil and 5.0 trillion cubic feet of gas are discovered. In this scenario, the discoveries are located in nine separate fields, seven on the Yakutat shelf and two on the Middleton shelf (Dames and Moore, 1978).

Exploration activity in this scenario begins in 1981 and lasts for ten years. All phases of activity overlap. Field development and the construction of facilities begin in 1985 and last through 1990. Production begins in 1988. Total direct construction employment peaks in 1989. The major construction activity in 1989 is the installation of platforms. As construction employment declines, mining employment rises to a peak of 1,899 in 1991. Petroleum employment maintains a permanent workforce of approximately 1,000 after 1995. Approximately 70 permanent positions in manufacturing result from the operation of the LNG plant which begins operations in 1989. Transportation activity peaks in 1985 with 392 employees. (Employment levels are shown in Table 55.)

The nonproportional relation between Alaska resident employment and direct employment results from the changing task composition of industry employment. Alaska resident construction employment peaks at 915 in 1987, three years prior to the peak in total construction employment. After 1987 the major construction activity is platform installation which is offshore

TABLE 55. DIRECT EMPLOYMENT REQUIREMENTS
MEAN SCENARIO

	Construction		Mining[1]		Manufacturing		Transportation	
	Total Direct Employment	SEAR Adjusted Employment	Total Direct Employment	SEAR Adjusted Employment	Total Direct Employment	SEAR Adjusted Employment	Total Direct Employment	SEAR Adjusted Employment
1981	0	0	452	106	0		162	68
1982	0	0	564	171	0		206	87
1983	0	0	935	271	0		348	146
1984	0	0	989	284	0		368	155
1985	483	254	1,054	315	0		392	173
1986	1,417	533	863	286	0		358	290
1987	2,485	915	808	305	0		305	248
1988	2,661	777	1,077	576	0		318	262
1989	3,266	627	1,338	779	35	35	398	332
1990	2,941	622	1,702	1,114	35	35	314	290
1991	685	88	1,899	1,198	64	64	229	222
1992	0	0	1,484	1,034	70	70	196	191
1993	0	0	1,071	939	70	70	221	215
1994	0	0	840	840	70	70	221	215
1995	0	0	865	865	70	70	221	215
1996	0	0	965	965	70	70	221	215
1997	0	0	990	990	70	70	221	215
1998	0	0	1,015	1,015	70	70	221	215
1999	0	0	1,015	1,015	70	70	221	215
2000	0	0	1,015	1,015	70	70	221	215

[1] Includes headquarters employment based on 2.67 persons per exploration well, .6 persons per development well, and 40 persons per 2,000 barrels per day during production. Once peak is reached, production employment is maintained (Alaska OCS Office).

SOURCE: Dames and Moore, 1978

work, assumed to have a low Alaska resident share because it requires specialized skills and is temporary. Alaska resident mining employment peaks in 1991 which is when total mining employment peaks. By 1994 all mining employment is production employment, all of which is assumed to be Alaska resident. Manufacturing employment is assumed to be all Alaska resident. Transportation employment, like mining, has a much smaller Alaska resident component during exploration. Peak resident employment occurs in 1989 when 332 Alaska residents are employed in transportation.

The only state revenue effects of this development occur because of onshore facilities which fall under the state's property tax. Oil terminals and onshore pipelines are the properties taxed by the state. The property tax increases to a maximum of $7.8 million in 1992. By 2000 the property tax has fallen to $6.7 million. Table 56 shows the property tax revenues from this scenario.

The 5 Percent Probability Resource Level Scenario

This scenario describes the activity surrounding the exploration, development, and production in the largest assumed find discussed in this report. It is assumed that 4.4 billion barrels of oil and 13.0 trillion cubic feet of gas are discovered. Altogether eighteen fields are developed: twelve fields on the Yakatat shelf, five fields on the Middleton Shelf, and one field on the Yakataga shelf.

Exploration begins in 1981 and lasts ten years. Mining employment reaches an early peak of 1,448 in 1984 during exploration. Field development

TABLE 56. NORTHERN GULF OCS PROPERTY TAX REVENUES

(Millions of Nominal Dollars)

	Mean Scenario	5 Percent Scenario
1986	.1	.5
1987	2.0	.5
1988	2.4	1.1
1989	7.8	1.5
1990	7.8	17.8
1991	7.8	17.9
1992	7.8	18.0
1993	7.8	18.0
1994	7.7	17.9
1995	7.7	17.8
1996	7.5	17.7
1997	7.4	17.4
1998	7.2	16.9
1999	7.0	16.7
2000	6.7	16.2

SOURCE: Based on construction cost

begins in 1984 and lasts until 1992. This is two years longer than in the mean scenario. Construction employment begins in 1984 and reaches a peak of 7,861 in 1988. Mining employment reaches a peak of 3,749 in 1991 and maintains a permanent employment of approximately 2,000. Production of oil begins in 1988 and gas in 1989. This scenario also includes an LNG plant which begins production in 1988 and has a long-term employment of 170. Transportation employment peaks in 1989 during development, with 761 employees. Table 57 shows the employment levels in this scenario.

As in the mean scenario, the Alaska employment share is greatest in the production phase and smallest during exploration. Alaska mining employment peaks at 2,461 in 1991, when total mining employment peaks. Alaska employment plays a relatively small part in the exploration peak in 1984. The Alaska resident construction employment peaks one year prior to total construction employment. This is a result of the increased importance of platform installation after 1987. Peak Alaska resident construction employment is 2,222. The shifting task composition of transportation employment accounts for the increased importance of Alaska resident employment after production begins. After peaking in 1991 at 660, transportation employment maintains a permanent employment of about 520.

This scenario produces property tax revenues from onshore facilities. Property tax reveneus begin in 1986 with the completion of the first onshore pipeline. Revenues peak in 1992 at $18 million. By 2000 property tax revenues have fallen to $16.2 million. (See Table 56.)

TABLE 57. DIRECT EMPLOYMENT REQUIREMENTS
5 PERCENT SCENARIO

	Construction		Mining[1]		Manufacturing		Transportation	
	Total Direct Employment	SEAR Adjusted Employment	Total Direct Employment	SEAR Adjusted Employment	Total Direct Employment	SEAR Adjusted Employment	Total Direct Employment	SEAR Adjusted Employment
1981	0	0	541	166	0		196	82
1982	0	0	927	266	0		343	144
1983	0	0	1,426	340	0		441	185
1984	1,529	765	1,448	418	0		539	227
1985	3,461	2,101	1,315	391	0		490	430
1986	4,748	2,208	965	370	0		417	340
1987	4,866	2,222	900	399	0		445	363
1988	7,861	1,888	1,588	798	85	85	761	628
1989	6,051	998	2,681	1,539	85	85	656	536
1990	3,799	444	3,712	2,300	170	170	688	650
1991	3,867	449	3,749	2,461	170	170	699	660
1992	1,200	139	3,603	2,279	170	170	566	519
1993	0	0	2,926	2,248	170	170	512	501
1994	0	0	2,729	2,154	170	170	539	525
1995	0	0	2,126	2,014	170	170	539	525
1996	0	0	2,044	2,044	170	170	539	525
1997	0	0	2,144	2,144	170	170	539	525
1998	0	0	2,194	2,194	170	170	539	525
1999	0	0	2,194	2,194	170	170	539	525
2000	0	0	2,156	2,156	170	170	527	513

[1] Includes headquarters employment based on 2.67 persons per exploration well, .6 persons per development well, and 40 persons per 2,000 barrels per day during production. Once peak is reached, production employment is maintained (Alaska OCS Office).

SOURCE: Dames and Moore, 1978

The 95 Percent Probability Resource Level Scenario

The 95 percent probability resource level for the lease sale area in the Northern Gulf is no oil or gas resources. Because there are no resources, this scenario describes an exploration-only case. Exploration begins in 1981 and lasts four years. The maximum employment occurs in the first two years with 541 mining employees and 196 transportation employees. The Alaska share of this employment is low; at its maximum, it includes 149 mining employees and 82 transportation employees. Because there is no production, there are no property taxes generated by this project. (See Table 58.)

Definition and Measures of Impact

OCS development will lead to changes in those factors which have been isolated as important to economic growth: exogenous employment, personal income, and state expenditures. Changes in these factors will result in changes in population, the structure of employment, the state's fiscal position, and the regional distribution of growth. These changes are the economic impact of OCS development.

We will examine the impact of each of the three petroleum scenarios. The impacts will be compared to economic growth in the moderate case. The impact will vary since the scenarios vary in terms of their primary employment impact, timing, level of production, and revenues which accrue to the state. The impacts will be measured as changes from the base case. In making this comparison, it must be assumed that the economy responds the same to employment and revenues generated by Northern Gulf OCS development as it did to similar changes in the past.

TABLE 58. DIRECT EMPLOYMENT REQUIREMENTS
95 PERCENT SCENARIO

	Mining[1]		Transportation	
	Total Direct Employment	SEAR Adjusted Employment	Total Direct Employment	SEAR Adjusted Employment
1981	541	149	196	82
1982	541	149	196	82
1983	405	114	142	62
1984	111	21	40	17
1985	0	0	0	0

[1]Includes headquarters employment based on 4 persons per exploration well, .6 persons per development well, and 40 persons per 2,000 barrels per day during production. Once peak is reached, production employment is maintained (Alaska OCS Office).

SOURCE: Dames and Moore, 1978

Rapid economic growth associated with OCS development will affect most economic variables. Although many variables will be affected, a much smaller number is important; and information on these dimensions of impact will describe the effect of rapid growth on the state economy. Petroleum development in the Alaska OCS can have two major types of impact. First, OCS development will affect the magnitude of the economic indicators. OCS development will expand the economy. Secondly, OCS development may change the process of growth. OCS development may change certain structural trends observed in the base case. Both of these dimensions will be considered when the impact of OCS development is examined.

The impact of any specific scenario can be discussed by referring to the following set of questions:

1. How has the magnitude of economic indicators been changed by OCS development?
   a. How has the growth of the aggregate indicators of economic activity--employment, population, personal income--been affected by OCS development?
   b. How has OCS development affected the state's fiscal position? Have state revenues and expenditures changed? What is the effect on the fund balance?
   c. What is the effect of OCS development on the earning power of individuals, as measured by real per capita income?

d. What is the effect of OCS development on the average level of services, as measured by real per capita state expenditures, provided by the state?

2. Has OCS development changed the process of growth?

    a. Are the components of population growth changed in relative importance?

    b. Are past trends in the age-sex distribution and its effect on the dependency ratio changed by OCS development?

    c. Are past trends in the composition of employment changed by OCS development?

    d. Does OCS development change the interaction among regions?

Summary of the Moderate Base Case

The moderate base case is one of three base cases used in this report. The alternative base cases used in this study differ by the assumed level of previous OCS activity; the non-OCS assumptions in all three base cases are similar. The moderate base case includes moderate development scenarios of the first Lower Cook OCS lease sale area and the Beaufort Sea OCS lease sale area.

Substantial growth is projected over the period 1978 to 2000 for the moderate base case. Employment is projected to reach 365,000 by 2000 and grow at an annual average rate of 3.3 percent. The most rapid growth occurs with the construction of the ALCAN gas line between 1981 and 1984. Population is projected to grow at a rate slightly less than employment and reach 789,000 by 2000. Personal income is projected to expand at an average annual rate of 10.6 percent between 1978 and 2000. The growth of these aggregate variables, while substantial, is less than the growth during the period 1965-1976.

Four structural characteristics of this projected growth were observed. First, as the scale of the economy expands, the importance of the support sector increases. Secondly, the changing age distribution of the population and labor force participation lead to decreases in the dependency ratio (population/employment). Third, as the state grows, more of this growth is concentrated in Anchorage. Finally, the state's fund balance increases to a peak and then falls as expenditures exceed revenues and the fund balance is used to make up the difference.

The Impacts of Northern Gulf OCS Development: Mean Scenario

This section will describe the economic impact of the mean Northern Gulf OCS development scenario. The impact of this scenario is, as would be expected, intermediate relative to the impacts of the high and low scenarios. Because of this, the mean scenario impacts will be described in detail in this section, while the impacts of the 5 percent and 95 percent scenarios will be described as they relate to this scenario.

The mean Northern Gulf OCS development scenario includes the development of a number of fields. Each phase of activity--exploration, development, and production--occurs at different times in each field, so the phases of activity are not distinct. Exploration begins in 1981. Development begins in 1985. Both of these phases end in 1990. Production begins two years prior to the end of exploration and development in 1988. This schedule of activity provides two significant time periods to examine: 1980-1990, when development and exploration occur, and 1990-2000, when only production activity occurs.

EMPLOYMENT

This section will examine the impact of OCS development on employment. Employment is one of the aggregate indicators of economic growth. OCS development increases the growth of employment in the projection period. OCS development not only affects the magnitude of employment growth but may also change the structure of employment observed in the base case. If OCS development affects the growth of industries differently than in the base case, the structure will change.

By 2000 employment is projected to be approximately 5,800, or 1.6 percent greater than in the moderate base case. (See Table 59.) The average growth rate between 1978 and 2000 has increased slightly from 3.3 percent per year in the base case to 3.4 percent per year with OCS development. The peak impact occurs in 1990 when employment is 10,300, or 3.9 percent greater than in the base case. This is the same year that total direct Alaska resident employment reaches its peak.

TABLE 59. EMPLOYMENT IMPACT
NORTHERN GULF OCS
MEAN SCENARIO, ALASKA

	Base Case Employment	Mean OCS Scenario Employment	Impact
1980	194,054	194,054	0
1985	224,931	227,742	2,811
1990[1]	266,632	278,055	11,423
1995	308,016	312,619	4,603
2000	364,721	370,496	5,775

[1]Peak direct Alaska resident employment. The end of the exploration-development phase.

SOURCE: MAP Model

The overall general pattern of employment impact follows the pattern of direct Alaska resident employment. Direct employment is close to 20 percent of the total impact throughout the period. Development of the Northern Gulf OCS does not prevent the fall in employment after the peak ALCAN construction years in 1983. The growth of employment from 1980, the year of the OCS lease sale, to 1990, the end of both the exploration and development, averages 3.7 percent per year. This is 13 percent greater than in the base case. The growth rate after 1990 is less than in the base case. The reduced rate of growth in the production period is a result of the decrease in employment impact from its peak in 1990.

The growth caused by OCS development does not significantly change the structure of employment from that observed in the base case. Table 60 compares the structure of the economy, as described by the employment distribution in the base and impact cases. The major change in the structure of the economy observed in the base case is supported by the introduction of the mean Northern Gulf OCS development scenario. The support sector increases in importance throughout the projection period, increasing to approximately 53 percent in both cases.

POPULATION

Population is an aggregate indicator of economic activity which measures the response of people to increased employment opportunities. OCS development will increase the magnitude of population growth. OCS development may also change the characteristics of the population such as the age-sex

TABLE 60. THE STRUCTURE OF THE ECONOMY
MEAN SCENARIO
ALASKA

	Proportion of Total Employment				
	1980	1985	1990	1995	2000
Support Sector					
Moderate Base	39.5	42.7	46.2	49.6	53.1
Mean Scenario	39.5	42.9	46.8	49.8	53.2
Government					
Moderate Base	36.0	33.1	29.6	26.5	23.1
Mean Scenario	36.0	32.7	28.8	26.2	22.9
Basic Sector					
Moderate Base	24.5	24.2	24.2	23.8	23.8
Mean Scenario	24.5	24.3	24.4	24.0	24.0

Support Sector includes transportation-communication-public utilities, trade, finance, and service employment.

Government includes state, local, and federal employment.

Basic Sector includes mining, manufacturing, agriculture-forestry-fisheries, and construction employment.

distribution or the importance of the components of change. This section will examine the impact on population of Northern Gulf OCS development.

Population is 16,440 greater by 2000 because of Northern Gulf OCS development; this is a 2.1 percent increase over the base case. Population impact peaks in 1990 at about 21,000, which is 3.5 percent greater than the base case. This is the year in which both the employment impact and the level of direct Alaska resident employment on the project reach their peak. The average growth rate between 1978 and 2000 is 3.2 percent per year. This is a slight increase from the 3.1 percent rate in the base case. As in the base case, population grows slightly slower than employment; the dependency ratio falls from 2.28 in 1978 to 2.17 in 2000. Table 61 describes the population impact.

The pattern of growth is affected by OCS development. The development of the Northern Gulf OCS does not reverse the decrease experienced after the peak ALCAN construction year, 1983. In both cases, population falls by less than one percent. Population, like employment, grows faster than in the base case in the period from the beginning of exploration to the end of development and grows slower after that. Between 1980 and 1990, the average annual rate of growth is 3.5 percent in the mean scenario and 3.1 percent in the base case. Between 1990 and 2000, the rate of growth in the mean scenario is 2.8 percent, compared to 2.9 percent in the base case. The main reason for this is that impact population increases throughout exploration and development. After that, impact population falls and stabilizes during production.

TABLE 61. POPULATION IMPACT
NORTHERN GULF OCS
MEAN SCENARIO, ALASKA

	Base Case Population	Mean OCS Scenario Population	Impact
1980	434,173	434,173	0
1985	509,057	513,372	4,315
1990[1]	591,580	612,523	20,944
1995	677,649	692,017	14,368
2000	789,287	805,725	16,437

[1]Peak direct Alaska resident employment. The end of the exploration-development phase.

SOURCE: MAP Model

Northern Gulf OCS development affects the components of population change. The most important effect occurs during the buildup to the peak impact in 1990. Table 62 compares the role of migration in population change between 1984 and 1995. These years cover the peak development years when the population impact from OCS development increases to its peak of 21,000 in 1990 and then falls to a constant level of approximately 15,000 by 1996. The importance of migration as a component of population change is increased relative to the base case during this period. Migration accounts for over 50 percent of the population change from 1986 to 1990 in the OCS case, while it accounts for over 50 percent only in 1988 and 1989 in the base case. Between 1990 and 1995, migration is less important to population change than in the base. The decrease in level of employment in the Northern Gulf and the higher number of births resulting from high population are responsible for this effect. By the time the population impact stabilizes in 1995, the importance of migration as a component of population change is the same; by 1996 migration is responsible for 51.4 percent of the change in population in both cases.

Two related trends concerning the structure of the population were observed in both the base case and the historical period. The first was the reduction in the dependency ratio. This trend is also projected to occur in the OCS development case. By 2000 the dependency ratio in both the base and OCS development cases has fallen to 2.17. The major reasons for this are an increase in the labor force participation of the working-age population and an increase in the proportion of working-age population in the population. This is related to the second observed change in the

TABLE 62. THE MIGRATION COMPONENT OF POPULATION CHANGE
NORTHERN GULF MEAN OCS SCENARIO
1986-1996

Migration as a Percent of Total Population Change

	Moderate Base Case	Mean OCS Scenario
1986	43.1	53.6
1987	49.1	59.7
1988	53.5	58.8
1989	53.2	55.4
1990	45.2	50.0
1991	40.2	28.5
1992	42.1	25.5
1993	46.8	40.2
1994	46.5	42.4
1995	49.1	47.5
1996	51.4	51.4

SOURCE: MAP Model

structure of the population, the aging of the population. Table 63 shows the age-sex distribution prior to OCS development and at the end of the projection period. As in the base case, the population is projected to age. The population over 30 increases from 37.6 percent in 1980 to 43 percent in 2000.

PERSONAL INCOME

The final aggregate indicator of economic growth is personal income. The impact of OCS development is to increase personal income relative to the base case. (See Table 64.) By 2000 Northern Gulf OCS development will have increased the level of personal income by $937.6 million, or 2.4 percent. Personal income is projected to increase at an average annual rate of 10.8 percent between 1978 and 2000. This is slightly greater than the growth rate in the base case of 10.7 percent per year. The peak impact occurs in 1990, when personal income is $1.1 billion, or 7.3 percent greater than in the base case.

The impact of Northern Gulf OCS development on personal income rises to its 1990 peak, then falls until 1994. This coincides with the decrease in the level of project employment. After 1994 direct resident employment is stable; the rise in personal income impact is a result of increasing prices and wages. OCS development is not enough to prevent the fall in personal income after the peak ALCAN year in 1983. The magnitude of the fall is similar in both the base and impact cases. Growth in personal income averages a rate of 11.4 percent per year during the development and exploration phase. After the end of this phase in 1990, the average

TABLE 63. AGE-SEX STRUCTURE OF THE POPULATION
NORTHERN GULF MEAN OCS SCENARIO
ALASKA

Age Cohorts	1980 Males	1980 Females	2000 Males	2000 Females
0-14	15.08	14.56	14.27	13.81
15-29	18.47	14.33	15.84	13.09
30-49	13.35	12.12	14.83	13.37
50-59	3.31	2.92	3.83	3.70
60 +	3.06	2.81	3.37	3.90

SOURCE: MAP Model

TABLE 64. PERSONAL INCOME IMPACT
NORTHERN GULF OCS MEAN SCENARIO
ALASKA

(Millions of Nominal Dollars)

	Base Case Personal Income	Mean OCS Scenario Personal Income	Impact
1980	5,395	5,395	0
1985	8,810	9,008	198
1990[1]	14,836	15,919	1,083
1995	23,829	24,367	537
2000	39,559	40,496	937

[1]Peak direct Alaska resident employment. The end of the exploration-development phase.

SOURCE: MAP Model

rate of growth is 9.8 percent per year. As with employment and population, the rate of growth of personal income is faster during the exploration-development phase than during the same time period in the base case and slower than in the base case after this period.

The growth in personal income reflects the ability of the economy to generate increased returns to factors. It is not the best measure of the welfare of the region because it reflects both the growth of employment and prices. One measure of welfare is real per capita income. This measures the command of the average individual over goods and services. Real per capita income accounts for the effect of prices and population on the growth in personal income. Table 65 shows the impact of Northern Gulf development on real per capita income. The development of the Northern Gulf OCS has two differential periods of impact. OCS activity has a positive effect on real per capita incomes until 1992; after this, the impact on real per capita income is negative. The impact on real per capita income is greatest in 1987, the year of the peak direct Alaska resident construction employment; real per capita income is $140, or 3.0 percent greater than in the base case. By 2000 real per capita income is less than but not significantly different from the base case. The differential between the OCS development and base cases is affected by the composition of employment. The greatest difference occurs when the peak in high wage construction employment occurs, not when the peak in total employment occurs. Real per capita income as a measure of welfare does not consider the distribution of income.

TABLE 65. REAL PER CAPITA INCOME IMPACT
NORTHERN GULF OCS MEAN SCENARIO
ALASKA

	Real Per Capita Income			Relative Price Index		
	Base Case	Mean Scenario	Impact	Base Case	Mean Scenario	Impact
1980	4,029	4,029	0	308.4	308.4	0
1985	4,463	4,511	48	387.8	389.0	1.2
1987[1]	4,732	4,873	140	425.5	429.1	3.6
1990[2]	5,119	5,250	131	489.9	495.1	5.2
1995	5,720	5,706	-14	614.8	617.1	2.3
2000	6,456	6,448	- 7	776.4	779.5	3.1

[1]Peak real per capita income impact.

[2]Peak direct Alaska resident employment. The end of the exploration-development phase.

SOURCE: MAP Model

The rapid growth which occurs during the exploration and development phases increases the price level relative to the base case. The relative price index is one percent greater than in the base by 1990, the end of the exploration-development phase. After 1990 the economy in the OCS development case is projected to expand less rapidly than in the base case. Because of this, prices do not increase as fast in the OCS case, and the price differential between the cases is reduced.

THE STATE FISCAL POSITION

The development of the Northern Gulf OCS will affect the state fiscal position in two ways. First, OCS development will affect the revenues received by the state. The state will receive direct revenues from the OCS activity in the form of property taxes. The extra economic growth which will result because of OCS activity will also affect state revenues. Secondly, OCS development will affect the state's fiscal position through its impact on state expenditures. The increase in population and economic activity which will result from OCS development may change the determinants of state expenditures. Both of these changes will affect the fund balance and the level of services provided by the state. This section will describe the impact of OCS development on the state's fiscal position.

REVENUES

Northern Gulf OCS development provides the state with a new source of revenue, property taxes from onshore facilities. However, the major revenue impact results from those revenues not directly generated by the project. Property tax revenues from Northern Gulf OCS development are projected to be minimal in the mean scenario. Between 1989 and 1993, they are approximately $7.8 million per year. This is only .2 percent of the total revenues in 1990. The direct property tax revenues fall to $6.7 million by 2000.

The overall revenue impact is much larger. Table 66 illustrates the impact of OCS development on total general fund revenues and endogenous revenues, which is a component of general fund revenues. By 1990, total general fund revenues are about $5 billion. This is $95 million greater than in the base case, a two percent increase because of OCS development. The revenue impact falls with the decrease in direct employment until 1995, when direct resident employment stabilizes. After 1995, the revenue impact increases. By 2000, the impact on total general fund revenues is $95 million. Total general fund revenues grow only slightly faster because of OCS development over the 1980-to-2000 period. After 1995, general fund revenues increase at a rate of 5.6 percent per year compared to 5.5 percent in the base case.

The major components of impact revenues are the endogenous revenues, those revenues generated by the growth of the economy.[1] The income taxes paid by OCS resident Alaska employees are included in these revenues. In 1995, when the impact on general fund revenues is the greatest, endogenous revenues account for 88 percent of the revenue impact. By 2000, these revenues account for 95 percent of the impact. Endogenous revenues

[1]Endogenous revenues include personal income taxes, nonpetroleum corporate income taxes, business license taxes, motor fuels tax, alcohol tax, cigarette tax, ad valorem tax, school tax, fees and license revenues, ferry revenues, and miscellaneous taxes and revenues.

TABLE 66. STATE REVENUE IMPACT
NORTHERN GULF OCS MEAN SCENARIO
ALASKA

(Millions of Nominal Dollars)

	General Fund Revenues			Endogenous Revenues		
	Base Case	Mean Scenario	Impact	Base Case	Mean Scenario	Impact
1980	1,625	1,625	0	231	231	0
1985	3,629	3,639	10	450	458	8
1990[1]	4,712	4,804	91	869	945	76
1991[2]	4,880	4,975	95	979	1,063	84
1995	5,864	5,911	47	1,600	1,647	46
2000	7,678	7,773	95	3,071	3,161	90

[1]Peak direct Alaska resident employment. The end of the exploration-development phase.

[2]Peak revenue impacts.

SOURCE: MAP Model

increase to $3.2 billion by 2000. This is 3 percent greater than in the base case. As with total revenues, the impact peaks in 1991 and begins rising again after 1995 when direct employment stabilizes. Over the period 1980 to 2000, endogenous revenues are projected to increase at an average rate of 14 percent per year. This is greater than the 13.8 percent rate of increase in the base case.

STATE EXPENDITURES

Table 67 shows the expenditure impact of OCS development. Total expenditures increase because of OCS development and the pattern of expenditure impact follows the projected pattern of OCS direct resident employment. By 2000, state expenditures are projected to be $10.1 billion with Northern Gulf OCS development; this is $106 million, or one percent, greater than in the base case. The maximum expenditure impact is achieved nine years earlier. In 1991, state expenditures are $188 million, or 4 percent greater than in the base case. Expenditures increase at a rate of 11.3 percent per year between 1980 and 1991, when they peak, and 7.9 percent after 1991. This is greater than the base case rate of 10.9 percent in the earlier period but less than the 8.3 percent in the later period.

Expenditures increase for two reasons. First, expenditures increase because of increases in population and prices. As population and prices increase, expenditures must increase to maintain the same level of service. Secondly, expenditures will increase if the level of service provided by state government increases. Real per capita expenditures are a measure of the level of services provided by the state. Table 67

TABLE 67. STATE GOVERNMENT EXPENDITURE IMPACTS
NORTHERN GULF OCS MEAN SCENARIO
ALASKA

	Total State Expenditures (Millions of Nominal Dollars)			Real Per Capita State Expenditures		
	Base Case	Mean Scenario	Impact	Base Case	Mean Scenario	Impact
1980	1,567	1,567	0	1,170	1,170	0
1985	2,748	2,762	15	1,392	1,383	- 9
1990[1]	4,557	4,713	157	1,572	1,554	-18
1991[2]	4,904	5,092	188	1,578	1,575	- 3
1995	6,667	6,733	66	1,600	1,577	-24
1996	7,201	7,268	67	1,601	1,576	-25
2000	10,029	10,135	106	1,637	1,614	-23

[1]Peak direct Alaska resident employment. The end of the exploration-development phase.

[2]Peak state expenditure impact.

SOURCE: MAP Model

shows the impact of OCS development on the real per capita expenditures. Real per capita expenditures are less than in the base case throughout the period. The difference is less than 1.5 percent throughout the period. The maximum difference in real per capita expenditures is in 1996 when they are $25 less than in the base case. By 2000, real per capita expenditures are $1,614 with OCS development; this is 1.4 percent less than in the base case.

FUND BALANCE

The state's fund balance consists of the total of the permanent and general fund. The permanent fund will not be affected by Northern Gulf OCS development because OCS development on the Northern Gulf does not produce the type of revenues subject to the permanent fund. The fund balance impact will be on the general fund. Table 68 shows the impact of OCS development on the fund balance. The fund balance follows the same pattern as in the base case, rising to a peak in 1997 and then falling as the fund balance is drawn on to meet expenditures. However, development of the Northern Gulf OCS according to the mean scenario reduces the level of the fund balance. By the end of the exploration-development phase in 1990, the fund balance is projected to be $150 million less than in the base case. This is a 1.2 percent reduction. By the end of the projection period in 2000, the fund balance is $14.9 billion, or almost 2 percent less than in the base case. The reduced fund balance generates less interest revenue which contributes to the reduction in the fund balance.

TABLE 68. IMPACT ON STATE FISCAL POSITION
NORTHERN GULF OCS MEAN SCENARIO
ALASKA

(Millions of Nominal Dollars)

	Fund Balance			General Fund Revenues Minus General Fund Expenditures		
	Base Case	Mean Scenario	Impact	Base Case	Mean Scenario	Impact
1980	1,329	1,329	0	361	361	0
1985	5,936	5,925	- 11	1,429	1,426	- 2
1990[1]	12,281	12,131	-150	1,044	1,004	-39
1991[2]	13,193	12,983	-210	912	851	-60
1995	15,809	15,513	-296	416	409	- 7
1997[3]	16,164	15,864	-300	91	88	- 2
2000	15,200	14,913	-287	-546	-536	10

[1]Peak direct Alaska resident employment. The end of the exploration-development phase.

[2]Maximum impact on General Fund revenues net of expenditures.

[3]Maximum fund balance impact.

SOURCE: MAP Model

The fund balance is reduced because the increased revenues associated with OCS development do not cover the increased cost. The difference between general fund revenues and general fund expenditures describes the imbalance between revenues and expenditures. The addition of the Northern Gulf OCS development according to the mean scenario reduces net revenues below their base case levels between 1981 and 1997. During this period, the revenue impact of OCS development is less than the expenditure impact. This results in part from the reliance on petroleum revenues which are not substantially increased by OCS development. After 1997, the OCS impact on net revenues is positive, which means the revenue impact is greater than the expenditure impact. This is not enough to make the overall fund balance impact positive, but it does reduce the negative fund balance impact of OCS development. The negative impact on the fund is at its maximum in 1997 when the fund balance is $300 million less than in the base case. By 2000, the fund balance is only $287 million less than in the base case. After 1997, expenditures in both the base and impact cases grow at similar rates, while revenues grow slightly faster with OCS development. This difference in growth rates causes the reduction in the negative fund balance impact by 2000. The growth in revenues is primarily a result of the faster growth of endogenous revenues.

The overall impact of Northern Gulf OCS development on the state fiscal position is negative. The fiscal position is a combination of the impact on state services as measured by real per capita expenditures and the fund balance. A clear negative fiscal impact can be seen since the OCS development decreases both the fund balance and the level of real per capita income from their base case levels.

THE REGIONS

This section examines the regional impacts of OCS development on two regions, Anchorage and Southcentral Alaska. Different types of impact can be expected in each region since the character of the regions differs. Anchorage is the metropolitan center of the state. OCS development will impact Anchorage through both the direct OCS headquarters employment and Anchorage's role as the administration and distribution center for the state. Southcentral will be mainly affected by the direct OCS development; Northern Gulf activity occurs within Southcentral Alaska. This section will describe the impact of OCS activity on each region in terms of the growth of the aggregate indicators of economic growth--population, employment, and disposable real personal income--and changes in the structure of the economy as measured by the distribution of employment.

Anchorage

Table 69 shows the impact on Anchorage of developing the Northern Gulf OCS according to the mean scenario. As at the state level, each of these indicators increases because of OCS activity. The pattern of increase follows the pattern of direct resident employment impact.

Population is projected to increase to 431,026 by 2000 with Northern Gulf OCS development. This is an 8,417, or 2 percent, increase over the base case. Population grows at an average annual rate of 3.7 percent from 1980 to 2000. This is slightly faster than the 3.6 percent growth rate in the base case over the same time period. The Anchorage population impact peaks in 1990, when population is 10,343 greater than in the

TABLE 69. IMPACT ON AGGREGATE INDICATORS OF ECONOMIC GROWTH
NORTHERN GULF OCS MEAN SCENARIO
ANCHORAGE

	Population		
	Base Case	Mean Scenario	Impact
1980	207,323	207,323	0
1985	248,194	249,962	1,768
1990	295,590	305,932	11,343
1995	350,467	357,795	7,328
2000	422,609	431,026	8,417

	Employment		
	Base Case	Mean Scenario	Impact
1980	91,938	91,938	0
1985	110,055	111,258	1,203
1990	134,221	139,743	5,522
1995	160,260	162,462	2,202
2000	196,092	199,012	2,920

	Real Disposable Personal Income (Millions of Constant Dollars)		
	Base Case	Mean Scenario	Impact
1980	677	677	0
1985	887	899	12
1990	1,177	1,235	58
1995	1,524	1,547	23
2000	2,015	2,047	32

SOURCE: MAP Model

base case. Even though the major direct employment occurs in the South-central region, Anchorage has almost half of the population impact. In 1990, 49 percent of the state population impact occurs in Anchorage; by 2000, the Anchorage impact is 51 percent of the statewide impact. As in the base case, population continues to concentrate in Anchorage. By 2000, Anchorage contains 53.5 percent of the state population in both the base case and the OCS development case.

Employment also increases because of Northern Gulf OCS development. By 2000, employment is projected to be 199,012, which is almost 3,000 greater than in the base case. Over the impact period, 1980-2000, employment grows at an average rate of 3.9 percent per year in the OCS development case, which is a slight increase over the base case growth rate. The Anchorage employment impact also peaks in 1990 at 5,522, which is 4 percent greater than the base case population. Anchorage has close to 50 percent of the OCS employment impact throughout the period. As in the base case, population increases slower than employment; the dependency ratio has fallen to 2.17 by 2000. This is slightly higher than the 2.16 dependency ratio in the base case in 2000.

Real disposable income is projected to be $2.0 billion in 2000, an increase of $32 million over the base case. Real disposable income increases at an average rate of 5.7 percent per year from 1980 to 2000, which is slightly faster than the 5.6 percent growth rate in the base case.

ECONOMIC STRUCTURE

The impact of OCS development in the Northern Gulf may not affect all industries equally. Table 70 illustrates the effect of OCS development on the structure of employment. All of the industrial sectors grow with OCS development. As in the base case, the most rapid growth occurs in the support sector. Over the impact period, 1980-2000, transportation-communication-utilities and local construction increases its share of employment from 14.9 percent to 17.7 percent; and trade, services, and finance-insurance-real estate increases its share from 46.4 percent to 58.9 percent. The basic sector maintains a relatively constant share of employment; the increase in this sector comes mainly from the growth in manufacturing. Although government employment increases, its share falls from 34.6 percent to 19.2 percent between 1980 and 2000. The development of the Northern Gulf OCS supports the changing structure of the economy projected in the base case.

Southcentral Alaska

Table 71 describes the impact of Northern Gulf OCS development according to the mean scenario on the Southcentral region of Alaska. This table shows three aggregate indicators of economic growth which are projected to increase with OCS development. The lease sale areas are located in the Southcentral region, so the major direct impact will occur in this region. The relatively underdeveloped support sector of the region will limit the impact of OCS development.

TABLE 70. ECONOMIC STRUCTURE
NORTHERN GULF OCS MEAN SCENARIO
ANCHORAGE

	Support Sector I		Support Sector II		Government		Basic Sector	
	Employment	% of Total	Employment	% of Total	Employment	% of Total	Employment	% of Total
1980	42,516	46.4	13,652	14.9	31,763	34.6	3,746	4.1
1985	54,917	49.7	17,453	15.8	33,527	30.3	4,632	4.2
1990	74,018	53.6	22,850	16.5	35,580	25.8	5,692	4.1
1995	89,403	56.0	27,195	17.0	36,368	22.8	6,780	4.3
2000	114,667	58.9	34,495	17.7	37,427	19.2	8,107	4.3

Support Sector I includes trade, services, and finance-insurance-real estate employment.

Support Sector II includes transportation-communication-public utilities and other construction employment.

Government includes state, local, and federal employment.

Basic Sector includes manufacturing, agriculture-forestry-fisheries, mining, and exogenous construction employment.

SOURCE: MAP Model

TABLE 71. IMPACT ON AGGREGATE INDICATORS OF ECONOMIC GROWTH
NORTHERN GULF OCS MEAN SCENARIO
SOUTHCENTRAL

	Population		
	Base Case	Mean Scenario	Impact
1980	59,054	59,054	0
1985	63,915	66,203	2,287
1990	70,015	76,801	6,786
1995	74,402	78,879	4,478
2000	81,385	86,386	5,001

	Employment		
	Base Case	Mean Scenario	Impact
1980	23,745	23,745	0
1985	26,323	27,497	1,174
1990	30,054	33,520	3,466
1995	32,810	34,629	1,819
2000	36,886	38,978	2,092

	Real Disposable Personal Income (Millions of Constant Dollars)		
	Base Case	Mean Scenario	Impact
1980	184	184	0
1985	219	235	16
1990	277	329	52
1995	330	355	25
2000	407	439	31

SOURCE: MAP Model

Population is projected to grow at an average annual rate of 1.9 percent from the lease sale in 1980 to the end of the period. By 2000, the population is 86,386, which is 5,001 or 6.1 percent greater than in the base case. The peak population impact occurs at the end of the exploration-development phase in 1990. Population is almost 6,800 greater than in the base case.

Employment is projected to increase to 38,978 by 2000, which is almost 2,100 greater than in the base case. With Northern Gulf development, employment increases at an annual rate of 2.5 percent between 1980 and 2000, compared to 2.2 percent in the base case. Peak employment impact occurs in 1990 when development and exploration end and peak direct Alaska resident employment occurs. In 1990 employment is 3,466 greater than in the base case. Direct resident OCS employment accounts for 46 percent of the total employment impact in 1990 and 41 percent in 2000.

Real disposable personal income in 2000 is $31 million greater than the base case because of OCS development. As with the population and employment impacts, the peak real disposable personal income impact occurs at the end of the exploration-development phase in 1990. Real disposable personal income is $52 million, or 20 percent, greater than in the base case in 1990. The importance of the high wage OCS employment results in this increase. Northern Gulf OCS development has a major impact on Southcentral Alaska.

ECONOMIC STRUCTURE

Northern Gulf OCS development according to the mean scenario supports the structural change which was projected in the base case. All sectors increase employment between 1980 and 2000; however, the rate of increase differs between industries. As in the base case, government's share decreases from 20.2 percent in 1980 to 16.3 percent. Trade, service, and finance-insurance-real estate expands its share of employment from 38.2 percent to 42.6 percent between 1980 and 2000. This response is expected, since the local economy will expand the goods and services produced locally as its scale increases. With the buildup of OCS activity in the Northern Gulf, the basic sector increases its share from 26.9 percent in 1980 to 27.5 percent in 1990. After the peak in Northern Gulf activity and the shutdown of the Upper Cook Inlet fields in 1990, the basic sector's share of total employment is reduced to 25.5 percent. Table 72 describes these structural changes.

The Impacts of Northern Gulf OCS Development: 5 Percent Scenario

The five percent probability resource level scenario projects a higher level of oil and gas discovery than the mean scenario. The higher level of discovery requires greater development activity than in the mean scenario. The most important difference between these scenarios is the magnitude of direct employment; differences in magnitude are also the major differences between the impacts associated with each scenario. This section will describe the magnitude of the impact associated with the

TABLE 72. ECONOMIC STRUCTURE
NORTHERN GULF OCS MEAN SCENARIO
SOUTHCENTRAL

	Support Sector I		Support Sector II		Government		Basic Sector	
	Employment	% of Total	Employment	% of Total	Employment	% of Total	Employment	% of Total
1980	9,173	38.2	3,515	14.7	4,837	20.2	6,462	26.9
1985	10,792	38.8	4,316	15.5	5,412	19.4	7,317	26.3
1990	13,321	39.1	5,338	15.7	6,058	17.8	9,358	27.5
1995	14,641	41.4	5,442	15.4	6,265	17.7	9,040	25.5
2000	17,155	42.6	6,157	15.3	6,548	16.3	10,369	25.8

Support Sector I includes trade, services, and finance insurance-real estate employment.

Support Sector II includes transportation-communication-public utilities and other construction employment.

Government includes state, local, and federal employment.

Basic Sector includes manufacturing, agriculture-forestry-fisheries, mining, and exogenous construction employment.

SOURCE: MAP Model

5 percent scenario in terms of four measures of economic activity: employment, population, state expenditures, and the fund balance. We will also compare the structural similarities and differences between the mean scenario and the 5 percent scenario.

The five percent scenario includes the development of eighteen fields. The number of fields developed means that the phases of development will overlap. For our analysis, we will concentrate on the period between the lease sale in 1980 and the end of exploration in 1991. This year is also the year of peak direct resident employment. This period includes exploration which lasts from 1981 to 1991 and the major portion of the development phase which lasts from 1984 to 1992. The period after 1992 is dominated by production.

GENERAL PATTERN OF GROWTH

The general pattern of development projected with the inclusion of the 5 percent Northern Gulf scenario is shown in Table 73. Four indicators--employment, population, state expenditures, and fund balance--are shown. The other variables mentioned in the discussion can be found in Appendix D. This scenario, like the mean scenario, increases employment, population, and state expenditures throughout the projection period. There are two major differences between the scenarios. First, the maximum population and employment increases do not occur when peak direct employment occurs as in the moderate scenario. Secondly, unlike the mean scenario, the 5 percent scenario has a positive fund balance impact in the final year of the projection period. In this section, we will discuss the impact of

TABLE 73. THE IMPACT ON MAJOR ECONOMIC INDICATORS
NORTHERN GULF OCS 5 PERCENT SCENARIO
ALASKA

	Population			Employment		
	Base Case	5% Scenario	Impact	Base Case	5% Scenario	Impact
1980	434,173	434,173	0	194,054	194,054	0
1985	509,057	528,700	19,643	224,931	238,432	13,501
1988[1]	556,942	595,911	38,969	249,550	271,304	21,754
1990	591,580	629,269	37,689	266,632	283,943	17,311
1991[2]	606,771	645,384	38,613	273,502	290,443	16,941
1995	677,649	710,099	32,450	308,016	318,397	10,381
2000	789,287	824,222	34,935	364,721	376,353	11,631

	State Expenditures (Millions of Nominal Dollars)			Fund Balance (Millions of Nominal Dollars)		
1980	1,567	1,567	0	1,329	1,329	0
1985	2,748	2,795	47	5,936	5,945	9
1988	3,750	4,019	268	9,980	9,826	-154
1990	4,557	4,801	245	12,281	12,007	-274
1991	4,904	5,124	220	13,193	12,892	-301
1995	6,667	6,798	131	15,809	15,508	-300
2000	10,029	10,180	151	15,200	15,290	90

[1] Peak employment and population impact.

[2] Peak direct Alaska resident employment. The end of the exploration-development phase.

SOURCE: MAP Model

Northern Gulf OCS development according to the 5 percent scenario as well as the differences between the mean and 5 percent scenarios.

Population is projected to be 824,222 by 2000. This is 34,935 or 4.4 percent greater than population in the base case population. Between 1980 and 2000, the population growth rate averages 3.3 percent per year which is greater than the 3.0 percent rate in the base case for the same time period. The maximum increase in population as a result of OCS development occurs in 1988 when population is almost 39,000 greater than in the base case. This is the same year that direct resident construction employment reaches its peak. By 1991 when exploration ends, population impact has risen to another peak of 38,600. The growth rate between 1980 and the end of exploration averages 3.7 percent per year, compared to 3.1 percent in the base case. After the major development and exploration activity is over in 1991, the growth slows to 2.8 percent per year, which is less than the base case growth rate during this same period.

The pattern of population growth and impact can be explained by the growth of total employment. Total employment is projected to be 11,631, or 3.2 percent greater than in the base case by 2000. The inclusion of the Northern Gulf 5 percent development scenario increases the growth rate between 1980 and 2000 from 3.2 percent per year in the base case to 3.4 percent per year. As with population, the maximum increase in employment occurs in 1988. Total direct resident employment in 1988 is 3,399, which is 341 less than the maximum direct employment which occurs in 1991. The major difference is the composition of this employment.

In 1988, over 55 percent of the direct resident employment is in construction. By 1991, only 12 percent are construction employees. The differential incomes earned by workers in the construction industry account for the earlier total peak impact. Employment in the support sector is determined by demand for output, which is a function of real income. The higher construction incomes allow them to have a greater impact than an equal number of other workers. The effect of these high incomes makes the real per capita income impact greatest in 1987 when direct construction employment is greatest.

The state fiscal position is affected by Northern Gulf OCS development according to the 5 percent scenario. This impact is shown by state expenditure and the fund balance. State expenditures are projected to increase to $10.2 billion by 2000; this is $151 million or 1.5 percent greater than in the base case. The growth rate between 1980 and 2000 is only slightly greater than in the base case. State expenditures grow at an average rate of 9.8 percent per year over the period, compared to 9.7 percent in the base case. The average rate of growth in expenditures is 11.4 percent per year between 1980 and 1981 and falls to 7.9 percent per year between 1991 and 2000. Expenditures grow faster in the base case after 1991. As in the mean scenario, all determinants of the growth in expenditures--population, prices, per capita real income--grow slower during this period as the adjustment from peak impact to production employment is made. The growth in expenditures is not so rapid as either population or prices. Because of this, real per capita expenditures are lower than in the base case. By 2000, real per capita expenditures are $58 or 3.6 percent less than in the base case.

The pattern of the fund balance growth in this scenario is similar to the base case pattern. The fund rises to a maximum amount in 1997, then falls in both cases. With Northern Gulf OCS development, the fund rises to a maximum of almost $16 billion by 1997. After this, the fund is drawn down as the general fund is used to make up the difference between expenditures and revenues. The pattern of fund balance growth with Northern Gulf OCS development in the 5 percent scenario differs in two ways from the base case. First, the peak in 1997 is not so great. The fund is $201 million less in 1997 with OCS development. Secondly, the fund balance does not fall by as much after 1997. By 2000, the fund balance is actually greater by $90 million than in the base case; the fund balance is .6 percent greater in 2000 because of OCS development.

The pattern is similar to the one in the mean Northern Gulf scenario. In both scenarios, the negative impact on the fund balance was reduced after 1997. The major cause of this pattern is the more rapid increase in revenues than expenditures in the latter part of the period. This positive impact on the fund balance is eliminated when prices are considered. OCS development increases the price level over the base case; this has the effect of reducing the real value of the fund balance. Since the fund balance is determined most significantly by a fixed flow of petroleum revenues which are not affected by Alaskan prices, price increases generally reduce the real value of the fund. The fund balance measured in constant dollars is reduced throughout the period by OCS development. By 2000, the real fund balance is $9 million less than in the base case. The negative impact on both the real fund balance and real per capita income means that OCS development according to the 5 percent scenario has a negative impact on the state's fiscal position.

STRUCTURAL SIMILARITIES AND DIFFERENCES

The major structural characteristics of the projected economic growth which were observed to be important in the base case were the increased importance of the support sector, the decreasing dependency ratio, the concentration of population in Anchorage, and the pattern of fund balance growth. The mean Northern Gulf OCS development scenario was shown to support the base case trends. Table 74 compares indicators of these structural characteristics between the mean scenario and the 5 percent scenario.

Similar structural changes occur in both the mean and 5 percent scenario cases. Both of these scenarios support the base case trends projected in these characteristics.

The Impacts of Northern Gulf OCS Development: 95 Percent Scenario

Table 75 shows the impact of the 95 percent Northern Gulf OCS development scenario on employment, population, state expenditures, and fund balance. This scenario describes the exploration-only case when no petroleum resources are found. The scenario has only minimal impact on the Alaska economy.

TABLE 74. STRUCTURAL CHARACTERISTICS OF THE ALASKA ECONOMY
NORTHERN GULF OCS 5 PERCENT SCENARIO

	1980	1990	2000
Percent of Employment in the Support Sector			
Mean Scenario	39.5	46.8	53.2
5% Scenario	39.5	47.0	53.4
Dependency Ratio (Population/Employment)			
Mean Scenario	2.24	2.20	2.17
5% Scenario	2.24	2.22	2.19
Percent of Population in Anchorage			
Mean Scenario	47.8	49.9	53.5
5% Scenario	47.8	49.9	53.4
General Fund Revenues Minus General Fund Expenditures (Millions of Nominal $)			
Mean Scenario	361	1,004	- 536
5% Scenario	361	1,002	- 428

TABLE 75. THE IMPACT ON MAJOR ECONOMIC INDICATORS
NORTHERN GULF OCS 95 PERCENT SCENARIO
ALASKA

	Population			Employment		
	Base Case	95% Scenario	Impact	Base Case	95% Scenario	Impact
1980	434,173	434,173	0	194,054	194,054	0
1981	455,563	456,248	686	206,479	206,985	507
1982	486,359	487,443	1,084	224,637	225,380	743
1983	502,802	503,935	1,133	230,228	230,934	706
1984	501,479	502,222	742	223,159	223,513	353
2000	789,287	789,450	163	364,721	364,731	10

	State Expenditures (Million of Nominal Dollars)			Fund Balance (Millions of Nominal Dollars)		
1980	1,567	1,567	0	1,329	1,329	0
1981	1,744	1,744	0	1,913	1,913	1
1982	2,015	2,020	5	2,619	2,618	- 1
1983	2,371	2,379	8	3,362	3,358	- 4
1984	2,581	2,588	7	4,507	4,499	- 8
2000	10,029	10,030	1	15,200	15,154	-46

SOURCE: MAP Model

Exploration occurs between 1981 and 1984. There is direct OCS employment only in these four years. The scenario increases employment and population by less than one percent. The maximum population impact occurs in 1983 when population is .2 percent greater than in the base case. At its maximum difference, employment is only .3 percent greater than in the base case.

The long-term impact is a result of adjustments during the exploration phase. For example, the growth during exploration phase increases state expenditures. State expenditures increase from this new base throughout the projection period. The major long-term impact of this development scenario is on the fund balance. By 2000 the fund balance is $46 million less than in the base case. The increased expenditures and the reduced interest revenues account for the growing negative impact on fund balances. The minimal impact of this scenario means that it will not affect the structural changes found in the base case.

Summary and Conclusions

Northern Gulf OCS development will change the magnitude of economic indicators. In all three cases--the 5 percent, mean, and 95 percent scenarios--the aggregate indicators of economic activity increase. If the Northern Gulf OCS is developed according to the 5 percent scenario, employment will be 3.2 percent larger than the base case in 2000, population will be 4.4 percent larger, and personal income will be 4.8 percent larger. The mean scenario increases employment by 1.6 percent over the base case in

2000; population, by 2.0 percent; and personal income, by 2.4 percent. The 95 percent scenario is the exploration-only case, and it increases the aggregate indicators by less than one percent.

Northern Gulf OCS development provides increased revenues directly from property taxes and indirectly from the increase in economic activity. State expenditures also increase. The pattern in both the production cases, the mean and 5 percent scenarios, is that over most of the period, the expenditure impact is greater than the revenue impact. This means that the fund balance is drawn down. After production begins, this trend is reversed and revenues increase faster than expenditures, leading to a reduction in the negative fund balance impact. By 2000 the fund balance impact in the 5 percent case is positive.

Two measures of individual welfare are real per capita income and real per capita state expenditures. In both the development cases, the impact on real per capita income is positive during exploration and development. Once production begins, the changing composition of employment and higher prices lead to a reduction in real per capita incomes below the base case levels. Real per capita expenditures are less than in the base case in both production cases.

Overall, the process of growth remains unchanged by OCS development. The structural changes and changing relationships projected in the base case are supported by OCS development. One change is an increased importance of migration as a component of population change during the buildup to peak employment impacts. This is only a short-run change, and base case proportions are reached once direct employment stabilizes. The increased proportion of employees in the population is also observed in both development cases. As in the base case, the increased scale of the economy increases the importance of the support sector as the economy provides more of its own goods and services. Finally, development of the Northern Gulf OCS increases the concentration of population in Anchorage.

V. THE IMPACT OF NORTHERN GULF OCS DEVELOPMENT: THE CUMULATIVE CASE

The impact of Northern Gulf OCS development will depend on the base case to which it is compared. In chapter III, we developed three base cases, each containing a different level of previous OCS lease sale activity. Varying the base case by the level of previous OCS activity will allow us to bracket the range of possible Northern Gulf OCS impact. Since the level of previous OCS activity is one variable which can be controlled to some extent by BLM, the sensitivity of the Northern Gulf OCS impacts to the level of previous OCS activity is of interest. In the last chapter, we provided an analysis of the impact of OCS development relative to the moderate base case. In this chapter, we will examine the range of impacts from the 5 percent scenario on the high base case and the 95 percent scenario on the low base case. For the most part, these impacts will differ only in magnitude from those discussed in the mean scenario. The changes in magnitude will be described by the general pattern of growth. Structural similarities and differences will also be discussed.

The Impact of Northern Gulf OCS Development At the 5 Percent Level: The High Base Case

THE HIGH BASE CASE

The major difference between the high and moderate base cases is the level of activity assumed in the Lower Cook and Beaufort OCS lease sale areas. The high case has a peak direct employment which is more than one-and-one-half times greater than in the moderate case in the Lower Cook and 24 percent greater in the Beaufort. The high Lower Cook scenario also includes construction and operation of an LNG facility. The high base case has greater levels of economic activity than the moderate case. Population is projected to be 801,117 by 2000 in the high base case, with a 3.1 percent average annual growth rate. Employment is projected to increase to 369,105 by 2000. This is almost 4,400 greater than employment in the moderate base case. The overall state fiscal position differs between the cases. Expenditures by 2000 are about one percent greater in the high base case than in the moderate case. The larger Beaufort revenues also lead to an increase in the fund balance between the high and moderate base cases. By 2000 the fund balance in the high base case is $16.7 billion which is $1.5 billion greater than in the moderate base case. The change in the structural characteristics found in the moderate base case are also found in the high base case.

THE GENERAL PATTERN OF GROWTH

Table 76 examines the economic growth with Northern Gulf OCS development according to the 5 percent scenario relative to the high base case. Comparing these cases shows us the impact of OCS development. The impact is similar to that projected in the other cases; population, employment, and state expenditures all increase as a result of OCS development. The fund balance is reduced because of OCS development, but the negative impact decreases by the end of the period.

TABLE 76. THE IMPACT ON MAJOR ECONOMIC INDICATORS
NORTHERN GULF OCS
5 PERCENT SCENARIO/HIGH BASE CASE

	Population			Employment		
	Base Case	5% Scenario	Impact	Base Case	5% Scenario	Impact
1980	431,495	431,495	0	192,187	192,187	0
1985	519,471	540,357	20,886	231,560	245,927	14,367
1988[1]	564,654	605,100	40,446	252,890	275,525	22,635
1990	600,285	639,451	39,166	270,213	288,328	18,115
1991[2]	616,303	656,425	40,121	277,510	295,235	17,725
1995	689,377	723,291	33,914	312,806	323 807	11,001
2000	801,117	837,888	36,771	369,105	381,508	12,403

	State Expenditure (Millions of Nominal Dollars)			Fund Balance (Millions of Nominal Dollars)		
1980	1,559	1,559	0	1,330	1,330	0
1985	2,824	2,904	80	5,937	5,922	- 14
1988	3,768	4,071	302	10,004	9,745	-259
1990	4,601	4,877	276	12,460	12,021	-439
1991	4,954	5,206	252	13,465	12,968	-499
1995	6,782	6,945	162	16,518	15,868	-649
2000	10,129	10,343	214	16,724	16,164	-559

[1]Maximum population and employment impact.

[2]Peak direct Alaska resident employment. The end of the exploration-development phase.

SOURCE: MAP Model

Population increases at an average rate of 3.4 percent per year from the beginning of OCS development in 1980 to the end of the period in 2000. In 2000 population is projected to be 837,888 which is 4.6 percent greater than in the base case. The maximum increase in population as a result of OCS development occurs in 1988 when population is 40,446, or 7.2 percent greater than in the base case. The growth rate during the exploration-development phase (1980-1991) averages 3.9 percent per year. After 1991, when production is the dominant activity, the growth rate averages 2.8 percent per year. The economy grows faster than in the base case during the exploration and development phase and slower during the production phase.

Employment is projected to increase to 381,508 by 2000. This is 12,403 greater than in the base case. The growth rate over the period of OCS development increases from 3.3 percent per year in the base case to 3.5 percent per year with OCS development. The peak employment impact occurs in 1988 when total employment is 27,635, or 9 percent greater than in the base case. Direct OCS resident employment does not peak until 1991. The reason the maximum employment increase from OCS development occurs before the peak direct project employment concerns the composition of employment. A larger proportion of direct resident employment in 1988 is construction employment. The higher incomes earned by these workers increase their impact on the economy. The impact on personal income from OCS development is also greatest in 1988. Employment, like population, increases faster in the exploration-development phase (1980-1991) than after 1991 when production is the dominant activity.

The state's fiscal position is affected by Northern Gulf OCS development. By 2000 state expenditures are projected to be $214 million or 2.1 percent greater than in the base case; total expenditures are projected to be $10.3 billion by 2000. The maximum impact of OCS development on state expenditures occurs in 1989 when expenditures are $324 million greater than in the base case. This is 8 percent greater than in the base case. The maximum expenditure impact occurs after the maximum population impact because of the lags built into the expenditure rule. The pattern of expenditure growth differs between the base case and the 5 percent scenario. Expenditures increase faster with Northern Gulf OCS development than in the base case, 11.6 percent per year compared to 11.1 percent, during the exploration-development phase (1980-1991). After 1991 the increase in expenditures is more rapid in the base case, 8.3 percent compared to 7.9 percent per year. The increase over the base case is not so great as the combined increase in prices and population, so OCS development has a negative impact on real per capita state expenditures. Real per capita state expenditures are $51 less than in the base case by 2000.

The pattern of fund balance growth is similar in both the base case and the OCS development case. In both cases, the fund rises to a peak in 1998 and then falls as the fund balance is drawn down to make up the difference between revenues and expenditures. At its peak in 1998, the fund balance with OCS development is $16.6 billion, which is $628 million less than in the base case. By 1995 the fund balance is $649 million, or 4 percent less than in the base case because of OCS development. By 2000 the negative fund balance impact has been reduced to $559 million.

This pattern of fund balance impact was projected in both the mean and 5 percent scenarios with the moderate base case.

The relative impacts of the 5 percent development scenario are similar when they occur with either the moderate or high base case. The population impact in 2000 differs between these cases by only 5.3 percent; the population impact is 34,935 with the moderate base case and 36,771 with the high scenario. The employment impact in 2000 is 11,631 with the moderate base case and 12,403 with the high base case, a difference of less than 7 percent. The fiscal impacts are less similar. The expenditure impacts differ by over 40 percent in 2000. The fund balance impact is positive with the moderate base case and negative with the high base case. The pattern of fund balance impact is similar in each case, with the negative fund balance impact being reduced by the end of the period. The lower expenditures and relatively greater size of OCS development in the moderate case are responsible for the positive fund impact by 2000.

STRUCTURAL SIMILARITIES AND DIFFERENCES

Table 78 compares certain structural characteristics of economic growth in the mean OCS-moderate base case scenario and the 5 percent OCS-high base case scenario. These indicators describe the four types of structural change found in the base case: first, the increased importance of the support sector as the scale of the economy increases; secondly, the increasing proportion of the population which is employed; third, the continuing concentration of population in Anchorage; finally, the pattern of state expenditure which results in their being greater than revenues.

TABLE 77. STRUCTURAL CHARACTERISTICS OF THE ALASKA ECONOMY
NORTHERN GULF OCS
OCS-MODERATE BASE SCENARIO/
5% OCS-HIGH BASE SCENARIO

	1980	1990	2000
Percent of Employment in the Support Sector			
Mean Scenario	39.5	46.8	53.2
5% Scenario	39.4	47.1	53.4
Dependency Ratio (Population/Employment)			
Mean Scenario	2.24	2.20	2.17
5% Scenario	2.25	2.22	2.20
Percent of Population in Anchorage			
Mean Scenario	47.8	49.9	53.5
5% Scenario	47.8	49.9	53.5
General Fund Revenues Minus General Fund Expenditures (Millions of Nominal $)			
Mean Scenario	361	1,004	- 536
5% Scenario	363	1,054	- 326

The development of the Northern Gulf OCS, according to the 5 percent scenario given the high base case, experiences the structural change which is similar to that found in the mean scenario case. The support sector increases its share of employment to about 53 percent in both cases. The dependency ratio decreases through the projection period, although it is slightly higher in the 5 percent scenario. By 2000, Anchorage has increased its share of state population to about 54 percent in both cases. In both the mean OCS-moderate base scenario and the 5 percent OCS-high base case scenario, general fund revenues net of expenditures are negative by 2000. In both cases, the fund balance must be drawn on to meet expenditures by 2000.

The Impact of Northern Gulf OCS Development At the 95 Percent Level: The Low Base Case

THE LOW BASE CASE

The low base case scenario contains the same non-OCS assumptions as the moderate and high base case scenarios. It differs from these cases in its assumptions about OCS activity in the Lower Cook and Beaufort Sea. Lower Cook is assumed to have exploration only in this scenario. Production occurs in the Beaufort. Peak employment in the Beaufort reaches 740 in 1989; this is 68 percent of the peak in the moderate Beaufort scenario. The growth in the low base case is less than in the moderate case. Over the period 1978-2000, population is projected to increase at an average rate of 3 percent per year. Population is projected to be 782,438 by 2000. Employment is projected to increase to 362,225 by 2000 in the low case. State expenditures are less than one percent lower than in the moderate case by 2000. They are projected to be almost $10 billion by 2000. The fund balance is $300 million less than in the moderate base case by 2000. In 2000 the fund balance is projected to be $14.9 billion. The pattern of fund balance growth is similar in both cases, rising to a peak of $16 billion in 1997, then falling as funds are used to make up the difference between expenditures and revenues. The structural changes found in the moderate base case are also found in the low base case.

THE GENERAL PATTERN OF GROWTH

The 95 percent scenario describes the activity associated with only exploration in the Northern Gulf OCS. The development has minimal impact on the Alaska economy. Table 78 shows the impact of exploration on population, employment, state expenditures, and the fund balance. The maximum increase in population occurs in 1983 when OCS exploration activity increases population by 1,134, or .2 percent. The maximum employment impact occurs in 1982. Employment is 743 or .3 percent greater than in the base case because of exploration activity. The expenditure impact follows the same pattern. Expenditures are $8 million or .3 percent greater in 1983. By 2000 expenditures are still $1 million greater than in the base case. The extra expenditures throughout the period result in the fund balance being $42 million less by 2000. These impacts are similar to those experienced with the moderate base case.

Because of the small impacts associated with OCS exploration, the structural change projected in the base case is not affected.

TABLE 78. THE IMPACT ON MAJOR ECONOMIC INDICATORS
NORTHERN GULF OCS
95 PERCENT SCENARIO/LOW BASE CASE

	Population			Employment		
	Base Case	95% Scenario	Impact	Base Case	95% Scenario	Impact
1980	431,495	431,495	0	192,187	192,18	0
1981	451,557	452,241	684	203,886	204,393	506
1982	482,344	483,427	1,084	222,330	223,073	743
1983	498,942	500,007	1,134	228,242	228,948	706
1984	497,291	498,073	782	221,077	221,443	366
2000	782,438	782,602	164	362,225	362,233	8

	State Expenditures (Millions of Nominal Dollars)			Fund Balance (Millions of Nominal Dollars)		
1980	1,559	1,559	0	1,330	1,330	0
1981	1,723	1,723	0	1,921	1,921	0
1982	1,988	1,993	5	2,640	2,639	- 1
1983	2,348	2,356	8	3,393	3,389	- 4
1984	2,559	2,567	7	4,548	4,540	- 8
2000	9,965	9,966	1	14,900	14,858	-42

SOURCE: MAP Model

VI. SENSITIVITY ANALYSIS

Our knowledge of future events is uncertain. In spite of this uncertainty, we need to make assumptions about certain future events. Events which are important to the future economy must be incorporated in our projections. These assumptions which form the basis for both the base case and OCS development scenarios are uncertain. The uncertainty surrounding these assumptions makes it necessary to investigate the extent to which our major findings are sensitive to the more important of these assumptions.

The previous sections tested the sensitivity of Northern Gulf OCS impacts to OCS-related assumptions. By examining the alternate OCS scenarios, we saw the effect of varying resource discovery levels on impacts. Examining the cumulative cases provided an indication of the sensitivity of our results to the level of previous OCS activity. In this section, we will test the sensitivity of our results to two general categories of assumptions. The first set includes the assumptions about the level of activity in the base case. We will examine the effect on the OCS impact results of major changes in the base case assumptions. The second set of assumptions to be examined concerns the state expenditure policy which was assumed to be adopted in the forecast period. Changes in the assumed expenditure policy will alter the effect of OCS development on state expenditures and may change the impacts on the economy.

In this section, six specific sensitivity tests were conducted on the mean Northern Gulf OCS development scenario. Comparing these results to the mean results in our basic case will allow us to assess the sensitivity of our results to these major sets of assumptions.

Sensitivity to Major Changes in the Base Case

The base case assumptions used in this study contain an element of uncertainty concerning two major construction projects, the ALCAN gasline and the state capital move from Juneau to Willow. ALCAN construction is included in our assumptions; the capital move is not. This section tests the sensitivity of our results to these assumptions.

In the base case, the ALCAN gasline is assumed to be constructed between 1981 and 1984 to transport natural gas from Prudhoe Bay to the "Lower 48." There is uncertainty concerning not only the timing of this construction but also the eventuality of construction. For a variety of reasons, including the recent recognition of substantial oil and gas reserves in Canada and Mexico, the outlook concerning the feasibility of the ALCAN line has changed since it was approved (Tussing and Barlow, 1979). Because of this uncertainty, it is necessary to test the effect on OCS impact of changes in the ALCAN assumptions. We examine the effect on the OCS impact of eliminating ALCAN construction from the base case. Eliminating ALCAN has two types of direct effects. First, major exogenous employment will be eliminated from 1981 to 1984. Secondly, eliminating ALCAN will reduce state revenues. Without the ALCAN, there will be no gas production in either Prudhoe or the Beaufort Sea. The state will not earn royalties, production taxes, or corporate income taxes from this gas. The reduction in revenues will affect economic activity through its effect on state expenditures.

The sensitivity of our findings to increased levels of exogenous base case activity was also tested. The base case assumptions did not include the capital move from Juneau to Willow. Although Alaskans voted to move the capital in 1974, recent cost estimates and disagreement over the method of paying for the move have made it less likely. In the sensitivity test, the major direct effect of the capital move is assumed to be the increased construction activity connected with the move. State government employment is not assumed to be affected by the move. (See Table 79.) The capital move is assumed to occur between 1981 and 1984, which is at the same time as the ALCAN construction.

TABLE 79. CAPITAL MOVE SCENARIO

	Construction Employment
1980	0
1981	869
1982	664
1983	1,185
1984	1,135
1985	716

SOURCE: Alaska Department of Labor, Alaska's Economic Outlook to 1985, 1978.

Table 80 compares the impact of the mean Northern Gulf OCS development scenario on three sets of base case assumptions: the basic case, the no-ALCAN case, and the capital move case. These tests show that the magnitude of OCS impact is relatively insensitive to changes in the base case assumptions. However, since the base case is changed in each case, the relative effect of OCS development will differ in each case. During the OCS exploration and development phase (1980-1990), the impacts in all three cases vary by small amounts. In the peak OCS development year, 1990, the population and employment impacts of the no-ALCAN and capital move cases vary by less than 200 people from the base case. Personal income varies by less than one percent. By 2000, the differences have increased but not significantly. The major reasons for the difference in the impact are the scale of the economy and the state expenditures. The scale of the economy affects the price level and price level impact of OCS development as well as the response of the endogenous sector to OCS development. By 2000, the state expenditure impact is greater in the no-ALCAN case than in either of the other cases; this determines the difference in the other variables. Expenditure differences result from the long-run revenue differences in the ALCAN case. Even in 2000, the impacts differ by less than 10 percent.

Sensitivity to State Expenditure Policy

In the previous analysis, it was necessary to specify an expenditure rule which captured the essential features of state fiscal policy. Inasmuch as state expenditures are actually a matter of policy choice, the expenditure rule could follow any one of an infinite number of possible specifications.

TABLE 80. THE IMPACT OF NORTHERN GULF OCS DEVELOPMENT WITH THREE ALTERNATE BASE CASES: BASIC CASE, NO ALCAN CONSTRUCTION, AND THE CAPITAL MOVE MEAN SCENARIO

	1981	1983	1990	2000
Population Impact				
Basic Case	515	1,893	20,944	16,437
No ALCAN	502	1,760	21,118	17,428
Capital Move	522	1,917	20,926	16,490
Employment Impact				
Basic Case	380	1,278	11,423	5,775
No ALCAN	372	1,187	11,530	6,300
Capital Move	385	1,295	11,408	5,786
Personal Income Impact (Millions of Nominal Dollars)				
Basic Case	19	74	1,083	938
No ALCAN	18	64	1,078	1,009
Capital Move	19	77	1,080	936
State Expenditures Impact (Millions of Nominal Dollars)				
Basic Case	4	15	157	106
No ALCAN	4	13	163	146
Capital Move	4	15	155	106
Fund Balance Impact (Millions of Nominal Dollars)				
Basic Case	1	-3	-150	-287
No ALCAN	1	-3	-164	-552
Capital Move	1	-3	-148	-276

SOURCE: MAP Model

The expenditure rule chosen in the analysis assumes that real per capita expenditures grow at a rate equal to one-half the rate of growth in real per capita income. Expenditures are also assumed to increase with increases in the available general fund balance. Past pattern of state expenditures points to these factors as determinants of expenditure growth (Scott, 1978). Even if we accept the general form of this rule, the relative effect of any one component may vary and the sensitivity of the measured impacts to this variation needs to be tested.

Three alternative formulations of the basic expenditure rule were tested. Each alternate rule differed by the assumed influence of real per capita income and the available general fund balance on the growth of state expenditures. Two cases examine the sensitivity of our measured impacts to the effect of real per capita income on expenditures. The expenditure elasticity of real per capita income is the percentage increase in state expenditures resulting from a one percent increase in real per capita income. In the basic rule, the expenditure elasticity of real per capita income was .5; two extreme elasticities were tested: the expenditure elasticity of real per capita income equal to 0 (EL3=0) and equal to 1 (EL3=1). The final rule tested the sensitivity of our results to the removal of the effect of the available general fund balance on expenditures (EX6=0). The major difference in all of the variables examined will result from differences in the expenditure impact.

Table 81 compares the relative OCS impacts of the various expenditure rules. The sensitivity of OCS impact to the expenditure elasticity of real per capita income can be seen by examining the impacts produced by the basic rule, the full income effect rule (EL3=1) and the no-income effect rule (EL3=0). The relative pattern of expenditure impacts can be explained by the pattern of real per capita income growth. The basic pattern of real per capita income growth in the impact case relative to the base case was shown in Chapter IV. Real per capita income increases faster than in the base case as direct OCS employment builds to a peak. After the peak employment is reached, real per capita income increases at a slower rate.

The greatest expenditure impact in 1990, the year of peak OCS employment, occurs in the full income effect case. The impact of $240 million is greater than either the basic case or the no-income effect case. By 2000 the state expenditure impact has decreased in both cases with positive income elasticities. This is because the rate of real per capita income growth after 1990 is lower than in the base case. By 2000 the case with no income effect on expenditures has a slightly larger impact. The impact on population, employment, personal income, and the fund balance is influenced by this expenditure effect.

The final expenditure rule tested removed the influence of the available fund balances from the determination of state expenditures. The impacts of OCS development are higher when the fund balance does not influence

TABLE 81. THE EFFECT OF ALTERNATE STATE EXPENDITURE POLICIES ON THE IMPACT OF NORTHERN GULF OCS DEVELOPMENT MEAN SCENARIO

	1985	1990	2000
Population Impact			
Basic Case	4,315	20,944	16,437
EL3=1	4,504	23,471	17,211
EL3=0	4,183	19,525	16,663
EX6=0	4,318	21,085	18,676
Employment Impact			
Basic Case	2,811	11,423	5,775
EL3=1	2,941	13,020	5,836
EL3=0	2,726	10,560	6,068
EX6=0	2,812	11,503	6,975
Personal Income Impact (Millions of Nominal Dollars)			
Basic Case	198	1,083	938
EL3=1	209	1,234	976
EL3=0	191	1,003	969
EX6=0	197	1,071	1,101
State Expenditures Impact (Millions of Nominal Dollars)			
Basic Case	15	157	106
EL3=1	20	240	124
EL3=0	12	117	125
EX6=0	14	153	177
Fund Balance Impact (Millions of Nominal Dollars)			
Basic Case	-11	-150	-286
EL3=1	-22	-373	-1,089
EL3=0	- 3	- 18	- 54
EX6=0	-11	-147	-638

SOURCE: MAP Model

expenditures. This can be seen by comparing the impacts of the no-fund balance effect case (EX6=0) and the basic case. The population, employment, and personal income impacts are greater by 2000. Expenditures are slightly greater in the basic case in 1990, but the no-fund balance case has a greater expenditure impact by 2000. The reason for this differential impact is straightforward. OCS development increases expenditures over the base case. This reduces the fund balance relative to the base case. In the basic rule case, the reduced fund balance relative to the base case exerts a downward relative pressure on expenditures. This reduced fund balance will limit the effect of the other factors increasing expenditures. When the fund balance does not affect expenditures, the relative reduction in the fund balance does not provide pressure to limit growth in expenditures.

A more important issue concerning the choice of the expenditure rule is the assumption implicit in our analysis that the state will choose to respond to changes caused by OCS development as it responded in the base case. If the state should behave differently in the face of OCS activity, the measured impacts may change significantly. To ascertain the importance of this to our results, it may be useful to distinguish that portion of the total impact due to changes in state spending from that which is due to changes in the private sector of the economy.

In order to isolate the component of our measured impact which is due to changes in state expenditures, we examined the impacts of the case in which the base case level of state expenditures was maintained. OCS development was not assumed to affect state expenditures in this case. Since OCS development increases both population and prices, such a policy would mean a reduction in the level of real per capita expenditures. This case is not presented as a plausible response of the state. However, it does permit us to separate, for purposes of analysis, that portion of impact due to state expenditures.

Table 82 illustrates the state expenditure impact. The proportion of impact due to state expenditures is equal to the proportion of impact not accounted for in the constant expenditure case. State expenditures account for close to 20 percent of the impact on employment, population, and prices. The state expenditure impact is greater in 1990 than in 2000. In 1990, increases in state expenditures account for 24 percent of the population impact, 26 percent of the employment impact, and 23 percent of the personal income impact. By 2000, state expenditure increases account for only 19 percent of the population increase, 18 percent of employment, and 18 percent of personal income. Examining the fund balance impact shows the extra revenues accumulated by the state because of OCS development. By 2000, over $1.5 billion have been accumulated.

TABLE 82. THE IMPACT OF STATE EXPENDITURES
NORTHERN GULF OCS
MEAN SCENARIO

	1985	1990	2000
Population Impact			
Basic Rule	4,315	20,944	16,437
Constant Expenditure	3,745	16,024	13,258
Employment Impact			
Basic Rule	2,811	11,423	5,775
Constant Expenditure	2,450	8,472	4,727
Personal Income Impact (Millions of Nominal Dollars)			
Basic Rule	198	1,083	938
Constant Expenditure	177	835	767

SOURCE: MAP Model

VII. SUMMARY AND CONCLUSIONS

In this report, we have assessed the major impacts that offshore oil and gas development in the Northern Gulf of Alaska will have on the process of Alaska economic growth. These projected impacts were assessed in terms of both an assumed base case growth without the project and the historical economic growth.

For all of the scenarios, the qualitative nature of the influence of OCS development on the growth process is similar. Development generates direct employment activity in the construction, mining, manufacturing, and transportation industries which builds to a peak during the development phase, then declines to a stable, long-term level as production dominates the activity. Since a number of fields are developed in each scenario, the various phases of development occur simultaneously. This development activity generates both new private incomes and public revenues which induce impacts. Expenditure of wages and salaries earned in OCS activity generates further income and employment in the endogenous sector of the economy through the increased demand for the output of these sectors. The increased economic activity also increases public expenditures which affect economic activity by increasing government employment and construction expenditures. The private sector has been shown in Chapter VI to have the dominant effect on the Northern Gulf OCS impacts.

The qualitative nature of the impacts is also similar across scenarios. Four major structural changes were observed in the base case and the historical period. First, as the scale of the economy increased, more goods and services were produced locally and the importance of the support sector increased. Secondly, the population aged and labor force participation increased over time; this led to an increase in the proportion of the population which is employed. Thirdly, the role of Anchorage as the administrative and distributive center of Alaska resulted in population growth continuing to center in Anchorage. Finally, state expenditures and revenues were projected to follow a pattern in which expenditures would increase faster than revenues after the major petroleum revenues peaked. This pattern of expenditure and revenue increase would necessitate drawing down the general fund balance. This results from the declining importance of the petroleum revenues throughout the period. All of the Northern Gulf OCS development scenarios support these trends.

The qualitative impact of OCS development on individual welfare was also similar across scenarios. In all scenarios, real per capita incomes increased significantly over the base case levels during the buildup to the peak employment. After this, increases in population and prices led to no real significant increases in real per capita income. The level of real per capita state expenditures is also reduced relative to the base case by OCS development. The reduction of real per capita state expenditures is one part of the negative fiscal impact of OCS development. The other part concerns the impact on the fund balance. In all cases, the combined effect of increased prices and expenditures from OCS development reduces the real value of the fund balance below its base case levels.

Quantitatively, the impacts across scenarios differ. The single most important determinant of impact is the size of the field. The 5 percent scenario has larger development activity and so has a larger impact. The 95 percent scenario contains only exploration and has only minimal impact on the major economic variables. Table 83 shows the relative year 2000 impacts across the five OCS scenarios.

The major dimensions of both base case growth and OCS development are uncertain. By examining the three alternate development scenarios, we get some feeling for the range of impacts possible from OCS development in the Northern Gulf. Examination of the assumptions in the base case shows that the major assumptions concerning the base case such as ALCAN do not affect the impact of OCS development significantly. However, the results are importantly affected by the assumptions made about the expenditure policy followed by the state.

TABLE 83. SUMMARY OF THE LONG-RUN IMPACTS OF ALTERNATIVE DEVELOPMENT SENARIOS (IMPACTS IN THE YEAR 2000)

	Population	Employment	State Expenditures (Millions of Nominal Dollars)	Fund Balance (Millions of Nominal Dollars)
Moderate Base Case				
Mean OCS Scenario	16,437	5,775	106	-287
5% OCS Scenario	34,935	11,631	151	90
95% OCS Scenario	163	10	1	46
High Base Case				
5% OCS Scenario	36,771	12,403	214	559
Low Base Case				
95% OCS Scenario	164	8	1	42

SOURCE: MAP Model

APPENDIX A

Historical Growth, 1965-1976

TABLE A.1. GROWTH IN EMPLOYMENT, ALASKA, 1965-1976

Industry	1965	1970	1971	1972	1973	1974	1975	1976
	Average Monthly Employment							
Mining	1,100	3,000	2,400	2,100	2,000	3,000	3,800	4,000
Contract Construction	6,400	6,900	7,400	7,900	7,800	14,100	25,900	30,200
Manufacturing	6,300	7,800	7,800	8,100	9,400	9,600	9,600	10,300
Food Processing	3,000	3,700	3,600	3,800	4,600	4,300	4,300	5,100
Logging-Lumber and Pulp	2,300	2,800	2,800	2,800	3,200	3,600	3,400	3,200
Other Manufacturing	1,000	1,300	1,400	1,500	1,500	1,700	1,900	2,000
Transportation, Communication and Public Utilities	7,200	9,100	9,800	10,000	10,400	12,400	16,500	15,800
Trucking and Warehousing	1,200	1,700	1,500	1,600	1,500	2,200	4,000	3,200
Water Transportation	1,000	800	800	800	900	1,000	1,400	1,300
Air Transportation	1,900	3,000	2,800	3,000	3,300	4,000	4,800	4,700
Other Transportation	500	900	1,000	1,000	1,100	1,300	1,800	1,900
Communications and Public Utilities	2,600	2,700	3,700	3,600	3,600	3,900	4,500	4,700
Trade	10,000	15,400	16,200	17,100	18,300	21,100	26,200	27,600
Wholesale	1,900	3,200	3,200	3,300	3,400	4,000	5,900	6,100
Retail	8,100	12,200	12,900	13,800	14,900	17,100	20,300	21,500
Finance, Insurance and Real Estate	2,200	3,100	3,200	3,700	4,300	4,900	6,000	7,100
Services	7,500	11,400	12,600	14,000	15,200	18,300	25,100	27,700
Hotels, Motels, etc.	1,000	1,400	1,600	1,800	1,900	2,500	3,200	3,200
Personal	700	800	900	900	900	800	900	900
Business	1,400	2,000	2,100	2,100	2,100	3,000	7,300	8,700
Medical	1,400	2,200	2,600	3,000	3,300	3,800	4,300	5,000
Other	3,000	5,000	5,400	6,200	7,000	8,200	9,400	9,900

TABLE A.1. (continued)

Industry	1965	1970	1971	1972	1973	1974	1975	1976
	Average Monthly Employment							
Government	29,000	35,600	38,000	40,500	41,600	43,800	47,200	47,200
Federal	17,400	17,100	17,300	17,200	17,100	18,000	18,300	17,900
State	7,000	10,300	11,700	13,300	13,800	14,200	15,500	14,100
Local	5,300	8,100	9,000	10,000	10,700	11,600	13,400	15,200
Agriculture, Forestry and Fisheries	100	800	900	900	1,000	1,000	1,000	1,200
Total Civilian Non-Agricultural Wage and Salary Employment	70,500	93,100	98,300	104,200	110,000	128,200	161,300	171,100
Total Civilian Basic	31,300	35,600	35,800	36,200	37,300	45,700	58,600	63,600
Military	33,000	31,400	30,100	26,500	27,500	27,500	25,300	24,500
Total Basic	64,300	67,000	65,900	62,700	64,800	73,200	83,900	88,100
Total Support Sector	26,900	39,000	41,800	44,800	48,200	56,700	73,800	78,200
Total Employment	114,000	129,900	133,900	136,500	143,200	161,500	190,200	203,200

Basic Employment Includes: Mining; Construction; Manufacturing; Federal Government; Agriculture, Forestry and Fisheries, and Military.

Support Sector Includes: Transportation, Communication and Public Utilities; Trade; Finance, Insurance and Real Estate; and the Services.

SOURCE: Alaska Department of Labor, Alaska Labor Force Estimates, various years.
Alaska Department of Labor, Estimates of Total Resident Population and Estimates of Total Civilian Population.

TABLE A.2. ANCHORAGE CIVILIAN EMPLOYMENT GROWTH, ALASKA, 1965-1976

Industry	1965	1970	1971	1972	1973	1974	1975	1976
Total	30,678	41,995	45,452	48,252	50,627	58,713	69,645	73,113
Agriculture, Forestry and Fisheries	33	52	63	76	82	100	110	100
Mining	371	958	916	806	769	1,036	1,301	1,409
Contract Construction	3,127	3,514	3,924	4,272	4,178	5,882	7,054	7,587
Manufacturing	791	1,018	1,117	1,215	1,286	1,379	1,571	1,629
Transportation, Communication and Public Utilities	2,618	3,907	4,591	4,522	4,625	5,383	7,343	7,409
Transportation	1,694	2,800	2,805	2,821	3,129	3,938	5,419	5,172
Air	773	1,482	1,455	1,629	1,835	2,123	2,610	2,668
Other	921	1,318	1,350	1,192	1,294	1,814	2,809	2,504
Communication	674	764	1,411	1,289	1,046	1,163	1,426	1,670
Public Utilities	250	343	374	411	451	483	499	568
Trade	5,280	8,617	9,334	9,948	10,663	12,298	14,928	15,958
Wholesale	1,226	2,220	2,292	2,423	2,475	2,860	4,077	4,240
Retail	4,053	6,397	7,042	7,525	8,188	9,438	10,852	11,718
Finance, Insurance and Real Estate	1,295	1,980	2,087	2,415	2,303	3,151	3,615	4,257
Services	3,767	6,403	7,027	7,725	8,319	10,119	13,465	15,450
Hotels	460	755	709	732	811	1,114	1,345	1,444
Personal	402	535	556	556	567	572	624	607
Business	789	1,188	1,194	1,120	1,190	1,680	3,795	4,914
Medical	681	1,200	1,480	1,759	1,993	2,283	2,286	2,657
Other	1,444	2,725	3,088	3,459	3,758	4,471	5,410	5,828
Federal Government	9,395	9,509	9,530	9,435	9,558	9,925	10,222	9,813
State Government	1,672	2,421	3,020	3,500	3,667	3,985	4,056	4,053
Local Government	2,329	3,615	3,846	4,349	4,677	5,257	5,979	5,413

SOURCE: Department of Labor, Statistical Quarterly, various issues.

TABLE A.3. EMPLOYMENT BY INDUSTRY, SOUTHCENTRAL ALASKA
1965, 1970-1976

Industry	1965	1970	1971	1972	1973	1974	1975	1976
Agriculture, Forestries and Fisheries	19	99	85	356	491	492	543	680
Mining	345	762	633	611	640	580	900	827
Contract Construction	880	583	896	768	681	1,239	3,656	6,978
Manufacturing	1,188	1,647	1,627	1,818	2,627	2,522	2,656	3,234
Food	1,086	1,293	1,229	1,456	1,995	2,013	2,003	2,127
Transportation, Communication and Public Utilities	542	760	796	793	896	1,329	1,576	1,472
Transportation	373	521	502	442	497	708	1,106	977
Communications	26	85	132	175	209	218	239	247
Public Utilities	132	154	163	176	189	03	231	248
Trade	813	1,338	1,319	1,383	1,460	1,611	2,337	2,533
Wholesale	102	193	275	162	133	202	344	353
Retail	711	1,145	1,134	1,221	1,327	1,459	1,983	2,180
Finance, Insurance and Real Estate	159	211	204	220	238	308	377	480
Services	738	1,027	1,099	1,228	1,440	1,709	2,128	2,597
Hotel	138	154	230	297	300	427	467	462
Personal	25	28	29	39	50	40	49	36
Business	117	114	94	87	139	178	441	756
Medical	139	275	286	315	451	400	391	465
Other	319	456	460	490	500	664	780	878
Government								
Federal	975	828	742	626	602	595	672	637
State and Local	1,465	2,327	2,726	2,932	3,056	3,180	3,455	3,592
Total	7,124	9,582	10,127	10,735	12,131	13,645	18,300	23,030

SOURCE: Estimated from Alaska Department of Labor, Research and Analysis Section Worksheets.
Alaska State Housing Authority, Alaska, Yakutat, Comprehensive Development Plan, Anchorage 1971.
Alaska Consultants, Inc., Anchorage, Alaska, Yakutat, Comprehensive Development Plan, December 1976.

APPENDIX B

MAP Model Assumptions

A set of assumptions about the level of exogenous variables determines a development scenario; this section describes the assumptions in the non-OCS base case scenario. There are four major types of assumptions required for a scenario. First, there are assumptions about the growth of exogenously determined employment in both the petroleum and nonpetroleum sectors. Secondly, assumptions about exogenously determined petroleum revenues received by the state are needed. Thirdly, there are assumptions about national variables. Finally, an assumption about the way the state spends its money is needed. Once these assumptions are set, the set of projections is determined by the model.

EMPLOYMENT ASSUMPTIONS

Employment assumptions include those associated with special projects and those associated with industry growth in manufacturing, agriculture-forestry-fisheries, and federal government.

Special Projects

Special projects include three basic types--petroleum projects, major construction projects, and operations of the major projects. Tables B.1 and B.2 show the project employment assumptions. The methods used to determine these levels are described below.

TABLE B.1. MINING EMPLOYMENT

Year	Prudhoe,[1] Lisburne and Kuparak	N. Gulf[2] and Lower Cook OCS	Upper[3] Cook	Other[4] Mining
1977	1,586	271	575	2,082
1978	1,624	0	575	2,082
1979	1,585	0	575	2,082
1980	1,783	0	575	2,082
1981	1,402	0	575	2,082
1982	1,149	0	575	2,082
1983	897	0	575	2,082
1984	904	0	575	2,082
1985	987	0	575	2,082
1986	963	0	610	2,082
1987	985	0	645	2,082
1988	985	0	680	2,082
1989	1,009	0	715	2,082
1990	1,009	0	750	2,082
1991	1,020	0	300	2,082
1992	1,020	0	300	2,082
1993	940	0	300	2,082
1994	886	0	300	2,082
1995	886	0	300	2,082
1996	886	0	300	2,082
1997	886	0	300	2,082
1998	886	0	300	2,082
1999	886	0	300	2,082
2000	886	0	300	2,082

[1] Based on employment scenarios from Alternatives for the Future: Petroleum Development Study, North Slope of Alaska (Department of Natural Resources, 1977). Scenarios for 1 and 5 billion barrel reserves were adjusted to reflect reserves and production schedules of these fields.

[2] Exploration activity drilled 9.6 wells; assumed employment per well equaled 90 man-years from OCS Technical Report No. 17 (Dames and Moore, 1978).

[3] Estimate by the author based on current employment.

[4] Net employment in mining.

TABLE B.2. CONSTRUCTION EMPLOYMENT

	ECONX 1			ECONX 2
Year	TAPS	ALCAN[3]	Total	Pacific[4] LNG
1977	5,300[1]	0	5,300	0
1978	0	0	0	0
1979	90[2]	0	90	0
1980	90	0	90	146
1981	90	1,425	1,515	844
1982	90	4,763	4,853	1,323
1983	0	4,663	4,663	420
1984	0	265	265	0
1985	0	0	0	0

[1]Based on estimate of TAPS construction employment by the Alaska State Labor Department.

[2]Assumed construction of four pump stations to increase capacity by 1982. Pump Station construction employment estimate from The Beaufort OCS Petroleum Development Scenarios, Dames and Moore, 1978.

[3]Northwest Energy Company manpower estimate, July 17, 1978.

[4]Based on letter to the Department of Natural Resources from S. California Gas, March 17, 1978, estimating peak construction employment of 1,500. Four-year construction period from E.I.S. for Pacific Alaska LNG Project, November 1974.

- Prudhoe Bay, Lisburne, and Kuparak mining employment was estimated from two sources of information. Employment scenarios were based on the scenarios described in the Alaska Department of Natural Resources, Alternatives for the Future: Petroleum Development Study, North Slope of Alaska (1977). The employment schedules were adjusted based on the estimated reserves, productivity, and the production schedules in Beaufort Sea Region Petroleum Development Scenarios (Technical Report No. 6, Alaska OCS Socioeconomic Studies Program, 1978).

- Northern Gulf OCS employment is an estimate of 1977 exploration employment. This was based on information in Monitoring Petroleum Activities in the Gulf of Alaska (Technical Report No. 17, Alaska OCS Socioeconomic Studies Program, 1978). Total employment associated with exploration was divided by the total wells drilled to obtain a man-years-per-well figure of approximately 90. Approximately 9.6 wells were drilled in 1977. Total exploration employment was adjusted by the percentage of Alaskan resident employment assumed in the report. There is no activity assumed after 1977.

- Upper Cook employment was an estimate of current employment made by the author. Employment was assumed to increase slightly between 1985 and 1990 as the oil fields are shut down. Gas production is assumed to continue after 1990.

- Other mining was assumed to maintain its 1976 level, except in Anchorage and Fairbanks which were adjusted to an estimate of the 1977 mining employment.

Table 6 shows special project construction employment.

- ECONX1 are highly paid construction workers associated with major projects, long hours, and extreme working conditions. Two projects are assumed in this category, the trans-Alaska pipeline and the ALCAN gasline. TAPS is completed in 1977. The 1977 employment is based on an actual estimate made by the Alaska Labor Department. After 1977 the line's capacity is assumed to be increased by the addition of four pump stations. Pump station construction employment estimates made in Technical Report No. 6 (Alaska OCS, 1978) were used to estimate employment. With completion of the TAPS construction in 1977, the line's capacity is assumed to be 1.2 million barrels per day. The capacity must be expanded to deliver the assumed base case North Slope production, which is 1.73 million barrels per day by 1983. Four additional pump stations were assumed to be needed to deliver this production. This was based on the ratio of capacity to pump stations (.15 million barrels per pump station) with eight pump stations. With this ratio, twelve pump stations would be needed to deliver 1.73 million barrels per day. These additions would also allow the line some additional capacity. The ALCAN gasline is assumed to be built between 1981 and 1984. The estimates are based on the most recent construction manpower estimates made by Northwest Energy Company in a letter to the state (July 1, 1978).

- ECONX2 employment is associated with special construction projects which are assumed to have regular employment schedules and be able to draw on local labor markets. One project of this type is assumed to be built, the Pacific LNG project. Pacific LNG is scheduled to begin construction in 1980 and operations in 1984 (Anchorage Daily News, September 23, 1978). The construction schedule is based on an estimated peak construction employment of 1,500 (letter from S. California Gas to Alaska Department of Natural Resources, May 17, 1978) and the four-year construction period from the 1974 E.I.S. for the Pacific LNG project.

Operations employment for these projects is transportation employment for the pipelines and manufacturing for the petrochemical projects. Alyeska estimated an operations employment of 300 for startup in 1977 and 850 per year for the long-term operations (Alaska Construction and Oil, October 1976). ALCAN operations employment is assumed to be 96 beginning in 1985. This estimate was based on ALCAN's 1976 application to the Federal Power Commission. The difference in operations employment is accounted for because TAPS has more pipeline in Alaska, the Valdez port employment is part of the TAPS employment, and TAPS has substantial Alaska headquarters employment. Operations employment for the Pacific LNG plant is 60 beginning in 1984.

Employment for these special projects is allocated to MAP Regions as follows:

1. Prudhoe, Lisburne, Kuparak employment to Region 1
2. Upper Cook N. Gulf OCS, Pacific LNG employment in Region 4
3. Other mining at its appropriate regional level
4. ALCAN and TAPS construction based on miles of pipe in region plus 300 TAPS headquarters in Anchorage in 1977
5. ALCAN operations is allocated by the miles of pipeline in each region
6. TAPS operations employment will be allocated as follows: 300 in Anchorage, 200 in Valdez, and the remainder based on the regional distribution of the pipeline.

Industry Growth

The level of employment in federal government and agriculture-forestry-fisheries is set exogenously. Federal government employment is assumed to follow its general historical trend and remain constant at the 1976 level throughout the forecast period. The trend in the historical period reflects increases in civilian employment offsetting decreasing military employment. The regional allocation will also remain constant. Employment in agriculture-forestry-fisheries will be assumed to increase at a rate of 3 percent per year. This reflects an assumption of little growth in agriculture and a modest increase in fisheries. The Southcentral Water Study estimated approximately a 5 percent annual increase with maximum fisheries development. Employment will be assumed to increase at this rate in each region.

Output in manufacturing must be determined exogenously. It is assumed to increase at an average annual rate of 4 percent which is consistent with both the historical trend and the assumed growth in the fisheries industry. Regional growth will be determined by the mix of industries with food manufacturing growing at the same rate as fisheries, 3 percent; lumber growing at 4 percent; paper growing at 2.5 percent; and other manufacturing bringing the growth rate into line with the overall 4 percent per year.

PETROLEUM REVENUE ASSUMPTIONS

Petroleum revenues to the state consist of royalties, production taxes, property taxes, and the corporate income tax. This section will examine the revenue assumptions chosen for the base case. Where it was possible and did not conflict with other assumptions made in this study, we used revenue estimates made by the state; in other cases, revenues were estimated based on assumptions about the wellhead value and production.

COOK INLET REVENUES

Table B.3 details the royalty and severance revenues from oil and gas production in Upper Cook Inlet. The overall assumption is that oil production would be over in 1995, while gas production will continue throughout the projection period. The specific assumptions are:

- Oil royalties and production tax are from a Legislative Affairs Agency memo of July 14, 1977. Revenues were estimated through 1985; after that a 15 percent decline was assumed in the value of oil produced. The average production of the well was assumed

TABLE B.3. COOK INLET REVENUES[1]

Fiscal Year	Oil Royalties (Millions)	Oil Production Tax (Millions)	Gas Royalties (Millions)	Gas Production Tax (Millions)
1978	33.1	16.3	4.4	2.3
1979	31.3	14.4	5.4	2.8
1980	29.5	12.7	6.9	3.6
1981	27.9	10.9	8.3	4.4
1982	26.4	9.1	9.0	4.6
1983	24.6	7.3	9.1	4.7
1984	22.9	5.5	9.3	4.8
1985	21.2	3.7	9.4	4.9
1986	20.1	3.0	9.4	4.9
1987	19.1	2.0	9.4	4.9
1988	18.2	1.0	9.4	4.9
1989	17.3	0	8.5	4.4
1990	16.4	0	7.7	3.9
1991	15.6	0	6.9	3.5
1992	14.8	0	6.2	3.2
1993	14.1	0	5.6	2.9
1994	13.4	0	5.0	2.6
1995	12.7	0	4.5	2.3
1996	0	0	4.1	2.1
1997	0	0	3.7	1.9
1998	0	0	3.3	1.7
1999	0	0	3.0	1.5
2000	0	0	2.6	1.4

[1] Same as The Permanent Fund and the Alaskan Economy (Goldsmith, 1977) study except oil royalties which are the same until 1985, then decline at 15 percent to be eliminated in 1996.

to decline below the taxable rate in 1989, and production was assumed to stop in 1995.

- Gas royalties and production tax are based on estimates of production through 1985 made by the Revenue Department in Revenue Journal, Vol. 1, No. 2, October 1976. Decline after 1985 was assumed by the author to be at a rate of 10 percent per year. The 1977 ratio of royalties and production taxes to production was assumed to hold throughout the projection period.

PRUDHOE BAY REVENUES

Prudhoe Bay will produce the major petroleum revenues for the state in the projection period. To arrive at revenue estimates, estimates of production and the wellhead value are needed. These estimates are shown in Table B.4 and Table B.5.

- Production of oil was assumed to equal estimates made in Technical Report No. 6 (Alaska OCS Socioeconomic Studies Program, 1978).

- The wellhead value per barrel of oil was calculated based on discussion with BLM-OCS. These assumptions reflect those made with respect to N. Gulf oil.

    1. West Coast market price is $12/bbl. This reflects a $1.50 discount from a $13.50/bbl Gulf Coast price. The discount is for transport costs. The real market price stays constant.

    2. Vessel costs equal $1.00/bbl from Valdez to the West Coast and $.75/bbl processing costs. These costs remain constant in real terms.

    3. The TAPS tariff is $5.25 in 1978. The nominal tariff remains constant until 1990 when it is assumed the increased

TABLE B.4. PRUDHOE BAY OIL

Fiscal Year	Production (Million Bbls)	Wellhead Price ($/Bbl)	Wellhead Value (Million$)	Royalties (Million$)	Production Tax (Million$)
1978	237.3	5.00	1186.5	148.3	124.6
1979	474.5	5.56	2638.2	329.8	277.0
1980	584.0	6.16	3597.4	449.7	377.7
1981	595.7	6.79	4044.8	505.6	424.7
1982	607.5	7.45	4525.9	565.7	475.2
1983	619.6	8.15	5049.7	631.2	530.2
1984	631.5	8.88	5607.7	701.0	588.8
1985	641.5	9.66	6196.9	774.6	650.7
1986	613.2	10.48	6426.3	803.3	674.8
1987	545.7	11.35	6193.7	774.2	650.3
1988	511.9	12.25	6270.8	783.9	658.4
1989	475.4	13.22	6284.8	785.6	659.9
1990	409.7	14.24	5834.1	729.3	561.5
1991	367.7	15.02	5522.9	690.4	531.6
1992	347.7	15.85	5511.0	688.9	530.4
1993	329.4	16.72	5507.6	688.5	530.1
1994	299.3	17.64	5279.7	660.0	508.2
1995	268.3	18.61	4993.1	624.1	480.6
1996	246.4	19.63	4836.8	604.6	465.5
1997	228.1	20.71	4724.0	590.5	454.7
1998	211.7	21.85	4625.6	578.2	445.2
1999	197.5	23.05	4552.4	569.1	438.2
2000	183.8	24.32	4470.0	558.8	430.2

TABLE B.5. PRUDHOE BAY GAS

Fiscal Year	Production (Billion C. Ft)	Wellhead Price ($/MCF)	Wellhead Value (Million$)	Royalties (Million$)	Production Tax (Million$)
1978	3.9	1.00	3.9	5	4
1979	5.1	1.06	5.4	.7	6
1980	5.9	1.11	6.5	8	.7
1981	28	1.17	32.8	4.1	3.4
1982	43	1.24	53.3	6.7	5.6
1983	50	1.31	65.5	8.2	6.9
1984	780	1.38	1076.4	134.6	113.0
1985	830	1.45	1203.5	150.4	126.4
1986	870	1.53	1331.1	166.4	139.8
1987	912	1.62	1477.4	184.7	155.1
1988	912	1.71	1559.5	194.9	163.7
1989	912	1.80	1641.6	205.2	172.4
1990	912	1.90	1732.8	216.6	181.9
1991	912	2.01	1833.1	229.1	192.5
1992	912	2.12	1933.4	241.7	203.0
1993	912	2.23	2033.8	254.2	213.5
1994	912	2.36	2152.3	269.0	226.0
1995	912	2.48	2261.8	282.7	237.5
1996	912	2.62	2389.4	298.7	250.9
1997	912	2.77	2526.2	315.8	265.3
1998	912	2.92	2663.0	332.9	279.6
1999	912	3.08	2809.0	351.1	294.9
2000	912	3.25	2964.0	370.5	311.2

operating costs dominate the decreasing capital costs. After 1990, the tariff remains constant in real terms.

This assumption reflects only one of a number which could be made concerning oil wellhead values.

- Production of gas at Prudhoe is assumed to increase following the Department of Revenue assumed production until 1987 when the peak production assumed by Dames and Moore (Beaufort OCS Petroleum Scenarios, 1978) is reached. This production level is assumed to remain throughout the period.

- The wellhead value of gas was calculated assuming the compromise energy bill is adopted so that Prudhoe gas could sell at a wellhead value of $1.45 per MCF. This assumes the ability to roll this gas with other gas. It is assumed that producers pay $.45 processing costs for a net of $1.00 wellhead. A constant real price of gas is assumed.[1]

Revenues from these are determined based upon state laws. Royalties are 12.5 percent of the wellhead value of oil and gas. The production tax in each case is a fraction of the nonroyalty value. This fraction depends upon the productivity of the average well in the field. The production tax on oil was assumed to equal 12 percent through 1989 when production declines and the rate falls to 11 percent. The production tax on gas is assumed to equal 12 percent throughout the projection period.

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[1]Base case was selected prior to final adoption of Federal Energy Act of 1978 which set a ceiling for Alaskan gas wellhead price.

MISCELLANEOUS REVENUES

There are three important miscellaneous petroleum revenues: the property tax, the reserves taxes, and the corporate income tax. Table B.6 shows the assumed value of these taxes.

- The property tax taxes all petroleum-related property except oil refining and gas processing property and leases at a rate of twenty mills. We used the property tax revenue series estimated by the Department of Revenue in Alaska Oil and Gas Structure. This assumed construction of the TAPS and ALCAN lines.
- The reserves tax involves the repayment by the state of taxes paid by petroleum producers in 1976 and 1977. Credits of up to 50 percent of the production taxes are given until the $499 million collected is repaid. This tax affects only producers at Prudhoe.
- The Alaskan corporate income tax was changed in the last legislative session so that no state projection of this revenue stream is available. The corporate income tax on petroleum is 9.4 percent of taxable petroleum income. Taxable income is gross income minus capital and operating costs and Alaskan taxes. The figure is not net of federal taxes. The tax was based on estimates of net income determined by the following procedure.

  1. ALCAN and TAPS income was based on an assumption that these lines would be guaranteed a 20 percent after-tax return on their equity by the rate structure. It

TABLE B.6. OTHER REVENUES

Fiscal Year	Property Tax[1] (Million$)	Reserves Tax[2] (Million$)	ANCSA[3] (Million$)	Corporate Income Tax[4] (Million$)
1978	173.0	(83.3)	(23.8)	33.5
1979	185.0	(166.4)	(52.9)	127.8
1980	193.2	(204.8)	(72.1)	167.3
1981	226.7	(44.8)	(81.6)	188.5
1982	251.8	0	(91.6)	212.8
1983	257.0	0	(102.3)	265.1
1984	261.4	0	(68.8)	348.9
1985	295.9	0	0	384.8
1986	281.1	0	0	405.1
1987	267.0	0	0	407.2
1988	253.7	0	0	421.6
1989	241.0	0	0	428.7
1990	229.0	0	0	421.4
1991	217.5	0	0	409.7
1992	206.6	0	0	416.5
1993	196.3	0	0	425.7
1994	186.5	0	0	418.8
1995	177.2	0	0	410.1
1996	168.3	0	0	410.7
1997	159.9	0	0	409.9
1998	151.9	0	0	411.0
1999	144.3	0	0	416.6
2000	137.1	0	0	418.5

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[1]Based on estimates in Alaska Oil and Gas Tax Structure, Department of Revenue.

[2]50 percent of Prudhoe production taxes.

[3]2.0 percent of wellhead value at Prudhoe until $500 million is paid to the fund.

[4]Actual fiscal year 78 value; afterwards estimated as explained in the text.

was assumed that 15 percent of the capital cost of both projects was equity. The TAPS project was assumed to cost $10.5 billion and the Alaskan portion of the ALCAN line was assumed to cost $4.3 billion. The equity portion was depreciated in a straightline return on the remaining equity adjusted for an assumed 48 percent Federal tax rate.

2. Corporate taxable income for Prudhoe Bay gas and oil production was derived by estimating the components of revenues and costs. Revenues are derived above. The cost assumptions were derived from Technical Report No. 6 (Alaska OCS Socioeconomic Studies Program, 1978). The assumptions are shown below:

	Prudhoe Oil	Prudhoe Gas
Total Costs	$9.45 billion	$2.6 billion
Debt Proportion	25 %	25 %
Interest on Debt	9.0%	9.0%
Project Life	25 years	26 years
Total Throughput	10.5 billion bbls	26 billion MCF

Capital costs per barrel were found with this information. Per barrel costs were used to account for the flow of investment over the life of the field. Capital costs equalled debt service plus depreciation costs. Operating costs were added for total costs. These costs were:

	Prudhoe Oil	Prudhoe Gas
Capital Costs	$1.24/bbl	$.14/MCF
Operating Costs	$1.00/bbl	$.08/MCF

In addition, $.12 per barrel and $.02 per MCF were allowed for overhead as per the legislation. Taxable income was found by subtracting these costs and allowable Alaska taxes from revenues.

3. The ratio of oil and gas taxable income to severance taxes at Prudhoe Bay was applied to Cook Inlet to estimate taxable income from this production.

4. Estimated corporate income tax was found by applying the .094 rate to this income.

5. A final portion of the tax includes a redistribution of multistate corporate profits. This portion allocates

worldwide corporate profits based on three factors: nonproduction property in Alaska as a percent of worldwide property, nonproduction payroll in Alaska as a percent of worldwide payroll, and Alaskan sales as a percent of worldwide sales. The average of these was taken as the proportion of worldwide profits which were taxed at 9.4 percent. Conversation with Alaska Department of Revenue led us to the conclusion that this component would be extremely small, so it was ignored in this study.

BEAUFORT OCS REVENUES

Tables B.7 through B.9 show the revenues associated with each of three Beaufort scenarios. Revenues are based on production estimates provided by the Alaska OCS Office of BLM. Wellhead values are determined by the wellhead value at Prudhoe minus transport costs from the Beaufort. These real 1978 transport costs were $.60 per barrel for oil and $.15 per MCF for gas. Other assumptions included:

1. Half of the production and offshore capital facilities would be located in state waters.

2. A conventional scheme of bonus bidding was used with $100 million being bid.

3. Discoveries on state-owned properties will be subject to state royalties and production taxes at current rates.

4. Oil and gas production from the Beaufort is transported via TAPS and ALCAN rather than new pipelines or alternate modes.

TABLE B.7. BEAUFORT MINIMUM SCENARIO
DIRECT REVENUE EFFECTS

(Millions of Nominal Dollars)

	Bonus[1]	Royalties[2]	Production[3] Tax	Property[4] Tax	Corporate[5] Income Tax
1979	50	0	0	0	0
1980	0	0	0	0	0
1981	0	0	0	.31	0
1982	0	0	0	44	0
1983	0	0	0	.70	0
1984	0	0	0	.71	0
1985	0	0	0	.48	0
1986	0	0	0	2.01	0
1987	0	0	0	4.75	0
1988	0	0	0	8.92	0
1989	0	9.10	7.60	13.29	.42
1990	0	24.10	20.30	15.05	3.77
1991	0	33.00	27.70	16.77	5.66
1992	0	42.80	35.90	17.58	7.84
1993	0	45.10	37.90	19.04	9.27
1994	0	44.00	40.00	20.43	9.10
1995	0	50.20	42.20	20.92	9.06
1996	0	50.60	42.50	20.37	9.21
1997	0	50.70	42.60	19.70	8.72
1998	0	49.40	41.50	18.89	8.18
1999	0	46.30	38.90	17.94	7.14
2000	0	42.80	35.90	16.82	5.81

[1] BLM-Alaska OCS Office.

[2] Royalties estimated at 12.5 percent of total wellhead value.

[3] Production tax equals 12 percent of the nonroyalty portion of total wellhead value.

[4] Tax at 20 mills of petroleum property value.

[5] Corporate income tax at 9.4 percent of taxable petroleum income.

TABLE B.8. BEAUFORT MODERATE SCENARIO
DIRECT REVENUE EFFECTS

(Millions of Nominal Dollars)

	Bonus[1]	Royalties[2]	Production Tax[3]	Property Tax[4]	Corporate Income Tax[5]
1979	50	0	0	0	0
1980	0	0	0	0	0
1981	0	0	0	31	0
1982	0	0	0	44	0
1983	0	0	0	70	0
1984	0	0	0	.71	0
1985	0	0	0	82	0
1986	0	0	0	3.03	0
1987	0	0	0	6.21	0
1988	0	0	0	11.01	0
1989	0	12.50	10.50	16.22	.43
1990	0	33.10	30.10	18.49	7.12
1991	0	51.00	42.90	20.69	10.41
1992	0	54.70	46.00	22.06	11.13
1993	0	57.80	48.50	24.18	11.96
1994	0	61.00	51.20	26.37	12.74
1995	0	63.20	53.00	27.60	11.29
1996	0	65.40	55.00	28.03	12.41
1997	0	67.70	56.80	28.00	12.77
1998	0	65.90	55.40	27.81	11.79
1999	0	62.20	52.30	27.50	9.87
2000	0	58.10	48.80	27.08	7.63

[1] BLM-Alaska OCS Office.

[2] Royalties estimated at 12.5 percent of total wellhead value.

[3] Production tax equals 12 percent of the nonroyalty portion of total wellhead value.

[4] Tax at 20 mills of petroleum property value.

[5] Corporate income tax at 9.4 percent of taxable petroleum income.

TABLE B.9. BEAUFORT HIGH SCENARIO DIRECT REVENUE EFFECTS

(Millions of Nominal Dollars)

	Bonus[1]	Royalties[2]	Production Tax[3]	Property Tax[4]	Corporate Income Tax[5]
1979	50	0	0	0	0
1980	0	0	0	0	0
1981	0	0	0	31	0
1982	0	0	0	44	0
1983	0	0	0	70	0
1984	0	0	0	.71	0
1985	0	0	0	.82	0
1986	0	0	0	3.78	0
1987	0	0	0	9.21	0
1988	0	0	0	16.71	0
1989	0	37.50	31.40	24.88	4.51
1990	0	67.10	56.40	28.60	15.54
1991	0	85.10	71.40	32.35	19.48
1992	0	90.70	76.20	34.72	20.43
1993	0	95.60	80.30	38.43	21.95
1994	0	100.80	84.70	42.18	23.09
1995	0	106.40	89.30	44.34	21.97
1996	0	112.20	94.30	45.13	23.18
1997	0	115.90	97.30	45.23	23.90
1998	0	112.70	94.60	45.21	20.42
1999	0	101.50	85.20	45.04	17.62
2000	0	91.70	77.00	44.73	13.19

[1] BLM-Alaska OCS Office.

[2] Royalties estimated at 12.5 percent of total wellhead value.

[3] Production tax equals 12 percent of the nonroyalty portion of total wellhead value.

[4] Tax at 20 mills of petroleum property value.

[5] Corporate income tax at 9.4 percent of taxable petroleum income.

APPENDIX C

A Procedure to Determine the Share of OCS Employment to Alaskan Residents

The direct total employment estimates made by Dames and Moore in the Northern Gulf OCS petroleum scenarios (Dames and Moore, 1978) have been refined to reflect resident/nonresident composition of this employment. Resident, in the context of these refinements, refers to an individual that resides in Alaska for the duration of employment (including offsite). Resident employees do not need to live in Alaska before the project begins. Resident employment is assumed to have full impact on the Alaska economy, while the impact of nonresident employees is assumed to be negligible. To assist in the determination of the share of employment to Alaska residents (SEAR), a cross section of information regarding the classification, structure, duration, and impact of OCS petroleum development-related employment is presented in Table C.1, "Characteristics of OCS Employment by Task," which accompanies this appendix.

A brief outline of the table's format and information content will precede a discussion of the assumptions used to provide consistency and accuracy in the interpretation of this information.

TABLE FORMAT

Columns one and two categorize employment by sector (or task) and by phase of development, respectively. Column three lists the rotation factor

TABLE C.1. CHARACTERISTICS OF OCS EMPLOYMENT BY TASK

1 Employment Sectors For Petroleum Operations[1]	2 Phase of Development[2]	3 Rotation Factor[3]	4 Duration[4]	5 Potential AK Resident Share from Industry[5]	6 Employment Multiplier[6]		7 Payments Allocation Coefficients Share to AK Residents[8] In Years: 1	5	10	8 Estimate Share of Employment To Alaskan Residents (SEAR) 1979-84	1985-89	1990 +
ONSHORE												
1. Service Base	Exploration	1		.15[a]						1.0	1.0	1.0
	Development	1	P	.2	1.5	1[7]		NA		1.0	1.0	1.0
	Production	1		1.0						1.0	1.0	1.0
2. Helicopter Service	Exploration	2								.5	.525	.578
	Development	1.5[a]	P	.2 (.3)[b]	1.5	1		NA		.5	.525	.578
	Production	1								1.0	1.0	1.0
3. Service Base Const.	Development	1.11	T	.5	1.5	1	.25	.25	.25	.5	.525	.578
4. Pipe Coating		1.11	T	.2	1.1	.2				.2	.21	.231
5. Onshore Pipeline Const.		1.11	T	.2	1.1	.2				.2	.21	.231
6. Oil Terminal Const.		1.11	T	.5	1.1	.2				.5	.525	.578
7. LNG Plant Const.		1.11	T	NA	1.1	.2				.5	.525	.578
8. Concrete Platform Const.[10]		NA	NA	NA	NA	NA				NA	NA	NA
9. Oil Terminal Operations	Production	1	P	1.0	1.5	1	.75	.75	.75[9]	1.0	1.0	1.0
10. LNG Plant Operations		1	P	1.0	1.5	1				1.0	1.0	1.0
OFFSHORE												
11. Surveys	Exploration	1	T	.2	1.1	.2	.15	.55	.55	.2	.21	.231
12. Rigs		2	T	.1	1.1	.2				.2	.21	.231
13. Platforms	Development	2	P	.1 (.3)[b]	1.2[c]	.4	.75	.75	.75[9]	.1	.3	.33
	Production	1		1.0	1.4[d]	.8				1.0	1.0	1.0
14. Platform Installation	Development	2	T	.1	1.1	.2	.25	.25	.25	.1	.105	.116
15. Offshore Pipeline Const.		2	T	.1	1.1	.2	.25	.25	.25	.1	.105	.116
16. Supply-Anchor-Tugboats	Exploration	1.5		.15	1.2[c]	.4				.4	.42	.462
	Development	1.5	T	.15	1.4[d]	.8		NA		.8	.98	.968
	Production	1.5		.5	1.4[d]	.8				.8	.88	.968

[a]Approximation [b]Numbers in parentheses indicate second 5-year period
[c]First three years [d]Thereafter NA = not applicable

TABLE NOTES

Characteristics of OCS Employment by Task

1. These are the employment sectors (or tasks) requested by Tom Smythe of Alaska Consultants in his November 21 correspondence with Richard Schmidt of Peat, Marwick, Mitchell and Co.

2. Dames and Moore, "Alaska OCS Socioeconomic Studies Program, Northern Gulf of Alaska, Petroleum Development Scenarios," Draft Report, Task 9BA, October 24, 1978, Table 5-4, pages 119-122.

3. Ibid.

4. Based on discussions found in Planning for Offshore Oil Development, Gulf of Alaska OCS Handbook, Division of Community Planning, ADCRA, 1978, pages 40-41 and 223-224. Note: P = permanent; T = temporary.

5. Interview: Max Beazley, Staff Engineer at Mobil Oil Corporation, Exploration and Producing. Mr. Beazley is currently working in the Prudhoe Unit, a planning team for future development in Prudhoe Bay.

6. "Planning for Offshore Oil Development," Division of Community Planning, ADCRA, October 1977, Table 12, pages 17-18.

7. The factors to the right of the multipliers are the ratios of respective task-specific multiplier increments (multiplier - 1) to the statewide basic sector employment multiplier (1.5 - 1 = .5). (See note 6, above.)

8. "A Social and Economic Impact Study of Offshore Petroleum and Natural Gas Development in Alaska: Phase II," Mathematics Science Northwest, Inc., and Alaska Consultants, Inc., for BLM, October 1976, page 19.

9. Amendments suggested by Ed Phillips, Alaska DNR.

10. Concrete Platform Construction is not considered feasible in the Gulf of Alaska.

associated with each task. The rotation factors are taken from Dames and Moore (see table note 2) and are calculated as follows:[1]

$$1 + \frac{\text{Number of days off duty}}{\text{Number of days on duty}}$$

They are used to determine the on- and offsite employment for a given task. Employment duration (permanent or temporary) by task is listed in column four. The information in columns one through four characterize employment by task. They are intended to provide qualitative limits for the SEAR estimates.

Columns five through seven provide alternative implicit and explicit estimates of the SEAR. Column five includes an industry perspective on the resident potential of Alaska OCS employment. Column six provides estimates of the impact multipliers of employment in each task. The multipliers are implicit indicators of in-state residence. The factors to the right of the employment multipliers are the implicit SEARs assumed in these multipliers, given an employment multiplier of 1.5 for Alaska. The payment allocation coefficients found in column seven were developed for use in a regional input-output analysis designed to capture the socioeconomic impacts of OCS petroleum development in the Yakutat area. (See table note 8.) The values associated with table note 9 are adjustments suggested to compensate for a bias toward higher payment allocation to Alaska

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[1]The assignment of a unitary rotation factor for offshore platforms production (task 13) suggests that an operations crew is never granted off-duty leave from the platform. Although this assumption appears to be questionable, Gordon Harrison of Dames and Moore attributes categorical data problems to its existence and notes that potential inconsistencies implied by its use are insignificant and are balanced elsewhere in employment assumptions for that task.

residents that was introduced to facilitate interregional effects. An even distribution of skills across resident and nonresident groups is required in order to reinterpret the payment allocation coefficients in the context of employment and residency. This assumption is, perhaps, unrealistic during exploration and petroleum field development. Under this interpretation, the payment allocation coefficients will overstate the SEAR for tasks relevant to those phases of development.

METHODOLOGY AND ASSUMPTIONS

The task-specific information just outlined has been mapped into a final SEAR estimate (in column eight) for each task using the following methodology:

1. The SEAR estimates contained in columns five, six, and seven are used to bracket a reasonable SEAR range for each task. For example, the SEAR range for offshore platform installation (task 14) extends from .1 to .25.

2. In the interest of consistency, an additional set of general, phase-specific SEAR guidelines are developed. Here, a given employment task is examined in the context of its phase of development.

Tasks subsumed under exploration (Onshore: service base, helicopter service; Offshore: surveys, rigs, supply-anchor-tugboats) are temporary, require "extreme specialization," and usually embrace a reparatory work crew having "international character."[2] These conditions imply a low SEAR (of approximately .1 to .2) for exploration employment. Of course,

[2]Dames and Moore, "Alaska OCS Socioeconomic Studies Program, Northern Gulf of Alaska, Petroleum Development Scenarios," Draft Report, Task 9BA, October 24, 1978, pp. 106-107.

exceptions to these guidelines occur. For example, helicopter service during exploration may be contracted through Anchorage-based firms.[3]

The offshore development phase, including platform installation (14) and operation (13) offshore pipeline construction (15), and supply-anchor-tug boats (16), is assumed to retain the descriptive and structural characteristics mentioned above for the case of exploration.

Onshore development includes various types of construction employment. Although the work force is generally seasonal (not unusual in the Alaska construction industry), the potential for civil construction work by Alaska-based contractors is more likely than that of offshore development or of exploration, particularly as the overall sphere of OCS development broadens. It is assumed that a SEAR of about .4 to .5 is consistent with these conditions.

During production, employment is generally permanent and oriented toward less specialized, more routine entry-level positions. These employment characteristics appear to be compatible with Alaska residency. Overall, we attach a SEAR of 1.0 to tasks subsumed under the production phase.

Table C.2 summarizes the general SEAR guidlines outlined above.

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[3]Dames and Moore, "Alaska OCS Socioeconomic Studies Program, Monitoring Petroleum Activities in the Gulf of Alaska and the Lower Cook Inlet Between April 1975 and June 1978," Technical Report #17, August 1978, p. 38.

TABLE C.2. PHASE-SPECIFIC SEAR GUIDELINE

	Onshore	Offshore
Exploration	.1 - .2	.1 - .2
Development	.4 - .5	.1 - .2
Production	1.0	1.0

Additionally, there are two principal relationships which influence the trend in the share of OCS employment to Alaska residents (SEAR). First, the internal supply of labor that is qualified to perform the variety of tasks delineated in column one of Table C.1 is assumed to increase in response to earlier "layers" of OCS petroleum development, as a function of other mining activity, and to more general growth in the Alaska economy. Second, for those OCS employees that initially accept nonresident status, it is likely that a certain percentage shift to Alaska residency over time. We consolidate the combined effects of these employment dynamics into an assumption calling for a one percent annual average rate of growth in the SEAR for all tasks having an initial SEAR of less than one. For simplicity, the continuous compounding of growth per period is replaced by a five percent increase between 1985 and 1989 and a ten percent increase thereafter. This assumption corresponds to the figures in the three subcolumns under column eight.

APPENDIX D

Selected Model Output

Variable Definitions

POP	Population (10^3 persons)
MIGNET	Net migration (10^3 persons)
NINCTOT	Natural increase (10^3 persons)
EM99	Total employment (10^3 persons)
EMSPP	Proportion of employment in the support sector
EMG9P	Proportion of employment in the government sector
EMNSP	Proportion of employment in the basic sector
EMA9	Employment in agriculture-forestry-fisheries (10^3 persons)
EMGF	Employment in federal government (10^3 persons)
EMP9	Employment in mining (10^3 persons)
EMT9	Employment in transportation (10^3 persons)
EMS9	Employment in services (10^3 persons)
EMPU	Employment in utilities (10^3 persons)
EMM9	Employment in manufacturing (10^3 persons)
EMFI	Employment in finance-insurance-real estate (10^3 persons)
EMD9	Employment in trade (10^3 persons)
EMCN	Employment in construction (10^3 persons)
EMCN1	Employment in local construction (10^3 persons)
EMGA	Employment in state and local government (10^3 persons)
EMOT	Other employment (10^3 persons)
PI	Personal income (millions of nominal dollars)
PIRPC	Real per capita personal income
RPI	Relative price index ($1957 US = 100)
E99S	Total state expenditures (millions of nominal dollars)
EXOPS	Total state operating expenditures (millions of nominal dollars)
EXCAP	Total state capital expenditures (millions of nominal dollars)
E99SRPC	Real per capita state expenditures
REVGF	Total general fund revenue (millions of nominal dollars)
RP9S	Total petroleum revenues (millions of nominal dollars)
RT98	Total nonpetroleum tax revenues (millions of nominal dollars)
RENS	Total endogenous revenues (millions of nominal dollars)

Variable Definitions (continued)

GFBAL	General fund balance (millions of nominal dollars)
PFBAL	Permanent fund balance (millions of nominal dollars)
RINS	Fund balance interest (millions of nominal dollars)
FUND	Total fund balance (millions of nominal dollars)
FUND77	Real fund balance (millions of real 1977 dollars)
SIMP	General fund revenue minus general fund expenditure (millions of nominal dollars)
EXBITES	State total expenditure as a percentage of personal income
VIABL2	Nonpetroleum revenues as a percentage of general fund expenditures
RENSRAT	Endogenous revenues as a percentage of personal income

MODERATE BASE CASE

	POP	MIGNET	NINCTOT	EM99	EMSPP	EMG9P	EMNSP	EMA9
1977	410.66	-24.935	6.383	185.508	0.363	0.378	0.259	1.1
1978	406.667	-11.241	7.202	178.526	0.373	0.386	0.242	1.2
1979	418.656	5.268	6.697	185.225	0.383	0.374	0.243	1.2
1980	434.173	8.65	6.87	194.054	0.395	0.36	0.245	1.2
1981	455.563	14.253	7.144	206.479	0.408	0.342	0.251	1.3
1982	486.359	23.18	7.633	224.637	0.422	0.319	0.258	1.3
1983	502.802	8.014	8.46	230.228	0.423	0.324	0.253	1.4
1984	501.479	-9.943	8.626	223.159	0.42	0.339	0.241	1.4
1985	509.057	-0.528	8.082	224.931	0.427	0.331	0.242	1.4
1986	523.083	6.046	7.971	231.906	0.434	0.322	0.244	1.5
1987	539.029	7.828	8.12	240.132	0.442	0.315	0.244	1.5
1988	556.942	9.585	8.332	249.55	0.449	0.307	0.244	1.6
1989	575.352	9.802	8.614	259.033	0.457	0.3	0.243	1.6
1990	591.58	7.336	8.9	266.632	0.462	0.296	0.242	1.7
1991	606.771	6.111	9.082	273.502	0.469	0.291	0.24	1.7
1992	622.686	6.694	9.22	280.902	0.475	0.285	0.24	1.8
1993	640.335	8.264	9.386	289.58	0.483	0.278	0.239	1.8
1994	658.298	8.349	9.616	298.329	0.489	0.272	0.239	1.8
1995	677.649	9.508	9.845	308.016	0.496	0.265	0.238	1.9
1996	698.466	10.701	10.12	318.616	0.503	0.258	0.239	2.
1997	719.126	10.228	10.438	328.881	0.51	0.252	0.238	2.1
1998	740.455	10.603	10.729	339.495	0.516	0.245	0.238	2.1
1999	764.593	13.11	11.031	352.046	0.524	0.238	0.238	2.2
2000	789.287	13.274	11.429	364.721	0.531	0.231	0.238	2.2

	EMGF	EMP9	EMT9	EMS9	EMPU	EMOT	EMM9	EMFI
1977	42.921	4.514	9.842	22.649	1.184	14.55	11.356	5.779
1978	42.921	4.351	10.294	21.9	1.194	14.269	11.906	5.738
1979	42.921	4.563	10.774	23.693	1.249	14.538	12.411	6.176
1980	42.921	5.104	11.393	25.945	1.321	14.886	12.896	6.758
1981	42.921	4.93	12.173	29.022	1.403	15.363	13.37	7.497
1982	42.921	4.576	13.232	33.543	1.507	16.033	13.843	8.524
1983	42.921	4.275	13.536	34.395	1.541	16.234	14.32	8.839
1984	42.921	4.415	13.237	32.47	1.526	15.979	14.867	8.578
1985	42.921	4.315	13.551	33.276	1.551	16.044	15.364	8.808
1986	42.921	4.312	14.02	35.194	1.602	16.293	15.877	9.295
1987	42.921	4.399	14.557	37.406	1.66	16.583	16.403	9.865
1988	42.921	4.643	15.139	39.868	1.722	16.909	16.947	10.494
1989	42.921	4.839	15.735	42.424	1.786	17.23	17.507	11.152
1990	42.921	4.853	16.207	44.432	1.837	17.484	18.085	11.686
1991	42.921	4.343	16.684	46.543	1.887	17.71	18.68	12.229
1992	42.921	4.322	17.166	48.701	1.938	17.95	19.297	12.788
1993	42.921	4.171	17.743	51.354	1.998	18.227	19.933	13.464
1994	42.921	4.12	18.302	53.952	2.055	18.503	20.59	14.129
1995	42.921	4.123	18.928	56.901	2.12	18.803	21.269	14.888
1996	42.921	4.125	19.589	60.114	2.187	19.126	21.971	15.701
1997	42.921	4.102	20.235	63.243	2.253	19.434	22.696	16.513
1998	42.921	4.078	20.893	66.526	2.319	19.746	23.445	17.35
1999	42.921	4.078	21.668	70.464	2.397	20.11	24.219	18.352
2000	42.921	4.079	22.429	74.399	2.472	20.471	25.019	19.352

	EMD9	EMCN	EMCN1	EMGA	PI	PIRPC	RPI	EXOPS
1977	24.819	16.559	11.189	27.256	4072.38	3924.32	252.71	810.
1978	24.766	11.434	11.307	25.941	4236.48	3723.81	279.75	944.
1979	26.405	12.277	11.972	26.373	4743.19	3862.07	293.358	1019.
1980	28.562	13.526	13.001	26.862	5305.29	4029.44	308.4	1120.35
1981	31.235	16.775	14.132	27.645	6400.84	4317.09	325.469	1247.59
1982	34.862	22.307	15.768	28.811	7916.37	4711.11	345.513	1432.16
1983	35.993	21.97	16.513	31.619	8570.5	4720.22	361.121	1696.62
1984	35.159	17.124	16.485	32.662	8276.16	4431.22	372.435	1848.08
1985	35.989	17.362	17.136	31.551	8809.96	4462.8	387.793	1905.99
1986	37.713	18.643	18.212	31.692	9763.24	4598.26	405.915	2071.54
1987	39.723	19.627	19.167	32.61	10854.	4732.11	425.528	2310.95
1988	41.919	20.821	20.228	33.642	12145.5	4885.77	446.354	2584.19
1989	44.205	21.865	21.311	34.807	13531.3	5024.07	468.12	2895.41
1990	46.052	22.415	22.213	35.998	14835.5	5118.93	489.906	3227.66
1991	47.913	23.159	22.956	36.741	16226.4	5221.23	512.187	3541.88
1992	49.819	23.931	23.805	37.255	17780.9	5330.02	535.75	3864.63
1993	52.108	25.089	24.884	37.715	19613.	5461.63	560.815	4214.64
1994	54.347	26.175	25.969	38.341	21601.7	5590.01	587.026	4608.74
1995	56.887	27.329	27.2	38.822	23829.1	5719.94	614.776	5024.26
1996	59.583	28.788	28.515	39.329	26434.	5875.33	644.155	5475.53
1997	62.266	29.971	29.917	39.946	29094.7	5997.29	674.618	5980.63
1998	65.01	31.451	31.396	40.411	32115.7	6139.43	706.475	6502.43
1999	68.273	33.231	33.175	40.838	35660.7	6297.37	740.639	7079.38
2000	71.508	35.03	34.972	41.496	39558.7	6455.75	776.366	7743.56

	EXCAP	E99S	E99SRPC	REVGF	RP9S	RT98	RENS	GFBAL
1977	270.326	1160.82	1118.56	796.27	197.201	214.301	278.522	668.165
1978	280.	1311.13	1152.49	1053.8	471.4	206.916	240.272	617.209
1979	290.	1414.71	1151.9	1440.77	860.7	274.373	222.549	814.761
1980	331.395	1566.76	1170.1	1624.51	996.3	312.909	230.856	1054.02
1981	372.128	1743.59	1175.94	1987.98	1278.41	355.308	264.013	1500.3
1982	443.634	2014.83	1198.99	2328.56	1475.74	437.17	336.947	2055.96
1983	521.473	2371.39	1306.03	2650.63	1642.7	551.719	419.177	2630.09
1984	561.826	2580.05	1381.42	3224.12	2121.71	650.162	447.095	3558.47
1985	654.295	2747.94	1392.01	3628.91	2422.22	682.227	450.247	4748.43
1986	780.546	3061.89	1442.06	3811.33	2430.93	737.288	497.794	5871.61
1987	838.027	3382.48	1474.67	4058.	2480.11	792.758	570.019	6983.04
1988	905.618	3750.11	1508.53	4312.45	2520.71	871.591	656.675	8044.19
1989	960.565	4144.94	1538.96	4583.19	2563.12	954.926	758.599	9044.13
1990	1009.75	4556.67	1572.25	4712.29	2459.19	1035.29	868.514	9836.55
1991	1010.06	4903.72	1577.87	4879.65	2406.19	1108.34	979.432	10503.9
1992	1034.08	5283.61	1583.8	5129.42	2430.36	1207.55	1101.96	11095.5
1993	1076.94	5704.91	1588.62	5401.93	2459.28	1324.32	1243.75	11604.2
1994	1126.46	6178.99	1598.96	5637.3	2427.37	1445.31	1411.72	11955.7
1995	1163.79	6667.18	1600.37	5864.25	2373.6	1578.32	1600.18	12128.3
1996	1208.79	7201.25	1600.56	6161.67	2365.73	1749.55	1821.53	12149.5
1997	1275.43	7809.19	1609.69	6494.16	2367.	1943.9	2075.96	11995.7
1998	1376.16	8472.7	1619.67	6840.48	2364.71	2158.69	2355.52	11641.7
1999	1490.43	9197.66	1624.2	7234.21	2370.6	2415.22	2681.24	11086.3
2000	1622.01	10029.1	1636.66	7678.43	2371.88	2718.09	3070.67	[illegible]

1977	2.4	35.343	679.6	671.369	0.131	531.912	557.16	-137.452
1978	48.975	46.954	666.194	602.483	0.134	568.508	595.271	-4.416
1979	153.275	46.878	968.037	834.862	0.131	622.528	650.896	301.853
1980	275.	68.529	1329.02	1090.28	0.133	718.529	748.6	360.987
1981	411.475	94.407	1911.78	1486.1	0.126	806.159	838.034	582.755
1982	563.425	135.832	2619.38	1918.02	0.115	910.708	944.496	707.604
1983	731.699	186.174	3361.79	2355.26	0.121	1040.8	1076.61	742.415
1984	948.649	238.984	4507.12	3061.74	0.136	1123.95	1161.92	1145.33
1985	1187.55	320.241	5935.98	3872.69	0.133	1168.37	1208.61	1428.86
1986	1437.35	421.456	7308.96	4555.55	0.128	1250.29	1292.95	1372.99
1987	1684.2	518.814	8667.24	5153.15	0.126	1363.94	1409.16	1358.28
1988	1935.8	615.127	9979.99	5656.8	0.123	1497.99	1545.92	1312.75
1989	2193.07	708.278	11237.2	6073.25	0.122	1647.03	1697.83	1257.22
1990	2444.52	797.57	12281.1	6342.26	0.122	1811.37	1865.23	1043.87
1991	2688.87	871.898	13192.8	6516.69	0.121	1971.43	2028.51	911.687
1992	2936.75	936.937	14032.3	6626.54	0.12	2138.22	2198.73	839.52
1993	3188.27	996.943	14792.5	6673.33	0.118	2320.88	2385.01	760.234
1994	3437.02	1051.42	15392.8	6634.06	0.117	2531.44	2599.43	600.242
1995	3680.52	1094.68	15808.8	6505.81	0.116	2756.47	2828.53	416.027
1996	3923.72	1125.02	16073.2	6312.95	0.114	3012.15	3088.54	264.418
1997	4168.14	1144.74	16163.8	6061.87	0.113	3294.18	3375.16	90.633
1998	4413.22	1152.31	16054.9	5749.53	0.112	3597.7	3683.53	-108.895
1999	4659.57	1145.91	15745.8	5378.73	0.11	3926.52	4017.51	-309.109
2000	4907.07	1125.51	15199.9	4953.28	0.109	4310.08	4406.52	-545.977

	EXBITES	VIABL2	RENSRAT
1977	0.229	0.604	0.068
1978	0.25	0.506	0.057
1979	0.24	0.468	0.047
1980	0.234	0.443	0.043
1981	0.22	0.438	0.041
1982	0.205	0.442	0.043
1983	0.223	0.431	0.049
1984	0.251	0.415	0.054
1985	0.25	0.403	0.051
1986	0.25	0.393	0.051
1987	0.249	0.392	0.053
1988	0.247	0.392	0.054
1989	0.246	0.394	0.056
1990	0.247	0.397	0.059
1991	0.245	0.404	0.06
1992	0.241	0.411	0.062
1993	0.237	0.419	0.063
1994	0.233	0.429	0.065
1995	0.229	0.44	0.067
1996	0.223	0.453	0.069
1997	0.22	0.466	0.071
1998	0.216	0.478	0.073
1999	0.212	0.493	0.075
2000	0.208	0.508	0.078

MEAN NORTHERN GULF DEVELOPMENT SCENARIO

(Levels and Differences from the Moderate Base Case)

	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
1977	410.66	-24.935	6.383	185.508	0.363	0.378	0.259	1.1
1978	406.667	-11.241	7.202	178.526	0.373	0.386	0.242	1.2
1979	418.656	5.268	6.697	185.225	0.383	0.374	0.243	1.2
1980	434.173	8.65	6.87	194.054	0.395	0.36	0.245	1.2
1981	456.078	14.768	7.144	206.859	0.408	0.341	0.251	1.3
1982	487.441	23.727	7.654	225.394	0.423	0.318	0.259	1.3
1983	504.694	8.784	8.501	231.506	0.425	0.322	0.253	1.4
1984	503.802	-9.582	8.697	224.632	0.421	0.337	0.242	1.4
1985	513.372	1.383	8.163	227.742	0.429	0.327	0.243	1.4
1986	530.903	9.4	8.127	236.983	0.439	0.316	0.245	1.5
1987	551.736	12.437	8.403	248.235	0.449	0.306	0.245	1.5
1988	573.044	12.531	8.788	259.246	0.456	0.299	0.245	1.6
1989	593.59	11.392	9.165	269.355	0.463	0.293	0.245	1.6
1990	612.523	9.453	9.491	278.055	0.468	0.288	0.244	1.7
1991	626.14	3.888	9.735	282.828	0.472	0.287	0.241	1.7
1992	639.242	3.344	9.754	287.596	0.477	0.282	0.241	1.8
1993	655.575	6.561	9.767	295.033	0.484	0.275	0.24	1.8
1994	672.781	7.288	9.918	303.083	0.491	0.269	0.24	1.8
1995	692.017	9.14	10.097	312.619	0.498	0.262	0.24	1.9
1996	713.324	10.959	10.351	323.534	0.505	0.255	0.24	2.
1997	734.418	10.423	10.676	334.057	0.511	0.249	0.24	2.1
1998	756.187	10.801	10.972	344.923	0.518	0.242	0.24	2.1
1999	780.692	13.23	11.28	357.663	0.525	0.235	0.24	2.2
2000	805.725	13.357	11.682	370.496	0.532	0.229	0.24	2.2

	EMGF	EMP9	EMT9	EMS9	EMPU	EMOT	EMM9	EMFI
1977	42.921	4.514	9.842	22.649	1.184	14.55	11.356	5.779
1978	42.921	4.351	10.294	21.9	1.194	14.269	11.906	5.738
1979	42.921	4.563	10.774	23.693	1.249	14.538	12.411	6.176
1980	42.921	5.104	11.393	25.945	1.321	14.886	12.896	6.758
1981	42.921	5.036	12.26	29.095	1.405	15.377	13.37	7.516
1982	42.921	4.747	13.358	33.696	1.511	16.06	13.843	8.563
1983	42.921	4.546	13.747	34.655	1.548	16.279	14.32	8.906
1984	42.921	4.699	13.464	32.756	1.534	16.033	14.867	8.652
1985	42.921	4.63	13.89	33.939	1.57	16.145	15.364	8.98
1986	42.921	4.598	14.614	36.442	1.635	16.473	15.877	9.617
1987	42.921	4.704	15.297	39.471	1.713	16.364	16.403	10.397
1988	42.921	5.219	15.956	42.25	1.781	17.238	16.947	11.107
1989	42.921	5.618	16.638	44.921	1.846	17.574	17.542	11.794
1990	42.921	5.967	17.126	47.229	1.903	17.858	18.12	12.404
1991	42.921	5.541	17.51	48.628	1.936	18.012	18.744	12.764
1992	42.921	5.356	17.683	50.188	1.972	18.164	19.367	13.169
1993	42.921	5.11	18.226	52.596	2.026	18.4	20.003	13.782
1994	42.921	4.96	18.751	55.055	2.08	18.651	20.66	14.411
1995	42.921	4.988	19.369	57.989	2.143	18.944	21.339	15.166
1996	42.921	5.09	20.047	61.3	2.212	19.274	22.041	16.004
1997	42.921	5.091	20.704	64.505	2.279	19.587	22.766	16.834
1998	42.921	5.093	21.374	67.868	2.346	19.905	23.515	17.691
1999	42.921	5.093	22.157	71.873	2.424	20.271	24.289	18.71
2000	42.921	5.094	22.924	75.869	2.5	20.633	25.089	19.725

	EMD9	EMCN	EMCN1	EMGA	PI	PIRPC	RPI	EXOPS
1977	24.819	16.559	11.189	27.256	4072.38	3924.32	252.71	810.
1978	24.766	11.434	11.307	25.941	4236.48	3723.81	279.75	944.
1979	26.405	12.277	11.972	26.373	4743.19	3862.07	293.358	1019.
1980	28.562	13.526	13.001	26.862	5395.29	4029.44	308.4	1120.35
1981	31.305	16.804	14.161	27.623	6419.62	4322.83	325.623	1247.59
1982	35.003	22.374	15.835	28.837	7958.32	4721.45	345.814	1435.16
1983	36.231	22.083	16.626	31.681	8644.94	4736.66	361.631	1703.05
1984	35.424	17.253	16.614	32.803	8360.41	4448.3	373.054	1859.66
1985	36.6	17.871	17.391	31.625	9008.04	4510.79	388.998	1918.4
1986	38.851	19.663	18.699	31.93	10154.8	4686.78	408.122	2101.17
1987	41.586	21.354	19.979	33.116	11535.2	4872.56	429.085	2370.06
1988	44.047	22.578	21.208	34.642	12978.7	5025.95	450.642	2686.92
1989	46.415	23.525	22.344	35.964	14452.9	5150.7	472.727	3020.64
1990	48.511	24.2	23.376	37.116	15918.8	5249.5	495.08	3364.35
1991	49.736	24.187	23.896	38.13	17081.8	5281.79	516.516	3701.41
1992	51.112	24.59	24.464	38.241	18420.4	5346.79	538.943	3985.63
1993	53.179	25.638	25.433	38.28	20170.9	5460.54	563.47	4293.68
1994	55.293	26.674	26.468	38.721	22121.4	5578.84	589.385	4667.79
1995	57.813	27.826	27.697	39.08	24366.6	5705.99	617.095	5070.97
1996	60.583	29.335	29.062	39.531	27050.8	5864.31	646.663	5519.27
1997	63.322	30.56	30.507	40.169	29784.8	5987.96	677.294	6030.96
1998	66.124	32.079	32.024	40.645	32888.1	6131.6	709.319	6558.54
1999	69.434	33.893	33.837	41.087	36514.4	6289.92	743.612	7141.71
2000	72.709	35.721	35.663	41.748	40496.4	6448.28	779.458	7810.61

	EXCAP	E99S	E99SRPC	REVGF	RP9S	RT98	RENS	GFBAL
1977	270.326	1160.82	1118.56	796.27	197.201	214.301	278.522	668.165
1978	280.	1311.13	1152.49	1053.8	471.4	206.916	240.272	617.209
1979	290.	1414.71	1151.9	1440.77	860.7	274.373	222.549	814.761
1980	331.395	1566.76	1170.1	1624.51	996.3	312.909	230.856	1054.02
1981	372.128	1743.59	1174.06	1988.55	1278.41	355.609	264.314	1500.87
1982	444.685	2018.89	1197.69	2330.77	1475.74	438.457	338.533	2055.49
1983	523.263	2379.64	1303.82	2655.01	1642.7	554.402	422.537	2627.34
1984	564.766	2594.65	1380.53	3230.48	2121.71	654.15	452.302	3550.23
1985	656.147	2762.46	1383.3	3638.62	2422.22	688.497	457.94	4737.79
1986	787.626	3098.81	1430.18	3832.81	2430.98	751.246	515.097	5852.35
1987	850.323	3454.3	1459.1	4100.44	2482.07	819.668	603.624	6947.33
1988	925.417	3873.39	1499.93	4377.05	2523.13	913.609	710.544	7971.75
1989	977.05	4287.93	1528.1	4664.6	2570.9	1006.07	824.565	8933.78
1990	1028.17	4713.48	1554.33	4803.72	2467.	1094.69	944.659	9686.79
1991	1036.81	5092.2	1574.53	4975.19	2414.02	1171.84	1062.99	10293.7
1992	1045.73	5419.18	1572.99	5202.18	2438.18	1257.98	1168.59	10843.6
1993	1086.45	5796.66	1569.22	5456.95	2467.08	1364.31	1296.13	11329.9
1994	1139.32	6254.34	1577.28	5685.61	2435.11	1481.71	1459.13	11667.1
1995	1178.86	6732.74	1576.6	5910.88	2381.26	1614.27	1646.58	11832.6
1996	1227.64	7268.04	1575.62	6212.98	2373.27	1789.26	1872.21	11851.2
1997	1299.15	7887.97	1585.79	6555.09	2374.39	1990.75	2135.58	11695.3
1998	1402.94	8560.98	1596.07	6911.39	2371.9	2213.05	2424.36	11341.6
1999	1519.83	9295.53	1601.21	7316.43	2377.55	2478.03	2760.51	10790.
2000	1653.84	10134.9	1613.77	7772.99	2378.55	2790.07	3161.16	10006.3

	PFBAL	RINS	FUND	FUND77	EXBITEL	R99L	E99L	SIMP
1977	2.4	35.343	670.6	671.369	0.131	531.912	557.16	-137.452
1978	48.975	46.954	666.184	602.483	0.134	568.508	595.271	-4.416
1979	153.275	46.878	968.037	834.862	0.131	622.528	650.896	301.853
1980	275.	68.529	1329.02	1090.28	0.133	718.529	748.6	360.987
1981	411.475	94.407	1912.34	1485.84	0.126	806.186	838.061	583.318
1982	563.425	135.921	2618.92	1916.02	0.115	912.631	946.418	706.579
1983	731.699	186.141	3359.04	2350.01	0.121	1045.	1080.82	740.128
1984	948.649	238.792	4498.88	3051.08	0.135	1131.33	1169.3	1139.84
1985	1187.55	319.665	5925.34	3853.77	0.131	1176.98	1217.22	1426.47
1986	1437.35	420.712	7289.7	4518.98	0.125	1270.34	1312.99	1364.36
1987	1634.2	517.466	8631.53	5089.38	0.122	1403.26	1448.48	1341.83
1988	1935.8	612.628	9907.55	5562.31	0.121	1565.81	1613.73	1276.02
1989	2193.07	703.207	11126.9	5955.01	0.12	1729.57	1780.37	1219.31
1990	2444.52	789.845	12131.3	6199.44	0.119	1902.28	1956.13	1004.46
1991	2688.87	861.414	12982.6	6359.14	0.122	2077.4	2134.49	851.285
1992	2936.75	922.226	13780.4	6469.01	0.121	2221.62	2282.13	797.754
1993	3188.27	979.308	14518.2	6518.7	0.118	2382.65	2446.79	737.805
1994	3437.02	1032.21	15104.1	6483.62	0.117	2584.86	2652.85	585.992
1995	3680.52	1074.48	15513.1	6360.15	0.115	2805.93	2877.99	408.973
1996	3923.72	1104.32	15775.	6171.79	0.113	3063.2	3139.59	261.844
1997	4168.14	1123.87	15863.5	5925.71	0.113	3352.5	3433.47	88.488
1998	4413.22	1131.28	15754.8	5619.43	0.111	3662.82	3748.65	-108.613
1999	4659.57	1124.9	15449.6	5256.42	0.11	3999.05	4090.04	-305.27
2000	4907.07	1104.77	14913.3	4840.63	0.108	4389.92	4486.36	-536.238

	EXBITES	VIABL2	RENSRAT
1977	0.229	0.604	0.068
1978	0.25	0.506	0.057
1979	0.24	0.468	0.047
1980	0.234	0.443	0.043
1981	0.219	0.438	0.041
1982	0.204	0.443	0.043
1983	0.222	0.431	0.049
1984	0.25	0.416	0.054
1985	0.246	0.405	0.051
1986	0.243	0.397	0.051
1987	0.239	0.399	0.052
1988	0.239	0.4	0.055
1989	0.238	0.404	0.057
1990	0.239	0.407	0.059
1991	0.241	0.412	0.062
1992	0.239	0.418	0.063
1993	0.234	0.426	0.064
1994	0.231	0.435	0.066
1995	0.226	0.446	0.068
1996	0.22	0.46	0.069
1997	0.217	0.473	0.072
1998	0.213	0.485	0.074
1999	0.209	0.5	0.076
2000	0.205	0.516	0.078

	POP	MIGNET	NINCTOT	EM99	EMA9	EMGF	EMP9	EMT9
1977	0.	0.	0.	0.	0.	0.	0.	0.
1978	0.	0.	0.	0.	0.	0.	0.	0.
1979	0.	0.	0.	0.	0.	0.	0.	0.
1980	0.	0.	0.	0.	0.	0.	0.	0.
1981	0.515	0.515	0.	0.38	0.	0.	0.106	0.087
1982	1.082	0.547	0.021	0.757	0.	0.	0.171	0.125
1983	1.893	0.77	0.042	1.278	0.	0.	0.271	0.211
1984	2.323	0.361	0.071	1.472	0.	0.	0.284	0.227
1985	4.315	1.91	0.082	2.811	0.	0.	0.315	0.338
1986	7.82	3.354	0.156	5.078	0.	0.	0.286	0.594
1987	12.707	4.609	0.284	8.103	0.	0.	0.305	0.74
1988	16.102	2.946	0.456	9.696	0.	0.	0.576	0.817
1989	18.238	1.589	0.552	10.322	0.	0.	0.779	0.902
1990	20.944	2.117	0.591	11.423	0.	0.	1.114	0.919
1991	19.369	-2.224	0.653	9.326	0.	0.	1.198	0.827
1992	16.556	-3.35	0.534	6.695	0.	0.	1.034	0.517
1993	15.24	-1.704	0.381	5.454	0.	0.	0.939	0.483
1994	14.483	-1.061	0.302	4.755	0.	0.	0.84	0.449
1995	14.368	-0.368	0.252	4.603	0.	0.	0.865	0.442
1996	14.858	0.258	0.231	4.919	0.	0.	0.965	0.458
1997	15.292	0.195	0.238	5.176	0.	0.	0.989	0.469
1998	15.732	0.198	0.243	5.428	0.	0.	1.015	0.481
1999	16.1	0.119	0.249	5.618	0.	0.	1.015	0.489
2000	16.437	0.083	0.253	5.775	0.	0.	1.015	0.495

	EMS9	EMPU	EMOT	EMM9	EMFI	EMD9	EMCM	EMCN
1977	0.	0.	0.	0.	0.	0.	0.	0.
1978	0.	0.	0.	0.	0.	0.	0.	0.
1979	0.	0.	0.	0.	0.	0.	0.	0.
1980	0.	0.	0.	0.	0.	0.	0.	0.
1981	0.073	0.002	0.014	0.	0.019	0.069	0.001	0.03
1982	0.153	0.004	0.027	0.	0.04	0.141	0.002	0.067
1983	0.26	0.007	0.046	0.	0.067	0.239	0.004	0.113
1984	0.287	0.008	0.053	0.	0.074	0.265	0.004	0.129
1985	0.663	0.018	0.101	0.	0.172	0.611	0.01	0.51
1986	1.248	0.033	0.18	0.	0.322	1.138	0.018	1.02
1987	2.065	0.053	0.281	0.	0.532	1.863	0.03	1.727
1988	2.382	0.059	0.329	0.	0.613	2.128	0.034	1.758
1989	2.498	0.06	0.343	0.035	0.642	2.21	0.035	1.66
1990	2.797	0.066	0.374	0.035	0.718	2.459	0.039	1.785
1991	2.085	0.048	0.302	0.064	0.535	1.822	0.029	1.028
1992	1.487	0.034	0.214	0.07	0.381	1.293	0.02	0.658
1993	1.242	0.028	0.172	0.07	0.318	1.071	0.017	0.55
1994	1.103	0.024	0.148	0.07	0.282	0.945	0.015	0.499
1995	1.089	0.023	0.141	0.07	0.278	0.925	0.014	0.498
1996	1.186	0.025	0.148	0.07	0.302	1.	0.016	0.547
1997	1.262	0.026	0.153	0.07	0.321	1.056	0.016	0.589
1998	1.342	0.027	0.158	0.07	0.341	1.114	0.017	0.628
1999	1.41	0.027	0.161	0.07	0.358	1.161	0.018	0.662
2000	1.47	0.028	0.162	0.07	0.373	1.201	0.018	0.691

	BACKT	EEGA	PI	PIRPC	RPI	EXOPS	EXCAP	E99S
1977	0.	0.	0.	0.	0.	0.	0.	0.
1978	0.	0.	0.	0.	0.	0.	0.	0.
1979	0.	0.	0.	0.	0.	0.	0.	0.
1980	0.	0.	0.	0.	0.	0.	0.	0.
1981	0.03	-0.022	18.781	5.738	0.154	0.	0.	0.
1982	0.067	0.026	41.945	10.34	0.301	3.007	1.051	4.058
1983	0.113	0.061	74.434	16.441	0.51	6.432	1.79	8.251
1984	0.129	0.14	84.25	17.086	0.619	11.577	2.94	14.596
1985	0.256	0.074	198.078	47.992	1.205	12.415	1.942	14.518
1986	0.487	0.238	391.609	88.523	2.207	29.631	7.081	36.924
1987	0.812	0.506	681.16	140.453	3.557	59.112	12.295	71.814
1988	0.981	1.	833.148	140.184	4.287	102.736	19.8	123.278
1989	1.033	1.156	921.582	126.625	4.607	125.227	16.485	142.988
1990	1.163	1.118	1083.34	130.57	5.174	136.684	18.418	156.812
1991	0.94	1.388	855.41	60.566	4.329	159.532	26.754	188.48
1992	0.658	0.986	639.52	16.777	3.193	121.003	11.651	135.57
1993	0.55	0.565	557.857	-1.094	2.654	79.039	9.505	91.746
1994	0.499	0.38	519.699	-11.168	2.36	59.047	12.868	75.355
1995	0.498	0.258	537.473	-13.953	2.319	46.707	15.066	65.562
1996	0.547	0.202	616.762	-11.02	2.508	43.738	18.854	66.793
1997	0.589	0.224	690.055	-9.332	2.676	50.328	23.723	78.777
1998	0.628	0.235	772.414	-7.828	2.844	56.109	26.776	88.277
1999	0.662	0.248	853.707	-7.453	2.974	62.324	29.401	97.867
2000	0.691	0.251	937.633	-7.473	3.092	67.047	31.836	105.852

	E99SRPC	REVGF	RP9S	RT98	RENS	GFBAL	PFBAL	RINS
1977	0.	0.	0.	0.	0.	0.	0.	0.
1978	0.	0.	0.	0.	0.	0.	0.	0.
1979	0.	0.	0.	0.	0.	0.	0.	0.
1980	0.	0.	0.	0.	0.	0.	0.	0.
1981	-1.884	0.569	0.	0.301	0.301	0.562	0.	0.
1982	-1.296	2.21	0.	1.286	1.587	-0.462	0.	0.039
1983	-2.214	4.387	0.	2.684	3.36	-2.747	0.	-0.032
1984	-0.883	6.359	0.	3.988	5.206	-8.238	0.	-0.192
1985	-8.704	9.707	0.	6.27	7.693	-10.633	0.	-0.577
1986	-11.884	21.48	0.05	13.958	17.303	-19.258	0.	-0.744
1987	-15.571	42.434	1.96	26.911	33.605	-35.707	0.	-1.348
1988	-8.598	64.605	2.42	42.018	53.869	-72.437	0.	-2.5
1989	-10.864	81.41	7.78	51.147	65.965	-110.352	0.	-5.071
1990	-17.918	91.434	7.81	59.406	76.145	-149.766	0.	-7.725
1991	-3.345	95.535	7.83	63.504	83.56	-210.164	0.	-10.484
1992	-10.81	72.758	7.82	50.434	66.63	-251.93	0.	-14.711
1993	-19.402	55.023	7.8	39.992	52.378	-274.359	0.	-17.635
1994	-21.682	48.305	7.74	36.395	47.41	-288.609	0.	-19.205
1995	-23.764	46.629	7.66	35.946	46.394	-295.664	0.	-20.203
1996	-24.937	51.312	7.54	39.707	50.68	-298.238	0.	-20.697
1997	-23.906	60.93	7.39	46.85	59.612	-300.383	0.	-20.877
1998	-23.599	70.906	7.19	54.352	68.841	-300.102	0.	-21.027
1999	-22.998	82.215	6.95	62.802	79.272	-296.262	0.	-21.007
2000	-22.894	94.555	6.67	71.975	90.488	-286.523	0.	-20.738

	FUND	FUND77	R99L	E99L
1977	0.	0.	0.	0.
1978	0.	0.	0.	0.
1979	0.	0.	0.	0.
1980	0.	0.	0.	0.
1981	0.562	-0.267	0.026	0.026
1982	-0.462	-2.008	1.923	1.923
1983	-2.747	-5.247	4.206	4.206
1984	-8.238	-10.666	7.382	7.382
1985	-10.633	-18.91	8.614	8.614
1986	-19.258	-36.57	20.043	20.043
1987	-35.707	-63.77	39.32	39.32
1988	-72.437	-94.488	67.817	67.817
1989	-110.352	-118.242	82.536	82.536
1990	-149.766	-142.816	90.905	90.905
1991	-210.164	-157.555	105.98	105.98
1992	-251.93	-157.527	83.398	83.398
1993	-274.359	-154.625	61.771	61.771
1994	-288.609	-150.445	53.425	53.425
1995	-295.664	-145.664	49.458	49.458
1996	-298.238	-141.164	51.049	51.049
1997	-300.383	-136.156	58.315	58.315
1998	-300.102	-130.098	65.12	65.12
1999	-296.262	-122.305	72.531	72.531
2000	-286.523	-112.648	79.844	79.844

5% NORTHERN GULF OCS DEVELOPMENT SCENARIO - MODERATE BASE CASE

(Levels and Differences from the Base Case)

	[illegible]	[illegible]	[illegible]	EM99	EMSPP	EMG9P	EMNSP	EMA9
1977	410.66	-24.935	6.383	185.508	0.363	0.378	0.259	1.1
1978	406.667	-11.241	7.202	178.526	0.373	0.386	0.242	1.2
1979	418.656	5.268	6.697	185.225	0.383	0.374	0.243	1.2
1980	434.173	8.65	6.87	194.054	0.395	0.36	0.245	1.2
1981	456.3	14.991	7.144	207.024	0.408	0.341	0.251	1.3
1982	488.036	24.091	7.663	225.814	0.423	0.318	0.259	1.3
1983	505.349	8.821	8.524	231.927	0.425	0.322	0.253	1.4
1984	509.263	-4.799	8.72	228.618	0.426	0.331	0.244	1.4
1985	528.7	11.041	8.381	238.432	0.441	0.312	0.247	1.4
1986	551.177	13.766	8.722	249.856	0.449	0.305	0.247	1.5
1987	573.345	13.043	9.14	260.596	0.457	0.298	0.246	1.5
1988	595.911	13.063	9.515	271.304	0.464	0.291	0.246	1.6
1989	614.058	8.274	9.886	278.573	0.467	0.288	0.245	1.6
1990	629.269	5.16	10.055	283.943	0.47	0.285	0.246	1.7
1991	645.384	6.007	10.107	290.443	0.477	0.279	0.244	1.7
1992	658.982	3.394	10.204	295.186	0.48	0.276	0.243	1.8
1993	674.401	5.215	10.199	301.643	0.486	0.271	0.243	1.8
1994	691.353	6.668	10.282	309.342	0.493	0.265	0.243	1.8
1995	710.099	8.318	10.428	318.397	0.5	0.258	0.242	1.9
1996	731.073	10.332	10.643	329.002	0.507	0.251	0.242	2.
1997	752.424	10.414	10.94	339.682	0.513	0.245	0.242	2.1
1998	774.426	10.771	11.236	350.684	0.52	0.238	0.242	2.1
1999	799.184	13.218	11.544	363.564	0.527	0.231	0.242	2.2
2000	824.222	13.098	11.948	376.353	0.534	0.225	0.241	2.2

	EMGF	EMP9	EMT9	EMS9	EMPU	EMOT	EMM9	EMFI
1977	42.921	4.514	9.842	22.649	1.184	14.55	11.356	5.779
1978	42.921	4.351	10.294	21.9	1.194	14.269	11.906	5.738
1979	42.921	4.563	10.774	23.693	1.249	14.538	12.411	6.176
1980	42.921	5.104	11.393	25.945	1.321	14.886	12.896	6.758
1981	42.921	5.096	12.283	29.127	1.406	15.383	13.37	7.524
1982	42.921	4.842	13.436	33.781	1.513	16.075	13.843	8.585
1983	42.921	4.615	13.807	34.74	1.55	16.294	14.32	8.928
1984	42.921	4.833	13.803	33.824	1.563	16.176	14.867	8.928
1985	42.921	4.706	14.851	36.814	1.646	16.524	15.364	9.723
1986	42.921	4.632	15.452	39.738	1.72	16.919	15.877	10.467
1987	42.921	4.798	16.136	42.578	1.79	17.283	16.488	11.195
1988	42.921	5.441	17.014	45.283	1.855	17.638	17.032	11.886
1989	42.921	6.378	17.326	47.076	1.897	17.875	17.677	12.347
1990	42.921	7.153	17.748	48.413	1.931	18.048	18.255	12.708
1991	42.921	6.804	18.224	50.536	1.979	18.255	18.85	13.253
1992	42.921	6.601	18.399	51.98	2.012	18.404	19.467	13.628
1993	42.921	6.419	18.836	54.11	2.059	18.606	20.103	14.169
1994	42.921	6.274	19.368	56.514	2.111	18.844	20.76	14.784
1995	42.921	6.137	19.963	59.358	2.172	19.119	21.439	15.516
1996	42.921	6.169	20.625	62.618	2.239	19.437	22.141	16.339
1997	42.921	6.246	21.289	65.88	2.306	19.752	22.866	17.184
1998	42.921	6.272	21.964	69.294	2.374	20.071	23.615	18.053
1999	42.921	6.272	22.753	73.357	2.452	20.438	24.389	19.087
2000	42.921	6.235	23.505	77.362	2.528	20.796	25.189	20.104

	EMD9	EMCN	EMCN1	EMGA	PI	PIRPC	RPI	EXOPS
1977	24.819	16.559	11.189	27.256	4072.38	3924.32	252.71	810.
1978	24.766	11.434	11.307	25.941	4236.48	3723.81	279.75	944.
1979	26.405	12.277	11.972	26.373	4743.19	3862.07	293.358	1019.
1980	28.562	13.526	13.001	26.862	5395.29	4029.44	308.4	1120.35
1981	31.335	16.817	14.174	27.614	6427.87	4325.38	325.69	1247.59
1982	35.082	22.41	15.871	28.843	7981.73	4727.28	345.982	1436.47
1983	36.309	22.121	16.664	31.732	8669.31	4741.62	361.802	1706.64
1984	36.408	18.405	17.001	32.648	8663.22	4540.84	374.626	1863.4
1985	39.228	20.828	18.501	31.577	9861.73	4741.44	393.406	1935.94
1986	41.828	22.722	20.083	33.171	11194.9	4912.34	413.476	2200.79
1987	44.357	23.952	21.27	34.65	12569.9	5048.93	434.237	2495.24
1988	46.73	24.946	22.465	35.955	14045.6	5172.48	455.689	2806.05
1989	48.308	24.85	23.298	37.291	15253.8	5212.07	476.609	3138.17
1990	49.546	24.573	23.927	37.931	16386.8	5233.65	497.573	3435.34
1991	51.393	25.355	24.703	38.126	17852.1	5321.2	519.836	3715.72
1992	52.662	25.571	25.306	38.682	19183.9	5367.8	542.336	4039.74
1993	54.48	26.354	26.149	38.691	20848.4	5457.35	566.469	4344.19
1994	56.538	27.361	27.155	38.94	22805.7	5569.65	592.269	4698.93
1995	58.972	28.482	28.353	39.26	25038.	5689.11	619.785	5095.91
1996	61.69	29.968	29.695	39.641	27730.1	5842.51	649.227	5533.99
1997	64.469	31.22	31.166	40.213	30528.9	5967.14	679.968	6037.48
1998	67.304	32.748	32.693	40.687	33700.5	6111.18	712.093	6564.05
1999	70.652	34.589	34.533	41.123	37403.3	6269.73	746.482	7145.34
2000	73.924	36.425	36.367	41.784	41437.7	6426.39	782.332	7811.52

	EXCAP	E99S	E99SRPC	REVGF	RP9S	RT98	RENS	GFBAL
1977	270.326	1160.82	1118.56	796.27	197.201	214.301	278.522	668.165
1978	280.	1311.13	1152.49	1053.8	471.4	206.916	240.272	617.209
1979	290.	1414.71	1151.9	1440.77	860.7	274.373	222.549	814.761
1980	331.395	1566.76	1170.1	1624.51	996.3	312.909	230.856	1054.02
1981	372.128	1743.59	1173.25	1988.8	1278.41	355.741	264.446	1501.11
1982	445.148	2020.66	1196.7	2331.89	1475.74	439.107	339.315	2055.45
1983	524.322	2384.29	1304.06	2656.96	1642.7	555.607	424.119	2625.5
1984	565.499	2599.16	1362.36	3239.97	2121.71	660.2	458.752	3554.08
1985	671.504	2795.42	1343.99	3678.83	2422.22	714.249	488.676	4756.97
1986	829.749	3241.05	1422.15	3912.1	2431.43	801.702	579.963	5838.68
1987	879.182	3610.01	1449.99	4189.35	2480.62	879.033	680.967	6895.05
1988	948.996	4018.55	1479.86	4467.46	2521.84	975.25	790.535	7889.87
1989	1004.7	4436.2	1515.79	4745.85	2564.66	1065.69	903.489	8811.47
1990	1041.21	4801.35	1533.45	4875.16	2477.	1137.63	1002.5	9562.27
1991	1050.16	5124.03	1527.31	5034.73	2424.1	1206.43	1106.64	10203.2
1992	1084.28	5516.36	1543.51	5285.35	2448.33	1307.05	1232.43	10761.1
1993	1116.77	5883.12	1539.97	5539.92	2477.26	1412.59	1359.28	11262.
1994	1168.01	6320.64	1543.62	5765.88	2445.3	1527.25	1518.12	11627.9
1995	1211.66	6797.75	1544.56	5995.05	2391.44	1661.13	1707.23	11827.9
1996	1260.99	7324.32	1543.16	6300.99	2383.39	1837.24	1933.96	11892.4
1997	1334.29	7938.78	1551.68	6651.	2384.42	2042.16	2201.14	11795.1
1998	1430.96	8604.66	1560.33	7021.5	2382.58	2271.32	2498.37	11518.3
1999	1549.84	9340.12	1565.62	7441.45	2387.3	2543.96	2843.89	11058.
2000	1686.03	10179.8	1578.71	7915.36	2388.07	2864.35	3254.85	10382.9

	PFBAL	RINS	FUND	FUND77	EXBITEL	R99L	E99L	SIMP
1977	2.4	35.343	670.6	671.369	0.131	531.912	557.16	-137.452
1978	48.975	46.954	666.184	602.483	0.134	568.508	595.271	-4.416
1979	153.275	46.878	968.037	834.862	0.131	622.528	650.896	301.853
1980	275.	68.529	1329.02	1090.28	0.133	718.529	748.6	360.987
1981	411.475	94.407	1912.59	1485.72	0.125	806.197	838.072	583.563
1982	563.425	135.938	2618.87	1915.05	0.114	913.483	947.271	706.283
1983	731.699	186.138	3357.2	2347.61	0.121	1047.32	1083.14	738.329
1984	948.649	238.662	4502.73	3040.87	0.131	1134.03	1172.	1145.54
1985	1187.55	319.934	5944.52	3822.92	0.122	1207.57	1247.81	1441.79
1986	1437.35	422.054	7276.04	4452.1	0.121	1356.12	1398.78	1331.52
1987	1684.2	516.509	8579.25	4998.54	0.12	1507.41	1552.62	1303.22
1988	1935.8	608.969	9825.67	5455.24	0.119	1668.95	1716.88	1246.42
1989	2193.07	697.476	11004.5	5841.58	0.12	1834.65	1885.45	1176.88
1990	2444.52	781.283	12006.8	6105.07	0.121	1980.82	2034.67	1002.25
1991	2688.87	852.698	12892.1	6274.48	0.119	2123.21	2180.29	885.312
1992	2936.75	915.892	13697.9	6390.05	0.12	2296.01	2356.52	805.766
1993	3188.27	973.534	14450.3	6453.87	0.118	2456.42	2520.56	752.426
1994	3437.02	1027.46	15064.9	6435.29	0.116	2650.04	2718.03	614.633
1995	3680.52	1071.73	15508.5	6330.64	0.115	2871.21	2943.28	443.523
1996	3923.72	1103.99	15816.1	6163.45	0.113	3127.04	3203.43	307.66
1997	4168.14	1126.75	15963.2	5939.55	0.112	3416.65	3497.63	147.137
1998	4413.22	1138.27	15931.5	5660.32	0.111	3732.86	3818.7	-31.734
1999	4659.57	1137.27	15717.5	5327.03	0.109	4075.1	4166.08	-213.973
2000	4907.07	1123.53	15290.	4944.66	0.108	4472.79	4569.23	-427.535

	EXBITES	VIABL2	RENSRAT
1977	0.229	0.604	0.068
1978	0.25	0.506	0.057
1979	0.24	0.468	0.047
1980	0.234	0.443	0.043
1981	0.219	0.438	0.041
1982	0.204	0.443	0.043
1983	0.221	0.432	0.049
1984	0.242	0.42	0.053
1985	0.227	0.419	0.05
1986	0.231	0.41	0.052
1987	0.23	0.413	0.054
1988	0.229	0.415	0.056
1989	0.234	0.416	0.059
1990	0.236	0.417	0.061
1991	0.232	0.424	0.062
1992	0.234	0.429	0.064
1993	0.23	0.436	0.065
1994	0.226	0.445	0.067
1995	0.222	0.456	0.068
1996	0.216	0.469	0.07
1997	0.213	0.483	0.072
1998	0.209	0.496	0.074
1999	0.205	0.512	0.076
2000	0.201	0.528	0.079

	POP	MIGNET	NINCTOT	EM99	EMA9	EMGF	EMP9	EMT9
1977	0.	0.	0.	0.	0.	0.	0.	0.
1978	0.	0.	0.	0.	0.	0.	0.	0.
1979	0.	0.	0.	0.	0.	0.	0.	0.
1980	0.	0.	0.	0.	0.	0.	0.	0.
1981	0.737	0.738	0.	0.545	0.	0.	0.166	0.11
1982	1.677	0.911	0.03	1.177	0.	0.	0.266	0.204
1983	2.547	0.807	0.065	1.699	0.	0.	0.34	0.271
1984	7.783	5.143	0.094	5.458	0.	0.	0.418	0.566
1985	19.643	11.568	0.299	13.501	0.	0.	0.391	1.3
1986	28.094	7.72	0.751	17.951	0.	0.	0.32	1.432
1987	34.316	5.215	1.02	20.464	0.	0.	0.399	1.579
1988	38.969	3.478	1.183	21.754	0.	0.	0.798	1.876
1989	38.706	-1.528	1.272	19.539	0.	0.	1.539	1.59
1990	37.689	-2.176	1.156	17.311	0.	0.	2.3	1.541
1991	38.613	-0.105	1.025	16.941	0.	0.	2.461	1.541
1992	36.296	-3.3	0.984	14.284	0.	0.	2.279	1.233
1993	34.066	-3.049	0.813	12.063	0.	0.	2.248	1.092
1994	33.055	-1.681	0.666	11.013	0.	0.	2.154	1.066
1995	32.45	-1.19	0.582	10.381	0.	0.	2.014	1.035
1996	32.606	-0.369	0.523	10.387	0.	0.	2.044	1.036
1997	33.297	0.187	0.503	10.802	0.	0.	2.144	1.054
1998	33.971	0.167	0.507	11.188	0.	0.	2.194	1.071
1999	34.591	0.107	0.513	11.519	0.	0.	2.194	1.085
2000	34.935	-0.176	0.519	11.631	0.	0.	2.156	1.076

	EMS9	EMPU	EMOT	EMM9	EMFI	EMD9	EMCM	EMCN
1977	0.	0.	0.	0.	0.	0.	0.	0.
1978	0.	0.	0.	0.	0.	0.	0.	0.
1979	0.	0.	0.	0.	0.	0.	0.	0.
1980	0.	0.	0.	0.	0.	0.	0.	0.
1981	0.105	0.003	0.021	0.	0.027	0.1	0.002	0.043
1982	0.238	0.007	0.042	0.	0.062	0.22	0.003	0.103
1983	0.345	0.009	0.061	0.	0.089	0.316	0.005	0.152
1984	1.354	0.037	0.197	0.	0.35	1.249	0.021	1.281
1985	3.538	0.095	0.48	0.	0.915	3.239	0.052	3.467
1986	4.544	0.118	0.626	0.	1.172	4.116	0.066	4.078
1987	5.167	0.13	0.7	0.085	1.33	4.634	0.075	4.324
1988	5.415	0.133	0.729	0.085	1.392	4.811	0.078	4.126
1989	4.653	0.111	0.644	0.17	1.194	4.103	0.066	2.985
1990	3.982	0.094	0.564	0.17	1.022	3.493	0.055	2.158
1991	3.993	0.092	0.545	0.17	1.024	3.48	0.055	2.196
1992	3.279	0.074	0.454	0.17	0.84	2.842	0.045	1.64
1993	2.756	0.061	0.379	0.17	0.705	2.373	0.037	1.266
1994	2.563	0.056	0.341	0.17	0.655	2.191	0.034	1.186
1995	2.457	0.052	0.316	0.17	0.627	2.085	0.033	1.153
1996	2.504	0.052	0.311	0.17	0.638	2.107	0.033	1.18
1997	2.637	0.053	0.318	0.17	0.671	2.203	0.034	1.249
1998	2.768	0.055	0.324	0.17	0.704	2.295	0.035	1.297
1999	2.894	0.056	0.328	0.17	0.735	2.379	0.037	1.358
2000	2.962	0.056	0.325	0.17	0.751	2.416	0.037	1.394

	[illegible]	[illegible]	[illegible]	[illegible]	RFI	EXOPS	EXCAP	E99S
1977	0.	0.	0.	0.	0.	0.	0.	0.
1978	0.	0.	0.	0.	0.	0.	0.	0.
1979	0.	0.	0.	0.	0.	0.	0.	0.
1980	0.	0.	0.	0.	0.	0.	0.	0.
1981	0.043	-0.031	27.035	8.285	0.221	0.	0.	0.
1982	0.103	0.032	65.355	16.172	0.469	4.319	1.514	5.832
1983	0.152	0.112	98.805	21.402	0.681	10.013	2.848	12.904
1984	0.516	-0.015	387.062	109.617	2.192	15.315	3.673	19.109
1985	1.366	0.026	1051.77	278.641	5.613	29.952	17.299	47.474
1986	1.87	1.478	1431.69	314.086	7.561	129.252	49.203	179.162
1987	2.102	2.04	1715.93	316.82	8.709	184.287	41.155	227.529
1988	2.238	2.313	1900.05	286.711	9.334	221.857	43.378	268.437
1989	1.987	2.484	1722.48	187.996	8.489	242.759	44.136	291.258
1990	1.714	1.933	1551.34	114.715	7.666	207.68	31.462	244.684
1991	1.747	1.385	1625.74	99.973	7.649	173.845	40.104	220.309
1992	1.501	1.427	1402.98	37.789	6.586	175.107	50.201	232.75
1993	1.266	0.976	1235.4	-4.285	5.654	129.551	39.833	178.207
1994	1.186	0.599	1204.	-20.359	5.243	90.187	41.552	141.652
1995	1.153	0.438	1208.86	-30.836	5.009	71.645	47.869	130.574
1996	1.18	0.312	1296.1	-32.824	5.072	58.461	52.206	123.07
1997	1.249	0.267	1434.16	-30.156	5.349	56.848	58.862	129.586
1998	1.297	0.276	1584.79	-28.242	5.618	61.625	54.796	131.965
1999	1.358	0.284	1742.6	-27.641	5.844	65.957	59.411	142.453
2000	1.394	0.288	1879.01	-29.359	5.966	67.961	64.022	150.73

	E99SRPC	REVGF	RP9S	RT98	RENS	GFBAL	PFBAL	RINS
1977	0.	0.	0.	0.	0.	0.	0.	0.
1978	0.	0.	0.	0.	0.	0.	0.	0.
1979	0.	0.	0.	0.	0.	0.	0.	0.
1980	0.	0.	0.	0.	0.	0.	0.	0.
1981	-2.698	0.818	0.	0.433	0.433	0.808	0.	0.
1982	-2.285	3.33	0.	1.936	2.369	-0.51	0.	0.057
1983	-1.973	6.331	0.	3.888	4.942	-4.596	0.	-0.036
1984	-19.055	15.846	0.	10.038	11.657	-4.387	0.	-0.322
1985	-48.016	49.917	0.	32.021	38.428	8.543	0.	-0.307
1986	-19.914	100.77	0.5	64.414	82.169	-32.926	0.	0.598
1987	-24.679	131.348	0.51	86.275	110.948	-87.984	0.	-2.305
1988	-28.674	155.008	1.13	103.659	133.861	-154.316	0.	-6.159
1989	-23.17	162.656	1.54	110.759	144.89	-232.66	0.	-10.802
1990	-38.793	162.871	17.81	102.34	133.984	-274.285	0.	-16.286
1991	-50.563	155.082	17.91	98.094	127.212	-300.656	0.	-19.2
1992	-49.284	155.93	17.97	99.5	130.467	-334.41	0.	-21.046
1993	-48.654	137.996	17.98	88.274	115.53	-342.219	0.	-23.409
1994	-55.335	128.578	17.93	81.932	106.4	-327.828	0.	-23.955
1995	-55.808	130.891	17.84	82.81	107.045	-300.332	0.	-22.948
1996	-57.402	139.32	17.66	87.691	112.429	-257.09	0.	-21.023
1997	-58.01	156.836	17.42	98.264	125.174	-200.586	0.	-17.996
1998	-59.338	181.02	17.87	112.629	142.851	-123.426	0.	-14.041
1999	-58.586	207.238	16.7	128.74	162.651	-28.289	0.	-8.64
2000	-57.947	236.93	16.19	146.262	184.376	90.152	0.	-1.98

	FUND	FUND77	R99L	E99L
1977	0.	0.	0.	0.
1978	0.	0.	0.	0.
1979	0.	0.	0.	0.
1980	0.	0.	0.	0.
1981	0.808	-0.382	0.038	0.038
1982	-0.51	-2.971	2.775	2.775
1983	-4.596	-7.649	6.527	6.527
1984	-4.387	-20.875	10.082	10.082
1985	8.543	-49.761	39.206	39.206
1986	-32.926	-103.453	105.83	105.83
1987	-87.984	-154.609	143.465	143.465
1988	-154.316	-201.555	170.959	170.959
1989	-232.66	-231.676	187.615	187.615
1990	-274.285	-237.184	169.448	169.448
1991	-300.656	-242.215	151.785	151.785
1992	-334.41	-236.48	157.79	157.79
1993	-342.219	-219.453	135.545	135.545
1994	-327.828	-198.77	118.603	118.603
1995	-300.332	-175.172	114.742	114.742
1996	-257.09	-149.504	114.887	114.887
1997	-200.586	-122.32	122.473	122.473
1998	-123.426	-89.215	135.163	135.163
1999	-28.289	-51.695	148.573	148.573
2000	90.152	-8.617	162.711	162.711

95% NORTHERN GULF OCS DEVELOPMENT SCENARIO -
MODERATE BASE CASE

(Levels and Differences from the Base Case)

1977	410.66	-24.935	6.383	185.508	0.363	0.378	0.259	1.1
1978	406.667	-11.241	7.202	178.526	0.373	0.386	0.242	1.2
1979	418.656	5.268	6.697	185.225	0.383	0.374	0.243	1.2
1980	434.173	8.65	6.87	194.054	0.395	0.36	0.245	1.2
1981	456.248	14.939	7.144	206.985	0.408	0.341	0.251	1.3
1982	487.443	23.552	7.661	225.38	0.423	0.318	0.259	1.3
1983	503.935	8.023	8.501	230.934	0.424	0.323	0.253	1.4
1984	502.222	-10.373	8.666	223.513	0.42	0.339	0.241	1.4
1985	509.593	-0.756	8.102	225.109	0.427	0.331	0.242	1.4
1986	523.51	5.927	7.982	232.001	0.434	0.322	0.244	1.5
1987	539.406	7.771	8.126	240.196	0.442	0.315	0.244	1.5
1988	557.285	9.548	8.336	249.598	0.449	0.307	0.244	1.6
1989	575.669	9.775	8.616	259.072	0.457	0.3	0.243	1.6
1990	591.875	7.312	8.9	266.663	0.462	0.296	0.242	1.7
1991	607.046	6.091	9.082	273.529	0.469	0.291	0.24	1.7
1992	622.948	6.681	9.22	280.927	0.475	0.285	0.24	1.8
1993	640.579	8.247	9.385	289.6	0.483	0.278	0.239	1.8
1994	658.517	8.326	9.615	298.341	0.489	0.272	0.239	1.8
1995	677.855	9.496	9.844	308.027	0.496	0.265	0.238	1.9
1996	698.668	10.697	10.119	318.63	0.503	0.258	0.239	2.
1997	719.316	10.216	10.437	328.892	0.51	0.252	0.238	2.1
1998	740.638	10.598	10.728	339.507	0.516	0.245	0.238	2.1
1999	764.758	13.093	11.03	352.052	0.524	0.238	0.238	2.2
2000	789.45	13.273	11.428	364.731	0.531	0.231	0.238	2.2

	EMGF	EMP9	EMT9	EMS9	EMPU	EMOT	EMM9	EMFI
1977	42.921	4.514	9.842	22.649	1.184	14.55	11.356	5.779
1978	42.921	4.351	10.294	21.9	1.194	14.269	11.906	5.738
1979	42.921	4.563	10.774	23.693	1.249	14.538	12.411	6.176
1980	42.921	5.104	11.393	25.945	1.321	14.886	12.896	6.758
1981	42.921	5.079	12.281	29.119	1.406	15.382	13.37	7.522
1982	42.921	4.725	13.352	33.692	1.511	16.06	13.843	8.562
1983	42.921	4.389	13.634	34.537	1.545	16.259	14.32	8.876
1984	42.921	4.436	13.271	32.538	1.528	15.992	14.867	8.596
1985	42.921	4.315	13.56	33.31	1.552	16.05	15.364	8.817
1986	42.921	4.312	14.024	35.212	1.602	16.297	15.877	9.3
1987	42.921	4.399	14.56	37.419	1.66	16.585	16.403	9.869
1988	42.921	4.643	15.141	39.878	1.722	16.911	16.947	10.496
1989	42.921	4.839	15.737	42.432	1.786	17.232	17.507	11.155
1990	42.921	4.853	16.209	44.439	1.837	17.485	18.085	11.688
1991	42.921	4.343	16.685	46.55	1.887	17.711	18.68	12.231
1992	42.921	4.322	17.168	48.707	1.938	17.951	19.297	12.789
1993	42.921	4.171	17.744	51.359	1.998	18.228	19.933	13.465
1994	42.921	4.12	18.302	53.955	2.056	18.503	20.59	14.13
1995	42.921	4.123	18.928	56.904	2.12	18.803	21.269	14.889
1996	42.921	4.125	19.59	60.119	2.187	19.126	21.971	15.702
1997	42.921	4.102	20.236	63.246	2.253	19.434	22.696	16.514
1998	42.921	4.078	20.894	66.53	2.319	19.747	23.445	17.351
1999	42.921	4.078	21.669	70.466	2.397	20.11	24.219	18.352
2000	42.921	4.079	22.429	74.403	2.472	20.471	25.019	19.353

	EMD9	EMCN	EMCN1	EMGA	PI	PIRPC	RPI	EXOPS
1977	24.819	16.559	11.189	27.256	4072.38	3924.32	252.71	810.
1978	24.766	11.434	11.307	25.941	4236.48	3723.81	279.75	944.
1979	26.405	12.277	11.972	26.373	4743.19	3862.07	293.358	1019.
1980	28.562	13.526	13.001	26.862	5395.29	4029.44	308.4	1120.35
1981	31.328	16.814	14.171	27.616	6425.92	4324.77	325.674	1247.59
1982	35.	22.374	15.835	28.861	7957.32	4720.92	345.808	1436.17
1983	36.123	22.034	16.577	31.711	8611.12	4728.18	361.406	1702.93
1984	35.222	17.157	16.518	32.763	8296.34	4433.49	372.599	1854.33
1985	36.021	17.374	17.148	31.627	8820.69	4462.45	387.889	1911.75
1986	37.73	18.645	18.214	31.737	9769.54	4596.78	405.976	2075.46
1987	39.735	19.628	19.168	32.638	10858.7	4730.33	425.576	2313.94
1988	41.928	20.821	20.228	33.664	12149.5	4883.9	446.397	2586.74
1989	44.213	21.865	21.311	34.824	13534.9	5022.23	468.159	2897.66
1990	46.059	22.415	22.213	36.011	14838.8	5117.13	489.944	3229.68
1991	47.919	23.159	22.956	36.752	16229.6	5219.52	512.224	3543.67
1992	49.825	23.932	23.806	37.263	17784.4	5328.41	535.788	3866.23
1993	52.112	25.089	24.884	37.722	19616.2	5460.07	560.853	4216.1
1994	54.35	26.175	25.969	38.346	21604.1	5588.47	587.059	4610.
1995	56.89	27.329	27.2	38.824	23831.7	5718.5	614.811	5025.25
1996	59.587	28.789	28.516	39.33	26437.4	5874.02	644.193	5476.39
1997	62.269	29.972	29.918	39.947	29098.	5996.06	674.656	5981.48
1998	65.013	31.453	31.398	40.411	32119.4	6138.27	706.516	6503.24
1999	68.275	33.232	33.176	40.839	35663.8	6296.25	740.677	7080.22
2000	71.511	35.032	34.974	41.495	39562.7	6454.72	776.409	7744.24

	EXCAP	E99S	E99SRPC	REVGF	RP9S	RT98	RENS	GFBAL
1977	270.326	1160.82	1118.56	796.27	197.201	214.301	278.522	668.165
1978	280.	1311.13	1152.49	1053.8	471.4	206.916	240.272	617.209
1979	290.	1414.71	1151.9	1440.77	860.7	274.373	222.549	814.761
1980	331.395	1566.76	1170.1	1624.51	996.3	312.909	230.856	1054.02
1981	372.128	1743.59	1173.43	1988.74	1278.41	355.709	264.415	1501.05
1982	445.039	2020.25	1198.52	2331.07	1475.74	438.634	338.812	2054.9
1983	523.046	2379.3	1306.41	2653.92	1642.7	553.793	421.913	2625.9
1984	562.985	2587.53	1382.77	3226.67	2121.71	651.909	449.51	3550.65
1985	653.797	2753.42	1392.97	3629.9	2422.22	683.093	451.462	4736.78
1986	779.093	3064.46	1441.88	3811.45	2430.93	737.752	498.456	5857.48
1987	836.837	3384.34	1474.28	4057.66	2480.11	793.042	570.424	6966.66
1988	904.428	3751.49	1508.01	4311.85	2520.71	871.811	656.989	8025.72
1989	959.443	4146.05	1538.4	4582.4	2563.12	955.121	758.878	9023.63
1990	1008.7	4557.58	1571.66	4711.32	2459.19	1035.47	868.77	9814.04
1991	1009.18	4904.55	1577.31	4878.53	2406.19	1108.51	979.676	10479.3
1992	1033.28	5284.31	1583.23	5128.16	2430.36	1207.73	1102.22	11068.9
1993	1076.23	5705.53	1588.09	5400.54	2459.28	1324.51	1244.03	11575.5
1994	1125.81	6179.45	1598.46	5635.73	2427.37	1445.49	1411.97	11924.9
1995	1163.24	6667.44	1599.85	5862.48	2373.6	1578.47	1600.39	12095.3
1996	1208.4	7201.54	1600.07	6159.79	2365.73	1749.73	1821.77	12114.3
1997	1275.19	7809.61	1609.26	6492.2	2367.	1944.14	2076.28	11958.2
1998	1376.4	8473.54	1619.33	6838.35	2364.71	2158.94	2355.83	11601.4
1999	1490.69	9198.56	1623.93	7231.91	2370.6	2415.49	2681.59	11043.
2000	1622.23	10029.8	1636.35	7675.91	2371.88	2718.34	3070.99	10246.5

	PFBAL	RINS	FUND	FUND77	EXBITEL	R99L	E99L	SIMP
1977	2.4	35.343	670.6	671.369	0.131	531.912	557.16	-137.452
1978	48.975	46.954	666.184	602.483	0.134	568.508	595.271	-4.416
1979	153.275	46.878	968.037	834.862	0.131	622.528	650.896	301.853
1980	275.	68.529	1329.02	1090.28	0.133	718.529	748.6	360.987
1981	411.475	94.407	1912.53	1485.75	0.125	806.194	838.069	583.505
1982	563.425	135.934	2618.32	1915.61	0.115	913.258	947.046	705.793
1983	731.699	186.1	3357.59	2350.46	0.121	1044.37	1080.69	739.275
1984	948.649	238.69	4499.3	3055.09	0.136	1127.96	1165.92	1141.71
1985	1187.55	319.694	5924.33	3864.14	0.133	1170.41	1210.65	1425.03
1986	1437.35	420.641	7294.83	4546.06	0.128	1251.35	1294.01	1370.51
1987	1684.2	517.825	8650.86	5142.83	0.126	1364.55	1409.77	1356.04
1988	1935.8	613.981	9961.52	5645.79	0.123	1498.44	1546.37	1310.66
1989	2193.07	706.985	11216.7	6061.66	0.122	1647.41	1698.22	1255.19
1990	2444.52	796.134	12258.6	6330.14	0.122	1811.72	1865.57	1041.86
1991	2688.87	870.322	13168.2	6504.09	0.121	1971.74	2028.83	909.632
1992	2936.75	935.216	14005.7	6613.5	0.12	2138.53	2199.04	837.469
1993	3188.27	995.08	14763.8	6659.93	0.118	2321.21	2385.35	758.145
1994	3437.02	1049.41	15361.9	6620.39	0.117	2531.73	2599.72	598.117
1995	3680.52	1092.52	15775.8	6491.89	0.116	2756.67	2828.74	413.906
1996	3923.72	1122.71	16038.	6298.77	0.114	3012.38	3088.77	262.215
1997	4168.14	1142.28	16126.3	6047.45	0.113	3294.49	3375.47	88.266
1998	4413.22	1149.68	16014.6	5734.77	0.112	3597.97	3683.8	-111.66
1999	4659.57	1143.09	15702.6	5363.66	0.11	3926.83	4017.82	-312.094
2000	4907.07	1122.48	15153.5	4937.91	0.109	4310.29	4406.73	-549.035

	EXBITES	VIABL2	RENSRAT
1977	0.229	0.604	0.068
1978	0.25	0.506	0.057
1979	0.24	0.468	0.047
1980	0.234	0.443	0.043
1981	0.219	0.438	0.041
1982	0.204	0.443	0.043
1983	0.222	0.431	0.049
1984	0.251	0.415	0.054
1985	0.25	0.403	0.051
1986	0.25	0.393	0.051
1987	0.249	0.392	0.053
1988	0.247	0.392	0.054
1989	0.246	0.394	0.056
1990	0.247	0.397	0.059
1991	0.245	0.404	0.06
1992	0.241	0.411	0.062
1993	0.237	0.419	0.063
1994	0.233	0.429	0.065
1995	0.229	0.44	0.067
1996	0.223	0.453	0.069
1997	0.22	0.466	0.071
1998	0.216	0.478	0.073
1999	0.212	0.493	0.075
2000	0.208	0.508	0.078

	POP	MIGNET	NINCTOT	EM99	EMA9	EMGF	EMP9	EMT9
1977	0.	0.	0.	0.	0.	0.	0.	0.
1978	0.	0.	0.	0.	0.	0.	0.	0.
1979	0.	0.	0.	0.	0.	0.	0.	0.
1980	0.	0.	0.	0.	0.	0.	0.	0.
1981	0.686	0.686	0.	0.507	0.	0.	0.149	0.108
1982	1.084	0.371	0.028	0.743	0.	0.	0.149	0.12
1983	1.133	0.009	0.041	0.706	0.	0.	0.114	0.097
1984	0.742	-0.43	0.039	0.353	0.	0.	0.021	0.034
1985	0.536	-0.228	0.02	0.178	0.	0.	0.	0.009
1986	0.427	-0.119	0.011	0.096	0.	0.	0.	0.005
1987	0.376	-0.057	0.006	0.064	0.	0.	0.	0.003
1988	0.343	-0.036	0.003	0.048	0.	0.	0.	0.002
1989	0.318	-0.028	0.002	0.038	0.	0.	0.	0.002
1990	0.295	-0.024	0.001	0.031	0.	0.	0.	0.002
1991	0.275	-0.02	0.	0.027	0.	0.	0.	0.001
1992	0.262	-0.013	-0.	0.025	0.	0.	0.	0.002
1993	0.243	-0.018	-0.001	0.02	0.	0.	0.	0.001
1994	0.219	-0.024	-0.001	0.012	0.	0.	0.	0.001
1995	0.207	-0.012	-0.001	0.011	0.	0.	0.	0.001
1996	0.202	-0.004	-0.001	0.014	0.	0.	0.	0.001
1997	0.189	-0.011	-0.001	0.011	0.	0.	0.	0.001
1998	0.183	-0.005	-0.001	0.012	0.	0.	0.	0.001
1999	0.165	-0.017	-0.001	0.006	0.	0.	0.	0.
2000	0.163	-0.002	-0.001	0.01	0.	0.	0.	0.001

	EMS9	EMPU	EMOT	EMM9	EMFI	EMD9	EMCM	EMCN
1977	0.	0.	0.	0.	0.	0.	0.	0.
1978	0.	0.	0.	0.	0.	0.	0.	0.
1979	0.	0.	0.	0.	0.	0.	0.	0.
1980	0.	0.	0.	0.	0.	0.	0.	0.
1981	0.098	0.003	0.019	0.	0.025	0.093	0.001	0.04
1982	0.149	0.004	0.027	0.	0.039	0.138	0.002	0.067
1983	0.142	0.004	0.025	0.	0.037	0.13	0.002	0.064
1984	0.068	0.002	0.013	0.	0.018	0.063	0.001	0.033
1985	0.034	0.001	0.006	0.	0.009	0.031	0.	0.012
1986	0.019	0.	0.003	0.	0.005	0.017	0.	0.002
1987	0.013	0.	0.002	0.	0.003	0.012	0.	0.001
1988	0.01	0.	0.002	0.	0.003	0.009	0.	0.
1989	0.009	0.	0.001	0.	0.002	0.008	0.	0.
1990	0.007	0.	0.001	0.	0.002	0.006	0.	-0.
1991	0.007	0.	0.001	0.	0.002	0.006	0.	0.
1992	0.007	0.	0.001	0.	0.002	0.006	0.	0.001
1993	0.005	0.	0.001	0.	0.001	0.004	0.	0.
1994	0.003	0.	0.	0.	0.001	0.003	0.	-0.
1995	0.004	0.	0.	0.	0.001	0.003	0.	0.
1996	0.005	0.	0.	0.	0.001	0.004	0.	0.001
1997	0.004	0.	0.	0.	0.001	0.003	0.	0.001
1998	0.004	0.	0.	0.	0.001	0.003	0.	0.002
1999	0.002	0.	0.	0.	0.	0.002	0.	0.001
2000	0.004	0.	0.	0.	0.001	0.003	0.	0.002

	[illegible]	EHGR	PI	PIRPC	RPI	EXOPS	EXCAP	E99S
1977	0.	0.	0.	0.	0.	0.	0.	0.
1978	0.	0.	0.	0.	0.	0.	0.	0.
1979	0.	0.	0.	0.	0.	0.	0.	0.
1980	0.	0.	0.	0.	0.	0.	0.	0.
1981	0.04	-0.029	25.086	7.68	0.206	0.	0.	0.
1982	0.067	0.049	40.949	9.812	0.295	4.012	1.405	5.417
1983	0.064	0.091	40.621	7.961	0.286	6.307	1.573	7.919
1984	0.033	0.101	20.18	2.27	0.164	6.242	1.159	7.484
1985	0.012	0.076	10.73	-0.352	0.095	5.765	-0.408	5.471
1986	0.002	0.044	6.301	-1.477	0.061	3.921	-1.453	2.569
1987	0.001	0.028	4.719	-1.777	0.048	2.994	-1.19	1.86
1988	0.	0.021	3.988	-1.867	0.042	2.549	-1.19	1.381
1989	0.	0.016	3.621	-1.848	0.039	2.253	-1.122	1.113
1990	-0.	0.013	3.324	-1.801	0.038	2.013	-1.054	0.91
1991	0.	0.01	3.219	-1.711	0.037	1.79	-0.881	0.828
1992	0.001	0.008	3.449	-1.609	0.038	1.598	-0.795	0.695
1993	0.	0.007	3.168	-1.559	0.037	1.461	-0.706	0.621
1994	-0.	0.005	2.422	-1.539	0.034	1.262	-0.646	0.465
1995	0.	0.002	2.613	-1.441	0.035	0.984	-0.552	0.262
1996	0.001	0.001	3.383	-1.309	0.038	0.863	-0.388	0.289
1997	0.001	0.001	3.277	-1.234	0.038	0.855	-0.232	0.422
1998	0.002	0.	3.777	-1.152	0.041	0.809	0.232	0.836
1999	0.001	0.001	3.086	-1.121	0.039	0.836	0.256	0.895
2000	0.002	-0.001	3.973	-1.031	0.042	0.68	0.223	0.711

	E99SPPC	REVGF	RP9S	RT98	RENS	GFBAL	PFBAL	RINS
1977	0.	0.	0.	0.	0.	0.	0.	0.
1978	0.	0.	0.	0.	0.	0.	0.	0.
1979	0.	0.	0.	0.	0.	0.	0.	0.
1980	0.	0.	0.	0.	0.	0.	0.	0.
1981	-2.508	0.759	0.	0.402	0.402	0.75	0.	0.
1982	-0.473	2.503	0.	1.463	1.865	-1.06	0.	0.053
1983	0.381	3.296	0.	2.075	2.736	-4.197	0.	-0.074
1984	1.351	2.552	0.	1.746	2.415	-7.816	0.	-0.294
1985	0.963	0.99	0.	0.866	1.215	-11.648	0.	-0.547
1986	-0.183	0.113	0.	0.465	0.662	-14.129	0.	-0.815
1987	-0.385	-0.34	0.	0.284	0.406	-16.375	0.	-0.989
1988	-0.517	-0.602	0.	0.221	0.314	-18.469	0.	-1.146
1989	-0.566	-0.793	0.	0.194	0.279	-20.504	0.	-1.293
1990	-0.591	-0.965	0.	0.181	0.256	-22.516	0.	-1.435
1991	-0.561	-1.125	0.	0.174	0.244	-24.57	0.	-1.576
1992	-0.569	-1.258	0.	0.184	0.255	-26.621	0.	-1.72
1993	-0.536	-1.387	0.	0.199	0.278	-28.711	0.	-1.864
1994	-0.504	-1.578	0.	0.176	0.244	-30.836	0.	-2.01
1995	-0.515	-1.77	0.	0.147	0.206	-32.957	0.	-2.159
1996	-0.493	-1.875	0.	0.182	0.241	-35.16	0.	-2.307
1997	-0.428	-1.965	0.	0.242	0.317	-37.527	0.	-2.461
1998	-0.335	-2.133	0.	0.242	0.311	-40.293	0.	-2.627
1999	-0.277	-2.301	0.	0.262	0.348	-43.277	0.	-2.821
2000	-0.312	-2.527	0.	0.252	0.322	-46.336	0.	-3.029

	FUND	FUND77	R99L	E99L
1977	0.	0.	0.	0.
1978	0.	0.	0.	0.
1979	0.	0.	0.	0.
1980	0.	0.	0.	0.
1981	0.75	-0.355	0.035	0.035
1982	-1.06	-2.411	2.55	2.55
1983	-4.197	-4.801	4.074	4.074
1984	-7.816	-6.652	4.008	4.008
1985	-11.648	-8.548	2.04	2.04
1986	-14.129	-9.488	1.059	1.059
1987	-16.375	-10.32	0.61	0.61
1988	-18.469	-11.004	0.454	0.454
1989	-20.504	-11.594	0.381	0.381
1990	-22.516	-12.113	0.347	0.347
1991	-24.57	-12.602	0.319	0.319
1992	-26.621	-13.039	0.307	0.307
1993	-28.711	-13.395	0.334	0.334
1994	-30.836	-13.668	0.292	0.292
1995	-32.957	-13.926	0.204	0.204
1996	-35.16	-14.18	0.23	0.23
1997	-37.527	-14.418	0.311	0.311
1998	-40.293	-14.762	0.271	0.271
1999	-43.277	-15.062	0.31	0.31
2000	-46.336	-15.371	0.215	0.215

HIGH BASE CASE

								EMA9
1977	410.66	-24.935	6.383	185.508	0.363	0.378	0.259	1.1
1978	406.709	-11.199	7.202	178.557	0.373	0.386	0.242	1.2
1979	417.661	4.23	6.699	184.486	0.382	0.376	0.242	1.2
1980	431.495	7.005	6.829	192.187	0.394	0.363	0.244	1.2
1981	453.534	15.095	7.04	205.348	0.408	0.342	0.25	1.3
1982	484.46	23.379	7.565	223.675	0.422	0.32	0.258	1.3
1983	507.184	14.354	8.401	233.949	0.426	0.317	0.256	1.4
1984	512.16	-3.836	8.828	231.	0.426	0.329	0.245	1.4
1985	519.471	-1.219	8.516	231.56	0.43	0.325	0.245	1.4
1986	531.137	3.306	8.351	236.106	0.435	0.319	0.246	1.5
1987	546.488	6.971	8.376	243.56	0.443	0.311	0.246	1.5
1988	564.654	9.622	8.547	252.89	0.451	0.303	0.246	1.6
1989	583.731	10.261	8.822	262.615	0.458	0.296	0.246	1.6
1990	600.285	7.445	9.117	270.213	0.463	0.292	0.244	1.7
1991	616.303	6.725	9.295	277.51	0.47	0.287	0.243	1.7
1992	632.719	6.967	9.45	285.074	0.476	0.282	0.242	1.8
1993	651.22	8.884	9.618	294.189	0.484	0.275	0.241	1.8
1994	669.835	8.752	9.866	303.2	0.49	0.269	0.241	1.8
1995	689.377	9.441	10.104	312.806	0.497	0.262	0.24	1.9
1996	708.66	8.918	10.369	322.086	0.503	0.257	0.24	2.
1997	729.94	10.673	10.609	332.789	0.511	0.249	0.24	2.1
1998	751.675	10.82	10.919	343.616	0.517	0.243	0.24	2.1
1999	776.143	13.246	11.227	356.32	0.525	0.236	0.24	2.2
2000	801.117	13.354	11.628	369.105	0.531	0.229	0.239	2.2

	EMGF	EMP9	EMT9	EMS9	EMPU	EMOT	EMM9	EMFI
1977	42.921	4.514	9.842	22.649	1.184	14.55	11.356	5.779
1978	42.921	4.365	10.296	21.905	1.194	14.27	11.906	5.739
1979	42.921	4.368	10.728	23.533	1.244	14.509	12.411	6.133
1980	42.921	4.692	11.284	25.552	1.308	14.813	12.896	6.654
1981	42.921	4.612	12.125	28.84	1.397	15.32	13.37	7.449
1982	42.921	4.059	13.193	33.39	1.502	15.998	13.843	8.483
1983	42.921	5.037	13.766	35.328	1.566	16.366	14.32	9.077
1984	42.921	5.383	13.796	34.347	1.577	16.261	14.867	9.063
1985	42.921	5.259	13.909	34.718	1.591	16.281	15.424	9.181
1986	42.921	5.072	14.229	36.064	1.624	16.442	15.937	9.514
1987	42.921	4.999	14.737	38.202	1.678	16.703	16.463	10.055
1988	42.921	5.207	15.317	40.678	1.74	17.023	17.007	10.685
1989	42.921	5.528	15.925	43.296	1.805	17.35	17.567	11.361
1990	42.921	5.69	16.39	45.258	1.856	17.602	18.145	11.893
1991	42.921	5.299	16.889	47.48	1.908	17.84	18.74	12.464
1992	42.921	5.289	17.377	49.668	1.96	18.084	19.357	13.033
1993	42.921	5.142	17.978	52.459	2.022	18.373	19.993	13.741
1994	42.921	5.054	18.549	55.133	2.081	18.654	20.65	14.426
1995	42.921	5.023	19.167	58.058	2.144	18.95	21.329	15.181
1996	42.921	4.979	19.748	60.856	2.204	19.231	22.031	15.901
1997	42.921	4.958	20.428	64.199	2.273	19.549	22.756	16.756
1998	42.921	4.954	21.095	67.544	2.34	19.867	23.505	17.608
1999	42.921	4.955	21.876	71.535	2.417	20.232	24.279	18.624
2000	42.921	4.949	22.641	75.514	2.493	20.594	25.079	19.635

	EMD9	EMCN	EMCN1	EMGA	PI	PIRPC	RPI	EXOPS
1977	24.819	16.559	11.189	27.256	4072.38	3924.32	252.71	810.
1978	24.771	11.436	11.309	25.941	4237.42	3724.25	279.75	944.
1979	26.247	12.129	11.912	26.421	4707.	3845.78	293.049	1019.
1980	28.18	13.203	12.84	26.81	5301.84	3994.15	307.633	1114.32
1981	31.063	16.779	14.031	27.328	6353.44	4310.39	325.009	1232.22
1982	34.717	22.411	15.697	28.68	7873.63	4709.21	345.135	1423.47
1983	36.838	22.87	16.87	31.257	8831.95	4802.91	362.572	1688.94
1984	36.888	18.753	17.256	32.984	8814.48	4582.21	375.594	1886.72
1985	37.315	18.326	17.783	32.417	9244.78	4556.73	390.557	1960.57
1986	38.487	19.117	18.587	32.334	10042.1	4637.71	407.677	2110.47
1987	40.381	20.222	19.453	32.784	11124.6	4767.74	426.97	2321.92
1988	42.575	21.468	20.531	33.703	12435.5	4918.55	447.767	2589.34
1989	44.918	22.535	21.556	34.839	13857.4	5054.72	469.652	2900.26
1990	46.76	22.927	22.626	36.089	15155.5	5137.21	491.461	3238.47
1991	48.713	23.723	23.421	36.819	16606.9	5242.79	513.966	3554.01
1992	50.65	24.482	24.306	37.423	18192.3	5348.03	537.636	3888.59
1993	53.039	25.735	25.431	37.905	20107.7	5485.07	562.936	4246.08
1994	55.338	26.861	26.556	38.617	22157.7	5613.37	589.303	4655.47
1995	57.86	27.965	27.786	39.163	24399.3	5736.03	617.043	5083.16
1996	60.249	29.059	28.97	39.734	26810.3	5858.41	645.787	5539.29
1997	63.067	30.462	30.408	40.106	29611.2	5996.68	676.492	6017.27
1998	65.855	31.927	31.872	40.644	32694.4	6139.33	708.481	6555.05
1999	69.155	33.733	33.677	41.084	36301.6	6297.3	742.741	7138.16
2000	72.419	35.554	35.496	41.748	40260.8	6455.19	778.545	7807.52

	EXCAP	E99S	E99SRPC	REVGF	RP9S	RT98	RENS	GFBAL
1977	270.326	1160.82	1118.56	796.27	197.201	214.301	278.522	668.165
1978	280.	1311.13	1152.37	1053.84	471.4	206.933	240.288	617.245
1979	290.	1418.71	1155.86	1439.75	860.7	273.822	222.013	813.789
1980	329.271	1558.6	1174.16	1620.	996.3	310.38	227.772	1055.05
1981	367.356	1723.39	1169.17	1981.98	1278.41	351.759	258.996	1511.52
1982	443.134	2005.45	1199.4	2325.41	1475.74	435.053	334.032	2072.03
1983	520.739	2362.76	1284.87	2656.71	1642.7	554.983	421.687	2659.46
1984	577.095	2633.73	1369.14	3255.09	2121.71	668.801	469.82	3576.47
1985	675.87	2824.41	1392.14	3672.12	2422.22	708.99	485.935	4748.96
1986	790.822	3111.91	1437.16	3845.12	2431.68	757.866	525.775	5864.93
1987	843.872	3400.38	1457.3	4085.13	2483.11	807.901	589.791	6988.94
1988	917.577	3768.46	1490.49	4343.36	2526.41	887.26	676.291	8067.69
1989	975.06	4165.87	1519.55	4671.14	2621.78	976.621	780.387	9134.33
1990	1041.28	4600.99	1559.57	4825.84	2535.3	1063.02	892.852	10001.7
1991	1044.98	4953.68	1563.86	5009.16	2489.55	1138.13	1005.77	10755.
1992	1075.02	5352.44	1573.45	5276.09	2518.52	1241.36	1133.31	11434.5
1993	1119.6	5784.12	1577.79	5566.89	2553.13	1362.7	1279.86	12040.3
1994	1173.67	6279.28	1590.75	5824.02	2526.88	1490.27	1455.48	12493.
1995	1212.24	6782.23	1594.41	6073.05	2481.04	1628.	1649.68	12775.3
1996	1257.39	7322.73	1600.09	6382.9	2479.73	1796.96	1869.37	12912.3
1997	1317.1	7898.02	1599.44	6720.21	2484.03	1985.7	2115.6	12904.8
1998	1395.6	8556.5	1606.71	7085.48	2476.71	2208.09	2407.12	12714.8
1999	1511.81	9290.09	1611.54	7485.72	2468.04	2470.08	2740.7	12324.7
2000	1645.2	10129.1	1624.02	7939.18	2456.93	2777.74	3138.59	11701.

	PFBAL	RINS	FUND	FUND77	EXBITEL	R99L	E99L	SIMP
1977	2.4	35.343	670.6	671.369	0.131	531.912	557.16	-137.452
1978	48.975	46.954	666.22	602.545	0.134	568.509	595.272	-4.38
1979	153.275	46.88	967.064	834.901	0.132	622.581	650.949	300.844
1980	275.	68.461	1330.05	1093.85	0.135	714.74	744.811	362.987
1981	411.475	94.479	1922.99	1496.93	0.125	796.569	828.444	592.942
1982	563.425	136.667	2635.46	1931.91	0.115	905.719	939.507	712.469
1983	731.699	187.299	3391.16	2366.32	0.117	1036.7	1072.52	755.7
1984	948.649	241.039	4525.12	3348.11	0.13	1149.35	1187.32	1133.96
1985	1187.55	321.501	5936.51	3645.63	0.132	1222.34	1262.58	1411.4
1986	1437.35	421.493	7302.28	4531.71	0.129	1294.23	1336.89	1365.77
1987	1684.2	518.346	8673.14	5139.25	0.125	1390.52	1435.74	1370.87
1988	1935.8	615.541	10003.5	5652.23	0.122	1520.	1567.93	1330.35
1989	2199.32	709.923	11333.7	6105.4	0.121	1669.85	1720.66	1330.17
1990	2458.6	804.352	12460.3	6414.43	0.121	1838.09	1891.94	1126.6
1991	2711.47	884.51	13466.5	6628.87	0.12	2000.85	2057.93	1006.22
1992	2968.35	956.21	14402.9	6777.69	0.119	2173.3	2233.8	930.422
1993	3229.32	1023.04	15269.7	6862.63	0.117	2359.76	2423.9	866.758
1994	3488.02	1085.02	15981.1	6860.99	0.116	2577.01	2644.99	711.406
1995	3742.45	1136.11	16517.8	6772.62	0.115	2807.52	2879.58	536.719
1996	3997.35	1174.96	16909.7	6624.7	0.114	3065.31	3141.7	391.906
1997	4253.82	1203.66	17158.6	6417.1	0.113	3334.98	3415.96	248.902
1998	4510.59	1222.37	17225.4	6151.21	0.112	3646.5	3732.33	66.789
1999	4766.77	1228.33	17091.4	5821.85	0.11	3980.98	4071.96	-133.957
2000	5022.66	1220.23	16723.7	5434.6	0.109	4370.14	4466.58	-367.754

	EXBITES	VIABL2	RENSRAT
1977	0.229	0.604	0.068
1978	0.25	0.506	0.057
1979	0.242	0.467	0.047
1980	0.237	0.442	0.043
1981	0.219	0.438	0.041
1982	0.205	0.442	0.042
1983	0.215	0.435	0.048
1984	0.241	0.421	0.053
1985	0.245	0.411	0.053
1986	0.247	0.4	0.052
1987	0.244	0.399	0.053
1988	0.242	0.399	0.054
1989	0.241	0.401	0.056
1990	0.244	0.402	0.059
1991	0.241	0.408	0.061
1992	0.239	0.415	0.062
1993	0.234	0.424	0.064
1994	0.231	0.433	0.066
1995	0.227	0.444	0.068
1996	0.223	0.455	0.07
1997	0.219	0.469	0.071
1998	0.215	0.482	0.074
1999	0.21	0.497	0.075
2000	0.206	0.513	0.078

5% NORTHERN GULF OCS DEVELOPMENT SCENARIO - HIGH BASE CASE

(Levels and Differences from the Base Case)

	POP	MIGNET	NINCTOT	EMMM	EMSPP	EMG9P	EMNSP	EMA9
1977	410.66	-24.935	6.383	185.508	0.363	0.378	0.259	1.1
1978	406.709	-11.199	7.202	178.557	0.373	0.386	0.242	1.2
1979	417.661	4.23	6.699	184.486	0.382	0.376	0.242	1.2
1980	431.495	7.005	6.829	192.187	0.394	0.363	0.244	1.2
1981	454.273	15.744	7.04	205.895	0.408	0.341	0.251	1.3
1982	486.141	24.292	7.595	224.856	0.423	0.319	0.258	1.3
1983	500.747	15.172	8.466	235.658	0.428	0.315	0.257	1.4
1984	520.191	1.538	8.923	236.585	0.432	0.321	0.248	1.4
1985	540.357	11.336	8.824	245.927	0.444	0.308	0.249	1.4
1986	560.731	11.233	9.152	255.065	0.45	0.302	0.248	1.5
1987	582.34	12.168	9.45	264.996	0.458	0.295	0.247	1.5
1988	605.1	12.991	9.781	275.525	0.465	0.288	0.247	1.6
1989	623.917	8.69	10.139	283.001	0.468	0.285	0.247	1.6
1990	639.451	5.224	10.315	288.328	0.471	0.282	0.247	1.7
1991	656.425	6.614	10.358	295.235	0.478	0.276	0.246	1.7
1992	670.49	3.596	10.471	300.08	0.481	0.273	0.245	1.8
1993	686.752	5.794	10.463	306.934	0.488	0.267	0.245	1.8
1994	704.358	7.042	10.561	314.864	0.494	0.262	0.244	1.8
1995	723.291	8.219	10.714	323.807	0.501	0.256	0.244	1.9
1996	742.659	8.452	10.918	333.013	0.507	0.25	0.243	2.
1997	764.683	10.893	11.133	344.153	0.514	0.243	0.243	2.1
1998	787.251	11.124	11.449	355.465	0.52	0.236	0.243	2.1
1999	812.471	13.456	11.768	368.566	0.528	0.229	0.243	2.2
2000	837.888	13.245	12.179	381.508	0.534	0.223	0.243	2.2

	EMGF	EMP9	EMT9	EMS9	EMPU	EMOT	EMM9	EMFI
1977	42.921	4.514	9.842	22.649	1.184	14.55	11.356	5.779
1978	42.921	4.365	10.296	21.905	1.194	14.27	11.906	5.739
1979	42.921	4.368	10.728	23.533	1.244	14.509	12.411	6.133
1980	42.921	4.692	11.284	25.552	1.308	14.813	12.896	6.654
1981	42.921	4.778	12.235	28.945	1.4	15.34	13.37	7.477
1982	42.921	4.325	13.397	33.628	1.509	16.041	13.843	8.545
1983	42.921	5.377	14.036	35.676	1.576	16.426	14.32	9.167
1984	42.921	5.801	14.277	35.751	1.615	16.459	14.867	9.426
1985	42.921	5.65	15.244	38.451	1.689	16.784	15.424	10.145
1986	42.921	5.392	15.704	40.827	1.747	17.097	15.937	10.742
1987	42.921	5.398	16.353	43.569	1.812	17.43	16.548	11.435
1988	42.921	6.005	17.225	46.277	1.876	17.776	17.092	12.122
1989	42.921	7.067	17.549	48.131	1.919	18.017	17.737	12.601
1990	42.921	7.99	17.965	49.415	1.953	18.188	18.315	12.959
1991	42.921	7.76	18.462	51.649	2.004	18.406	18.91	13.532
1992	42.921	7.568	18.64	53.108	2.037	18.557	19.527	13.913
1993	42.921	7.39	19.099	55.37	2.086	18.77	20.163	14.485
1994	42.921	7.208	19.642	57.846	2.139	19.012	20.82	15.119
1995	42.921	7.037	20.229	60.66	2.199	19.282	21.499	15.845
1996	42.921	7.023	20.805	63.478	2.258	19.556	22.201	16.569
1997	42.921	7.102	21.505	66.97	2.328	19.882	22.926	17.462
1998	42.921	7.148	22.194	70.473	2.397	20.208	23.675	18.353
1999	42.921	7.149	22.993	74.61	2.476	20.579	24.449	19.405
2000	42.921	7.105	23.751	78.671	2.552	20.938	25.249	20.435

	EMD9	EMCN	EMCN1	EMGA	PI	PIRPC	RPI	EXOPS
1977	24.819	16.559	11.189	27.256	4072.38	3924.32	252.71	810.
1978	24.771	11.436	11.309	25.941	4237.42	3724.25	279.75	944.
1979	26.247	12.129	11.912	26.421	4707.	3845.78	293.049	1019.
1980	28.18	13.203	12.84	26.81	5301.84	3994.15	307.633	1114.32
1981	31.163	16.822	14.074	27.297	6380.53	4318.76	325.232	1232.22
1982	34.938	22.515	15.801	28.712	7939.13	4725.5	345.607	1427.79
1983	37.157	23.024	17.024	31.37	8932.54	4824.14	363.253	1698.96
1984	38.171	20.065	17.803	32.962	9218.75	4690.48	377.827	1902.13
1985	40.71	21.886	19.242	32.75	10367.6	4839.89	396.434	2021.75
1986	42.783	23.27	20.532	34.211	11554.4	4958.54	415.572	2279.21
1987	45.176	24.621	21.63	35.238	12919.7	5088.48	436.01	2548.91
1988	47.531	25.653	22.828	36.4	14413.	5207.65	457.398	2854.31
1989	49.168	25.545	23.698	37.677	15659.3	5245.99	478.435	3186.37
1990	50.397	25.128	24.383	38.359	16784.6	5255.81	499.423	3490.25
1991	52.335	25.966	25.215	38.52	18314.9	5346.07	521.904	3772.17
1992	53.622	26.162	25.847	39.146	19673.2	5388.71	544.503	4108.25
1993	55.537	27.041	26.737	39.152	21421.4	5483.3	568.865	4419.69
1994	57.649	28.087	27.782	39.467	23441.6	5595.18	594.817	4789.73
1995	60.061	29.16	28.981	39.836	25688.	5707.02	622.32	5199.23
1996	62.451	30.273	30.184	40.269	28174.7	5826.64	651.114	5642.81
1997	65.376	31.754	31.7	40.577	31126.4	5967.6	682.106	6119.54
1998	68.278	33.3	33.245	41.123	34381.1	6113.12	714.414	6666.31
1999	71.677	35.178	35.122	41.583	38164.	6272.01	748.937	7260.07
2000	74.987	37.041	36.983	42.26	42275.	6428.27	784.892	7937.83

	EXCAP	E99S	E99SPPC	REVGF	RP9S	RT98	RENS	GFBAL
1977	270.326	1160.82	1118.56	796.27	197.201	214.301	278.522	668.165
1978	280.	1311.13	1152.37	1053.84	471.4	206.933	240.288	617.245
1979	290.	1414.71	1155.86	1439.75	860.7	273.822	222.013	813.789
1980	329.271	1558.6	1174.16	1620.	996.3	310.38	227.772	1055.05
1981	367.356	1723.39	1166.47	1982.8	1278.41	352.193	259.429	1512.33
1982	444.658	2011.3	1197.1	2328.74	1475.74	436.99	336.403	2071.52
1983	523.594	2375.68	1282.99	2663.09	1642.7	558.914	426.673	2654.9
1984	580.82	2652.99	1349.83	3271.59	2121.71	679.316	481.991	3572.66
1985	694.158	2904.1	1355.69	3725.62	2422.22	743.449	527.161	4734.48
1986	834.413	3324.98	1426.88	3951.56	2432.18	827.266	614.294	5784.29
1987	879.174	3664.62	1443.3	4221.02	2483.62	899.559	707.62	6824.99
1988	951.94	4070.68	1470.77	4500.99	2527.54	996.437	817.102	7808.97
1989	1009.56	4490.24	1504.25	4834.6	2623.32	1093.04	932.36	8767.47
1990	1061.13	4877.29	1527.22	4987.66	2553.11	1171.12	1034.11	9562.34
1991	1074.1	5206.08	1519.62	5161.2	2507.46	1242.04	1140.34	10256.3
1992	1114.03	5617.	1538.55	5427.12	2536.49	1347.	1271.58	10867.4
1993	1148.19	5993.24	1534.1	5697.41	2571.11	1456.98	1403.	11429.
1994	1204.15	6451.7	1539.92	5942.82	2544.81	1578.41	1569.69	11857.6
1995	1250.15	6944.72	1542.86	6191.76	2498.88	1717.27	1764.86	12125.9
1996	1300.76	7479.16	1546.7	6507.13	2497.39	1890.99	1989.86	12260.8
1997	1367.77	8061.7	1545.59	6858.41	2501.45	2090.04	2248.34	12260.4
1998	1453.52	8737.83	1553.6	7246.43	2494.58	2328.3	2559.35	12086.7
1999	1575.07	9489.05	1559.44	7671.37	2484.74	2608.46	2915.25	11723.3
2000	1713.66	10343.4	1572.78	8152.32	2473.12	2935.58	3337.05	11141.6

	PFBAL	RINS	FUND	FUND77	EXBITEL	R99L	E99L	SINP
1977	2.4	35.343	670.6	671.369	0.131	531.912	557.16	-137.452
1978	48.975	46.954	666.22	602.515	0.134	568.509	595.272	-4.38
1979	153.275	46.88	967.064	834.901	0.132	622.581	650.949	300.844
1980	275.	68.461	1330.05	1093.85	0.135	714.74	744.811	362.987
1981	411.475	94.479	1923.8	1496.54	0.125	796.607	828.482	593.751
1982	563.425	136.724	2634.95	1928.9	0.114	908.502	942.29	711.145
1983	731.699	187.263	3386.6	2358.72	0.117	1043.25	1079.06	751.656
1984	948.649	240.721	4521.31	3027.56	0.126	1159.62	1197.58	1134.71
1985	1187.55	321.235	5922.93	3779.37	0.122	1263.45	1303.69	1400.72
1986	1437.35	420.48	7221.64	4396.53	0.122	1407.03	1449.68	1299.61
1987	1684.2	512.701	8509.19	4937.55	0.119	1541.75	1586.96	1287.55
1988	1935.8	604.064	9744.77	5390.11	0.118	1698.21	1746.14	1235.58
1989	2199.32	691.813	10966.9	5799.32	0.119	1864.43	1915.24	1222.03
1990	2458.6	778.672	12020.9	6089.62	0.12	2014.33	2068.69	1054.15
1991	2711.47	853.759	12967.8	6286.3	0.118	2160.01	2217.09	946.812
1992	2968.35	921.3	13835.8	6428.71	0.119	2338.85	2399.36	868.023
1993	3229.32	983.346	14658.3	6519.21	0.117	2502.67	2566.81	822.523
1994	3488.02	1042.23	15345.6	6527.11	0.115	2702.98	2770.97	687.297
1995	3742.45	1091.63	15868.4	6451.17	0.114	2929.73	3001.8	522.75
1996	3997.35	1129.5	16258.1	6317.34	0.113	3187.67	3264.06	389.789
1997	4253.82	1158.06	16514.2	6125.29	0.111	3463.92	3544.89	256.078
1998	4510.59	1177.26	16597.3	5877.7	0.11	3789.22	3875.05	83.055
1999	4766.77	1184.36	16490.1	5570.55	0.108	4139.03	4230.01	-107.172
2000	5022.66	1178.14	16164.3	5210.35	0.107	4543.98	4640.42	-325.805

	EXBITES	VIABL2	RENSRAT
1977	0.229	0.604	0.068
1978	0.25	0.506	0.057
1979	0.242	0.467	0.047
1980	0.237	0.442	0.043
1981	0.218	0.439	0.041
1982	0.204	0.443	0.042
1983	0.214	0.436	0.048
1984	0.232	0.425	0.052
1985	0.224	0.422	0.051
1986	0.23	0.414	0.053
1987	0.227	0.417	0.055
1988	0.227	0.419	0.057
1989	0.231	0.421	0.06
1990	0.234	0.421	0.062
1991	0.23	0.427	0.062
1992	0.232	0.432	0.065
1993	0.228	0.44	0.065
1994	0.224	0.448	0.067
1995	0.221	0.459	0.069
1996	0.217	0.471	0.071
1997	0.212	0.485	0.072
1998	0.208	0.499	0.074
1999	0.204	0.515	0.076
2000	0.201	0.531	0.079

	POP	MIGNET	NINCTOT	EM99	EMA9	EMGF	EMP9	EMT9
1977	0.	0.	0.	0.	0.	0.	0.	0.
1978	0.	0.	0.	0.	0.	0.	0.	0.
1979	0.	0.	0.	0.	0.	0.	0.	0.
1980	0.	0.	0.	0.	0.	0.	0.	0.
1981	0.74	0.74	0.	0.547	0.	0.	0.166	0.11
1982	1.681	0.913	0.03	1.18	0.	0.	0.266	0.204
1983	2.563	0.818	0.065	1.709	0.	0.	0.34	0.271
1984	8.031	5.375	0.095	5.585	0.	0.	0.418	0.572
1985	20.886	12.555	0.309	14.367	0.	0.	0.391	1.335
1986	29.594	7.928	0.8	18.959	0.	0.	0.32	1.475
1987	35.852	5.197	1.074	21.436	0.	0.	0.399	1.616
1988	40.446	3.368	1.234	22.635	0.	0.	0.798	1.909
1989	40.187	-1.571	1.317	20.386	0.	0.	1.539	1.624
1990	39.166	-2.22	1.197	18.115	0.	0.	2.3	1.575
1991	40.121	-0.111	1.063	17.725	0.	0.	2.461	1.573
1992	37.771	-3.37	1.021	15.006	0.	0.	2.279	1.263
1993	35.532	-3.09	0.845	12.744	0.	0.	2.248	1.121
1994	34.523	-1.71	0.696	11.664	0.	0.	2.154	1.094
1995	33.914	-1.222	0.61	11.001	0.	0.	2.014	1.062
1996	33.998	-0.466	0.549	10.927	0.	0.	2.044	1.057
1997	34.743	0.22	0.524	11.364	0.	0.	2.144	1.078
1998	35.576	0.303	0.53	11.849	0.	0.	2.194	1.1
1999	36.328	0.21	0.542	12.246	0.	0.	2.194	1.117
2000	36.771	-0.109	0.551	12.403	0.	0.	2.156	1.11

	EMS9	EMPU	EMOT	EMM9	EMFI	EMD9	EMCM	EMCN
1977	0.	0.	0.	0.	0.	0.	0.	0.
1978	0.	0.	0.	0.	0.	0.	0.	0.
1979	0.	0.	0.	0.	0.	0.	0.	0.
1980	0.	0.	0.	0.	0.	0.	0.	0.
1981	0.106	0.003	0.021	0.	0.028	0.1	0.002	0.043
1982	0.239	0.007	0.043	0.	0.062	0.221	0.003	0.104
1983	0.349	0.009	0.06	0.	0.09	0.319	0.005	0.154
1984	1.404	0.038	0.198	0.	0.362	1.283	0.021	1.312
1985	3.733	0.098	0.503	0.	0.964	3.395	0.054	3.561
1986	4.763	0.122	0.655	0.	1.227	4.296	0.07	4.154
1987	5.367	0.134	0.727	0.085	1.38	4.795	0.078	4.4
1988	5.599	0.136	0.753	0.085	1.437	4.955	0.081	4.185
1989	4.836	0.115	0.667	0.17	1.24	4.25	0.068	3.04
1990	4.157	0.097	0.586	0.17	1.066	3.637	0.057	2.201
1991	4.169	0.095	0.566	0.17	1.068	3.622	0.057	2.243
1992	3.44	0.077	0.474	0.17	0.881	2.972	0.047	1.68
1993	2.911	0.064	0.397	0.17	0.744	2.498	0.039	1.306
1994	2.713	0.058	0.358	0.17	0.693	2.312	0.036	1.226
1995	2.602	0.055	0.333	0.17	0.664	2.2	0.034	1.195
1996	2.622	0.054	0.325	0.17	0.668	2.202	0.034	1.215
1997	2.771	0.056	0.333	0.17	0.705	2.309	0.036	1.292
1998	2.929	0.057	0.341	0.17	0.745	2.423	0.037	1.373
1999	3.075	0.059	0.346	0.17	0.781	2.522	0.039	1.445
2000	3.157	0.059	0.345	0.17	0.8	2.568	0.039	1.487

	EMGNI	EMGA	PI	PIRPC	RPI	EXOPS	EXCAP	E99S
1977	0.	0.	0.	0.	0.	0.	0.	0.
1978	0.	0.	0.	0.	0.	0.	0.	0.
1979	0.	0.	0.	0.	0.	0.	0.	0.
1980	0.	0.	0.	0.	0.	0.	0.	0.
1981	0.043	-0.031	27.094	8.375	0.223	0.	0.	0.
1982	0.104	0.032	65.504	16.293	0.472	4.319	1.524	5.844
1983	0.154	0.113	190.598	21.23	0.681	10.019	2.855	12.917
1984	0.547	-0.022	404.27	108.273	2.232	15.411	3.725	19.259
1985	1.46	0.332	1122.84	283.16	5.877	61.179	18.288	79.692
1986	1.946	1.877	1512.32	320.824	7.896	168.744	43.591	213.072
1987	2.178	2.454	1795.1	320.746	9.04	226.989	35.302	264.237
1988	2.297	2.698	1977.46	289.102	9.631	264.97	34.362	302.215
1989	2.042	2.837	1801.94	191.273	8.783	286.105	34.495	324.371
1990	1.757	2.27	1629.17	118.598	7.962	251.787	19.855	276.305
1991	1.794	1.791	1708.07	103.277	7.937	218.157	29.124	252.406
1992	1.541	1.723	1480.87	40.684	6.867	219.669	39.007	264.559
1993	1.306	1.247	1313.68	-1.773	5.928	173.609	28.588	209.121
1994	1.226	0.85	1283.82	-18.191	5.514	134.262	30.479	172.414
1995	1.195	0.673	1288.7	-29.012	5.277	116.07	37.919	162.484
1996	1.215	0.535	1364.43	-31.773	5.326	103.52	43.365	156.422
1997	1.292	0.47	1515.2	-29.082	5.613	102.27	50.668	163.68
1998	1.373	0.479	1686.78	-26.211	5.933	111.258	57.917	181.336
1999	1.445	0.499	1862.43	-25.293	6.197	121.918	63.255	198.961
2000	1.487	0.511	2014.2	-26.918	6.347	130.312	68.462	214.344

	E99SRPC	REVGF	RP9S	RT98	RENS	GFBAL	PFBAL	RINS
1977	0.	0.	0.	0.	0.	0.	0.	0.
1978	0.	0.	0.	0.	0.	0.	0.	0.
1979	0.	0.	0.	0.	0.	0.	0.	0.
1980	0.	0.	0.	0.	0.	0.	0.	0.
1981	-2.704	0.819	0.	0.434	0.434	0.81	0.	0.
1982	-2.303	3.335	0.	1.937	2.37	-0.514	0.	0.057
1983	-1.882	6.382	0.	3.931	4.986	-4.555	0.	-0.036
1984	-19.302	16.507	0.	10.514	12.171	-3.805	0.	-0.319
1985	-36.448	53.502	0.	34.459	41.225	-14.48	0.	-0.266
1986	-19.277	106.441	0.5	69.401	88.519	-80.637	0.	-1.014
1987	-14.007	135.884	0.51	91.658	117.829	-163.953	0.	-5.645
1988	-19.72	157.633	1.13	109.177	140.811	-258.719	0.	-11.477
1989	-15.307	163.461	1.54	116.423	151.973	-366.859	0.	-18.11
1990	-32.342	161.824	17.81	108.105	141.261	-439.309	0.	-25.68
1991	-44.24	152.031	17.91	103.912	134.572	-498.715	0.	-30.751
1992	-34.897	151.023	17.97	105.638	138.268	-567.113	0.	-34.91
1993	-43.698	130.516	17.98	94.28	123.136	-611.348	0.	-39.698
1994	-50.839	118.805	17.93	88.135	114.216	-635.457	0.	-42.794
1995	-51.546	118.703	17.84	89.266	115.177	-649.426	0.	-44.482
1996	-53.393	124.23	17.66	94.032	120.483	-651.543	0.	-45.46
1997	-53.855	138.199	17.42	104.333	132.743	-644.367	0.	-45.608
1998	-53.107	160.953	17.87	120.21	152.224	-628.102	0.	-45.106
1999	-52.097	185.648	16.7	138.377	174.554	-601.316	0.	-43.967
2000	-51.234	213.133	16.19	157.832	198.463	-559.367	0.	-42.092

	FUND	FUND77	R99L	E99L
1977	0.	0.	0.	0.
1978	0.	0.	0.	0.
1979	0.	0.	0.	0.
1980	0.	0.	0.	0.
1981	0.81	-0.397	0.038	0.038
1982	-0.514	-3.015	2.783	2.783
1983	-4.555	-7.61	6.544	6.544
1984	-3.805	-20.554	10.266	10.266
1985	-14.48	-66.254	41.108	41.108
1986	-80.637	-135.187	112.792	112.792
1987	-163.953	-201.691	151.226	151.226
1988	-258.719	-262.121	178.207	178.207
1989	-366.859	-306.078	194.581	194.581
1990	-439.309	-324.805	176.747	176.747
1991	-498.715	-342.578	159.162	159.162
1992	-567.113	-348.98	165.555	165.555
1993	-611.348	-343.414	142.916	142.916
1994	-635.457	-333.887	125.978	125.978
1995	-649.426	-321.449	122.217	122.217
1996	-651.543	-307.359	122.363	122.363
1997	-644.367	-291.812	128.932	128.932
1998	-628.102	-273.516	142.722	142.722
1999	-601.316	-251.301	158.048	158.051
2000	-559.367	-224.25	173.844	173.844

LOW BASE CASE

1977	410.66	-24.935	6.383	185.508	0.363	0.378	0.259	1.1
1978	406.709	-11.199	7.202	178.557	0.373	0.386	0.242	1.2
1979	417.661	4.23	6.699	184.486	0.382	0.376	0.242	1.2
1980	431.495	7.005	6.829	192.187	0.394	0.363	0.244	1.2
1981	451.557	13.127	7.04	203.886	0.406	0.345	0.249	1.3
1982	482.344	23.318	7.485	222.33	0.421	0.321	0.258	1.3
1983	498.942	8.306	8.324	228.242	0.423	0.325	0.252	1.4
1984	497.291	-10.153	8.598	221.077	0.42	0.341	0.24	1.4
1985	504.71	-0.564	7.959	222.88	0.426	0.333	0.241	1.4
1986	518.422	5.852	7.852	229.756	0.433	0.324	0.243	1.5
1987	534.266	7.847	7.998	238.04	0.441	0.316	0.242	1.5
1988	551.407	8.93	8.215	246.998	0.448	0.309	0.242	1.6
1989	569.207	9.331	8.474	256.188	0.456	0.303	0.242	1.6
1990	585.921	7.973	8.746	264.313	0.461	0.298	0.241	1.7
1991	601.605	6.727	8.961	271.644	0.468	0.293	0.239	1.7
1992	617.354	6.624	9.126	278.97	0.474	0.287	0.239	1.8
1993	635.193	8.509	9.29	287.806	0.482	0.28	0.238	1.8
1994	653.018	8.337	9.531	296.515	0.489	0.274	0.238	1.8
1995	671.975	9.199	9.761	305.943	0.496	0.267	0.237	1.9
1996	691.018	9.023	10.023	315.281	0.502	0.261	0.237	2.
1997	712.023	10.734	10.274	325.984	0.509	0.253	0.237	2.1
1998	733.658	11.048	10.591	336.919	0.516	0.247	0.237	2.1
1999	757.817	13.251	10.912	349.551	0.524	0.239	0.237	2.2
2000	782.438	13.313	11.316	362.225	0.53	0.233	0.237	2.2

	EMGF	EMP9	EMT9	EMS9	EMPU	EMOT	EMM9	EMFI
1977	42.921	4.514	9.842	22.649	1.184	14.55	11.356	5.779
1978	42.921	4.365	10.296	21.905	1.194	14.27	11.906	5.739
1979	42.921	4.368	10.728	23.533	1.244	14.509	12.411	6.133
1980	42.921	4.692	11.284	25.552	1.308	14.813	12.896	6.654
1981	42.921	4.336	12.033	28.495	1.387	15.264	13.37	7.36
1982	42.921	4.13	13.113	33.073	1.493	15.949	13.843	8.402
1983	42.921	3.836	13.436	33.992	1.53	16.163	14.32	8.735
1984	42.921	3.835	13.133	32.057	1.514	15.904	14.867	8.471
1985	42.921	3.753	13.449	32.866	1.54	15.969	15.364	8.702
1986	42.921	3.725	13.911	34.749	1.59	16.217	15.877	9.181
1987	42.921	3.835	14.452	36.969	1.649	16.51	16.403	9.753
1988	42.921	3.975	15.008	39.304	1.708	16.821	16.947	10.352
1989	42.921	4.151	15.59	41.786	1.771	17.135	17.507	10.992
1990	42.921	4.36	16.091	43.918	1.825	17.407	18.085	11.555
1991	42.921	3.968	16.589	46.119	1.877	17.649	18.68	12.121
1992	42.921	3.856	17.068	48.255	1.928	17.887	19.297	12.674
1993	42.921	3.809	17.653	50.933	1.989	18.171	19.933	13.357
1994	42.921	3.733	18.209	53.514	2.046	18.446	20.59	14.019
1995	42.921	3.661	18.823	56.396	2.109	18.739	21.269	14.761
1996	42.921	3.619	19.41	59.211	2.17	19.025	21.971	15.483
1997	42.921	3.6	20.092	62.538	2.239	19.347	22.696	16.333
1998	42.921	3.598	20.766	65.888	2.307	19.671	23.445	17.187
1999	42.921	3.595	21.545	69.834	2.385	20.038	24.219	18.192
2000	42.921	3.593	22.306	73.76	2.46	20.4	25.019	19.19

	EMD9	EMCN	EMCN1	EMGA	PI	PIRPC	RPI	EXOPS
1977	24.819	16.559	11.189	27.256	4072.38	3924.32	252.71	810.
1978	24.771	11.436	11.309	25.941	4237.42	3724.25	279.75	944.
1979	26.247	12.129	11.912	26.421	4707.	3845.78	293.049	1019.
1980	28.18	13.203	12.84	26.81	5301.84	3994.15	307.633	1114.32
1981	30.736	16.434	13.899	27.412	6267.25	4278.38	324.412	1232.22
1982	34.427	22.056	15.555	28.451	7788.36	4685.88	344.602	1410.43
1983	35.623	21.793	16.336	31.314	8455.86	4703.56	360.317	1676.29
1984	34.777	16.946	16.307	32.437	8155.89	4414.17	371.543	1830.07
1985	35.611	17.19	16.964	31.323	8685.5	4448.06	386.886	1887.08
1986	37.31	18.446	18.038	31.494	9621.	4582.89	404.95	2053.14
1987	39.328	19.445	18.987	32.405	10707.9	4720.6	424.578	2291.21
1988	41.427	20.531	20.009	33.492	11945.4	4866.2	445.187	2565.52
1989	43.652	21.534	21.051	34.603	13293.5	5003.09	466.806	2869.87
1990	45.603	22.166	21.987	35.729	14635.1	5109.99	488.814	3197.53
1991	47.547	22.939	22.759	36.548	16053.9	5219.21	511.29	3518.78
1992	49.433	23.703	23.588	37.14	17590.9	5328.01	534.801	3846.62
1993	51.749	24.864	24.682	37.578	19424.5	5461.91	559.928	4194.1
1994	53.977	25.943	25.76	38.232	21395.5	5590.21	586.104	4589.25
1995	56.462	27.068	26.957	38.717	23579.7	5717.76	613.712	5002.19
1996	58.864	28.21	28.139	39.247	25958.6	5847.45	642.437	5446.57
1997	61.675	29.628	29.574	39.623	28708.6	5990.23	673.101	5917.61
1998	64.479	31.148	31.093	40.173	31748.6	6137.4	705.102	6452.18
1999	67.753	32.934	32.878	40.65	35280.2	6297.34	739.293	7034.25
2000	70.985	34.729	34.671	41.325	39151.6	6456.57	775.004	7698.62

	EXCAP	E99S	E99SRPC	REVGF	RP9S	RT98	RENS	GFBAL
1977	279.326	1160.82	1118.56	796.269	197.2	214.301	278.522	668.165
1978	280.	1311.13	1152.37	1053.84	471.4	206.933	240.288	617.245
1979	290.	1418.71	1155.86	1439.75	860.7	273.322	222.013	813.789
1980	329.271	1558.6	1174.16	1620.	996.3	310.38	227.772	1055.05
1981	367.356	1723.39	1176.45	1979.55	1278.41	350.363	257.599	1509.12
1982	438.358	1987.63	1195.81	2318.53	1475.74	430.826	328.462	2076.88
1983	518.389	2347.63	1305.85	2641.6	1642.7	545.471	410.847	2661.78
1984	559.485	2559.27	1385.15	3216.1	2121.71	644.263	439.283	3599.55
1985	653.028	2727.38	1396.76	3620.69	2421.88	676.142	442.097	4798.83
1986	781.256	3043.7	1449.83	3802.1	2429.91	730.619	488.959	5928.82
1987	837.412	3361.66	1481.97	4047.45	2478.65	785.191	560.005	7047.66
1988	905.241	3730.58	1519.71	4299.57	2518.62	862.611	645.08	8112.87
1989	957.021	4115.37	1548.82	4558.96	2553.89	942.811	743.085	9114.2
1990	1004.1	4520.31	1578.28	4667.32	2430.95	1018.65	851.055	9894.7
1991	1001.08	4870.91	1583.55	4822.41	2364.37	1092.01	964.129	10535.6
1992	1021.29	5251.84	1590.69	5082.76	2400.58	1193.17	1087.67	11107.9
1993	1064.81	5670.89	1594.56	5350.79	2428.14	1309.47	1227.98	11595.2
1994	1113.88	6145.23	1605.6	5580.47	2393.23	1428.85	1395.25	11919.5
1995	1149.1	6628.35	1607.27	5804.14	2341.42	1561.11	1581.18	12065.2
1996	1192.77	7153.8	1611.45	6083.17	2327.77	1723.84	1793.88	12049.
1997	1254.45	7722.26	1611.28	6393.15	2323.5	1906.6	2034.21	11868.4
1998	1360.96	8403.72	1624.52	6742.36	2321.79	2125.88	2318.27	11476.6
1999	1476.21	9134.35	1630.41	7134.33	2329.04	2383.17	2644.11	10876.9
2000	1607.52	9965.29	1643.37	7573.25	2331.72	2684.56	3030.63	10034.1

	PFBAL	RINS	FUND	FUND77	EXBITEL	R99L	E99L	SIMP
1977	2.4	35.343	670.6	671.369	0.131	531.912	557.16	-137.453
1978	48.975	46.954	666.22	602.515	0.134	568.509	595.272	-4.38
1979	153.275	46.88	967.064	834.901	0.132	622.581	650.949	300.844
1980	275.	68.461	1330.05	1093.85	0.135	714.74	744.811	362.987
1981	411.475	94.479	1920.59	1497.82	0.127	796.469	828.344	590.54
1982	563.425	136.499	2640.3	1938.46	0.115	897.113	930.9	719.713
1983	731.699	187.638	3393.47	2382.76	0.122	1028.04	1063.86	753.171
1984	948.649	241.202	4548.2	3097.07	0.136	1112.56	1150.52	1154.73
1985	1187.55	323.117	5986.38	3914.73	0.133	1156.25	1196.49	1438.19
1986	1437.35	424.984	7366.17	4602.15	0.129	1237.76	1280.41	1379.79
1987	1684.2	522.818	8731.86	5203.19	0.126	1350.06	1395.28	1365.69
1988	1935.8	619.651	10048.7	5710.66	0.124	1483.43	1531.36	1316.82
1989	2192.22	713.086	11306.4	6127.86	0.122	1628.4	1679.2	1257.76
1990	2440.75	802.411	12335.5	6384.57	0.122	1789.27	1843.12	1029.03
1991	2680.6	875.685	13216.2	6539.71	0.122	1952.24	2009.32	880.718
1992	2925.5	938.534	14033.4	6638.84	0.121	2121.84	2182.34	817.266
1993	3173.85	996.968	14769.1	6673.31	0.119	2302.74	2366.88	735.648
1994	3419.25	1049.7	15338.8	6621.2	0.117	2513.77	2581.76	569.703
1995	3659.62	1090.81	15724.8	6482.49	0.116	2737.25	2809.31	386.055
1996	3899.12	1119.04	15948.1	6280.56	0.115	2988.63	3065.02	223.246
1997	4139.3	1135.86	16007.7	6016.84	0.113	3254.47	3335.45	59.586
1998	4380.25	1141.23	15856.9	5689.65	0.112	3561.05	3646.88	-150.812
1999	4622.62	1131.88	15499.5	5304.22	0.11	3891.97	3982.95	-357.34
2000	4866.29	1108.08	14900.4	4864.23	0.109	4274.44	4370.88	-599.121

	EXBITES	VIABL2	RENSRAT
1977	0.229	0.604	0.068
1978	0.25	0.506	0.057
1979	0.242	0.467	0.047
1980	0.237	0.442	0.043
1981	0.222	0.437	0.041
1982	0.205	0.442	0.042
1983	0.223	0.43	0.049
1984	0.253	0.414	0.054
1985	0.251	0.401	0.051
1986	0.252	0.391	0.051
1987	0.25	0.39	0.052
1988	0.25	0.389	0.054
1989	0.248	0.391	0.056
1990	0.249	0.394	0.058
1991	0.246	0.401	0.06
1992	0.242	0.409	0.062
1993	0.238	0.417	0.063
1994	0.234	0.427	0.065
1995	0.23	0.438	0.067
1996	0.226	0.45	0.069
1997	0.221	0.463	0.071
1998	0.217	0.476	0.073
1999	0.212	0.49	0.075
2000	0.209	0.506	0.077

95% NORTHERN GULF OCS DEVELOPMENT SCENARIO -
LOW BASE CASE

(Levels and Differences from the Base Case)

	POP	MIGNET	NINCTOT	EM99	EMSPP	EMG9P	EMNSP	EMA9
1977	410.66	-24.935	6.383	185.508	0.363	0.378	0.259	1.1
1978	406.709	-11.199	7.202	178.557	0.373	0.386	0.242	1.2
1979	417.661	4.23	6.699	184.486	0.382	0.376	0.242	1.2
1980	431.495	7.005	6.829	192.187	0.394	0.363	0.244	1.2
1981	452.241	13.712	7.94	204.393	0.407	0.344	0.249	1.3
1982	483.427	23.69	7.513	223.073	0.422	0.32	0.258	1.3
1983	500.077	8.316	8.365	228.948	0.423	0.325	0.252	1.4
1984	498.073	-10.545	8.547	221.443	0.42	0.341	0.239	1.4
1985	505.276	-0.802	7.981	223.064	0.426	0.333	0.241	1.4
1986	518.872	5.722	7.864	229.85	0.433	0.324	0.243	1.5
1987	534.66	7.786	8.004	238.1	0.441	0.316	0.242	1.5
1988	551.766	8.89	8.219	247.041	0.448	0.309	0.242	1.6
1989	569.539	9.302	8.476	256.222	0.456	0.303	0.242	1.6
1990	586.227	7.947	8.748	264.339	0.461	0.298	0.241	1.7
1991	601.891	6.706	8.961	271.666	0.468	0.293	0.239	1.7
1992	617.622	6.606	9.125	278.987	0.474	0.287	0.239	1.8
1993	635.402	8.492	9.289	287.82	0.482	0.28	0.238	1.8
1994	653.25	8.321	9.53	296.526	0.489	0.274	0.238	1.8
1995	672.192	9.184	9.759	305.953	0.496	0.267	0.237	1.9
1996	691.214	9.002	10.022	315.284	0.502	0.261	0.237	2.
1997	712.212	10.729	10.272	325.991	0.509	0.253	0.237	2.1
1998	733.838	11.041	10.59	336.928	0.516	0.247	0.237	2.1
1999	757.989	13.244	10.911	349.56	0.524	0.239	0.237	2.2
2000	782.602	13.305	11.315	362.233	0.53	0.233	0.237	2.2

	EMGF	EMP9	EMT9	EMS9	EMPU	EMOT	EMM9	EMFI
1977	42.921	4.514	9.842	22.649	1.184	14.55	11.356	5.779
1978	42.921	4.365	10.296	21.905	1.194	14.27	11.906	5.739
1979	42.921	4.368	10.728	23.533	1.244	14.509	12.411	6.133
1980	42.921	4.692	11.284	25.552	1.308	14.813	12.896	6.654
1981	42.921	4.485	12.141	28.593	1.39	15.294	13.37	7.385
1982	42.921	4.279	13.233	33.221	1.498	15.976	13.843	8.441
1983	42.921	3.95	13.533	34.134	1.534	16.188	14.32	8.772
1984	42.921	3.856	13.168	32.13	1.516	15.917	14.867	8.49
1985	42.921	3.753	13.458	32.901	1.541	15.976	15.364	8.711
1986	42.921	3.725	13.916	34.767	1.591	16.22	15.877	9.186
1987	42.921	3.835	14.455	36.982	1.649	16.512	16.403	9.756
1988	42.921	3.975	15.011	39.313	1.709	16.823	16.947	10.355
1989	42.921	4.151	15.592	41.794	1.771	17.136	17.507	10.994
1990	42.921	4.36	16.092	43.924	1.825	17.408	18.085	11.557
1991	42.921	3.968	16.591	46.125	1.878	17.65	18.68	12.123
1992	42.921	3.856	17.069	48.26	1.928	17.888	19.297	12.675
1993	42.921	3.809	17.654	50.937	1.989	18.171	19.933	13.359
1994	42.921	3.733	18.21	53.518	2.046	18.446	20.59	14.02
1995	42.921	3.661	18.823	56.4	2.109	18.739	21.269	14.762
1996	42.921	3.619	19.411	59.212	2.17	19.025	21.971	15.483
1997	42.921	3.6	20.093	62.54	2.239	19.347	22.696	16.334
1998	42.921	3.598	20.767	65.891	2.307	19.671	23.445	17.188
1999	42.921	3.595	21.546	69.837	2.385	20.039	24.219	18.193
2000	42.921	3.593	22.307	73.763	2.46	20.4	25.019	19.191

	PFBAL	RINS	FUND	FUND77	EXBITEL	R99L	E99L	SIMP
1977	2.4	35.343	670.6	671.369	0.131	531.912	557.16	-137.453
1978	48.975	46.954	666.22	602.515	0.134	568.509	595.272	-4.38
1979	153.275	46.88	967.064	834.901	0.132	622.581	650.949	300.844
1980	275.	68.461	1330.05	1093.85	0.135	714.74	744.811	362.987
1981	411.475	94.479	1921.34	1497.44	0.127	796.503	828.378	591.285
1982	563.425	136.551	2639.23	1936.	0.115	899.646	933.433	717.895
1983	731.699	187.563	3389.26	2377.9	0.121	1032.1	1067.91	750.035
1984	948.649	240.907	4540.41	3090.3	0.137	1116.56	1154.52	1151.15
1985	1187.55	322.572	5974.8	3906.11	0.133	1158.42	1198.66	1434.39
1986	1437.35	424.174	7352.24	4592.7	0.129	1238.86	1281.51	1377.45
1987	1684.2	521.843	8715.84	5193.	0.126	1350.67	1395.89	1363.6
1988	1935.8	618.53	10030.7	5699.88	0.124	1483.88	1531.8	1314.91
1989	2192.22	711.831	11286.7	6116.57	0.122	1628.77	1679.57	1255.92
1990	2440.75	801.027	12313.9	6372.86	0.122	1789.6	1843.45	1027.23
1991	2680.6	874.176	13192.8	6527.61	0.122	1952.54	2009.63	878.906
1992	2925.5	936.899	14008.3	6626.41	0.121	2122.12	2182.63	815.453
1993	3173.85	995.205	14742.1	6660.62	0.119	2303.01	2367.15	733.844
1994	3419.25	1047.82	15310.	6608.29	0.117	2514.03	2582.02	567.891
1995	3659.62	1088.8	15694.2	6469.41	0.116	2737.5	2809.57	384.211
1996	3899.12	1116.89	15915.5	6267.34	0.115	2988.88	3065.27	221.309
1997	4139.3	1133.58	15972.9	6003.37	0.113	3254.64	3335.62	57.363
1998	4380.25	1138.8	15819.7	5675.95	0.112	3561.31	3647.14	-153.148
1999	4622.62	1129.28	15459.9	5290.32	0.11	3892.27	3983.25	-359.801
2000	4866.29	1105.31	14858.2	4850.15	0.109	4274.77	4371.21	-601.707

	EXBITES	VIABL2	RENSRAT
1977	0.229	0.604	0.068
1978	0.25	0.526	0.057
1979	0.242	0.467	0.047
1980	0.237	0.442	0.043
1981	0.221	0.437	0.041
1982	0.205	0.442	0.042
1983	0.223	0.43	0.049
1984	0.253	0.414	0.054
1985	0.252	0.401	0.051
1986	0.252	0.391	0.051
1987	0.251	0.39	0.052
1988	0.25	0.389	0.054
1989	0.248	0.391	0.056
1990	0.249	0.394	0.058
1991	0.246	0.401	0.06
1992	0.242	0.409	0.062
1993	0.238	0.417	0.063
1994	0.234	0.427	0.065
1995	0.23	0.438	0.067
1996	0.226	0.45	0.069
1997	0.221	0.463	0.071
1998	0.217	0.476	0.073
1999	0.212	0.49	0.075
2000	0.209	0.506	0.077

	POP	HIGNET	NINCIOT	EMB9	EHA9	EMGF	EMP9	EMI9
1977	0.	0.	0.	0.	0.	0.	0.	0.
1978	0.	0.	0.	0.	0.	0.	0.	0.
1979	0.	0.	0.	0.	0.	0.	0.	0.
1980	0.	0.	0.	0.	0.	0.	0.	0.
1981	0.684	0.685	0.	0.506	0.	0.	0.149	0.108
1982	1.084	0.372	0.028	0.743	0.	0.	0.149	0.12
1983	1.134	0.01	0.041	0.706	0.	0.	0.114	0.097
1984	0.782	-0.392	0.039	0.366	0.	0.	0.021	0.035
1985	0.566	-0.238	0.022	0.183	0.	0.	0.	0.009
1986	0.45	-0.13	0.012	0.094	0.	0.	0.	0.005
1987	0.395	-0.062	0.006	0.06	0.	0.	0.	0.003
1988	0.359	-0.04	0.004	0.043	0.	0.	0.	0.002
1989	0.332	-0.029	0.002	0.034	0.	0.	0.	0.002
1990	0.307	-0.026	0.001	0.026	0.	0.	0.	0.001
1991	0.286	-0.02	0.	0.022	0.	0.	0.	0.001
1992	0.268	-0.018	-0.	0.018	0.	0.	0.	0.001
1993	0.25	-0.017	-0.001	0.014	0.	0.	0.	0.001
1994	0.233	-0.016	-0.001	0.011	0.	0.	0.	0.001
1995	0.217	-0.015	-0.001	0.009	0.	0.	0.	0.001
1996	0.196	-0.021	-0.001	0.003	0.	0.	0.	0.
1997	0.189	-0.005	-0.002	0.007	0.	0.	0.	0.001
1998	0.18	-0.006	-0.001	0.008	0.	0.	0.	0.001
1999	0.172	-0.007	-0.001	0.009	0.	0.	0.	0.001
2000	0.164	-0.008	-0.001	0.009	0.	0.	0.	0.001

	EMS9	EMPU	EMOT	EMM9	EMFI	EMD9	EMCM	EMCN
1977	0.	0.	0.	0.	0.	0.	0.	0.
1978	0.	0.	0.	0.	0.	0.	0.	0.
1979	0.	0.	0.	0.	0.	0.	0.	0.
1980	0.	0.	0.	0.	0.	0.	0.	0.
1981	0.097	0.003	0.019	0.	0.025	0.093	0.001	0.04
1982	0.149	0.004	0.027	0.	0.038	0.138	0.002	0.066
1983	0.141	0.004	0.025	0.	0.036	0.13	0.002	0.064
1984	0.073	0.002	0.013	0.	0.019	0.068	0.001	0.034
1985	0.035	0.001	0.007	0.	0.009	0.033	0.001	0.013
1986	0.018	0.	0.003	0.	0.005	0.017	0.	0.002
1987	0.013	0.	0.002	0.	0.003	0.011	0.	0.001
1988	0.009	0.	0.001	0.	0.002	0.009	0.	0.
1989	0.008	0.	0.001	0.	0.002	0.007	0.	-0.
1990	0.006	0.	0.001	0.	0.002	0.006	0.	-0.
1991	0.006	0.	0.001	0.	0.001	0.005	0.	0.
1992	0.005	0.	0.001	0.	0.001	0.004	0.	0.
1993	0.004	0.	0.	0.	0.001	0.004	0.	0.
1994	0.004	0.	0.	0.	0.001	0.003	0.	0.
1995	0.003	0.	0.	0.	0.001	0.003	0.	0.
1996	0.001	0.	0.	0.	0.	0.001	0.	-0.
1997	0.003	0.	0.	0.	0.001	0.003	0.	0.001
1998	0.003	0.	0.	0.	0.001	0.003	0.	0.002
1999	0.004	0.	0.	0.	0.001	0.003	0.	0.002
2000	0.004	0.	0.	0.	0.001	0.003	0.	0.002

	EMD9	EMCN	EMCN1	EMGA	PI	PIRPC	RPI	EXOPS
1977	24.819	16.559	11.189	27.256	4072.38	3924.32	252.71	810.
1978	24.771	11.436	11.309	25.941	4237.42	3724.25	279.75	944.
1979	26.247	12.129	11.912	26.421	4707.	3845.78	293.049	1019.
1980	28.18	13.203	12.84	26.81	5301.84	3994.15	307.633	1114.32
1981	30.828	16.473	13.938	27.383	6292.12	4286.13	324.619	1232.22
1982	34.565	22.122	15.621	28.5	7829.1	4695.79	344.899	1414.43
1983	35.753	21.857	16.4	31.406	8496.34	4711.6	360.605	1682.58
1984	34.844	16.981	16.342	32.536	8177.23	4416.8	371.719	1836.3
1985	35.643	17.203	16.977	31.4	8696.63	4447.58	386.99	1892.89
1986	37.327	18.448	18.04	31.537	9627.34	4581.2	405.016	2056.95
1987	39.339	19.445	18.988	32.431	10712.6	4718.58	424.631	2294.02
1988	41.436	20.531	20.009	33.511	11949.2	4864.11	445.234	2567.84
1989	43.659	21.534	21.051	34.617	13297.	5001.02	466.851	2871.87
1990	45.609	22.166	21.987	35.739	14638.4	5107.99	488.857	3199.28
1991	47.551	22.939	22.759	36.556	16056.9	5217.3	511.332	3520.29
1992	49.438	23.703	23.588	37.145	17593.8	5326.19	534.843	3847.94
1993	51.752	24.864	24.682	37.581	19427.4	5460.17	559.97	4195.22
1994	53.98	25.943	25.76	38.234	21398.4	5588.55	586.146	4590.19
1995	56.465	27.069	26.958	38.718	23582.5	5716.21	613.755	5002.95
1996	58.865	28.21	28.139	39.247	25960.8	5845.94	642.477	5447.18
1997	61.677	29.63	29.576	39.621	28711.7	5988.9	673.145	5918.04
1998	64.482	31.15	31.095	40.172	31752.2	6136.17	705.149	6452.66
1999	67.756	32.935	32.879	40.648	35284.1	6296.2	739.342	7034.71
2000	70.988	34.731	34.673	41.324	39155.9	6455.52	775.054	7699.06

	EXCAP	E99S	E99SRPC	REVGF	RP9S	RT98	RENS	GFBAL
1977	270.326	1160.82	1118.56	796.269	197.2	214.301	278.522	668.165
1978	280.	1311.13	1152.37	1053.84	471.4	206.933	240.288	617.245
1979	290.	1414.71	1155.86	1439.75	860.7	273.822	222.013	813.789
1980	329.271	1558.6	1174.16	1620.	996.3	310.38	227.772	1055.05
1981	367.356	1723.39	1173.93	1980.3	1278.41	350.759	257.996	1509.86
1982	439.758	1993.03	1195.34	2321.01	1475.74	432.272	330.304	2075.8
1983	519.938	2355.51	1306.22	2644.87	1642.7	547.526	413.558	2657.56
1984	560.615	2566.71	1386.34	3218.67	2121.71	646.014	441.699	3591.76
1985	652.662	2732.94	1397.66	3621.77	2421.88	677.067	443.388	4787.25
1986	779.791	3046.14	1449.49	3802.25	2429.91	731.094	489.635	5914.89
1987	836.263	3363.37	1481.44	4047.14	2478.65	785.471	560.408	7031.64
1988	904.106	3731.79	1519.06	4298.99	2518.62	862.822	645.383	8094.95
1989	955.973	4116.31	1548.13	4558.2	2553.89	942.993	743.346	9094.44
1990	1003.13	4521.04	1577.58	4666.4	2430.95	1018.82	851.297	9873.15
1991	1000.29	4871.56	1582.88	4821.36	2364.37	1092.18	964.36	10512.2
1992	1020.61	5252.38	1590.04	5081.57	2400.58	1193.34	1087.91	11082.8
1993	1064.19	5671.28	1593.92	5349.46	2428.14	1309.64	1228.21	11568.2
1994	1113.34	6145.49	1604.98	5579.02	2393.23	1429.01	1395.48	11890.7
1995	1148.69	6628.55	1606.68	5802.57	2341.42	1561.29	1581.42	12034.6
1996	1192.5	7153.97	1610.93	6081.43	2327.77	1724.	1794.12	12016.4
1997	1254.65	7722.72	1610.84	6391.25	2323.5	1906.76	2034.42	11833.6
1998	1361.21	8404.27	1624.12	6740.42	2321.79	2126.12	2318.58	11439.5
1999	1476.48	9134.92	1630.03	7132.28	2329.04	2383.45	2644.48	10837.3
2000	1607.82	9965.87	1643.02	7571.07	2331.72	2684.89	3031.05	9991.92

	[illegible]	[illegible]	PI	PIRPC	RPI	EXOPS	EXCAP	E99S
1977	0.	0.	0.	0.	0.	0.	0.	0.
1978	0.	0.	0.	0.	0.	0.	0.	0.
1979	0.	0.	0.	0.	0.	0.	0.	0.
1980	0.	0.	0.	0.	0.	0.	0.	0.
1981	0.04	-0.029	24.879	7.75	0.207	0.	0.	0.
1982	0.067	0.05	40.742	9.91	0.297	3.997	1.4	5.397
1983	0.064	0.091	40.48	8.039	0.287	6.29	1.55	7.879
1984	0.034	0.099	21.332	2.629	0.176	6.228	1.13	7.44
1985	0.013	0.077	11.129	-0.48	0.104	5.808	-0.365	5.555
1986	0.002	0.043	6.34	-1.699	0.066	3.805	-1.464	2.441
1987	0.001	0.026	4.668	-2.016	0.053	2.807	-1.149	1.714
1988	0.	0.018	3.867	-2.09	0.047	2.325	-1.134	1.212
1989	-0.	0.014	3.496	-2.066	0.044	2.005	-1.048	0.945
1990	-0.	0.01	3.223	-2.	0.042	1.745	-0.97	0.73
1991	0.	0.007	3.094	-1.906	0.042	1.508	-0.784	0.648
1992	0.	0.005	2.98	-1.816	0.042	1.313	-0.684	0.535
1993	0.	0.003	2.887	-1.746	0.042	1.121	-0.62	0.387
1994	0.	0.002	2.84	-1.656	0.042	0.934	-0.537	0.266
1995	0.	0.001	2.867	-1.551	0.043	0.758	-0.406	0.203
1996	-0.	-0.	2.191	-1.508	0.04	0.605	-0.267	0.172
1997	0.001	-0.002	3.117	-1.332	0.044	0.43	0.202	0.461
1998	0.002	-0.002	3.621	-1.23	0.047	0.477	0.246	0.555
1999	0.002	-0.002	3.949	-1.145	0.049	0.465	0.272	0.574
2000	0.002	-0.002	4.32	-1.059	0.05	0.441	0.295	0.586

	E99SRPC	REVGF	RP9S	RT98	RENS	GFBAL	PFBAL	RINS
1977	0.	0.	0.	0.	0.	0.	0.	0.
1978	0.	0.	0.	0.	0.	0.	0.	0.
1979	0.	0.	0.	0.	0.	0.	0.	0.
1980	0.	0.	0.	0.	0.	0.	0.	0.
1981	-2.528	0.754	0.	0.397	0.397	0.745	0.	0.
1982	-0.47	2.48	0.	1.446	1.842	-1.075	0.	0.052
1983	0.369	3.27	0.	2.055	2.711	-4.212	0.	-0.075
1984	1.189	2.567	0.	1.751	2.416	-7.785	0.	-0.295
1985	0.902	1.086	0.	0.925	1.291	-11.582	0.	-0.545
1986	-0.332	0.145	0.	0.475	0.676	-13.926	0.	-0.811
1987	-0.523	-0.316	0.	0.28	0.403	-16.016	0.	-0.975
1988	-0.656	-0.578	0.	0.211	0.302	-17.926	0.	-1.121
1989	-0.695	-0.762	0.	0.182	0.261	-19.766	0.	-1.255
1990	-0.708	-0.918	0.	0.171	0.243	-21.555	0.	-1.384
1991	-0.673	-1.059	0.	0.164	0.231	-23.367	0.	-1.509
1992	-0.653	-1.191	0.	0.164	0.233	-25.18	0.	-1.636
1993	-0.638	-1.328	0.	0.165	0.231	-26.984	0.	-1.762
1994	-0.618	-1.457	0.	0.167	0.233	-28.797	0.	-1.889
1995	-0.582	-1.578	0.	0.176	0.242	-30.641	0.	-2.016
1996	-0.518	-1.734	0.	0.167	0.231	-32.578	0.	-2.145
1997	-0.437	-1.895	0.	0.155	0.202	-34.801	0.	-2.281
1998	-0.398	-1.941	0.	0.231	0.311	-37.137	0.	-2.436
1999	-0.375	-2.051	0.	0.283	0.365	-39.598	0.	-2.6
2000	-0.354	-2.172	0.	0.329	0.42	-42.184	0.	-2.772

	FUND	FUND77	R99L	E99L
1977	0.	0.	0.	0.
1978	0.	0.	0.	0.
1979	0.	0.	0.	0.
1980	0.	0.	0.	0.
1981	0.745	-0.373	0.035	0.035
1982	-1.075	-2.456	2.533	2.533
1983	-4.212	-4.854	4.054	4.054
1984	-7.785	-6.764	3.996	3.996
1985	-11.582	-8.618	2.17	2.17
1986	-13.926	-9.453	1.103	1.103
1987	-16.016	-10.191	0.613	0.613
1988	-17.926	-10.785	0.445	0.445
1989	-19.766	-11.293	0.368	0.368
1990	-21.555	-11.711	0.332	0.332
1991	-23.367	-12.098	0.301	0.301
1992	-25.18	-12.434	0.29	0.29
1993	-26.984	-12.691	0.275	0.275
1994	-28.797	-12.906	0.265	0.265
1995	-30.641	-13.082	0.252	0.252
1996	-32.578	-13.223	0.251	0.251
1997	-34.801	-13.473	0.169	0.169
1998	-37.137	-13.703	0.256	0.256
1999	-39.598	-13.898	0.299	0.299
2000	-42.184	-14.082	0.332	0.332

APPENDIX E

Census Division Projections

The purpose of this appendix is to describe the methodology chosen to allocate the MAP projections for the Southcentral Region to census divisions within the region. Projections of employment, population, and income for the Southcentral Region were made through the year 2000. Within the Southcentral Region, it is necessary to disaggregate the results to census divisions. The following seven census divisions are included: Matanuska-Susitna, Kenai-Cook Inlet, Seward, Valdez-Chitina-Whittier, Kodiak, Cordova-McCarthy, and Yakutat (a portion of the Skagway-Yakutat Census Division). Population, income, and employment by the five regional industrial sectors was allocated to each census division. Census division projections were made consistent with projections made by Alaska Consultants (1979).

The approach described below produces only allocations of regional projections and cannot be assumed to substitute for a detailed analysis and forecast of local economic growth. Two types of information are used to make the census division allocations: historical information on the census divisions and the regional projections made by the MAP model. Judgmental review of the historical period is used to set starting parameters for each census division. These parameters are adjusted throughout the projection period to account for changes in relationships at the regional level. This process allows the census division allocations to reflect changes in relationships such as scale effects projected by the MAP model.

The allocation of population and income to the census divisions depends upon the allocation of employment. Census division allocations of employment follow traditional economic base theory. This theory assumes the main cause of regional economic growth is the growth in the region's basic sector; growth in the basic sector is determined by factors external to the region. Employment in the nonbasic sector responds to growth in the basic sector since it serves the basic sector. Once the relation between these sectors is known and basic employment is known, nonbasic employment is determined. For this allocation process, industrial sector I (mining and exogenous construction), sector II (manufacturing and agriculture-forestry-fisheries), and sector III (government) are basic. Sector IV (construction and transportation-communications-utilities) and sector V (trade, services, and finance) are nonbasic. Employment was allocated in the following six steps:

- Adjustment for Census Division of Direct Impact. For the base case and each OCS scenario, the regional totals were adjusted by subtracting the projections made by Alaska Consultants for the census divisions of impact. Alaska Consultants' projections were used for Yakutat, Cordova, Seward, and Kodiak.[1]
- Allocation of Employment in Industries I and II and Federal Government. Employment in these industries was allocated to each census division exogenously. This allocation will reflect assumptions regarding particular

[1]Kodiak is assumed to be unaffected by Northern Gulf OCS development and remains at its base case level throughout.

projects and developments such as a bottomfishery in Kodiak or construction and operation of an LNG in Kenai. Alaska resident OCS employment in excess of Alaska Consultants' resident employment estimates were allocated to the other census divisions based on the proportion of population in the census division.

- Allocation of State and Local Government Employment. Regional projections of government employment in the base case were allocated to the census divisions using the shift-share technique. Shift-share analysis assumes that the growth rate of subregions is related to that of regions. The sub-regional growth rate is made up of a share component equal to the regional rate plus a shift component which describes the subregion's comparative advantage.

The comparative advantage term for each census division was found by examining the growth rate of government employment in each census division over four periods: 1965-1970, 1965-1976, 1970-1976, and 1972-1976. The average annual growth rates for government employment for each census division and the region are shown in Table E.1.

After examining the differential in growth rates from Table E.1, the differences shown in Table E.2 were selected for the projection period. For each census division, except Valdez, the average differential over all periods was used. The period

TABLE E.1. GROWTH RATES OF STATE AND LOCAL GOVERNMENT EMPLOYMENT FOR SELECTED PERIODS

Census Divisions	1965-1970	1965-1976	1970-1976	1972-1976
Kodiak	1.089	1.078	1.098	1.029
Kenai	1.122	1.108	1.096	1.062
Matanuska-Susitna	1.061	1.107	1.147	1.103
Seward	1.038	1.053	1.066	1.100
Cordova	1.071	1.078	1.084	1.060
Valdez	1.070	1.075	1.079	1.104
Southcentral Region	1.097	1.085	1.075	1.052

SOURCE: Alaska Department of Labor, Labor Force Estimates, various years.

TABLE E.2. YEARLY GOVERNMENT EMPLOYMENT GROWTH RATES FOR THE PROJECTION PERIOD

Census Division	Growth Rate
Kodiak	R - .04
Kenai	R + .02
Mat-Su	R + .03
Seward	R - .01
Cordova	R
Valdez	R
Yakutat	R

Where: R is the Southcentral regional rate of growth from the MAP regional model.

1972-1976 was dropped for Valdez to abstract from pipeline-induced increases. Yakutat was assumed to resemble the Cordova Census Division since separate information was not available for this area. A check against the Lynn-Canal Icy Straits labor market area which contains Yakutat shows that this is a reasonable assumption. Excess government employment was allocated to the census divisions based on the proportion of government employment in the initial allocation.

- Allocation of Nonbasic Employment. Economic base theory is operationalized through the development of nonbasic/basic multipliers which describe the relationship between the sectors. Two multipliers are developed to allocate nonbasic employment to the region, one describing Sector IV and one describing Sector V. The long-run multipliers for a change in basic employment are assumed to equal the average nonbasic-to-basic ratios found for the period 1972-1976 (except Valdez, where 1975 and 1976 were ignored because of the pipeline). Table E.3 shows the nonbasic/basic ratios used in the projection. (Yakutat is assumed to be the same as Cordova. A check against a 1976 employment survey in Yakutat conducted by Alaska Consultants showed these ratios to be similar.)

The major cause of growth in the Matanuska-Susitna Census Division (without the capital move) is assumed to be the growth of this area as a suburban community of Anchorage. Because of this assumption, nonbasic employment is assumed

TABLE E.3. NONBASIC/BASIC MULTIPLIERS FOR THE PROJECTION PERIOD

Census Division	Multiplier for Sector IV (Construction and Transportation-Communications-Utilities)	Multiplier for Sector V (Trade, Services, and Finance-Insurance-Real Estate)
Kodiak	.18	.35
Kenai	.39	.57
Seward	.11	.33
Cordova	.18	.32
Valdez	.25	.38
Yakutat	.18	.32

to grow as a function of population. Estimates of Matanuska-Susitna (Mat-Su) Census Division nonbasic employment are based on the following approach:

1. Mat-Su population is estimated as a function of Anchorage population using the following regression equation:

   $$\text{Mat-Su Population} = -9851 + .1269 \times (\text{Anchorage Population})$$

   $$R^2 = .986$$

   This was estimated in "The Effects of Regional Population Growth on Hunting for Selected Big Game Species in Southcentral Alaska, 1976-2000" (ISER, 1978).

2. Nonbasic employment is estimated using multipliers relating the change in population and the change in employment. These multipliers are assumed to equal the average from the period 1970-1976; they were .03 for industry IV and .06 for industry V.

The extra regional nonbasic employment was allocated to the census division based on the proportion of employment in the census division. This captures any scale effects projected at the regional level since multipliers in larger regions will change.

- <u>Allocation of Regional Population</u>. Except for the Matanuska-Susitna Census Division, population was allocated as a function of total civilian employment. Population-to-employment ratios were found from two sources. For Kodiak, Kenai, Seward, and Valdez, population/employment ratios were found by comparing Alaska Labor Department estimates of population and employment. In all but Valdez, the ratios used are the average of the 1972-1976 ratios. For Valdez, the 1975 and 1976 ratios were not included in the average because of the pipeline. The population-to-employment ratios for Cordova and Yakutat were based on estimates made by Alaska Consultants. Table E.4 shows these estimates.

  The extra population in the region was allocated based on the proportion of total population occurring in each census division. For this allocation, the population in Matanuska-Susitna was assumed to equal that found by multiplying the population/employment ratio by total employment.

TABLE E.4. POPULATION-TO-EMPLOYMENT RATIOS FOR THE PROJECTION PERIOD

Census Division	Population-to-Employment Ratio
Kodiak	2.3
Kenai	2.6
Seward	2.3
Cordova	2.1
Valdez	2.6
Yakutat	2.2

SOURCES: Alaska Department of Labor, Labor Force Estimates by Industry and Area and Population Estimates by Census Division.

Alaska Consultants, Inc, Cordova Comprehensive Development Plan, 1976, and Yakutat Comprehensive Development Plan, 1976.

- Allocation of Real Disposable Personal Income. Real disposable personal income by place of residence was allocated to each census division by the proportion of the total population in the census division.

Tables E.5 through E.8 include the estimates of growth in each census division in the Southcentral region in five-year increments.[1] These

[1]Low scenario projections are provided for only the period of significant impact, 1981-1984.

projections are consistent with the census division projections made for the communities of impact (Alaska Consultants, 1978) and the MAP projections for the Southcentral region. However, the variables will not add to the Southcentral totals. Since a portion of the growth in the Matanuska-Susitna Census Division is assumed to be Anchorage metropolitan area growth, a portion of the Matanuska-Susitna population is assumed to be projected in the Anchorage region.

TABLE E.5. CENSUS DIVISION PROJECTIONS
NORTHERN GULF MODERATE BASE CASE

	1980	1981	1982	1983	1984	1985	1990	1995	2000
Seward									
EM1EX	3	3	4	4	4	4	5	7	9
EMRR	223	224	204	245	290	352	508	543	568
EMG9	404	412	420	428	437	446	492	543	600
EMS4	93	95	117	100	103	106	131	141	161
EMS5	433	438	443	455	469	484	562	734	955
POP	3,468	3,516	3,564	3,634	3,779	3,967	4,415	4,920	5,732
DPIR	10.2	11.9	13.1	12.6	12.7	13.6	17.4	21.8	28.7
Kodiak									
EM1EX	2	2	4	5	6	7	9	9	9
EMRR	1,867	2,644	2,776	2,916	3,062	2,382	2,734	2,932	3,082
EMG9	2,031	2,099	2,120	2,141	2,163	2,184	2,296	2,366	2,414
EMS4	495	533	588	643	733	778	863	959	1,048
EMS5	1,302	1,416	1,540	1,672	1,801	1,917	2,306	2,803	2,998
POP	10,856	11,447	12,017	12,614	13,278	13,851	15,668	17,967	19,556
DPIR	33.8	38.9	44.1	43.6	44.6	47.5	61.9	79.6	97.9
Cordova									
EM1EX	2	2	2	2	3	3	4	5	8
EMRR	409	707	717	727	737	439	474	496	549
EMG9	359	404	408	412	416	420	440	452	489
EMS4	97	98	100	101	103	104	112	117	128
EMS5	281	290	300	310	321	328	384	438	599
POP	2,872	3,002	3,054	3,104	3,156	3,208	3,498	3,714	4,322
DPIR	8.9	10.2	11.2	10.7	10.6	11.0	13.8	16.5	21.6
Yakutat									
EM1EX	2	2	3	3	2	2	4	6	6
EMRR	53	96	98	108	110	75	86	107	112
EMG9	90	90	90	95	95	100	110	123	130
EMS4	44	41	43	55	60	60	80	75	72
EMS5	71	73	73	82	85	93	123	149	156
POP	604	604	622	634	634	639	746	877	934
DPIR	1.9	2.1	2.3	2.2	2.1	2.2	2.9	3.9	4.7

TABLE E.5. (Continued)

	1980	1981	1982	1983	1984	1985	1990	1995	2000
Kenai									
EM1EX	851	1,549	2,028	1,125	705	705	880	430	430
EMRR	2,100	781	807	833	920	2,278	2,644	3,319	4,202
EMG9	856	848	907	1,056	1,111	1,037	1,251	1,397	1,536
EMS4	1,870	1,875	2,046	1,766	1,569	1,687	1,945	2,046	2,412
EMS5	4,378	4,591	4,762	4,393	4,123	3,894	5,110	5,401	6,316
POP	27,044	28,370	29,775	26,291	25,100	26,307	29,015	29,001	32,801
DPIR	82.8	96.4	109.2	90.9	84.3	90.3	114.6	128.5	164.2
Matanuska-Susitna									
EM1EX	6	6	6	6	6	6	6	6	6
EMRR	100	56	58	60	62	94	141	167	215
EMG9	622	604	634	723	748	685	749	756	749
EMS4	622	695	690	751	754	696	873	1,076	1,264
EMS5	1,991	2,329	2,197	2,514	2,709	2,520	3,117	3,825	3,731
POP	16,458	17,495	18,533	19,750	20,608	21,645	27,659	34,623	43,778
DPIR	51.2	59.4	68.0	68.3	69.2	78.2	118.4	162.6	230.4
Valdez									
EM1EX	417	327	327	327	327	327	327	327	327
EMRR	41	25	26	28	29	45	56	72	95
EMG9	475	463	486	557	576	530	585	597	599
EMS4	293	270	261	292	284	243	253	254	256
EMS5	716	688	630	743	776	665	691	696	697
POP	5,223	17,495	18,533	19,750	20,608	4,958	4,674	4,468	4,464
DPIR	16.6	16.9	17.1	18.2	18.7	17.0	18.5	19.8	22.3

EM1EX includes exogenous construction, mining, and all direct OCS employment.
EMRR includes other manufacturing and agriculture-forestry-fisheries.
EMG9 includes federal, state, and local government.

EMS4 includes local construction and transportation.
EMS5 includes trade, services, and finance-insurance-real estate.

POP is population.
DPIR is real disposable personal income (millions of constant dollars).

TABLE E.6. CENSUS DIVISION PROJECTIONS
LOW NORTHERN GULF DEVELOPMENT SCENARIO
MODERATE BASE CASE

	1981[1]	1982	1983	1984
Seward				
EM1EX	3	4	4	4
EMRR	224	205	245	290
EMG9	414	423	431	438
EMS4	110	140	119	108
EMS5	441	448	459	471
POP	3,376	3,628	3,686	3,795
DPIR	11.7	13.5	12.9	12.8
Kodiak				
EM1EX	2	4	5	6
EMRR	2,644	2,776	2,916	3,062
EMG9	2,099	2,120	2,141	2,163
EMS4	533	588	643	733
EMS5	1,416	1,540	1,672	1,801
POP	11,447	12,017	12,614	13,278
DPIR	39.5	44.8	44.2	44.8
Cordova				
EM1EX	2	2	2	3
EMRR	707	717	727	737
EMG9	404	408	412	416
EMS4	103	110	111	106
EMS5	291	301	311	319
POP	1,507	1,538	1,563	1,581
DPIR	5.2	5.7	5.5	5.3
Yakutat				
EM1EX	2	3	3	2
EMRR	97	98	108	110
EMG9	94	93	96	95
EMS4	82	71	70	63
EMS5	79	81	84	86
POP	708	692	670	642
DPIR	2.4	2.6	2.4	2.2

TABLE E.6. (Continued)

	1981[1]	1982	1983	1984
Kenai				
EM1EX	1,645	2,129	1,200	720
EMRR	1,234	1,294	1,357	1,484
EMG9	849	908	1,054	1,111
EMS4	1,792	1,957	1,707	1,550
EMS5	4,623	4,970	4,379	4,116
POP	29,863	31,267	27,677	26,505
DPIR	103.1	116.6	97.1	89.4
Matanuska-Susitna				
EM1EX	68	71	54	16
EMRR	56	58	60	62
EMG9	604	634	722	747
EMS4	526	559	591	624
EMS5	1,052	1,118	1,182	1,248
POP	17,884	20,022	21,274	21,137
DPIR	58.2	66.0	66.3	66.5
Valdez				
EM1EX	344	344	341	330
EMRR	25	26	28	29
EMG9	464	487	556	476
EMS4	256	248	280	281
EMS5	690	656	749	773
POP	4,625	4,579	5,080	5,171
DPIR	18.1	18.2	19.6	19.8

[1] Only years with significant impact.

EM1EX includes exogenous construction, mining, and all direct OCS employment.
EMRR includes other manufacturing and agriculture-forestry-fisheries.
EMG9 includes federal, state, and local government.

EMS4 includes local construction and transportation.
EMS5 includes trade, services, and finance-insurance-real estate.

POP is population.
DPIR is real disposable personal income (millions of constant dollars).

TABLE E.7. CENSUS DIVISION PROJECTIONS
MEAN NORTHERN GULF DEVELOPMENT SCENARIO
MODERATE BASE CASE

	1980	1985	1990	1995	2000
Seward					
EM1EX	3	440	5	7	9
EMRR	223	354	510	543	568
EMG9	404	463	510	545	602
EMS4	93	144	263	155	175
EMS5	433	511	510	736	957
POP	3,468	4,135	4,775	5,056	5,768
DPIR	10.8	14.7	20.4	22.7	29.3
Kodiak					
EM1EX	2	7	9	9	9
EMRR	1,867	2,382	2,734	2,932	3,082
EMG9	2,031	2,184	2,269	2,366	2,414
EMS4	495	778	863	959	1,048
EMS5	1,302	1,917	2,306	2,803	2,998
POP	10,856	13,851	15,668	17,967	19,556
DPIR	33.8	49.2	67.0	80.8	99.3
Cordova					
EM1EX	2	3	557	17	24
EMRR	697	749	812	902	969
EMG9	359	420	475	495	523
EMS4	97	119	313	324	332
EMS5	281	329	439	530	652
POP	2,872	3,240	4,098	4,536	5,000
DPIR	8.9	11.5	17.5	20.4	25.4
Yakutat					
EM1EX	2	2	12	20	20
EMRR	94	111	164	197	204
EMG9	90	107	179	188	198
EMS4	44	129	554	395	520
EMS5	71	104	231	250	263
POP	604	815	2,148	2,175	2,306
DPIR	1.9	2.9	9.2	9.8	11.7

TABLE E.7. (Continued)

	1980	1985	1990	1995	2000
Kenai					
EM1EX	851	1,055	1,602	712	787
EMRR	2,100	2,278	2,644	3,319	4,202
EMG9	856	1,031	1,270	1,357	1,497
EMS4	1,870	1,736	1,783	1,890	2,165
EMS5	4,378	4,738	5,787	5,690	6,686
POP	27,046	28,900	33,794	32,191	34,404
DPIR	84.2	102.7	144.6	144.8	174.7
Matanuska-Susitna					
EM1EX	6	230	469	187	235
EMRR	100	94	141	167	215
EMG9	622	681	761	734	730
EMS4	622	669	721	949	1,151
EMS5	1,991	2,500	3,199	3,908	4,866
POP	16,458	21,869	28,972	35,553	44,846
DPIR	51.2	76.4	118.7	145.8	189.7
Valdez					
EM1EX	417	387	451	376	388
EMRR	41	45	56	72	95
EMG9	475	527	594	580	584
EMS4	293	245	228	231	228
EMS5	716	693	769	724	732
POP	5,222	5,058	4,048	3,345	4,547
DPIR	16.3	18.0	17.3	15.0	23.1

EM1EX includes exogenous construction, mining, and all direct OCS employment.
EMRR includes other manufacturing and agriculture-forestry-fisheries.
EMG9 includes federal, state, and local government.

EMS4 includes local construction and transportation.
EMS5 includes trade, services, and finance-insurance-real estate.

POP is population.
DPIR is real disposable personal income (millions of constant dollars).

TABLE E.8. CENSUS DIVISION PROJECTIONS
HIGH NORTHERN GULF DEVELOPMENT SCENARIO
MODERATE BASE CASE

	1980	1985	1990	1995	2000
Seward					
EM1EX	3	116	34	7	9
EMRR	223	353	514	544	568
EMG9	404	454	528	549	605
EMS4	93	147	391	185	198
EMS5	433	497	619	743	963
POP	3,468	4,093	5,129	5,140	5,832
DPIR	10.8	17.1	22.1	23.5	29.9
Kodiak					
EM1EX	2	7	9	9	9
EMRR	1,867	3,214	3,689	3,957	4,159
EMG9	2,031	2,184	2,269	2,366	2,414
EMS4	495	778	863	959	1,048
EMS5	1,302	1,917	2,306	2,803	2,998
POP	10,856	13,851	15,668	17,967	19,556
DPIR	33.8	57.8	67.5	82.0	100.4
Cordova					
EM1EX	2	3	54	50	57
EMRR	409	749	884	945	1,012
EMG9	359	421	509	530	556
EMS4	97	124	478	502	504
EMS5	281	329	492	584	704
POP	2,872	3,252	4,834	5,222	5,666
DPIR	8.9	13.6	20.9	23.8	29.7
Yakutat					
EM1EX	2	3,495	64	100	137
EMRR	53	117	237	263	271
EMG9	90	166	242	255	267
EMS4	44	183	904	847	843
EMS5	71	197	329	357	369
POP	604	1,239	3,420	3,519	3,670
DPIR	1.9	5.2	14.8	16.1	18.8

TABLE E.8. (Continued)

	1980	1985	1990	1995	2000
Kenai					
EM1EX	851	2,242	2,012	1,214	1,283
EMRR	2,100	2,278	2,644	3,319	4,202
EMG9	856	1,005	1,262	1,315	1,444
EMS4	1,870	2,145	1,583	1,697	2,058
EMS5	4,378	5,671	6,237	6,136	7,165
POP	27,044	33,397	35,205	34,049	36,853
DPIR	84.2	139.4	151.6	155.5	189.3
Matanuska-Susitna					
EM1EX	6	992	732	283	553
EMRR	100	94	141	167	215
EMG9	622	664	756	711	704
EMS4	622	681	617	819	1,052
EMS5	1,991	2,464	3,323	4,050	5,010
POP	16,458	22,806	29,963	36,703	46,049
DPIR	51.2	88.0	124.6	155.2	229.7
Valdez					
EM1EX	417	591	522	462	474
EMRR	41	45	56	72	95
EMG9	475	514	590	562	563
EMS4	293	287	200	204	216
EMS5	716	787	821	765	780
POP	5,223	5,567	5,609	5,139	4,855
DPIR	16.3	23.3	24.1	23.5	25.0

EM1EX includes exogenous construction, mining, and all direct OCS employment.
EMRR includes other manufacturing and agriculture-forestry-fisheries.
EMG9 includes federal, state, and local government.

EMS4 includes local construction and transportation.
EMS5 includes trade, services, and finance-insurance-real estate.

POP is population.
DPIR is real disposable personal income (millions of constant dollars).

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