

**KETCHIKAN PUBLIC
UTILITIES**

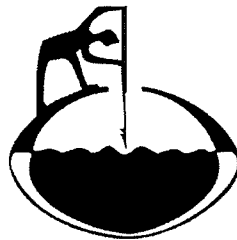
**ELECTRIC LOAD GROWTH
STUDY**

by
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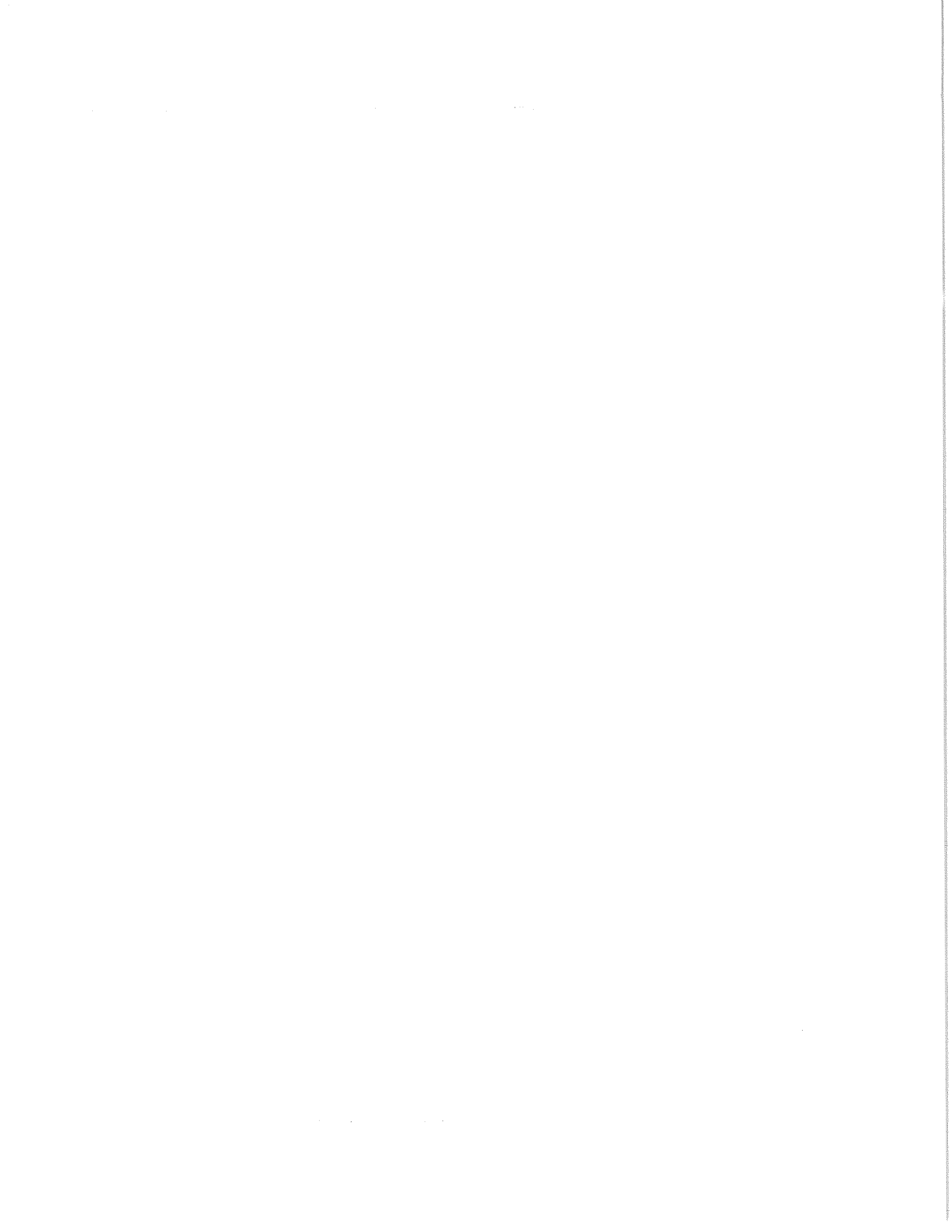
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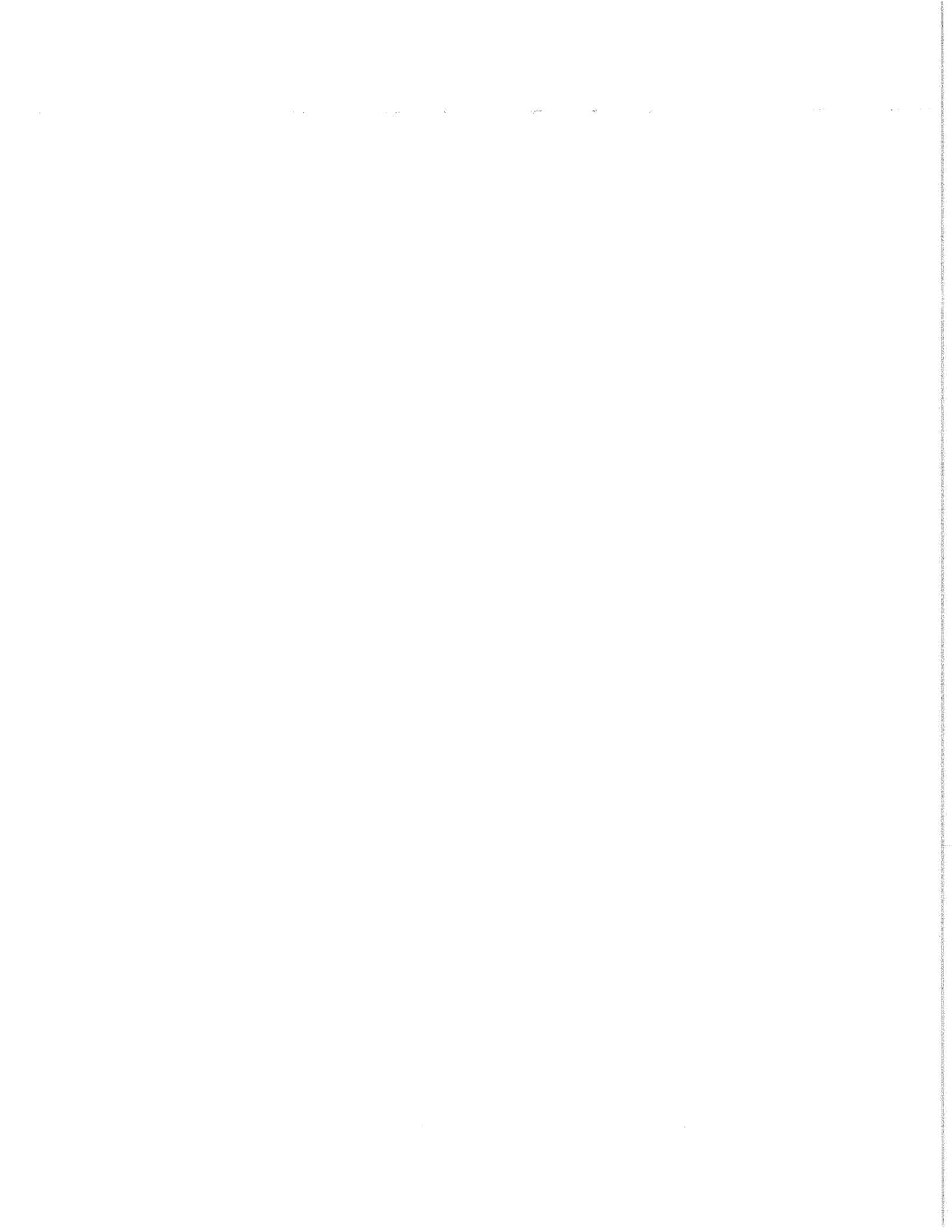


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KETCHIKAN PUBLIC UTILITIES ELECTRIC LOAD GROWTH STUDY

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KETCHIKAN PUBLIC UTILITIES ELECTRIC LOAD GROWTH STUDY

1. SUMMARY

Ketchikan Public Utility (KPU) asked the Institute of Social and Economic Research to project electricity sales and generation requirements in Ketchikan in the coming years. Rather than one set of projections we have estimated a range of likely future growth, given different assumptions about important factors influencing the economy and electricity use. Throughout that range of likely growth--the LOW, BASE, and HIGH CASES— we project that electricity generation by KPU will temporarily drop but subsequently begin growing again, although at a slower rate than in the past.

KPU asked for these projections because it is facing decisions about whether to increase its generating capacity, either through an intertie that would increase available hydropower, or through construction of more diesel-powered facilities. Estimating how electricity use in Ketchikan might grow in the future is complicated by the present uncertain status of the Ketchikan economy which will take several years to resolve through restructuring. During the transition it is natural to focus attention on immediate and often negative events. In this study we attempt not only to consider these near term events, but also what factors will be important in determining electricity use in the longer term. We believe that our projections are realistic since they are based on a conservative interpretation of historical patterns and trends in the Ketchikan economy and in electricity use patterns in Ketchikan.

A number of factors will influence electricity generation requirements in the future, including:

- the health of the timber industry in the region
- development of new large scale processing facilities for timber and seafood
- extent to which new industry self generates electricity for their own needs
- growth of other sectors of the economy including tourism, seafood, federal government, state government, regional center activities, and non-wage private income
- relative attractiveness of electric space heating, and
- potential expansion of the service territory

We anticipate only a small reduction in electricity sales in response to the economic recession in all CASES. First, we anticipate that the support sector employment decline will be small as support businesses attempt to “tough it out” during this period of uncertainty. Second,

we expect the percent decline in population to be less than that of employment as some people move out of the work force but remain in the community. Third, since residential sales are primarily a function of the housing stock which we do not expect to decline, we anticipate that residential sales will not fall significantly. Fourth, Commercial and Industrial electricity sales directly to the timber industry forms a very small share of the total, so the direct effect of a recession in the timber sector on electricity sales will be small. (Sales to Ketchikan Pulp Company (KPC) is a separate category and not included in Commercial or Industrial Sales.) Fifth, in a recession we expect commercial sales to be related to the number of businesses rather than jobs.

In the BASE CASE projection we adopt a set of conservative assumptions regarding the future direction of the factors influencing growth. We assume that after several years of uncertainty employment levels the timber industry stabilizes at 45 percent of the 1996 level and that non-timber employment grows at a 1 percent annual rate. The large scale processing facilities associated with the new uses of the pulp mill neither purchase nor sell electricity to KPU. Furthermore we assume no increase in the share of the housing stock heating with electricity and no extensions of the utility service territory.

In the BASE CASE annual generation (combined generation of KPU diesel and hydroelectric capacity) falls from a peak in 1995 of 159 thousand MWH to 145 thousand MWH in 1997. This is the result of reductions in residential and non-residential sales as well as the termination of the sale of electricity to the KPC. Growth resumes in 1998 and averages about 1.2 percent annually after that. This rate of growth is below the historical growth rate in generation due to the drag on the economy imposed by the reduction in the timber industry. The 1995 level of generation is reached in 2006. (Table A.)

In the HIGH CASE we assume that the timber industry stabilizes at an employment level 60 percent of the 1996 level, and that non-timber employment grows at an annual rate of 2 percent. As in the BASE CASE we assume that the large scale processing facilities associated with the new uses of the pulp mill neither purchase nor sell electricity to KPU. Consistent with the historical trend we assume in this case a modest increase in the share of the housing stock heating with electricity, but as with the BASE CASE that there are no extensions of the utility service territory.

Generation in this CASE recovers to the 1995 level by 2002 as a result of more rapid economic growth and more intensive use of electricity.

In the LOW CASE we assume that the timber industry stabilizes at an employment level only 15 percent of the 1996 level, and that non-timber employment grows at an annual rate of .5 percent. At this level of activity in the timber industry there are no large scale processing facilities associated with the pulp mill that could either purchase or sell electricity to KPU. We assume no increase in the share of the housing stock heating with electricity and no extensions of the utility service territory.

In this CASE generation growth is very slow and only returns to the 1995 level in 2019.

Projected peak demand is presented in Part 3. of Figure A. In the BASE CASE it falls from 31.4 MW in 1995 to 27 MW in 1998 and subsequently grows at a rate slightly below that of total generation. The same pattern occurs in both the HIGH and the LOW CASES.

The projections of generation and peak load in Figure A. do not include new large-scale commercial or industrial load. In early 1998 Ketchikan Public Utility began supplying the Ketchikan Pulp Mill with all the electricity requirements for their sawmill and other facilities. The most current estimate of this load is 1.9 MW continuous (16,644 MWH per year) with a peak demand of 3.5 MW. Since the long-term health of the timber industry remains uncertain at this time we do not include this new industrial load in the CASES presented in Figure A.

FIGURE A. (part 1.)

KETCHIKAN PUBLIC UTILITIES
PROJECTIONS OF ELECTRICITY GENERATION
(MWH)

	KPU GENERATION				RESIDENTIAL SALES				NON-RESIDENTIAL SALES & UNACCOUNTED			
	HIST	BASE	HIGH	LOW	HIST	BASE	HIGH	LOW	HIST	BASE	HIGH	LOW
1970	0				27,128							
1971	0				29,246							
1972	0				30,797							
1973	0				30,958							
1974	0				NA							
1975	0				32,838							
1976	0				35,059							
1977	0				35,082							
1978	0				36,754							
1979	0				37,462							
1980	85,966				39,135				42,423			
1981	87,512				42,834				41,771			
1982	98,107				43,164				50,505			
1983	99,228				44,961				49,040			
1984	110,991				51,292				48,867			
1985	115,908				49,236				53,434			
1986	109,120				46,795				54,475			
1987	114,297				46,904				55,325			
1988	137,879				49,269				63,872			
1989	131,907				52,812				65,691			
1990	140,311				54,115				70,304			
1991	145,686				56,031				74,080			
1992	152,980				54,277				73,371			
1993	146,251				53,188				79,262			
1994	158,347				58,594				84,005			
1995	159,079				55,472				89,380			
1996	158,383				59,360				89,170			
1997	145,528	145,528	145,528	145,528	58,826	58,826	58,826	58,826	85,197	85,197	85,197	85,197
1998		146,117	147,607	145,794		55,440	56,000	56,000		85,057	85,930	84,186
1999		146,287	149,101	143,980		56,000	56,840	55,440		84,661	86,527	83,003
2000		147,466	153,182	143,236		56,560	58,834	55,440		85,234	88,457	82,287
2001		149,354	157,893	143,274		57,120	60,310	55,440		86,490	91,509	82,324
2002		151,889	162,687	143,645		58,257	61,824	55,440		87,791	94,606	82,680
2003		153,743	167,222	144,079		58,839	63,376	55,440		88,990	97,415	83,097
2004		155,526	171,555	145,219		59,428	64,967	56,000		90,117	99,990	83,633
2005		157,332	175,873	146,362		60,022	66,597	56,560		91,258	102,511	84,173
2006		159,159	180,304	147,510		60,622	68,269	57,120		92,415	105,101	84,716
2007		161,009	184,851	148,961		61,228	69,982	57,968		93,588	107,759	85,264
2008		162,882	189,518	149,835		61,841	71,739	58,258		94,777	110,490	85,814
2009		164,778	194,307	150,715		62,459	73,540	58,550		95,981	113,294	86,369
2010		166,697	199,222	151,600		63,084	75,385	58,842		97,202	116,174	86,927
2011		168,640	204,265	152,491		63,715	77,278	59,136		98,439	119,131	87,489
2012		170,607	209,441	153,387		64,352	79,217	59,432		99,693	122,169	88,055
2013		172,598	214,753	154,288		64,995	81,206	59,729		100,964	125,288	88,625
2014		174,613	220,205	155,195		65,645	83,244	60,028		102,252	128,491	89,198
2015		176,654	225,799	156,108		66,302	85,333	60,328		103,558	131,781	89,776
2016		178,719	231,541	157,026		66,965	87,475	60,630		104,881	135,160	90,357
2017		180,810	237,433	157,950		67,634	89,671	60,933		106,222	138,630	90,943
2018		182,927	243,480	158,880		68,311	91,922	61,238		107,581	142,194	91,532
2019		185,070	249,686	159,816		68,994	94,229	61,544		108,958	145,854	92,125
2020		187,239	256,055	160,757		69,684	96,594	61,851		110,354	149,613	92,722
2021		189,435	262,592	161,704		70,381	99,018	62,161		111,769	153,474	93,324
2022		191,658	269,300	162,657		71,084	101,504	62,472		113,202	157,439	93,929
2023		193,909	276,185	163,615		71,795	104,052	62,784		114,656	161,511	94,539
2024		196,187	283,251	164,580		72,513	106,663	63,098		116,129	165,693	95,152
2025		198,494	290,502	165,551		73,238	109,341	63,413		117,621	169,988	95,770

ANNUAL GROWTH RATES

1970-1980	ERR			3.7%						
1980-1990	5.0%			3.3%				5.2%		
1990-1995	2.5%			0.5%				4.9%		
1995-2000	-1.5%	-0.8%	-2.1%	0.4%	1.2%	-0.0%		-0.9%	-0.2%	-1.6%
2000-2005	1.3%	2.8%	0.4%	1.2%	2.5%	0.4%		1.4%	3.0%	0.5%
2005-2010	1.2%	2.5%	0.7%	1.0%	2.5%	0.8%		1.3%	2.5%	0.6%
2010-2025	1.2%	2.5%	0.6%	1.0%	2.5%	0.5%		1.3%	2.6%	0.6%

KPU GENERATION EQUALS THE SUM OF DIESEL AND HYDRO CONSISTENT WITH KPU GENERATION AND DISTRIBUTION REPORT

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FIGURE A. (part 2.)

KETCHIKAN PUBLIC UTILITIES
PROJECTIONS OF ECONOMIC VARIABLES

	EMPLOYMENT (INC MILITARY & SELF EMP)				POPULATION			
	HIST	BASE	HIGH	LOW	HIST	BASE	HIGH	LOW
1970	0				10,200			
1971	0				10,200			
1972	0				10,300			
1973	0				10,500			
1974	0				10,700			
1975	0				10,900			
1976	0				11,200			
1977	0				11,400			
1978	0				11,600			
1979	0				11,800			
1980	7,048				11,316			
1981	6,824				12,042			
1982	7,103				12,268			
1983	7,322				12,459			
1984	7,214				12,438			
1985	7,663				12,623			
1986	8,128				12,729			
1987	8,880				12,793			
1988	9,372				12,594			
1989	9,680				13,259			
1990	10,397				13,828			
1991	9,892				14,261			
1992	9,874				14,536			
1993	10,258				14,535			
1994	10,419				14,638			
1995	10,733	10,733	10,733	10,733	14,771			
1996		10,600	10,600	10,600	14,701			
1997		10,109	10,109	10,109	14,599	14,599	14,599	14,599
1998		9,894	9,919	9,719		14,210	14,228	14,089
1999		9,885	10,020	9,666		14,204	14,512	14,053
2000		10,009	10,335	9,504		14,346	14,803	13,941
2001		10,117	10,693	9,508		14,490	15,099	14,010
2002		10,228	10,953	9,538		14,635	15,401	14,080
2003		10,330	11,187	9,575		14,781	15,709	14,151
2004		10,425	11,399	9,621		14,929	16,023	14,221
2005		10,522	11,606	9,668		15,078	16,343	14,293
2006		10,619	11,817	9,714		15,229	16,670	14,364
2007		10,718	12,032	9,761		15,381	17,004	14,436
2008		10,817	12,252	9,809		15,535	17,344	14,508
2009		10,918	12,475	9,856		15,690	17,690	14,581
2010		11,019	12,704	9,904		15,847	18,044	14,653
2011		11,121	12,937	9,952		16,006	18,405	14,727
2012		11,225	13,174	10,000		16,166	18,773	14,800
2013		11,329	13,416	10,049		16,327	19,149	14,874
2014		11,435	13,663	10,098		16,491	19,532	14,949
2015		11,542	13,915	10,147		16,655	19,922	15,023
2016		11,649	14,173	10,196		16,822	20,321	15,099
2017		11,758	14,435	10,245		16,990	20,727	15,174
2018		11,868	14,702	10,295		17,160	21,142	15,250
2019		11,979	14,975	10,345		17,332	21,565	15,326
2020		12,091	15,253	10,395		17,505	21,996	15,403
2021		12,204	15,537	10,446		17,680	22,436	15,480
2022		12,318	15,827	10,496		17,857	22,884	15,557
2023		12,434	16,122	10,547		18,035	23,342	15,635
2024		12,550	16,423	10,599		18,216	23,809	15,713
2025		12,668	16,730	10,650		18,398	24,285	15,792

ANNUAL GROWTH RATES

1970-1980	ERR				1.0%		
1980-1990	4.0%				2.0%		
1990-1995	0.6%				1.3%		
1995-2000	-1.4%	-0.8%	-2.4%		-0.6%	0.0%	-1.2%
2000-2005	1.0%	2.3%	0.3%		1.0%	2.0%	0.5%
2005-2010	0.9%	1.8%	0.5%		1.0%	2.0%	0.5%
2010-2025	0.9%	1.9%	0.5%		1.0%	2.0%	0.5%

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FIGURE A. (part 3.)

KETCHIKAN PUBLIC UTILITIES
PROJECTIONS OF PEAK DEMAND
(MW)

KPU PEAK DEMAND				
	HIST	BASE	HIGH	LOW
1970	10.0			
1971	12.4			
1972	12.5			
1973	13.9			
1974	13.4			
1975	13.7			
1976	14.0			
1977	16.3			
1978	15.1			
1979	16.1			
1980	17.7			
1981	16.9			
1982	19.1			
1983	20.8			
1984	21.6			
1985	25.1			
1986	20.4			
1987	22.0			
1988	23.8			
1989	26.7			
1990	26.6			
1991	25.3			
1992	27.4			
1993	26.9			
1994	28.6			
1995	31.4	31.4	31.4	31.4
1996	26.9	26.9	26.9	26.9
1997	30.1	30.1	30.1	30.1
1998		27	27	27
1999		27.2	27.6	26.9
2000		27.4	28.3	26.7
2001		27.7	29.0	26.7
2002		28.1	29.7	26.8
2003		28.3	30.4	26.9
2004		28.6	31.0	27.0
2005		28.9	31.7	27.2
2006		29.2	32.3	27.4
2007		29.4	33.0	27.6
2008		29.7	33.7	27.8
2009		30.0	34.4	27.9
2010		30.3	35.1	28.0
2011		30.6	35.8	28.2
2012		30.9	36.6	28.3
2013		31.2	37.3	28.4
2014		31.5	38.1	28.6
2015		31.8	38.9	28.7
2016		32.1	39.7	28.8
2017		32.4	40.5	29.0
2018		32.7	41.4	29.1
2019		33.0	42.3	29.3
2020		33.3	43.1	29.4
2021		33.7	44.0	29.5
2022		34.0	45.0	29.7
2023		34.3	45.9	29.8
2024		34.6	46.9	30.0
2025		35.0	47.9	30.1

ANNUAL GROWTH RATES

1970-1980	5.9%		
1980-1990	4.2%		
1990-1995	3.4%		
1995-2000	-2.7%	-2.1%	-3.2%
2000-2005	1.1%	2.3%	0.4%
2005-2010	1.0%	2.1%	0.6%
2010-2025	1.0%	2.1%	0.5%

HISTU5.WK4

2. HISTORICAL REVIEW OF THE KETCHIKAN ECONOMY AND POPULATION

2.a. Economic Structure

Analysis of the structure of a regional economy usually begins with the identification of the Basic Sectors. Basic Sectors can be defined as those activities that bring purchasing power into the region from outside its borders. There are nine important sources of money flows into the Ketchikan economy. Using a simple economic base model which attributes all employment generated and income earned within the economy to one of these Basic Sectors, we can produce a rough estimate of the relative importance of each of the Basic Sectors to the Ketchikan economy.

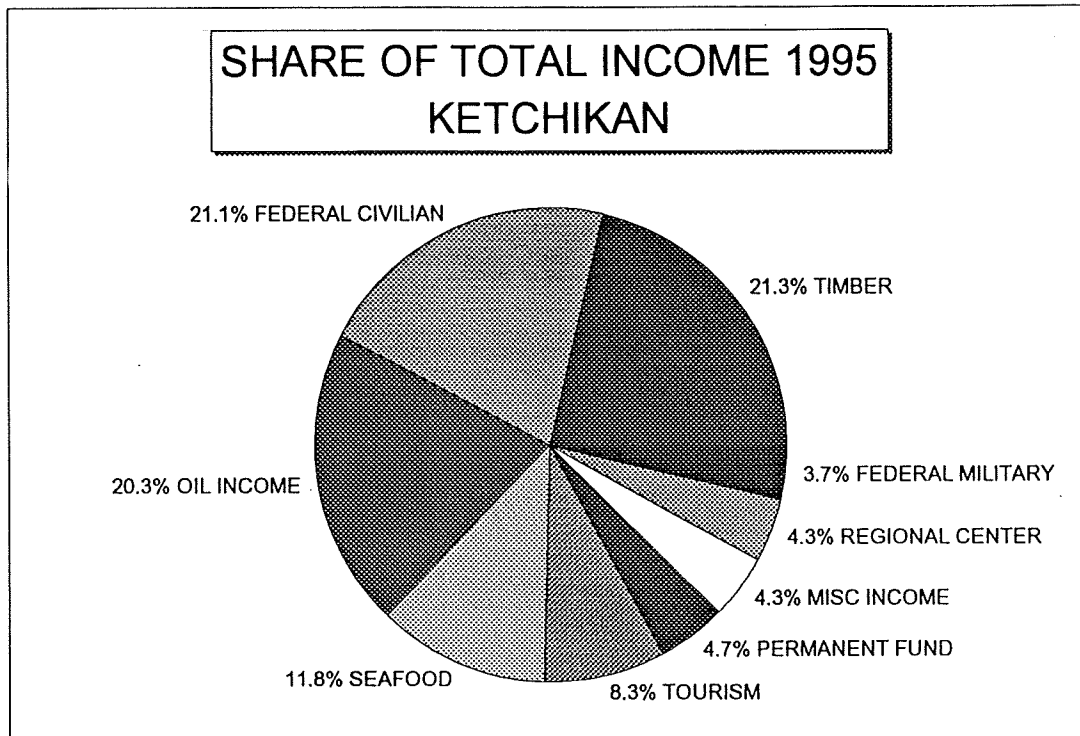
Total personal income paid to Ketchikan Gateway Borough residents in 1995 was \$437 million from all sources (Figure 1.) . Employment, including active duty military and self employed, totaled 10.72 thousand (Figure 2.).

Timber. Not surprisingly timber harvesting and processing accounted for the largest share of personal income, about \$93.2 million or 21.3 percent of the total, and of jobs, about 2.66 thousand or 24.8 percent of the total. These estimates include not only the employment and wages associated with timber harvesting and processing, but also its supporting infrastructure and economic activity supported by local procurement and payrolls. The employment share is larger than the income share due to the relatively high wages paid in timber harvesting and processing relative to support activities, as well as the fact that some of the nine sources of money flows and income we identify, like the Alaska Permanent Fund, only generate jobs indirectly.

Federal Civilian. Next in order of importance was the various civilian activities of the federal government which accounted for about \$92.2 million, or 21.1 percent of total income earned by residents and 1.64 thousand jobs (15.3 percent). The importance of the federal government to the Ketchikan economy comes not so much from the presence of about 300 federal employees, but primarily from the transfer payments to households that flow into the economy from the federal government, and to the support to state and local government provided by federal transfers to those entities. Transfer payments of \$50 million to individuals (excluding the Permanent Fund dividend) accounted for 11 percent of total personal income in 1995. Based on statewide figures we estimate that 60 percent of those transfers were Federal transfers--social security payments, medical assistance, veterans benefits, income maintenance, etc.--that are not associated with another Basic industry. In other words the flow of income into the community from those sources is not contingent upon the presence of any of the other Basic industries in the community.

Oil. Oil accounted for about \$88.8 million, or 20.3 percent of total income earned by residents in 1995 and 2.17 thousand jobs (20.2 percent). The importance of oil to the Ketchikan economy is due to the fact that about 85 percent of the state government budget is paid for by oil, and the state government budget is an important driver of the economy of the state and its regions. State government spending supports not only the 567 state government employees located in Ketchikan, but also through state to local government transfers, a large share of the

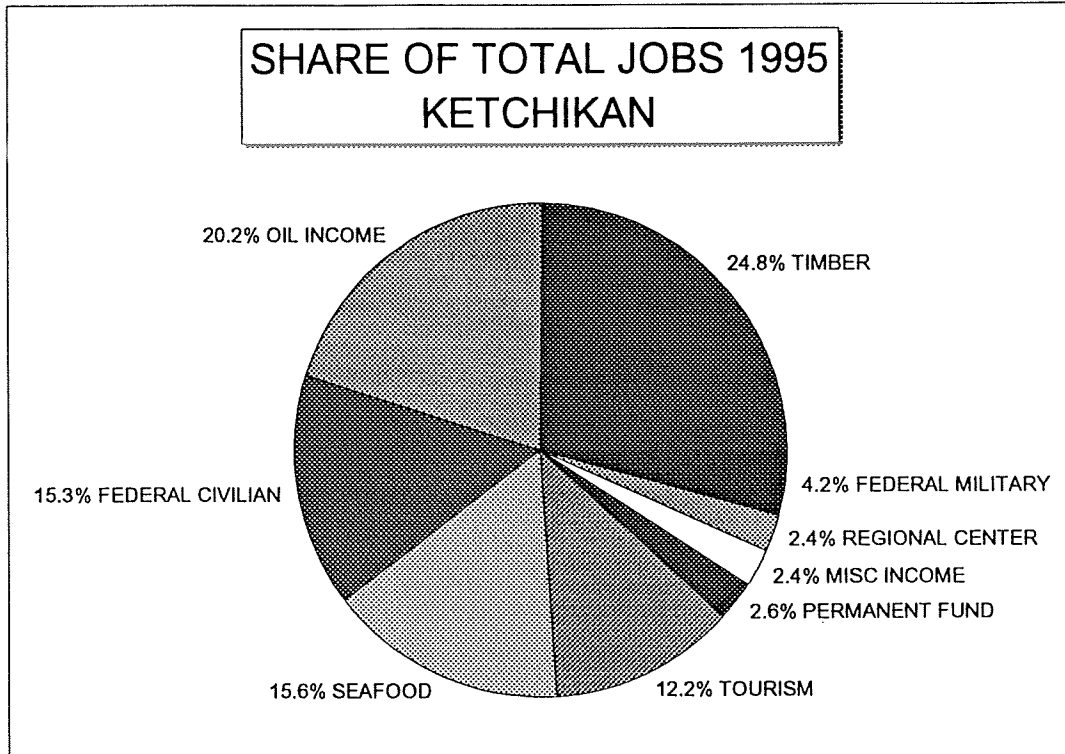
FIGURE 1.



1995 TOTAL INCOME (million \$)	\$437.4	100.0%
TIMBER	\$93.2	21.3%
FEDERAL CIVILIAN	\$92.2	21.1%
OIL INCOME	\$88.8	20.3%
SEAFOOD	\$51.7	11.8%
TOURISM	\$36.5	8.3%
PERMANENT FUND	\$20.5	4.7%
MISC INCOME	\$19.0	4.3%
REGIONAL CENTER	\$19.0	4.3%
FEDERAL MILITARY	\$16.2	3.7%
AGRICULTURE	\$0.2	0.0%
MINING	\$0.1	0.0%
OIL PRODUCTION	\$0.0	0.0%

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FIGURE 2.



1995 TOTAL JOBS (thousand)	10.72	100.0%
TIMBER	2.66	24.8%
OIL INCOME	2.17	20.2%
FEDERAL CIVILIAN	1.64	15.3%
SEAFOOD	1.67	15.6%
TOURISM	1.31	12.2%
PERMANENT FUND	0.28	2.6%
MISC INCOME	0.26	2.4%
REGIONAL CENTER	0.26	2.4%
FEDERAL MILITARY	0.46	4.2%
AGRICULTURE	0.00	0.0%
OIL PRODUCTION	0.00	0.0%
MINING	0.00	0.0%

AIDKETCH.WK4

916 local government employees. Furthermore, the state budget supports a large capital budget, loans programs, and transfer payments directly to individuals (for example, the longevity bonus).

Fishing. Next in order of importance to the Ketchikan economy was the \$51.7 million attributable to fish harvesting and fish processing, accounting for 11.8 percent of total income. Total employment associated with this sector was 1.67 thousand or 15.6 percent. (Fish harvesting employment does not appear in the wage and salary employment figures because most harvesters are self employed.)

Together these four Basic Sectors accounted for 3/4 of the total personal income earned by Ketchikan residents and employment in the community. Five other activities accounted for the remainder of personal income and employment.

Tourism. Tourism accounted for \$36.5 million of personal income in 1995, about 8.3 percent of the total, and 1.31 thousand jobs (12.2 percent). Our definition of tourism is the activity generated by pleasure visitor expenditures. It excludes the influence of spending by residents of the greater Ketchikan region as well as non-resident business spending of fishermen and others.

Permanent Fund. About \$12.3 million was paid out in Permanent Fund dividends to residents of Ketchikan in 1995 and this accounted for total personal income of \$20.5 million, about 4.7 percent of the total. Spending of Permanent Fund dividends supported about .28 thousand jobs in the local economy (2.6 percent).

Miscellaneous income. About \$10 million of the \$58 million of dividend, interest, and rental payments to Ketchikan residents in 1995 was estimated to flow into the regional economy independent of activity in any of the other Basic sectors of the economy. This source of purchasing power resulted in \$19.0 million in personal income and employment of .26 thousand (2.4 percent).

Regional Hub. Ketchikan serves as the regional center for the Prince of Wales-Outer Ketchikan Census Area. Households and businesses in this area, with a 1995 population of 6.750 thousand, employment of 2.88 thousand, and total personal income of \$126 million, rely on Ketchikan as an important source for transportation, personal and business services, and retail trade. We estimate that the purchasing power that impacts Ketchikan from this source is equal to the contribution from miscellaneous income. This results in total personal income to Ketchikan of \$19 million and employment of .26 thousand.

Federal military. The expenditures in support of the 212 active duty military in Ketchikan in 1995 generated total personal income for the regional economy of \$16.2 million and employment of .46 thousand (4.2 percent).

These estimates of the contribution of each Basic Sector activity to the Ketchikan economy are based on a very aggregate analysis and they could be refined by more detailed analysis of the sources of income and the monetary flows through the Ketchikan economy. A

more detailed analysis would result in some shares getting a little bigger and some a bit smaller, but the general pattern would not change. Several important observations emerge from this analysis.

First, timber is the most important source of Basic Sector activity for the Ketchikan economy, particularly in relation to the two other significant private Basic Sectors with a direct presence in the economy--seafood and tourism. Second, there are a large number of sources of income for the Ketchikan economy which provide economic diversification. Third, a large share of the money flows into the Ketchikan economy come from relatively invisible sources. Oil money is one such invisible source. Oil revenues support state and local government activities including transfers to individuals. In their absence state and local government activities would be dramatically scaled back and disposable household incomes would be significantly reduced due to higher taxes and lower payments from government.

Other sources of income flowing into the community independent of jobs include the Permanent Fund dividend, dividend-interest-and rental income (miscellaneous income), and income from Ketchikan's status as a regional hub. Together these other sources of income account for nearly \$60 million of total Ketchikan personal income. These sources of income provide another important source of diversification for the economy.

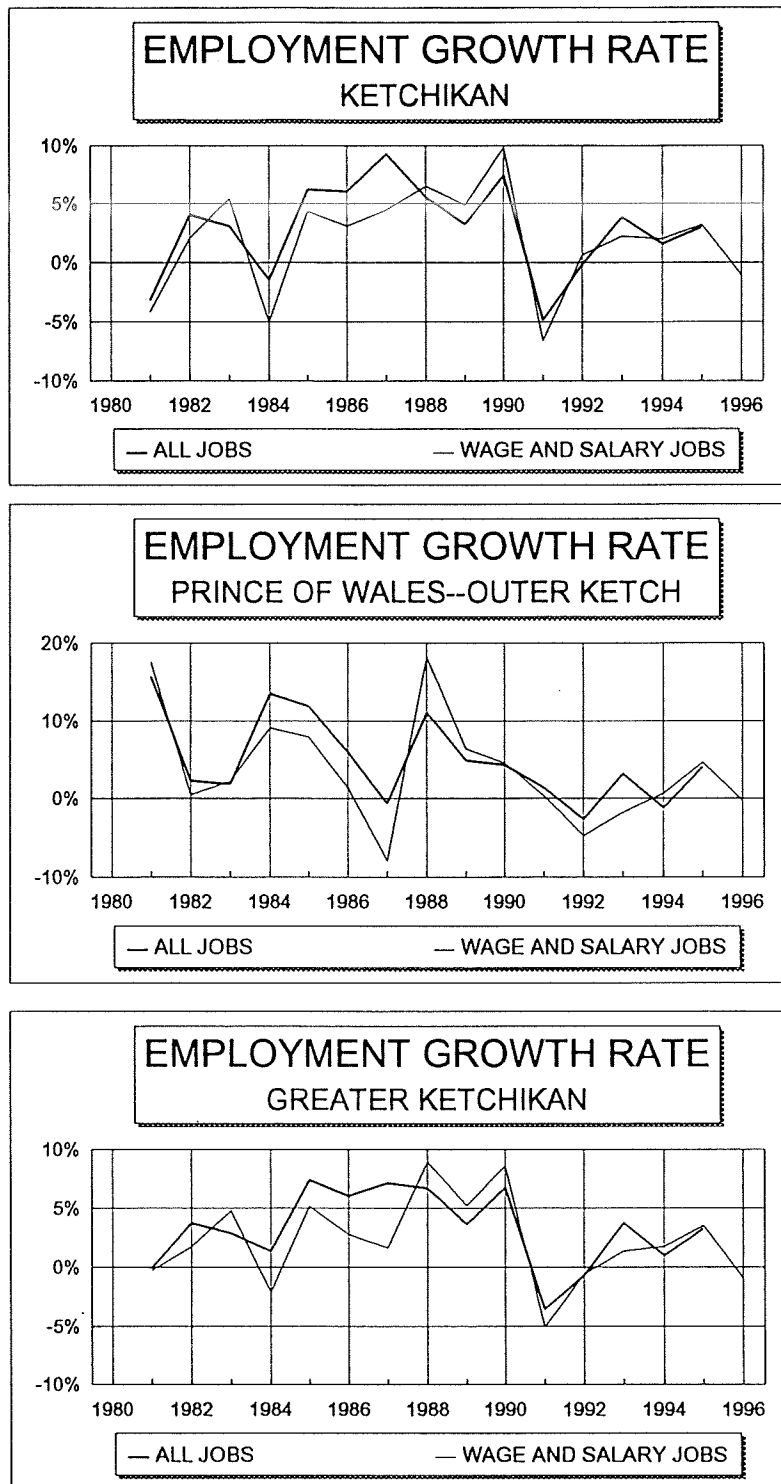
2.b. Basic Sector Growth Since 1980

Natural Resource Cycles have been the most obvious factor influencing economic growth in the Ketchikan economy since 1980. Economic growth since 1980 can best be understood as a positive trend influenced by significant natural resource cycles. Figure 3. shows the annual growth rate in employment, both total and wage and salary (net of active duty military and self employed), for the Ketchikan and Prince of Wales-Outer Ketchikan Census Areas, as well as the two Census Areas combined (Greater Ketchikan). It is useful to look at Greater Ketchikan as an economic region because of the many employment and income links between Ketchikan and Prince of Wales-Outer Ketchikan.

The patterns of growth for Ketchikan and Prince of Wales are somewhat complimentary in that growth was more rapid in Ketchikan in the mid 1980's and more rapid in Prince of Wales in the early 1980's. The result was positive growth for the entire Greater Ketchikan Area throughout the 1980's, with annual increases averaging more than 5 percent for the six year period from 1985 to 1990. Greater Ketchikan experienced slower growth in the early 1980's, averaging 3 percent annually, as well as the 1990's, .7 percent, due to two years of employment decline in 1991 and 1992.

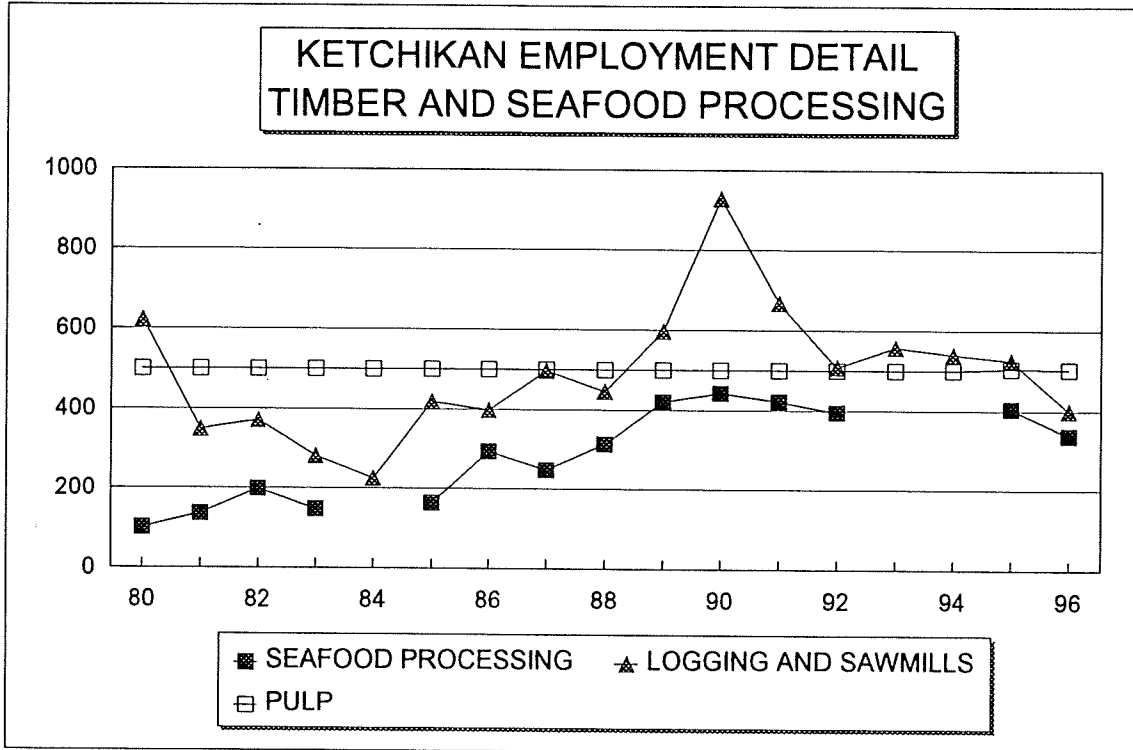
The slow growth in the early part of the 1980's is partially the result of the cyclical decline in the timber industry. The rapid growth in the mid 1980's was primarily due to the increase in the value of the timber and seafood harvests. This is reflected in the large employment growth shown in Figure 4. in both logging-sawmill and seafood processing employment starting in 1985 in Ketchikan. A very pronounced cycle appears in logging-sawmill

FIGURE 3.



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FIGURE 4.



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employment which peaks in 1990 while seafood harvesting employment, which peaked in the same year, does not exhibit the same magnitude of cycle.

Oil Revenue Boom. This boom in the second half of the 1980's, as well as the slow growth in the first half of the 1980's is the opposite of what was happening in much of the rest of the state during the 1980's. This was the decade of the oil price boom, when high oil prices drove up petroleum revenues to unprecedented heights in the first half of the decade and low oil prices drove petroleum revenues down in the second half. Government spending of oil revenues fueled rapid economic growth in the first half of the decade and set the stage for a severe recession which occurred between 1986 and 1989. Growth in state and local government employment did occur in Ketchikan, but the effect of the oil boom cycle was less pronounced there than in other locations.

Tourism increased steadily through the 1980's and into the 1990's, particularly with the expansion of the number and average size of cruise ships visiting the community. The growth of independent travelers, although not as rapid, has also contributed to expansion of this sector of the economy.

Federal Government employment has declined at 1.2 percent annually since 1980. However transfer payments, the majority of which are funded by the federal government, have grown at twice the rate of total income (inflation adjusted) and have increased from 8.5 percent to 14.2 percent of total income since 1980. (Total transfer payments includes the Permanent Fund Dividend).

The **Permanent Fund Dividend**, was first paid in 1982. It has gradually grown in importance as a part of personal income for Ketchikan residents.

Miscellaneous Income, defined as the small portion of dividends--interest--rent income that is independent of other Basic Sector activity, has grown at a 4.4 percent annual rate (inflation adjusted) and has been a small contributor to overall economic growth.

The importance of Ketchikan as a **Regional Hub** has also increased with the growth of the Prince of Wales--Outer Ketchikan Census Area, which has outpaced that of Ketchikan in employment, income, and population growth since 1980. Table 1. compares growth rates for the two Census Areas and shows that Prince of Wales--Outer Ketchikan growth has exceeded that of Ketchikan as measured by each of these indicators.

TABLE 1. ANNUAL GROWTH RATES			
		KETCHIKAN	PRINCE OF WALES-- OUTER KETCHIKAN
EMPLOYMENT		2.8 %	4.9%
REAL PERSONAL INCOME		2.9%	3.8%
POPULATION		1.8%	3.9%

Although **Military** employment has fluctuated from year to year, it has not experienced a trend since 1980. Real wages paid to the military have however increased at a 3.4 percent annual rate with most of the growth occurring after 1988. Thus some growth can be attributable to this Basic Sector.

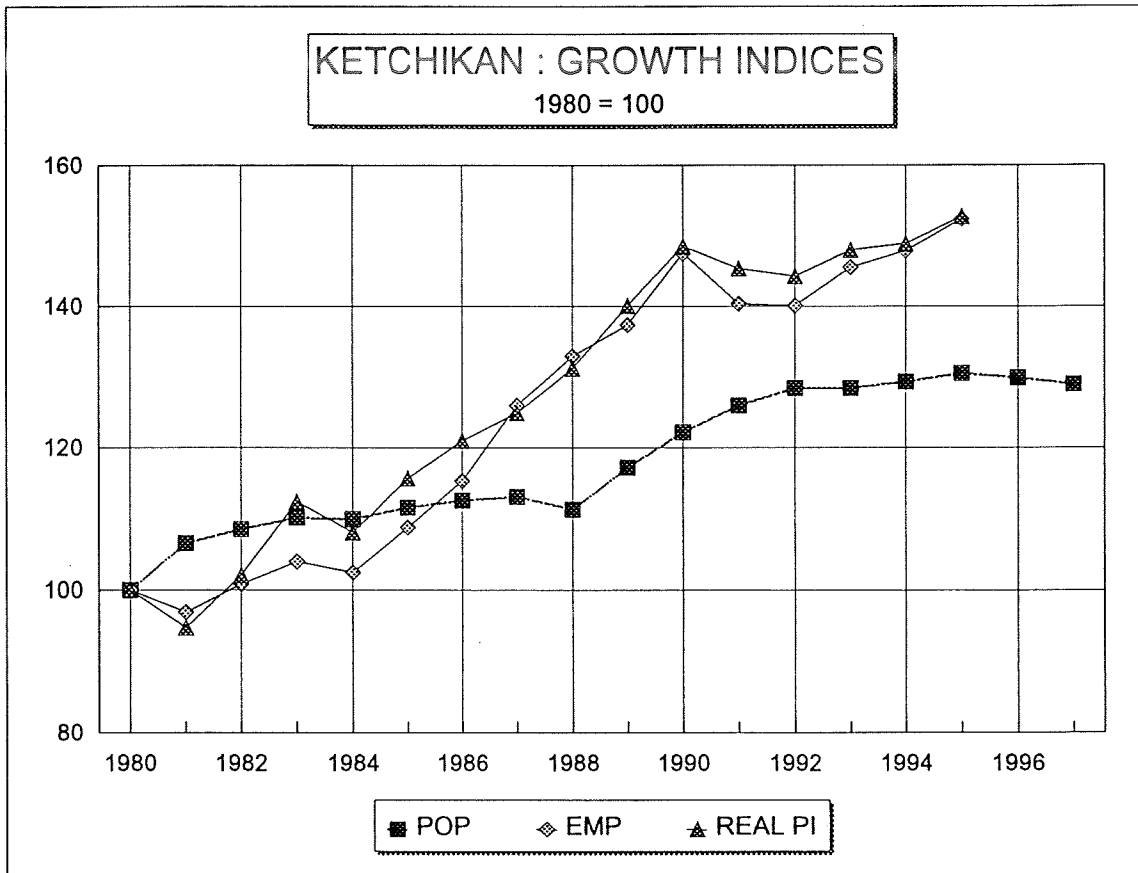
2.c. Pattern of Response and Change in Support Employment

The overall pattern of growth of the Ketchikan economy and population is illustrated by Figure 5, which shows the index of growth since 1980 of employment, real personal income, and population. We see that employment by 1990 was nearly 50 percent above the 1980 base. After a pause over the next 2 years, growth resumed, albeit at a slower rate. In 1995 employment was 52 percent above the 1980 level. Real personal income growth tracked employment fairly closely although it lagged somewhat in the mid 1980's. By 1995 it was also 52 percent above the 1980 level. On the other hand population growth has been much slower than employment. There was little growth at all between 1983 and 1988. This was followed by a spurt between 1988 and 1992, over a period when employment also grew rapidly but subsequently fell. Since 1992 the population has not increased appreciably.

Generally we would expect to see total employment grow in response to growth in Basic Sector income. This is because infrastructure jobs--construction, transportation, communications, utilities, and business services--and support jobs--trade, finance, and services--depend upon local purchases and payrolls generated by Basic Sector income and purchases. For example if a fish processing plant locates in the community it makes local purchases from many of the businesses in the community, and its payrolls support spending by the households in the community on a range of goods and services.

In addition we would expect that over time the infrastructure and support sectors would increase as a result of maturation of the regional economy. This is due to two factors. First as economic activity within the region grows and demand increases, economies of scale should make it possible to offer a wider variety of goods and services within the local economy. These economies of scale may include the transportation of goods from outside the region and this combined with possible increases in competition within the local economy may lead to reductions in relative costs in the region, which could further foster local provision of goods and services. Second, the national trend toward services as a share of personal consumption

FIGURE 5.



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expenditures (relative to manufactured goods) means there is more opportunity for consumer purchases to be provided by local businesses rather than imported from a distant manufacturing site.

An additional reason for an increase in the infrastructure and support sectors over time would be due to increasing real income per capita and with it purchasing power. This has in fact been an important factor in the growth of the Ketchikan economy since 1980 as real (1996) per capita income has increased at an annual rate of 1.3 percent since 1980, growing from \$25,743 to \$31,450. The increase occurred before 1990, and there has been no growth in per capita income since that time.

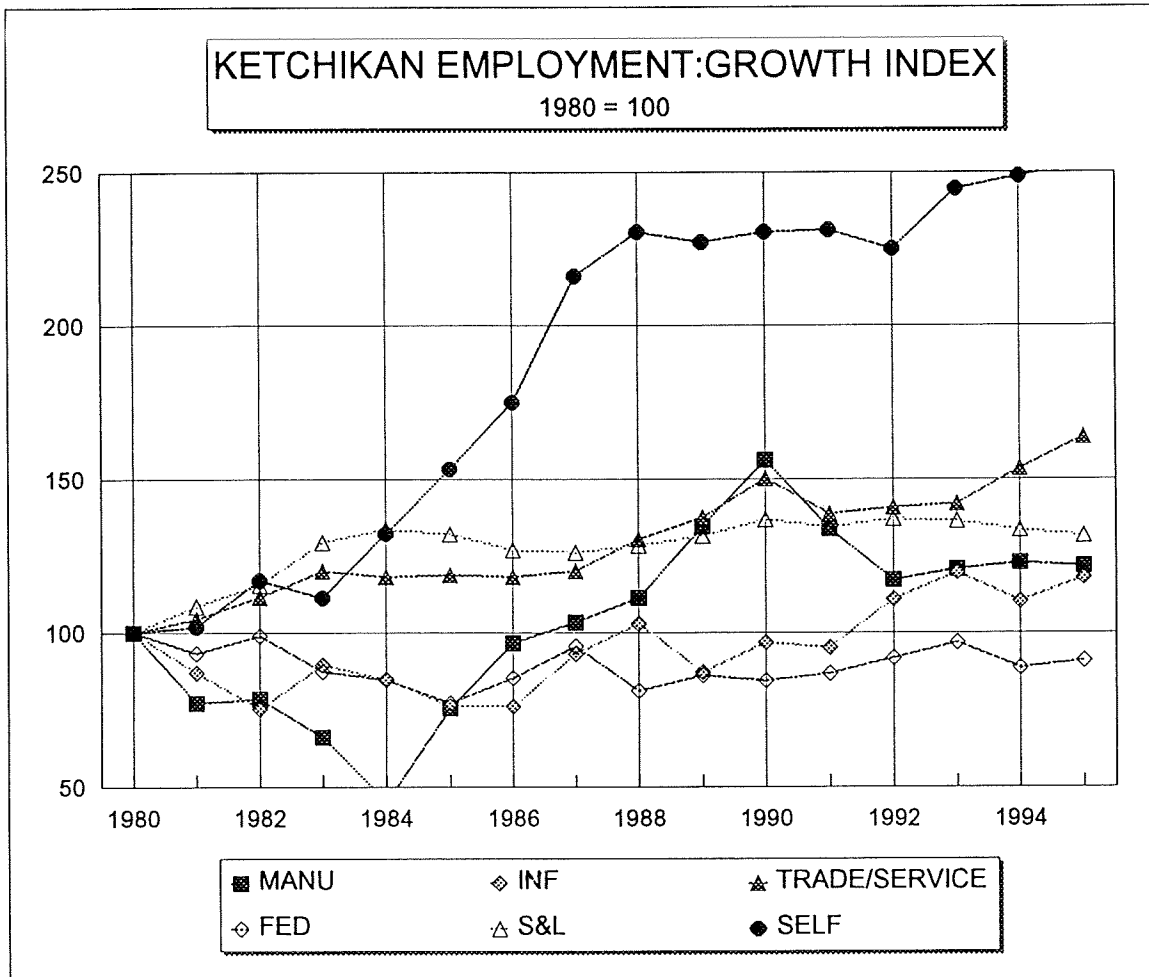
Figure 6. shows that growth in support employment, as defined by wage and salary trade/service employment has in fact outstripped total employment growth between 1980 and 1995 albeit not by a large margin. But considering the strong growth in real per capita personal income, as well as the fact that tourism and regional hub employment is concentrated in trade and services, the growth in support employment is not remarkable. It suggests that neither economies of scale, the shift to a service based economy, or increasing real per capita personal income, has been a strong contributor to support sector employment growth in Ketchikan. This conclusion is tempered however by the fact that growth in the self employed portion of the work force has been particularly rapid, particularly in the mid 1980's and a majority of the self employed are in trade and services. However some growth in self employment is due to growth in the seafood industry in the 1980's. Furthermore the definition of self employment was broadened in 1984 and some of the growth we observe may be an artifact of that change in definition.

Figure 7. provides a further perspective on the relationship between Basic Sector and Support activity. It shows the level of wage and salary employment in manufacturing (fish processing, timber harvesting, and timber processing) plus government (financed primarily by sources outside the local economy) compared to that of wage and salary employment in trade and services which is primarily dependent upon locally generated payrolls. Although there has been an upward trend in both categories of employment, trade and service employment does not show the significant cycle evident in manufacturing employment. There has been a tendency for trade/service employment to grow more rapidly than basic over the entire period, but for most of the cycle trade/service growth has lagged.

The other important characteristic of the relationship between Basic and Support employment evident from Figure 7. is that the year to year change in Support employment has often not even been in the same direction as the change in Basic employment. This was particularly the case in the early 1980's and has also been true in recent years. It is necessary to look at the pattern of change over a period of several years to understand the relationship between the two sectors.

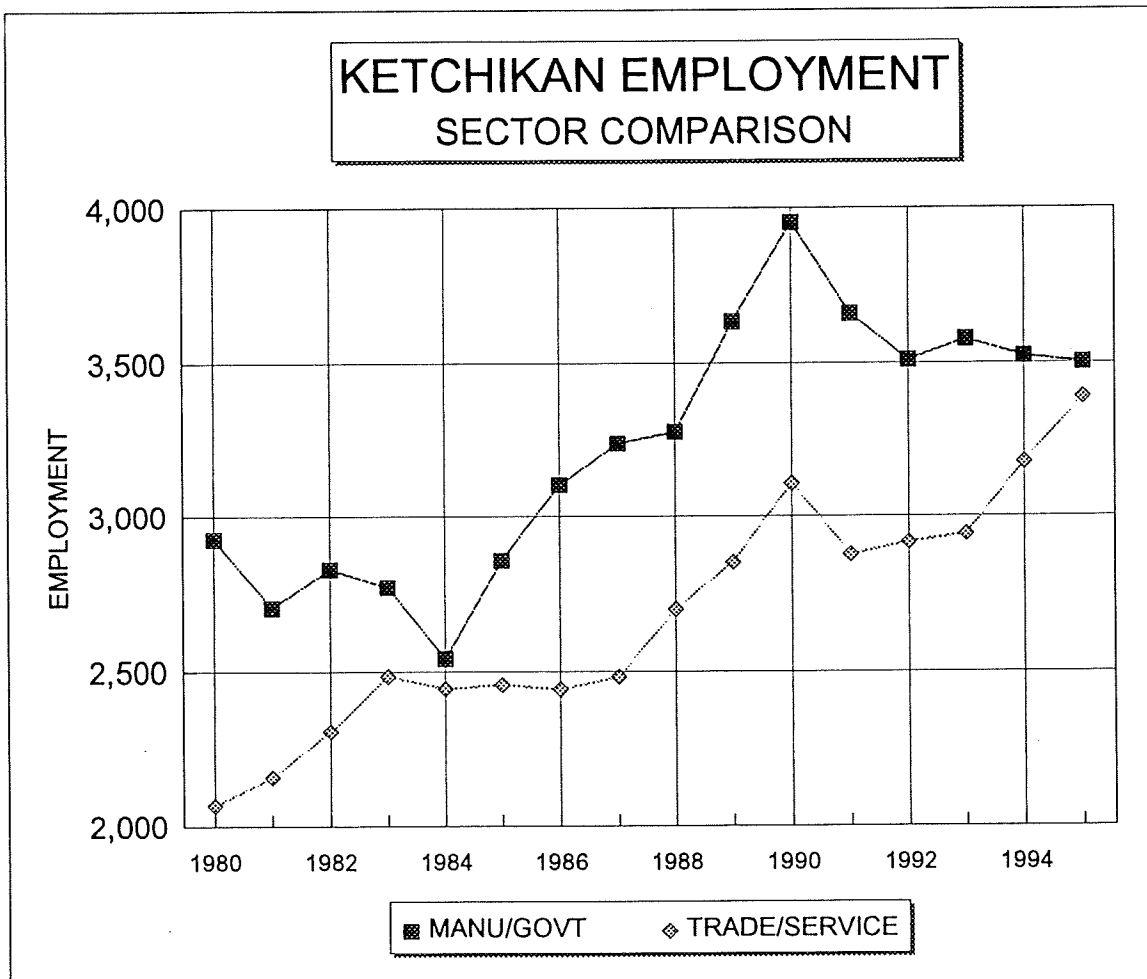
There are a number of reasons why Support employment will not respond in lock-step fashion to changes in Basic employment, and why the growth of the Support sector in Ketchikan may left the community somewhat under served. First, Basic employment is an indicator, but not

FIGURE 6.



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FIGURE 7.



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an accurate measure of the Basic income flowing into the regional economy. As already indicated the Permanent Fund dividend, miscellaneous income, and regional hub income, and state and federal money all flow into Ketchikan without associated jobs. Changes in these flows will not be reflected in changes in Basic employment but do increase local purchasing power that stimulates Support employment.

Second, tourism activity has been increasing without the boom and bust cycle associated with timber and seafood. This provides a steady source of trade/service employment growth.

Third, there is normally a lag, often of many years, between the time that Basic income increases in a region and the support sector response works its way through the economy. This may be due to lack of information or lack of entrepreneurial resources. One can see this phenomenon at work in larger places like Anchorage and Juneau. Dramatic increases in retail trade opportunities happened in the early 1990's as the "retail boxes" moved into these regions independent of any real growth in Basic activity.

Uncertainty about the future of the economy could be another reason for a lag in the development of Support activities. Because a large share of the Basic sector employment growth in Ketchikan in the 1980's was attributable to cyclical natural resource industries, there may have been some reluctance by business to invest in Support businesses. The uncertainty over the future of the pulp mill may also have contributed to this reluctance in recent years.

Fifth, the proximity of Seattle may have served, and continue to serve as a deterrent to the development of a more complete local Support sector. The high average real income of the population suggests an ability to travel and this may lead to a higher proportion of consumer purchases of goods and services outside the community that other towns of comparable size in Alaska.

Finally, some of the growth in Basic employment during the 1980's, and subsequent decline in Basic employment in the early 1990's was partially insulated from the Support sector of the Ketchikan economy because it was taken by non-residents. Based on an annual review by the Alaska Department of Labor the two industries with the largest share of non-Alaska resident labor are fish processing and logging. For example near the height of the seafood and timber harvesting boom in 1988 the non-Alaska resident share of food manufacturing was 48 percent and of logging 28 percent. In contrast the share across all industries was 8 percent.

This is reflected in data for Ketchikan for the same year. Table 2. shows the share of non-resident employment by industry. The share is highest in manufacturing, which includes fish processing and timber harvesting, and next highest in construction, which also tends to be cyclical. The total share of non-residents employment in Ketchikan of 23 percent is also quite high compared to the statewide figure of 17 percent and that of other regions of the state. For example in Juneau 13 percent of workers were non-Alaskans in that year. Furthermore this data only reflects firms headquartered in Alaska. Many of the seafood and logging firms are headquartered outside the state. The non-resident share of these firms is generally higher than those with headquarters within the state.

TABLE 2. RESIDENCE OF KETCHIKAN WORKERS IN 1988		
	RESIDENT	NON-RESIDENT
SUM	10,342	3,115
AGRICULTURE	82	45
MINING	0	0
CONSTRUCTION	758	389
MANUFACTURING	2,474	1,477
TRANSPORTATION	1,578	260
WHOLE TRADE	285	71
RETAIL TRADE	1,815	375
FINANCE	272	25
SERVICES	1,755	383
LOCAL GOVT	1,323	90

This non-Alaska resident employment and earnings was partially offset by the importation of earnings by Ketchikan residents. It is not possible to estimate the size of this inflow since only the net flow of income out of Ketchikan is reported in preparing the personal income statistics for the regional economy. However in most years the non-resident earnings reported by the Alaska Department of Labor have been about twice the size of the net residence adjustment reported by the US Department of Commerce. This suggests some gross inflow of earnings, probably from Prince of Wales--Outer Ketchikan.

It is difficult to draw conclusions on the magnitude of flows from this data. For example one further complication is that some firms may report employment in Ketchikan, where they are headquartered, which are physically located in the Prince of Wales-Outer Ketchikan Census Area. In that case jobs reported in Ketchikan may actually be taken by non-residents and the associated income, reported in Ketchikan, may actually accrue to residents of Prince of Wales-Outer Ketchikan.

In summary, the growth of the Support sector of the Ketchikan economy has followed that of the Basic sectors, but it has not tracked closely and there are some reasons to suspect that its growth has lagged somewhat due to a number of factors. These would include uncertainty, the large number of non-Alaska resident workers, proximity to Seattle, normal time lags, lack of entrepreneurs, and lack of information about the market. This suggests some continued growth

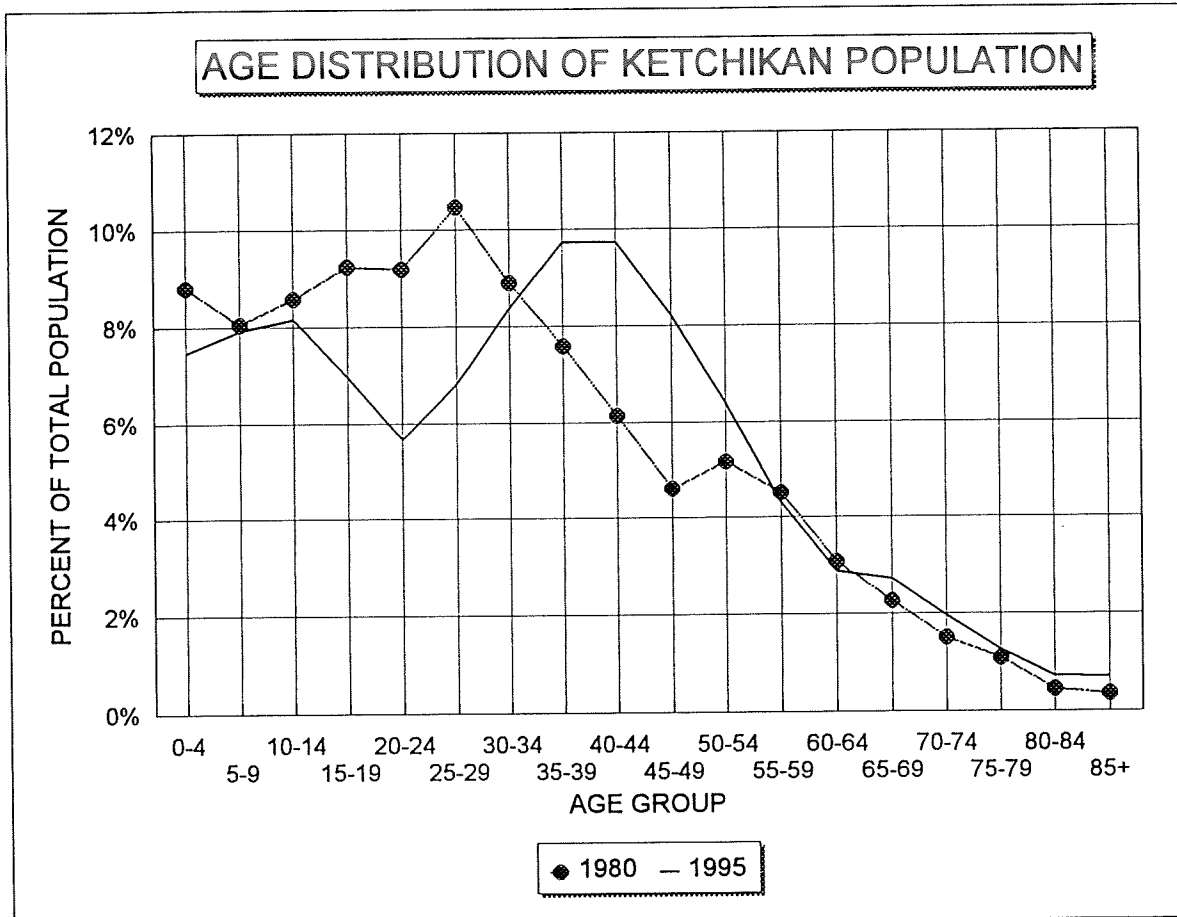
of the Support sector of the economy might occur in the absence of Basic Sector growth. In fact that has happened for the last several years.

2.d. Composition of Population and Households

Since 1980 annual population growth in Ketchikan has averaged 1.8 percent compared to 2.8 percent annual growth for employment. As a consequence the ratio of population to jobs in Ketchikan has fallen from about 1.75 in 1981 to just under 1.4 in 1995. This would suggest that Ketchikan has a high labor force participation rate and a low unemployment rate. However the unemployment rate in Ketchikan is not unusually low and thus we cannot conclude that the labor market is particularly tight. The increase in the number of jobs may mean that the number of multiple job holders has increased, particularly since the fastest growing job category during this period has been the self-employed.

The population of Ketchikan, like the rest of the state, has significantly aged since 1980, but Ketchikan has an older population than the state. Figure 8, which contrasts the Ketchikan age distribution in 1980 and 1995 clearly demonstrates this change in the age structure of the population. The proportions of young Alaskans in the population (under 35) has fallen and the proportion of older Alaskans has increased. The shift has been so pronounced that the absolute size of the population aged 15 to 30 has declined by several hundred. Over the same time period the 45 to 55 population has more than doubled in size. Although the proportion of the population over 65 is larger in Ketchikan than the state as a whole, and it has been increasing faster than total population, its growth rate has been slower than in the rest of the state. Table 3, shows the size of each age group and growth since 1980.

FIGURE 8.



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TABLE 3. AGE DISTRIBUTION OF KETCHIKAN POPULATION			
	1980	1995	Percent Change
0-4	996	1103	10.7 %
5-9	911	1170	28.4 %
10-14	971	1204	24 %
15-19	1045	1029	-1.5 %
20-24	1040	837	-19.5 %
25-29	1184	1008	-14.9 %
30-34	1007	1239	23.0 %
35-39	859	1437	67.3 %
40-44	695	1437	106.8 %
45-49	522	1213	132.4 %
50-54	585	946	61.7 %
55-59	511	636	24.5 %
60-64	348	425	22.1 %
65+	642	1089	69.6 %

The aging of the population has implications for both population stability and the sources of income. As people age they tend to put down roots in a community and this reduces their likelihood to move. Older people tend to have more financial assets, including retirement income, which is a source of income independent of wages paid in to current employees.

Retirement income appears in the personal income statistics when it is accrued by workers rather than when it is actually received by retirees. Consequently its importance as a source of income to the community cannot be measured from existing statistics and we can estimate its importance only from the size of the over 65 population. Since this population continues to increase in Ketchikan we can conclude that this source of income to the community is becoming increasingly important.

3. PROJECTIONS OF THE KETCHIKAN ECONOMY AND POPULATION

3.a. The Current Economic Situation

Employment was essentially constant between 1995 and 1996, and preliminary information for 1997 suggests that as of yet there has been no decline in response to the closure of the Ketchikan Pulp mill early in the year. Figure 9. shows the number of workers employed each month for the last several years. The number of employed workers for each month of 1997 has been above the level for 1996. Several factors account for the delay in the job loss from the mill closure negatively impact overall employment levels. These factors include the work force retained to close the mill, the severance pay to former employees, the draw on savings by former employees to pay for living expenses, unemployment insurance payments, and the special federal appropriation to South east communities to mitigate to economic loss from the reduction in allowable annual sales from the Tongass National Forest to 267 million board feet under the new Tongass Land Management Plan.

Although the timber harvest in the mid 1990's is only about half that of the peak in 1990 we assume that the Ketchikan economy is not contracting in response to that decline. This is because a large share of the labor force associated with timber harvesting was non-resident and as a result the Support Sector of the economy did not expand during the timber boom to the extent it might have if all the jobs went to residents. As a consequence the effect on total employment and population of the loss in timber harvest was less severe than might have been expected.

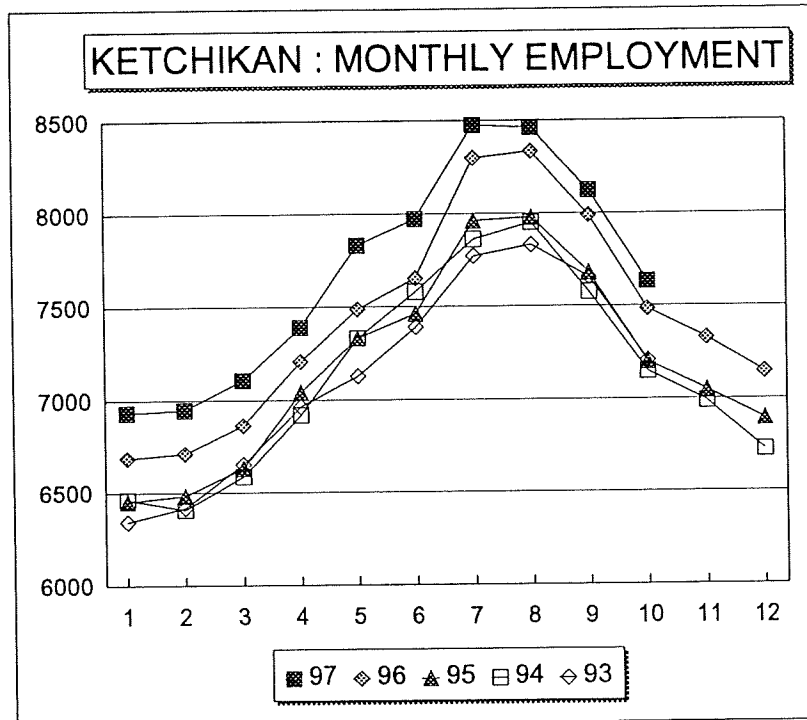
3.b. Timber Scenarios

The closure of the Ketchikan pulp mill and the reduction of the allowable annual sales from the Tongass National Forest to 267 million board feet have resulted in an uncertain future for the timber industry in Southeast Alaska. The range of projections for the actual timber harvest and the number of jobs within the region that the harvest might support is extremely wide.

One position based on a recent study by two US Forest Service economists is that demand will support only a fraction of the allowable annual sales (Timber Products Output and Timber Harvests in Alaska: Projections for 1997-2010, by David J. Brooks and Richard W. Haynes., 1997). This study makes no employment projections but does not rule out the possibility of the establishment of various value added manufacturing industries as consumers of the projected demand. Another position is that intensive small scale manufacturing can produce more regional employment from a smaller harvest than was generated in past years with a much larger harvest (Modeling a Small-scale Secondary Manufacturing Timber Industry for Southeast Alaska--A Draft Working Paper, by Dave Katz in Southeast Timber Task Force Report prepared for Governor Tony Knowles, 1997).

Since the industry will continue to be in transition for at least several years it is impossible to project a single future scenario for the timber industry at this time. For the purpose

FIGURE 9.



source: Alaska Department of Labor

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of projecting Ketchikan Public Utility electric generation requirements in future years we have developed three different generic scenarios. Each is based on an estimate of the number harvesting, sawmill, and manufacturing jobs in the timber industry in the Ketchikan economy in future years. The starting point for the scenarios is an estimate of 900 jobs in 1996 divided among 500 in pulp manufacture, 300 in logging, and 100 in saw milling. These figures are based on an estimate of timber employment for the Southern region of Southeast Alaska of approximately 1,200, of which 300 were residing outside of Ketchikan.

The assumptions of the Mid Case scenario are as follows:

TABLE 4. MID CASE TIMBER EMPLOYMENT SCENARIO			
	PULP MILL	SAWMILL	HARVESTING
1996	500	100	300
1997	125	100	200
1998	50	100	150
1999	75	100	150
2000	100	100	200
2001+	100	100	200

In this scenario we assume some alternative timber manufacturing activity eventually develops and with annual average employment of 100. This could be a veneer plant, a fish waste plant, ethanol plant, other value added manufacturing, or some combination of facilities. The exact nature of the activity is not as important as the number of jobs created. The supply of timber is sufficient to existing sawmill operating and the logging employment stabilizes at 200. After a transition employment in the timber industry stabilizes at 400 compared to 900 prior to the closure of the pulp mill and imposition of the 267 million board foot harvest ceiling.

Based upon this scenario we can also project the total number of jobs in the economy, in construction, transportation, trade, services, etc. each year that are attributable to the timber industry. For this purpose we use an economic multiplier with a value of approximately 1.9. This means that 9 jobs in the construction, transportation, trade, service, and other sectors of the economy depend upon every 10 jobs in the timber industry. This multiplier is an estimate of the number of total jobs in the economy that would be lost for each job lost in the timber industry. We use a multiplier value to analyze contraction of an industry that is somewhat less than we would use in the case of an expansion of industry. This is based review of the experiences of other regions in Alaska that have suffered recessions in recent years (see below).

For an employment level of 900 in the timber industry, we estimate total employment dependent on timber, or at risk from a decline in the timber industry, to be 1,700. Furthermore, we estimate that the multiplier effect of any change in timber employment will occur over a 4-

year period. One third of the effect (33 percent) will be felt in the first year, two thirds (66 percent) in the second year, 89 percent in the third year, and 100 percent of the multiplier effect will be felt in year four and every year thereafter.

Using these assumptions about the multiplier and its lag structure, the total impact of the cumulative loss of 500 timber jobs would be as shown in Table 5. The annual loss of timber jobs is most pronounced in 1997 with an additional loss in 1998 for a cumulative loss of 600 timber jobs. In the next 2 years 200 jobs are added in manufacturing and harvesting and at that time timber employment stabilizes at the constant level of 400 jobs, a reduction of 500 jobs from the 1996 level of 900. The loss of jobs elsewhere in the economy peaks at 490 in 2000 even as employment in timber is growing. When conditions stabilize in 2003 the total job loss from the cumulative loss of 500 timber jobs is 950.

TABLE 5. MID CASE SCENARIO TIMBER JOB LOSS					
	JOBS	ANNUAL LOSS	CUMULATIVE LOSS	MULTIPLIER LOSS	TOTAL JOB LOSS
1996	900	0	0	0	0
1997	425	475	475	142	617
1998	300	125	600	322	922
1999	325	-25	575	477	1022
2000	400	-75	500	490	990
2001	400	0	500	475	975
2002	400	0	500	457	957
2003+	400	0	500	450	950

The assumptions of the **Low Case** scenario have been chosen to represent a worst case alternative. In this scenario no alternative timber manufacturing activity develops and processing employment falls to 0. The supply of timber is sufficient to keep the existing sawmills operating only through the current contract. A reduced level of logging is all that remains of the industry by the year 2000. After the transition employment in the timber industry stabilizes at 150 compared to 900 prior to the closure of the pulp mill. This is shown in Table 6.

TABLE 6. LOW CASE TIMBER EMPLOYMENT SCENARIO			
	PULP MILL	SAWMILL	HARVESTING
1996	500	100	300
1997	125	100	200
1998	0	100	100
1999	0	100	150
2000	0	0	150
2001+	0	0	150

The total impact of the cumulative loss of 750 timber jobs, using the multiplier and lag structure assumptions presented above, is shown in Table 7. The job loss stabilizes at 1,425 in 2003.

TABLE 7. LOW CASE SCENARIO TIMBER JOB LOSS					
	JOBS	ANNUAL LOSS	CUMULATIVE LOSS	MULTIPLIER LOSS	TOTAL JOB LOSS
1996	900	0	0	0	0
1997	425	475	475	142	617
1998	200	225	700	352	1,052
1999	250	(50)	650	500	1,150
2000	150	100	750	607	1,357
2001	150	0	750	650	1,400
2002	150	0	750	665	1,410
2003+	150	0	750	675	1,425

The assumptions of the **High Case** scenario have been chosen to represent an optimistic case. In this scenario either a large scale or several smaller scale alternative timber manufacturing activities develop. Processing employment stabilizes at 200. The supply of timber is sufficient to keep the existing sawmills operating through the current contract and production eventually expands. A reduced level of logging provides a steady supply of timber to the processors. After the transition employment in the timber industry stabilizes at 550 compared to 900 prior to the closure of the pulp mill.

TABLE 8. HIGH CASE TIMBER EMPLOYMENT SCENARIO			
	PULP MILL	SAWMILL	HARVESTING
1996	500	100	300
1997	125	100	200
1998	50	100	100
1999	100	100	100
2000	150	100	200
2001+	200	150	200

The total impact of the cumulative loss of 350 timber jobs using the multiplier and lag structure assumptions described above, is shown in Table 9.

TABLE 9. HIGH CASE SCENARIO TIMBER JOB LOSS					
	JOBS	ANNUAL LOSS	CUMULATIVE LOSS	MULTIPLIER LOSS	TOTAL JOB LOSS
1996	900	0	0	0	0
1997	425	475	475	142	617
1998	250	175	650	337	987
1999	300	(50)	600	470	1,070
2000	450	(150)	450	492	942
2001	550	(100)	350	425	775
2002	550	0	350	360	710
2003	550	0	350	325	675
2004+	550	0	350	315	665

3.c. Assumptions for Other Economic Sectors

We assume three different growth rates for non-timber dependent employment to combine with our three timber scenarios. These growth rates are based on our most recent set of state and regional economic projections done for the State of Alaska Department of

Transportation (DOT) using the ISER MAP Model of Alaska (Alaska's Economy and Population, 1959-2020, March 1996).

The assumptions regarding timber manufacturing in those projections are approximately equivalent to those in our three timber scenarios developed for this study. In the DOT projections we assumed that the Ketchikan pulp mill would close. In the base case DOT projection we assumed alternative manufacturing employment of 200 would replace 40 percent of the lost jobs. In the high case we assumed 300 replacement jobs and in the low case 100 replacement jobs. The assumptions regarding timber harvesting and sawmill employment were more optimistic than our current timber scenarios. In the base case we assumed constant employment at the 1996 level. In the high case we assumed a .5 percent growth rate, and in the low case we assumed a 1 percent decline rate.

Consequently the overall projections of wage and salary employment in the DOT report of approximately 0, 1, and 2 percent respectively are somewhat higher than would be the case if we substituted the timber scenarios for the logging assumptions made for that study. Thus we have assigned these growth rates to the non-timber dependent sector of the Ketchikan economy for our employment projections. The result is that the total employment growth rates, combining the non-timber dependent employment growth with the timber scenarios, will be consistent with, but lower than, the DOT projections. These non-timber growth rates are as follows:

Mid case	1 percent
Low case	.5 percent
High case	2 percent

The Mid case growth rate of 1 percent is approximately 100 new jobs per year. This number of new jobs could be attained in many different ways. One alternative that would generate that rate of job growth would be a 6 percent growth in tourism activity and 1 percent real increases in federal dollars, miscellaneous income, and Permanent Fund dividend payments coming into the community. The high case represents approximately 200 new jobs per year. This could be attained by some expansion in seafood processing, some growth from the provision of services to outlying areas, and the development of mining activity in the region. The low case represents the addition of less than 50 jobs per year. This could be accomplished by growth in tourism of 4 percent with no increases in any other sector.

3. d. Total Projected Employment

The **BASE CASE** total employment (including military active duty and the self employed) projection, based on the combination of the mid case timber scenario with the mid case non-timber dependent growth rate, is shown in Table 10. The **HIGH CASE** projection of employment combines the high timber scenario with the high non-timber related employment growth rate (Table 11.). The **LOW CASE** projection of employment combines the low timber scenario with the low non-timber dependent employment growth rate (Table 12.). The overall growth rates for the entire forecast period are .6 1.6, and 0 percent annually respectively. For comparison the DOT employment projections are presented in Table 13. Figure 10. graphically

TABLE 10.
EMPLOYMENT ASSUMPTIONS FOR BASE CASE

BASE CASE	TIMBER JOBS			LOSS FROM BASE			TOTAL			TOTAL JOBS			POP	JOB INDEX	POP INDEX
	PULP MILL	SAW MILL	LOGGING	ANNUAL CHANGE	CUMULATIVE	MULTIPLIER LOSS	LOSS FROM BASE	TIMBER WITH MULTIPPLIER	NON-TIMBER	SUM	POP	JOB INDEX			
1996	500	100	300	900	0	0	617.5	1726.2	8,875	10,601	14,701	100.0	100.0	100.0	
1997	125	100	200	425	475	475	922.5	1108.7	9,000	10,109	14,599	95.4	97.7	97.7	
1998	50	100	150	300	600	322.5	1022.5	803.7	9,090	9,894	14,210	93.3	96.7	96.7	
1999	75	100	150	325	575	447.5	990	736.2	9,181	9,885	14,204	93.2	96.6	96.6	
2000	100	100	200	400	500	490	975	751.2	9,273	10,009	14,346	94.4	97.6	97.6	
2001	100	100	200	400	500	475	957.5	768.7	9,365	10,117	14,490	95.4	98.6	98.6	
2002	100	100	200	400	500	457.5	950	776.2	9,459	10,228	14,635	96.5	99.5	99.5	
2003	100	100	200	400	500	450	950	776.2	9,554	10,330	14,781	97.4	100.5	100.5	
2004	100	100	200	400	500	450	950	776.2	9,649	10,425	14,929	98.3	101.5	101.5	
2005	100	100	200	400	500	450	950	776.2	9,746	10,522	15,078	99.3	102.6	102.6	
2006	100	100	200	400	500	450	950	776.2	9,843	10,619	15,229	100.2	103.6	103.6	
2007	100	100	200	400	500	450	950	776.2	9,942	10,718	15,381	101.1	104.6	104.6	
2008	100	100	200	400	500	450	950	776.2	10,041	10,817	15,535	102.0	105.7	105.7	
2009	100	100	200	400	500	450	950	776.2	10,141	10,918	15,690	103.0	106.7	106.7	
2010	100	100	200	400	500	450	950	776.2	10,243	11,019	15,847	103.9	107.8	107.8	
2011	100	100	200	400	500	450	950	776.2	10,345	11,121	16,006	104.9	108.9	108.9	
2012	100	100	200	400	500	450	950	776.2	10,449	11,225	16,166	105.9	110.0	110.0	
2013	100	100	200	400	500	450	950	776.2	10,553	11,329	16,327	106.9	111.1	111.1	
2014	100	100	200	400	500	450	950	776.2	10,659	11,435	16,491	107.9	112.2	112.2	
2015	100	100	200	400	500	450	950	776.2	10,765	11,542	16,655	108.9	113.3	113.3	
2016	100	100	200	400	500	450	950	776.2	10,873	11,649	16,822	109.9	114.4	114.4	
2017	100	100	200	400	500	450	950	776.2	10,982	11,758	16,990	110.9	115.6	115.6	
2018	100	100	200	400	500	450	950	776.2	11,092	11,868	17,160	111.9	116.7	116.7	
2019	100	100	200	400	500	450	950	776.2	11,202	11,979	17,332	113.0	117.9	117.9	
2020	100	100	200	400	500	450	950	776.2	11,314	12,091	17,505	114.0	119.1	119.1	
2021	100	100	200	400	500	450	950	776.2	11,428	12,204	17,680	115.1	120.3	120.3	
2022	100	100	200	400	500	450	950	776.2	11,542	12,318	17,857	116.2	121.5	121.5	
2023	100	100	200	400	500	450	950	776.2	11,657	12,434	18,035	117.3	122.7	122.7	
2024	100	100	200	400	500	450	950	776.2	11,774	12,550	18,216	118.4	123.9	123.9	
2025	100	100	200	400	500	450	950	776.2	11,892	12,668	18,398	119.5	125.1	125.1	

HISTU5.WK4

TABLE 11.
EMPLOYMENT ASSUMPTIONS FOR HIGH CASE

YEAR	TIMBER JOBS			LOSS FROM BASE			TOTAL JOBS			POP	JOB INDEX	POP INDEX
	PULP MILL	SAW MILL	LOGGING	SUM	ANNUAL CHANGE	CUMULATIVE	MULTIPLIER LOSS	TOTAL LOSS FROM BASE	TIMBER WITH MULTIPPLIER			
1996	500	100	300	900	0	0	142.5	617.5	1726.2	8,875	10,601	14,701
1997	125	100	200	425	475	475	337.5	987.5	1108.7	9,000	10,109	14,599
1998	50	100	100	250	175	650	470	1070	738.7	9,180	9,919	14,228
1999	100	100	100	300	-50	600	492.5	942.5	656.2	9,364	10,020	14,512
2000	150	100	200	450	-150	450	425	775	783.7	9,551	10,335	14,803
2001	200	150	200	550	-100	350	360	710	951.2	9,742	10,693	15,099
2002	200	150	200	550	0	350	325	675	1016.2	9,937	10,953	15,401
2003	200	150	200	550	0	350	315	675	1051.2	10,135	11,187	15,709
2004	200	150	200	550	0	350	315	665	1061.2	10,338	11,399	16,023
2005	200	150	200	550	0	350	315	665	1061.2	10,545	11,606	16,343
2006	200	150	200	550	0	350	315	665	1061.2	10,756	11,817	16,670
2007	200	150	200	550	0	350	315	665	1061.2	10,971	12,032	17,004
2008	200	150	200	550	0	350	315	665	1061.2	11,190	12,252	17,344
2009	200	150	200	550	0	350	315	665	1061.2	11,414	12,475	17,690
2010	200	150	200	550	0	350	315	665	1061.2	11,642	12,704	18,044
2011	200	150	200	550	0	350	315	665	1061.2	11,875	12,937	18,405
2012	200	150	200	550	0	350	315	665	1061.2	12,113	13,174	18,773
2013	200	150	200	550	0	350	315	665	1061.2	12,355	13,416	19,149
2014	200	150	200	550	0	350	315	665	1061.2	12,602	13,663	19,532
2015	200	150	200	550	0	350	315	665	1061.2	12,854	13,915	19,922
2016	200	150	200	550	0	350	315	665	1061.2	13,111	14,173	20,321
2017	200	150	200	550	0	350	315	665	1061.2	13,374	14,435	20,727
2018	200	150	200	550	0	350	315	665	1061.2	13,641	14,702	21,142
2019	200	150	200	550	0	350	315	665	1061.2	13,914	14,975	21,565
2020	200	150	200	550	0	350	315	665	1061.2	14,192	15,253	21,996
2021	200	150	200	550	0	350	315	665	1061.2	14,476	15,537	22,436
2022	200	150	200	550	0	350	315	665	1061.2	14,765	15,827	22,884
2023	200	150	200	550	0	350	315	665	1061.2	15,061	16,122	23,342
2024	200	150	200	550	0	350	315	665	1061.2	15,362	16,423	23,809
2025	200	150	200	550	0	350	315	665	1061.2	15,669	16,730	24,285

HIGH CASE

HISTU5.WK4

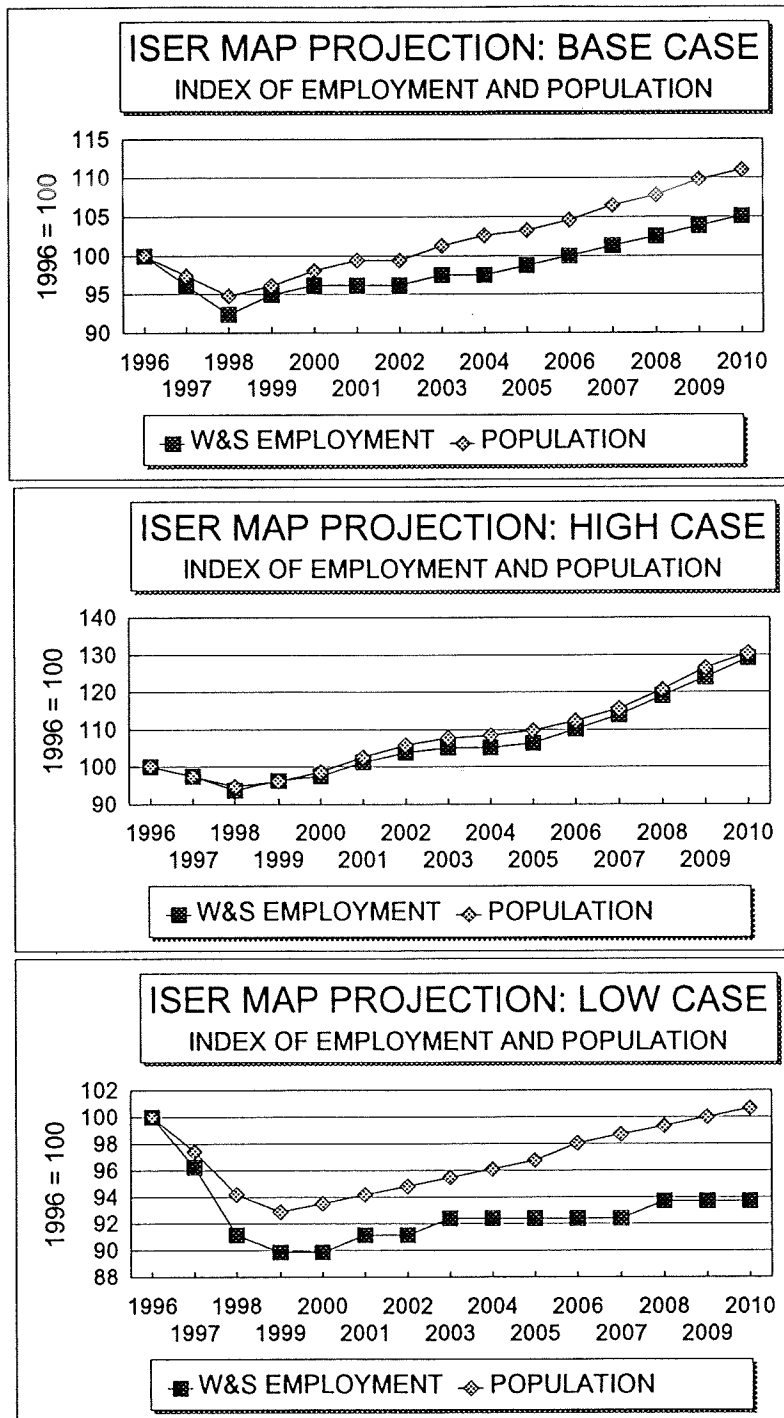
TABLE 12.
EMPLOYMENT ASSUMPTIONS FOR LOW CASE

YEAR	TIMBER JOBS			LOSS FROM BASE			TOTAL JOBS			POP	JOB INDEX	POP INDEX
	PULP MILL	SAW MILL	LOGGING	SUM	ANNUAL CHANGE	CUMULATIVE	MULTI-PLIER LOSS	TOTAL LOSS FROM BASE	TIMBER WITH MULTI-PLIER			
1996	500	100	300	900		0		617.5	1726.2	8,875	10,601	14,701
1997	125	100	200	425	475	475	142.5	1052.5	1108.7	9,000	10,109	14,599
1998	0	100	100	200	225	700	352.5	1425	673.7	9,045	9,719	14,089
1999	0	100	150	250	-50	650	500	1150	576.2	9,090	9,666	14,053
2000	0	0	150	150	100	750	607.5	1357.5	368.7	9,136	9,504	13,941
2001	0	0	150	150	0	750	650	1400	326.2	9,181	9,508	14,010
2002	0	0	150	150	0	750	665	1415	311.2	9,227	9,538	14,080
2003	0	0	150	150	0	750	675	1425	301.2	9,273	9,575	14,151
2004	0	0	150	150	0	750	675	1425	301.2	9,320	9,621	14,221
2005	0	0	150	150	0	750	675	1425	301.2	9,366	9,668	14,293
2006	0	0	150	150	0	750	675	1425	301.2	9,413	9,714	14,364
2007	0	0	150	150	0	750	675	1425	301.2	9,460	9,761	14,436
2008	0	0	150	150	0	750	675	1425	301.2	9,508	9,809	14,508
2009	0	0	150	150	0	750	675	1425	301.2	9,555	9,856	14,581
2010	0	0	150	150	0	750	675	1425	301.2	9,603	9,904	14,653
2011	0	0	150	150	0	750	675	1425	301.2	9,651	9,952	14,727
2012	0	0	150	150	0	750	675	1425	301.2	9,699	10,000	14,800
2013	0	0	150	150	0	750	675	1425	301.2	9,748	10,049	14,874
2014	0	0	150	150	0	750	675	1425	301.2	9,796	10,098	14,949
2015	0	0	150	150	0	750	675	1425	301.2	9,845	10,147	15,023
2016	0	0	150	150	0	750	675	1425	301.2	9,895	10,196	15,099
2017	0	0	150	150	0	750	675	1425	301.2	9,944	10,245	15,174
2018	0	0	150	150	0	750	675	1425	301.2	9,994	10,295	15,250
2019	0	0	150	150	0	750	675	1425	301.2	10,044	10,345	15,326
2020	0	0	150	150	0	750	675	1425	301.2	10,094	10,395	15,403
2021	0	0	150	150	0	750	675	1425	301.2	10,144	10,446	15,480
2022	0	0	150	150	0	750	675	1425	301.2	10,195	10,496	15,557
2023	0	0	150	150	0	750	675	1425	301.2	10,246	10,547	15,635
2024	0	0	150	150	0	750	675	1425	301.2	10,297	10,599	15,713
2025	0	0	150	150	0	750	675	1425	301.2	10,349	10,650	15,792

LOW CASE

HISTU5.WK4

FIGURE. 10.



HISTU3.WK4

displays the DOT projections of employment and population while Figure 11. shows the employment projections we use in this study.

TABLE 13. KETCHIKAN WAGE AND SALARY EMPLOYMENT PROJECTIONS FROM ISER MAP MODEL (THOUSAND)			
	low	base	high
1996	7.9	7.9	7.9
1997	7.6	7.6	7.7
1998	7.2	7.3	7.4
1999	7.1	7.5	7.6
2000	7.1	7.6	7.7
2005	7.3	7.8	8.4
2010	7.4	8.3	10.2
2015	7.6	8.9	11.3
2020	7.9	9.6	12.8
2025	7.8	10.3	14.5

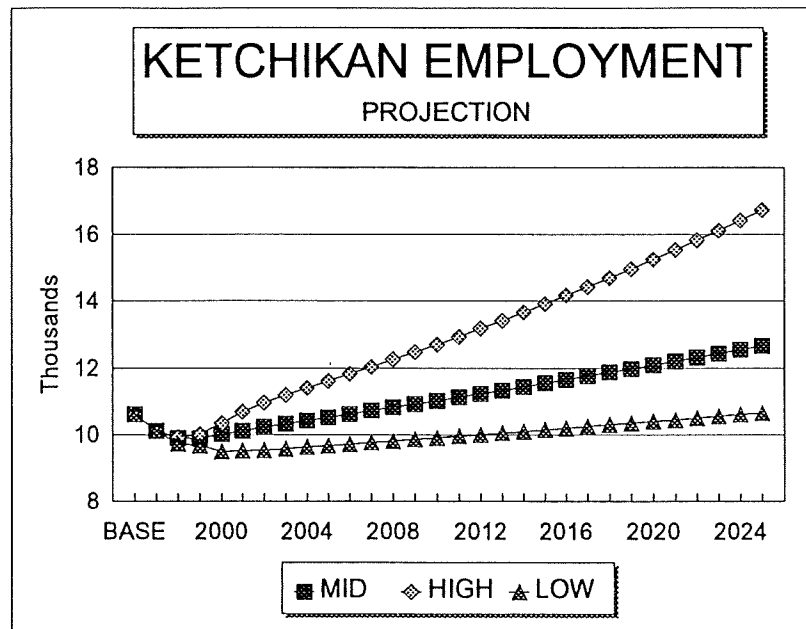
3.e. Time Profile of Employment

Growth in the non-timber economy will eventually offset the employment decline associated with the reduction in the scale of the timber sector. The pattern of total employment will depend upon the magnitude of the reduction of the timber sector and the rate of growth of the non-timber sector. The near term total employment pattern for each projection is shown in Figure 12.

Using the assumptions of our **BASE CASE** the number jobs in the Ketchikan economy bottoms out in 1999. In that year the index of total employment, using 1996 as the base of 100, is 93.2. This represents a decline of about 700 total jobs. Subsequent modest recovery of the timber economy combined with 1 percent annual growth of the non-timber sector results in a return to the 1996 level of employment by 2006. From that time the annual growth rate of employment is just under 1 percent, closely following the growth rate of the non-timber sector. This is shown in Table 10.

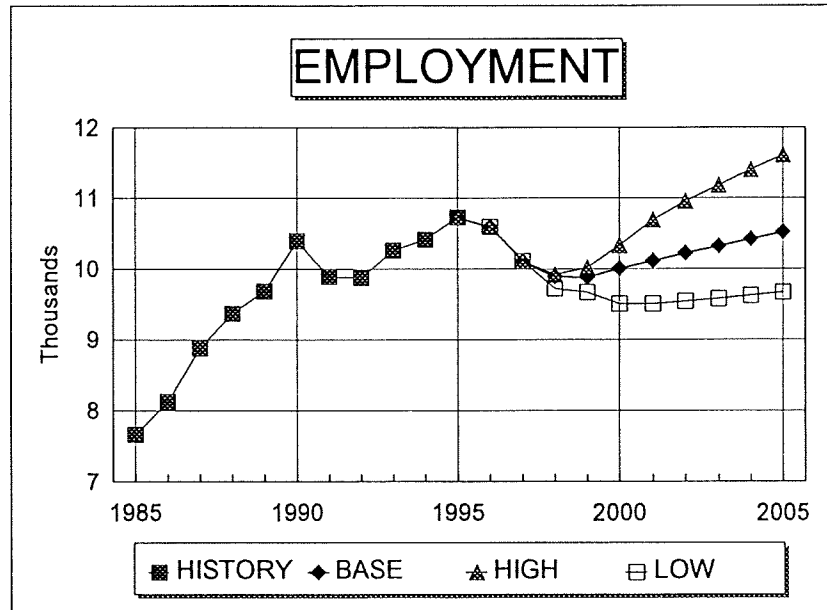
In the **HIGH CASE** the number of jobs in the Ketchikan economy bottoms out in 1998. In that year the index of total employment, using 1996 as the base of 100, is 93.6. This represents a decline of a little less than 700 total jobs. Subsequent recovery of the timber

FIGURE 11.



HISTU3.WK4

FIGURE 12.



HISTU3.WK4

economy combined with 2 percent annual growth of the non-timber sector results in a rapid return to the 1996 level of employment by 2001. From that time the annual growth rate of employment is just under 2 percent, closely following the growth rate of the non-timber sector. (Table 11.)

Using the assumptions of our **LOW CASE** the number jobs in the Ketchikan economy does not bottom out until 2000. In that year the index of total employment, using 1996 as the base of 100, is 89.7. This represents a decline of about 1,100 total jobs. The subsequent modest growth of the non-timber sector (.5 percent annually) does not return employment to the 1996 level until 2024 in this case. (Table 12.)

3.f. Projected Population

Through the 1980's Ketchikan population grew more slowly than employment but since about 1990 the rates of change have been approximately the same. We assume that population growth in the future will be slightly more rapid than employment growth. This reflects the assumption that the population will continue to age. The labor force participation rate of older Alaskans is less than that of younger Alaskans, and the retiree population is expected to continue to increase as a share of the total.

For simplicity we assume that when employment is growing, the population growth rate will be equal to the non-timber dependent employment growth rate. Thus in the **BASE CASE** the population growth rate is 1 percent annually. In the low case it is .5 percent and in the high case it is 2 percent. The population projections for each case are included in Tables 10. through 12.

When projected employment is declining we assume that population will also decline, but at a slower rate than employment. This reflects the fact that out migration is not the only way for the labor market to clear. Part of the excess labor supply may be eliminated by an increase in the unemployment rate or a reduction in the labor force participation rate. We assume that when the number of jobs is declining, the decline in population will occur at half the rate of employment decline.

These assumptions result in population projections somewhat lower than our most recent set of state and regional economic projections done for the State of Alaska Department of Transportation using the ISER MAP Model of Alaska (Alaska's Economy and Population, 1959-2020, March 1996). This is consistent with the fact that the MAP projections are based on the assumption of relatively constant employment in timber harvesting and sawmills compared to the more recent assumptions of significant decline in this sector. The MAP projections are shown in Table 14.

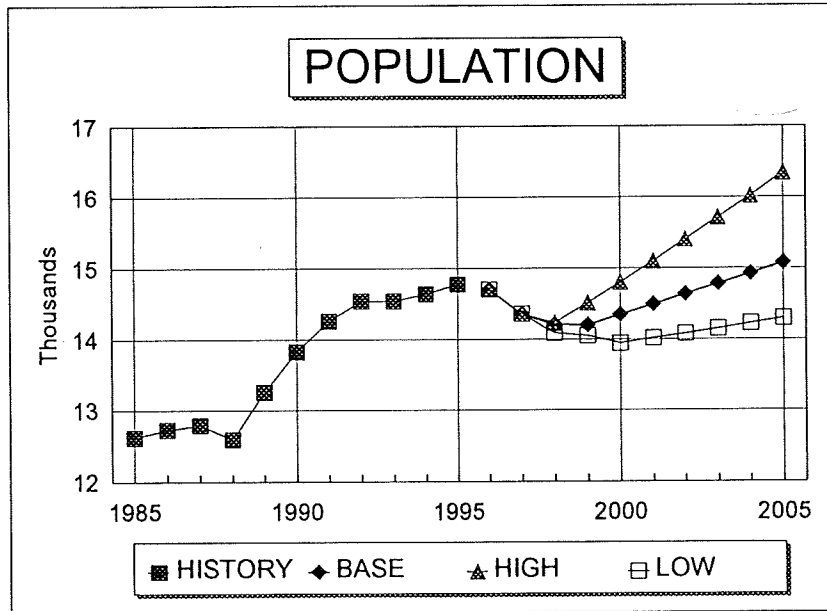
TABLE 14. KETCHIKAN POPULATION PROJECTIONS FROM THE ISER MAP MODEL (THOUSAND)			
	low	base	high
1996	15.4	15.4	15.4
1997	15	15	15
1998	14.5	14.6	14.6
1999	14.3	14.8	14.8
2000	14.4	15.1	15.2
2005	14.9	15.9	16.9
2010	15.5	17.1	20.4
2015	16.2	18.6	22.9
2020	16.8	20.1	25.8
2025	17.1	21.6	29

The time pattern of population in the near term using these assumptions is shown in Figure 13. Using the assumptions of our **BASE CASE** the Ketchikan population bottoms out in 1999. In that year the index of total population, using 1996 as the base of 100, is 96.6. This represents a decline of about 500 people. Subsequent modest recovery of the timber economy combined with 1 percent annual growth of the non-timber sector results in a return to the 1996 level of population by 2003. From that time the annual growth rate of population is just under 1 percent, closely following the growth rate of non-timber sector employment.

Using the assumptions of our **HIGH CASE** the Ketchikan population bottoms out in 1998. In that year the index of total population, using 1996 as the base of 100, is 96.8. This represents a decline of about 500 people. Subsequent modest recovery of the timber economy combined with 2 percent annual growth of the non-timber sector results in a return to the 1996 level of population by 2000. From that time the annual growth rate of population is just under 2 percent, closely following the growth rate of non-timber sector employment.

Using the assumptions of our **LOW CASE** the Ketchikan population bottoms out in 2000. In that year the index of total population, using 1996 as the base of 100, is 94.8. This represents a decline of about 700 people. The slow (.5 percent) annual growth of the non-timber sector results in a return to the 1996 level of population by 2011. From that time the annual growth rate of population is just under .5 percent, closely following the growth rate of non-timber sector employment.

FIGURE 13.



HISTU3.WK4

3.g. Comparison with Sitka and South central Alaska

The closure of the pulp mill in Sitka in 1993 caused an economic shock to that community similar in magnitude to the closure of the Ketchikan pulp mill. Manufacturing employment, which includes the pulp mill and logging, fell by 400 from more than 700 in the early 1990's to about 300 after the closure. Total employment fell by about 400 from 1993 to 1994, but subsequently stabilized and began to increase. Population fell about 400 between 1992 and 1996. The pattern of change for these variables, using an index of 1993 = 100 is shown in Figure 14. The preliminary evidence from 1997 is consistent with this pattern of slow recovery. Figure 15 shows the number of persons employed in Sitka households by month through the fall of 1997. By this measure employment is higher in 1997 than in 1993.

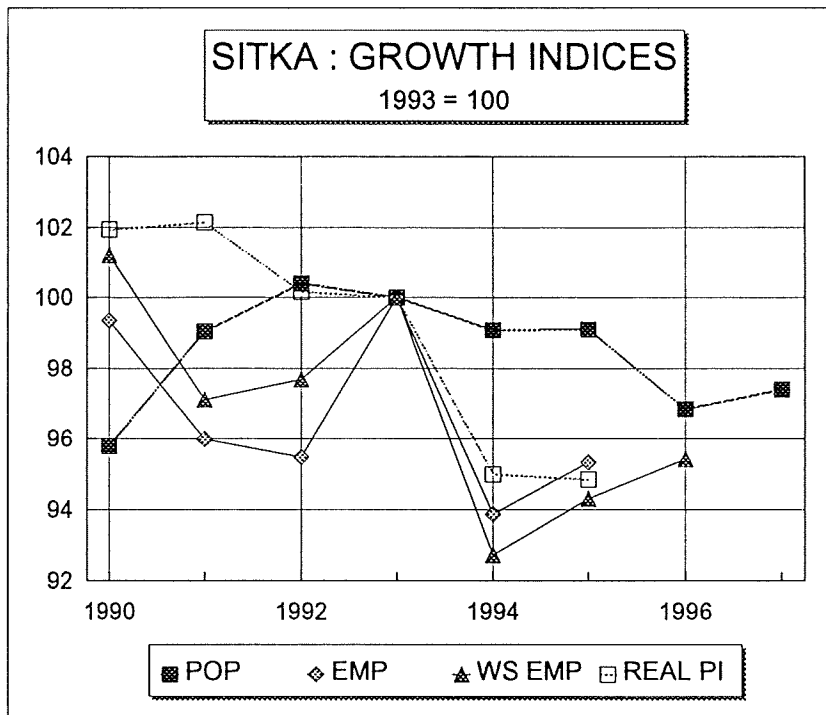
Growth in other sectors of the Sitka economy cushioned the shock from the pulp mill closure. Figure 16. presents the index of employment (1993 =100) for aggregations of all the categories of wage and salary employment of the Sitka economy except manufacturing. Services employment has continued to grow and was 20 percent above the 1993 level by 1996. Trade has remained fairly constant while infrastructure has declined about 5 percent. State and local government is at the same level in 1996 as 1993. Federal employment has declined by the largest amount. Proprietor employment has changed very little.

The strength of the trade and service sectors of the Sitka economy can be traced to at least 3 factors. The first is the general trend in the US economy toward a higher proportion of service jobs. The second is the continued growth of tourism which is primarily reflected in trade and service employment (as well as infrastructure and proprietors). The third is the threshold effect.

Once a certain level of demand or purchasing power has been reached in a community there exists an opportunity for new businesses to become established. The decision to invest depends upon the business being able to cover all of its costs, both fixed and variable, as well as return a profit. However when demand or purchasing power in the community declines the decision of a business to continue operations in the short run depends only on the variable costs. As long as the business is covering its variable costs and paying some portion of its fixed costs, which it is required to pay whether or not it continues to operate, it is likely to continue in business. Consequently the level of demand or purchasing power required to maintain a particular level of support employment will be less than the level of demand necessary to reach that level of support employment.

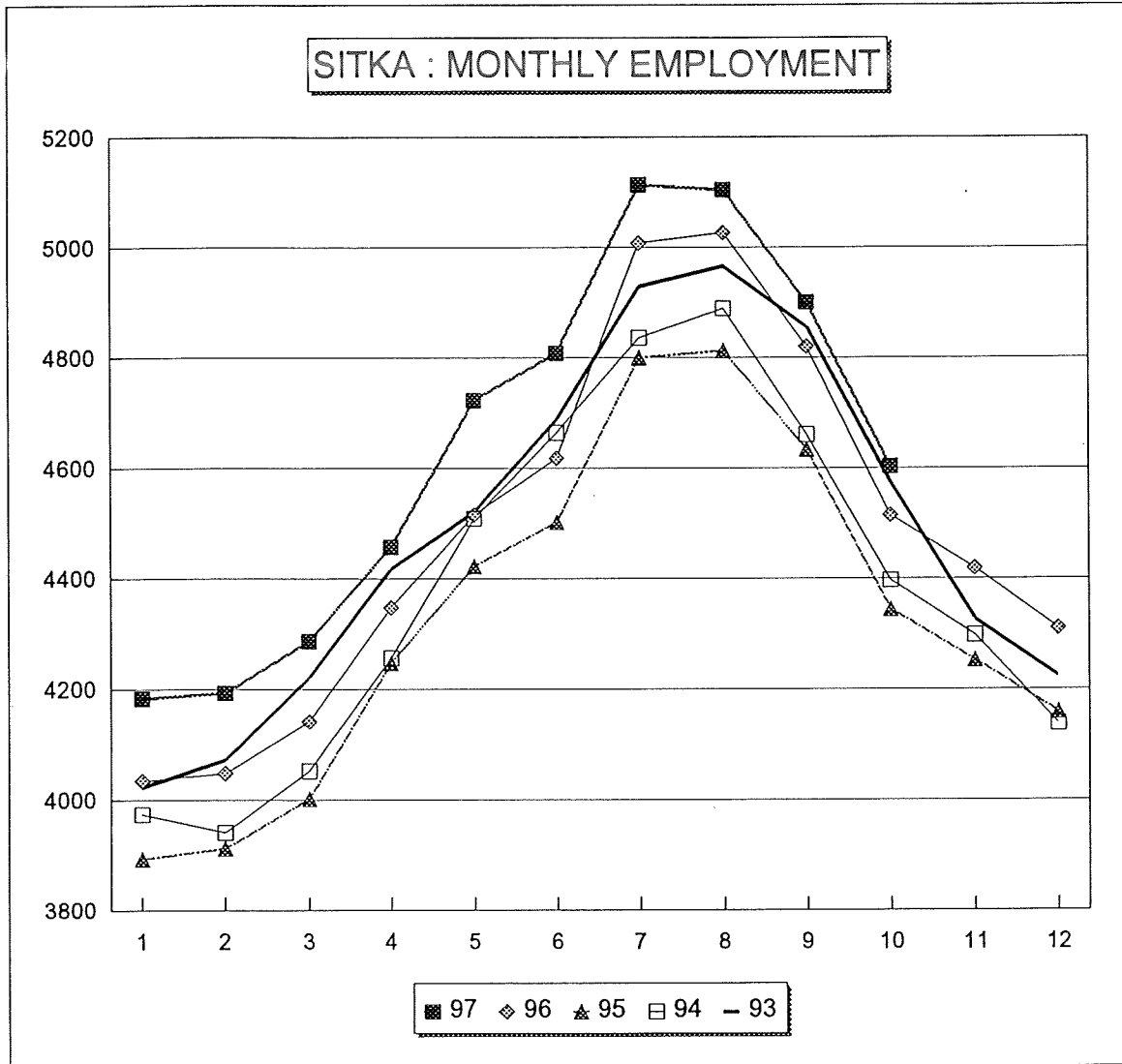
These are several reasons to believe that the support employment and population response to the closure of the Ketchikan pulp mill would be similar in pattern and relative magnitude to the response in Sitka. First, the share of total employment attributable to the mill in each case is comparable. Second, the composition of the population in each community is similar (Figure 17.) Third in both cases a portion of trade and service employment is dependent upon tourism and is therefore insulated from changes in activity in other Basic sectors. Fourth, both have other non-wage sources of purchasing power that support trade and service jobs. In the case of Ketchikan, it is the outlying communities in the Prince of Wales-Outer Ketchikan Census Area. In the case of Sitka it is the large share of total income that comes from non-wage sources. In

FIGURE 14.



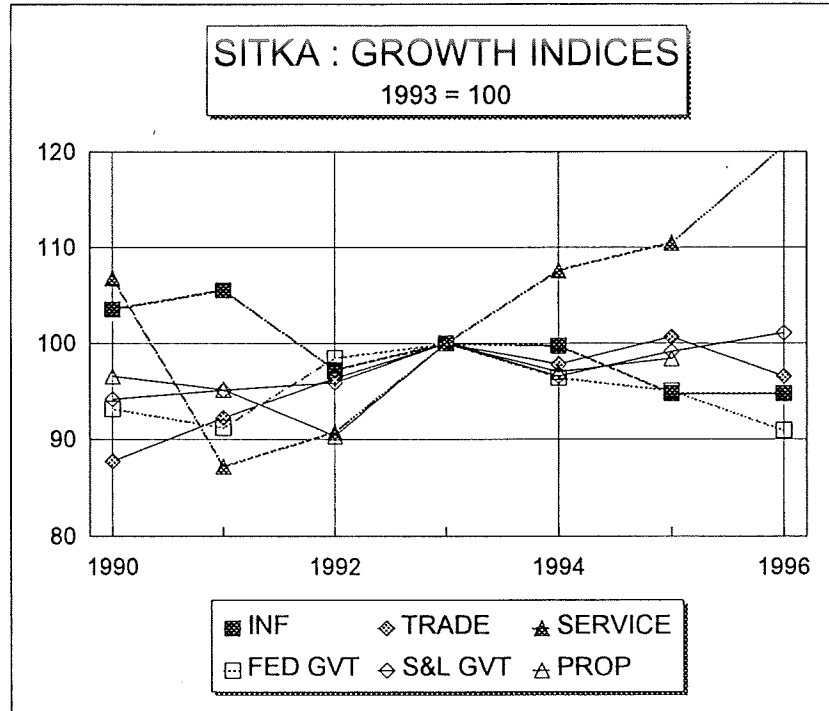
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FIGURE 15.



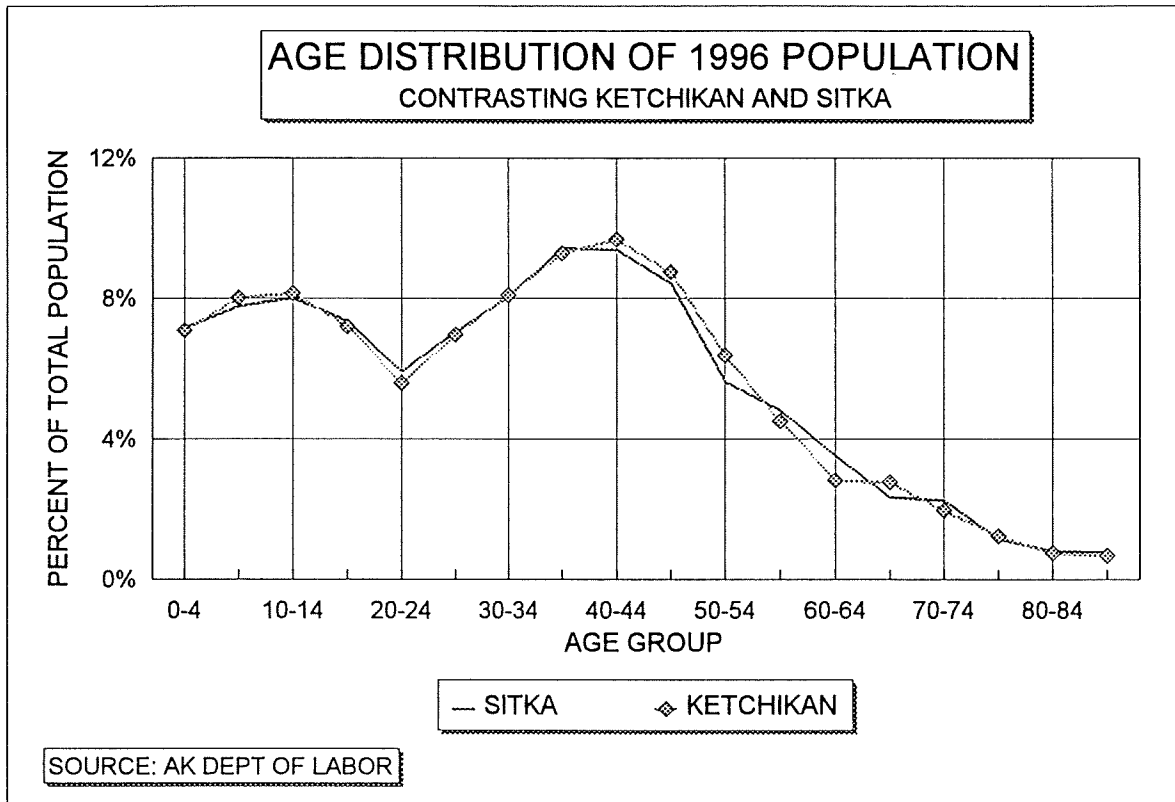
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FIGURE 16.



EMPKET2.WK4

FIGURE 17.



Ketchikan in 1995, 27 percent of personal income came from dividends-interest-rent and transfers while in Sitka it was 35 percent. (This compares to 29 percent for the state as a whole.)

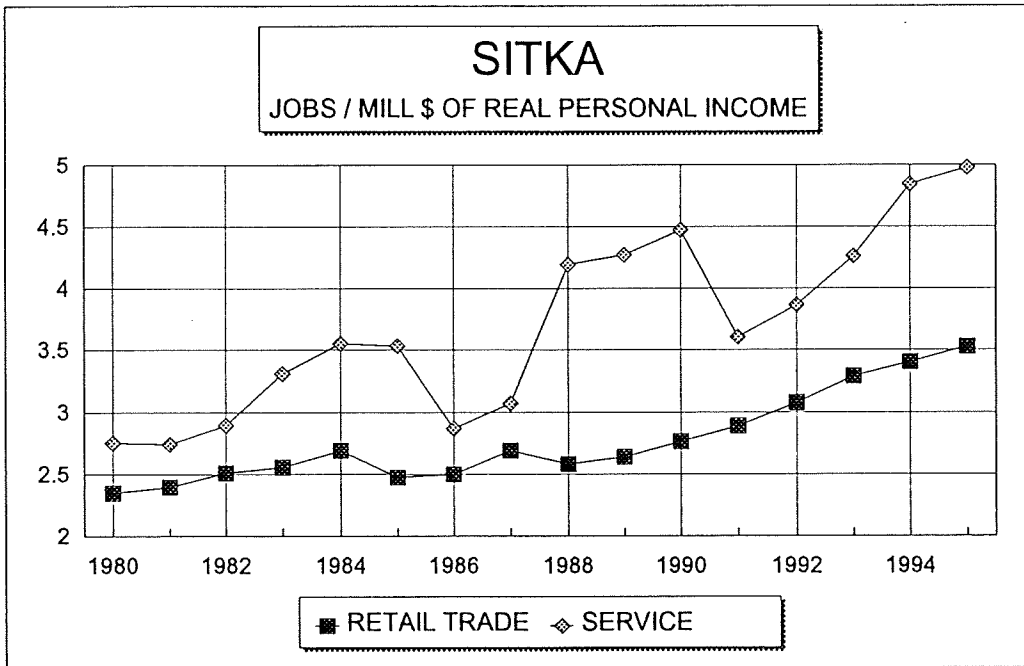
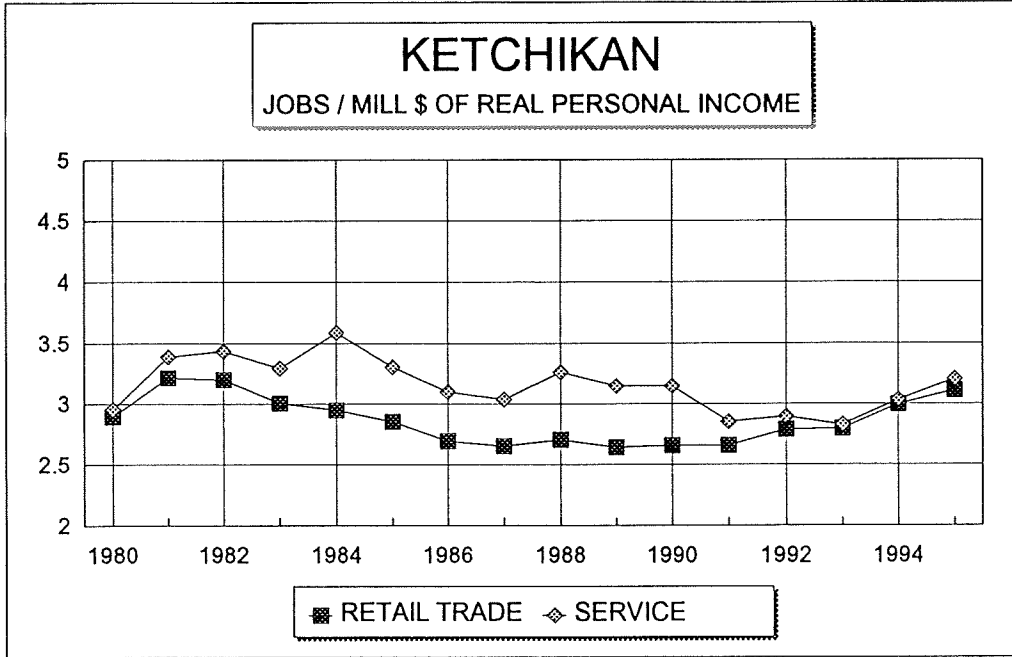
One factor that suggests the negative support employment response in Ketchikan to mill closure might be less than in Sitka is that Ketchikan may be somewhat under served as measured by the ratio of support employment to real personal income. The number of jobs in retail trade and services in Ketchikan and Sitka per million dollars of real personal income is shown in Figure 18. Whereas there has been a gradual increase in the number of support jobs for each \$1 million of personal income in Sitka since 1980, there has been little net change in Ketchikan over the same period. For example by 1995 there were 5 service jobs in Sitka for every \$1 million of personal income, while in Ketchikan there were only 3. By this crude measure and using Sitka as the base, the Ketchikan economy had a deficit of about 800 jobs. (The statewide average for 1995 was 4.1 service jobs per \$1 million of personal income.) If Ketchikan were under served relative to Sitka or the state then it is less likely that a reduction in timber sector employment and income would have as large a negative effect on support employment as was the case in Sitka.

As discussed above there are a number of possible reasons to explain why the support sector might be under represented in Ketchikan. One possible reason for the absence of support sector expansion in Ketchikan since the 1980's could be a combination of the cyclical nature of the growth--mostly driven by timber and seafood--and a high share of non-Alaska resident employment in the impacted industries. These factors may have led investors to be particularly cautious about the prospects for investments to expand trade and service businesses in the community.

South central Alaska in the later half of the 1980's provides another example of the pattern of employment and population response to a negative economic shock. The shock that struck the state economy in 1995 in response to the slowdown in state spending was felt particularly hard in South central Alaska. One important indicator of the magnitude of the downward shock was the drop in construction employment in Anchorage shown in Figure 19. which was primarily dependent on the spending of petroleum revenues by state government. The share of total jobs lost to the Anchorage economy as a result of this drop is similar in magnitude to the share of total jobs lost to the Ketchikan economy from the closure of the pulp mill. (The drop in construction employment happened over a period of several years rather than all at once.)

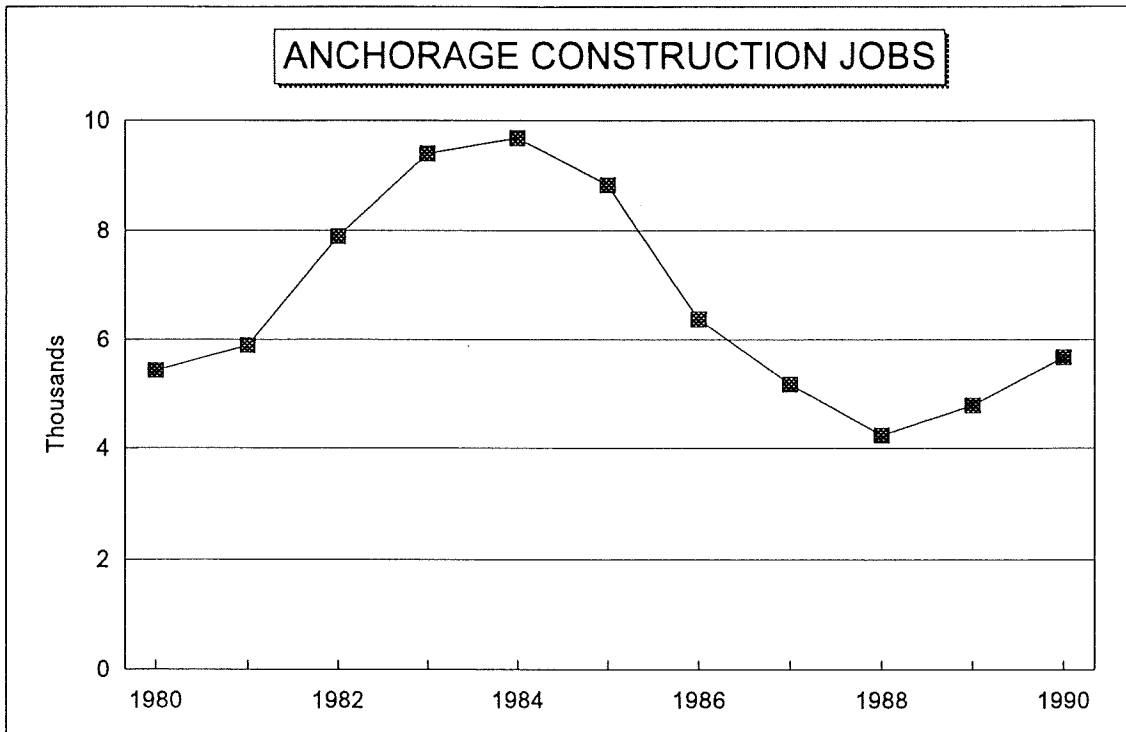
The pattern of response of total employment and population in Anchorage to this economic shock is shown in Figure 20. Using 1995 as a base for indices of employment and population, we see that total employment fell 10 percent over a period of three years but had recovered the 1985 level by 1991. This recovery was assisted and accelerated by the Exxon Valdez oil spill cleanup effort. Population eventually fell by 5 percent from its peak in 1986. It also had recovered its former level by 1991.

FIGURE 18.



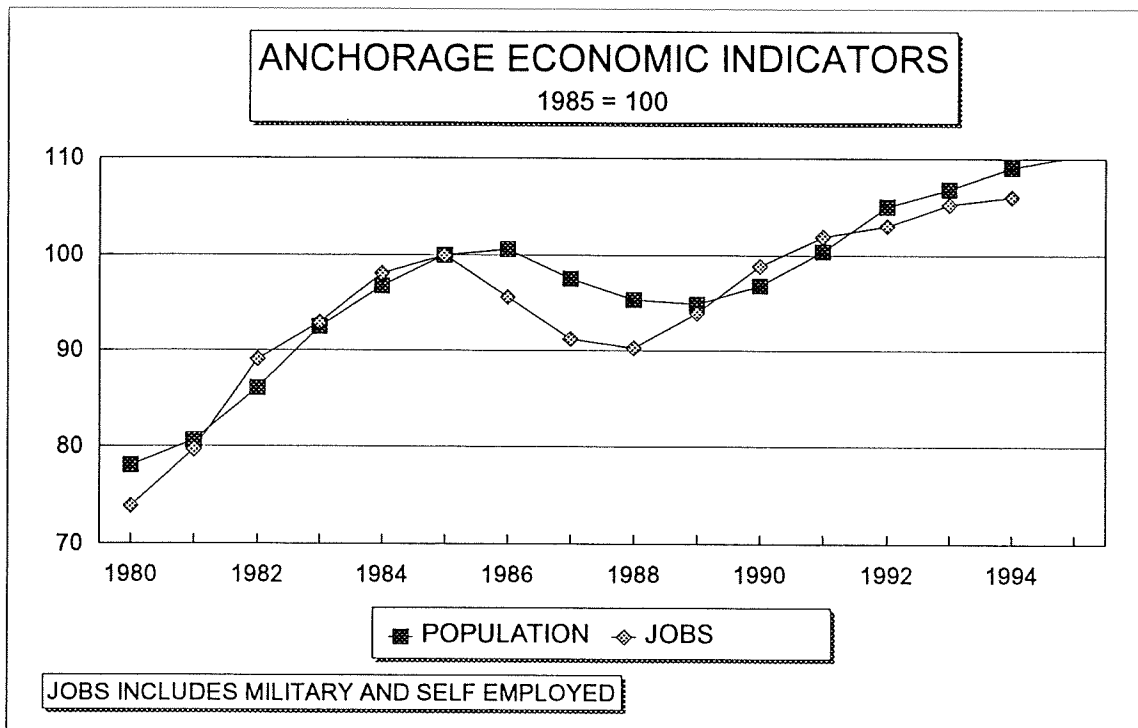
EMPKET2.WK4

FIGURE 19.



HISTU3.WK4

FIGURE 20.



HISTU3.WK4

4. HISTORICAL REVIEW OF KETCHIKAN ELECTRICITY REQUIREMENTS

4.a. Residential Electric Sales

Residential electric sales have risen steadily over time with growth of Ketchikan population and personal income, albeit at a declining rate. The long term upward trend is shown in Figure 21. as well as the annual rate of change in sales. The annual growth rates for 10 year intervals have been as shown in Table 15.

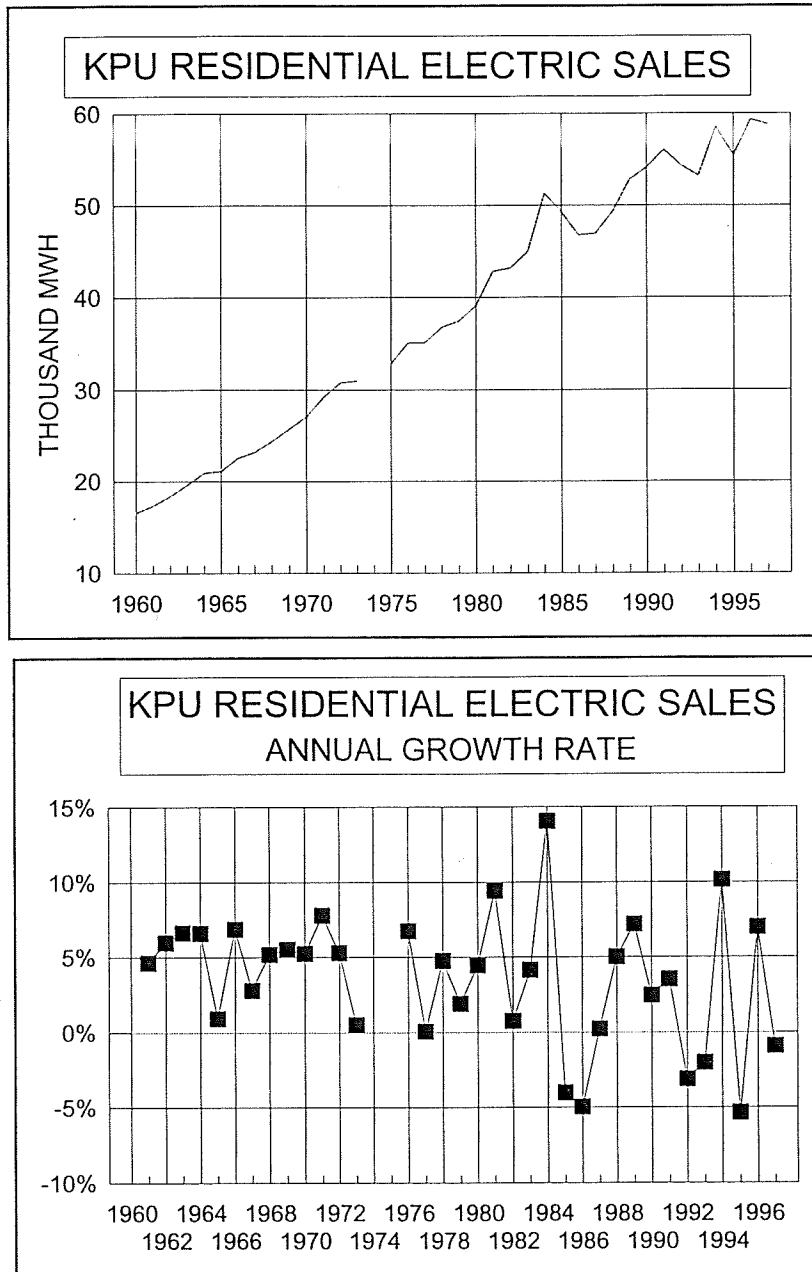
TABLE 15. KETCHIKAN RESIDENTIAL ELECTRICITY SALES--GROWTH RATES (ANNUAL)			
	sales	customers	sales/customer
1960-1970	5 %	1.7 %	3.3 %
1970-1980	3.7 %	3.8 %	-.1 %
1980-1990	3.3 %	1.4 %	1.8 %
1990-1995	.5 %	1.3 %	-.8 %

Growth has been positive with the exception of two years in the mid 1980' and three of the last four years. The annual change has become more volatile over time so that the years of negative growth have been largely offset by years when sales increased by particularly large amounts.

Growth in the number of customers has accounted for the larger share of growth in sales over time except for the early years. As shown in Figure 22. growth in the number of customers was particularly strong in the 1980's, averaging 3.8 percent annually. The rate has since dropped in half to about 1.4 percent annually. In only 3 years since the early 1960' has the annual change been negative, most recently in 1988. The largest annual decline since 1960 has been about 2 percent.

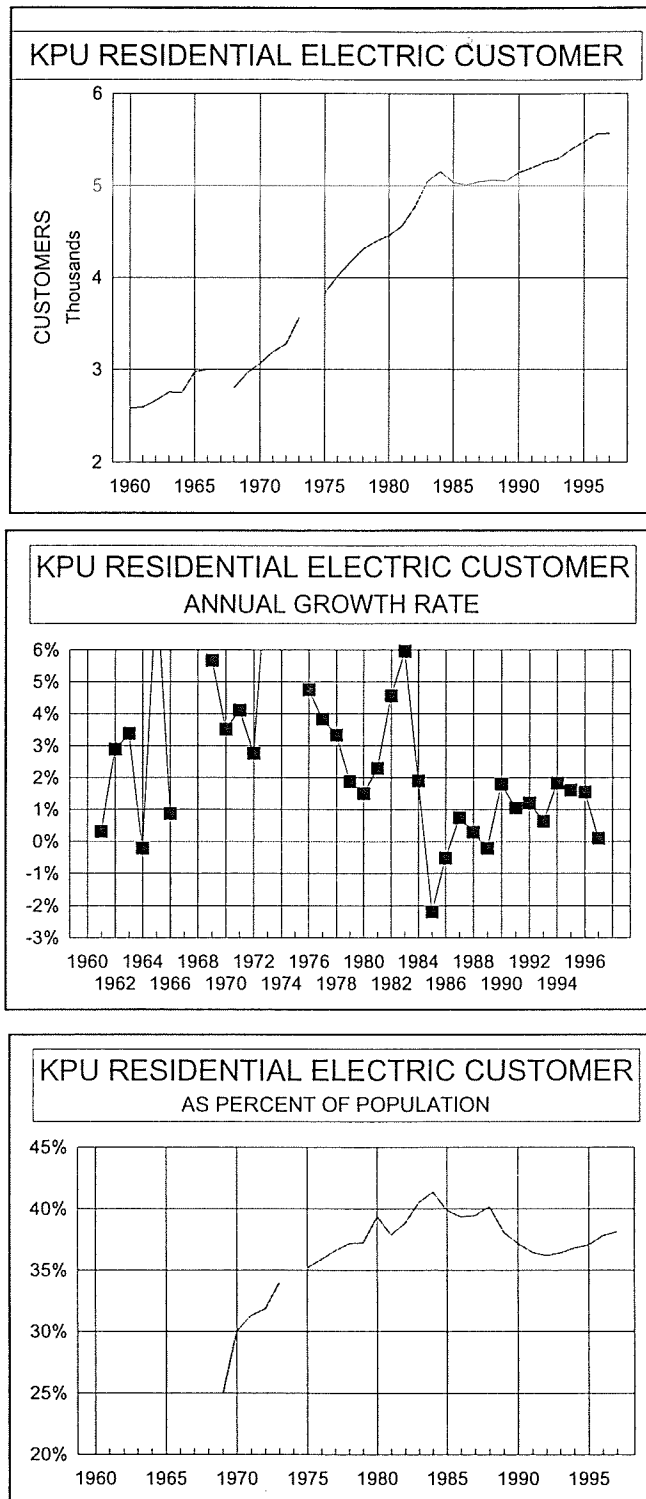
The ratio of Ketchikan Public Utility residential electric customers to the population in the Ketchikan Gateway Borough increased steadily during the 1970's and up until 1984. It subsequently declined slightly and now appears to have stabilized at about .37. The growth in this ratio can be attributed to a combination of extension of the service territory of the utility which has given a larger portion of the Borough population access to utility electricity, and a declining trend in average household size over time. The average household size in Ketchikan was 3.26 in 1970, 2.76 in 1980, and 2.7 in 1990. At the present time access to utility electricity extends to most of the population of the Borough and average household size is unlikely to continue trending downward. Thus we would expect the ratio of customers to population to remain at approximately .37 unless the service territory were to expand beyond the current Borough boundary.

FIGURE 21.



HISTU5.WK4

FIGURE 22.



Annual residential electric sales per customer increased rapidly during the 1960's from about 6,500 to 9,000 kwh. (Figure 23.) Since then growth has continued but at a slower rate. In the last 5 years annual sales per customer has fluctuated between 10,000 and 11,000 kwh. The change in residential sales per customer is more volatile from year to year than the change in customers because sales per customer is somewhat dependent upon the weather. This is particularly true for the portion of the load that is electric space heating.

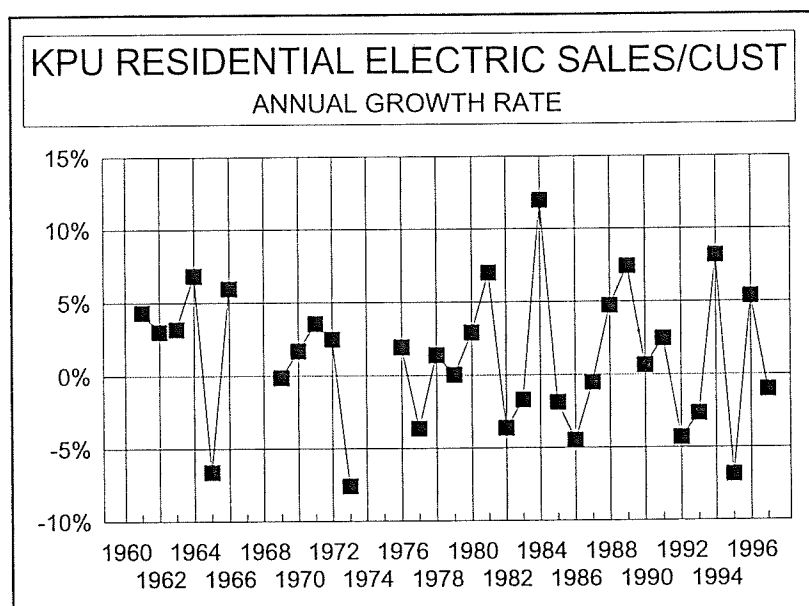
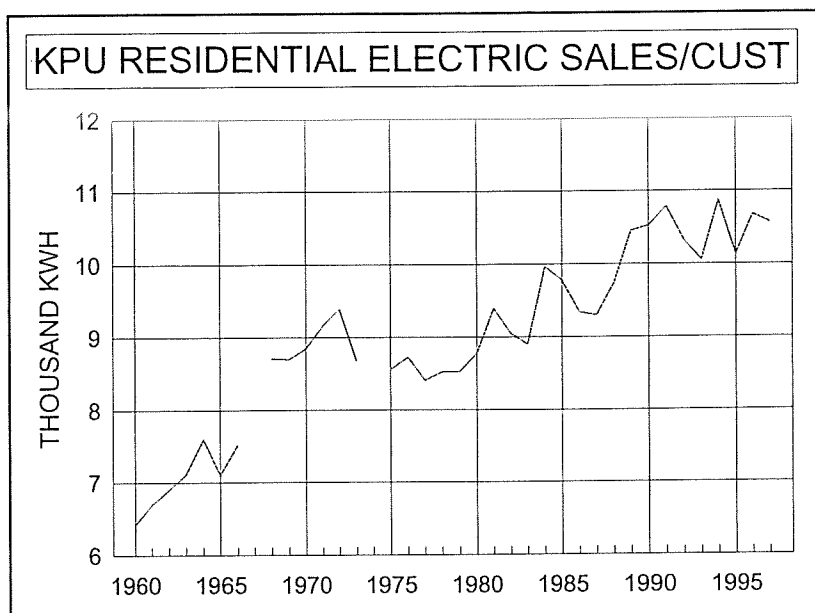
The share of the Ketchikan Borough housing stock which heated with electricity was 4 percent in 1970 and 5 percent in 1980. However by 1990 it was reported by the US Census to be 15 percent, or 754 units. This would account both for some of the growth in sales per customer since 1980 and the increase in volatility of sales per customer.

The presence of electric space heating is also confirmed by the fact that monthly residential sales are sensitive to fluctuations in the number of heating degree days (HDD). Using data from 1994 through 1996 we found that an increase of HDD of 100 in a month would increase residential sales by 255 MWH. In 1994 about 31 percent of sales were accounted for by HDD and although use of other appliances is also sensitive to temperature, this finding is consistent with the information from the Census about the presence of a significant amount of electric space heating among Ketchikan electric utility customers.

Residential electricity sales per customer in 3 other utilities are contrasted with Ketchikan in Figure 24. Sitka has considerable higher sales per customer while those of Petersburg have historically been less than Ketchikan. In both cases however there appears to be a stronger positive trend in sales. In contrast the average Chugach Electric customer has annual sales below that of Ketchikan.

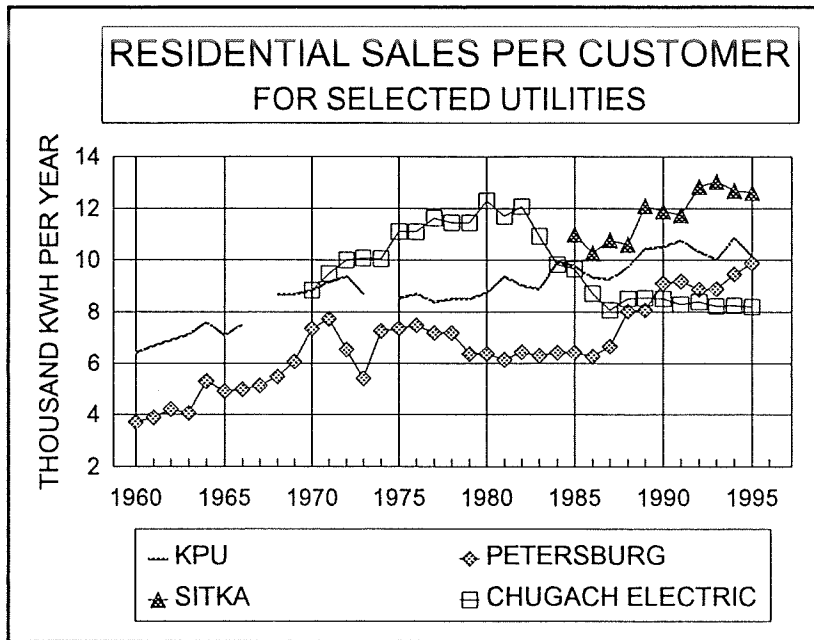
Much of this difference is probably attributable to differences in the share of electric space heating in the respective service territories. Table 16. shows the trends in the share of space heating that is electric in these and other communities. Those Southeast Alaska communities with access to electricity from hydro power have exhibited a positive trend in the share of space heating that is electric. The share in Sitka is above, and the share in Wrangell-Petersburg below Ketchikan which is consistent with their differences in annual sales per customer.

FIGURE 23.



HISTU5.WK4

FIGURE 24.



HISTU3.WK4

TABLE 16. PERCENT OF HOUSING STOCK HEATING WITH ELECTRICITY			
CENSUS AREA	1970	1980	1990
KETCHIKAN	4%	5%	15%
SITKA	0%	6%	25%
JUNEAU	1%	8%	30%
WRANGELL-PETERSBURG	3%	2%	8%
PRINCE OF WALES	0%	9%	11%
SKAGWAY-Y-A	4%	2%	6%
HAINES	0%	2%	3%
ANCHORAGE	6%	18%	14%
MATSU	1%	33%	12%

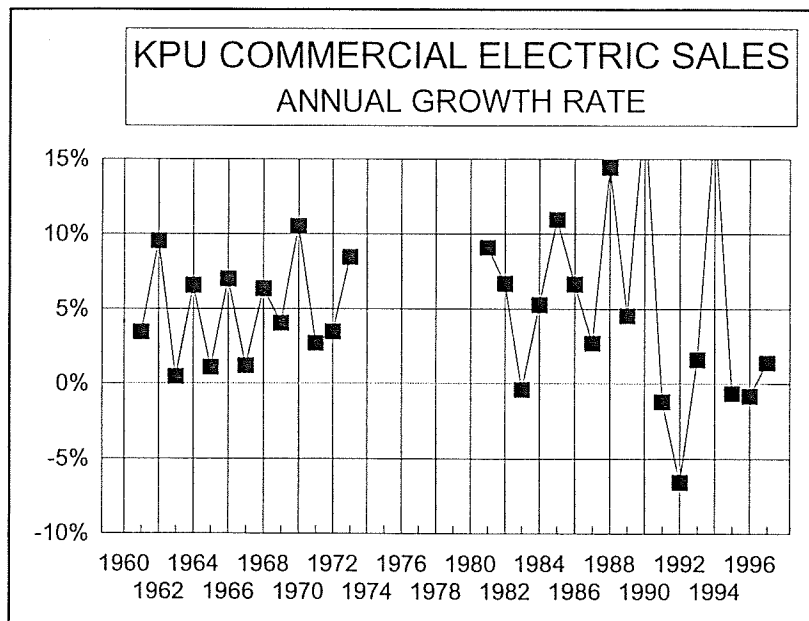
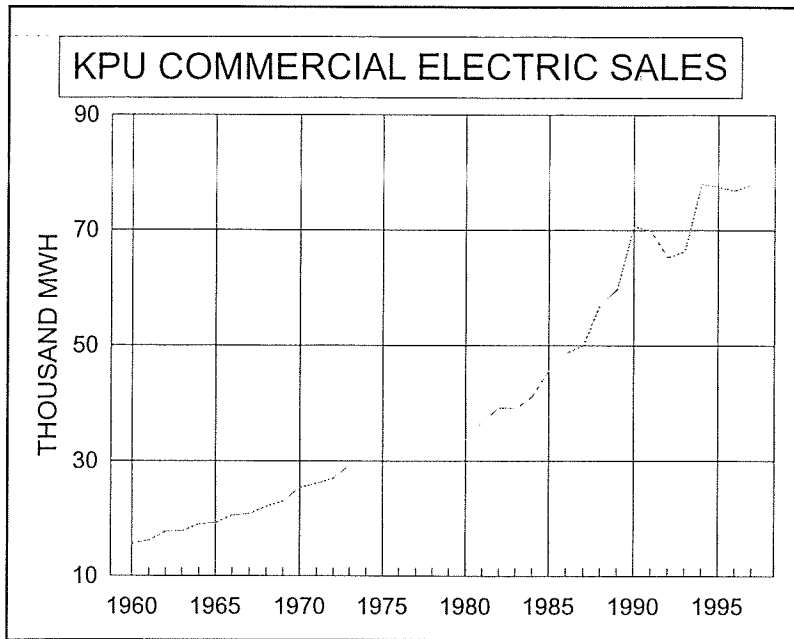
4.b. Commercial Electric Sales

This category includes small commercial, large commercial, and industrial sales as reported in the monthly revenue report of Ketchikan Public Utility. It is equivalent to the Commercial category reported by the Alaska Power Authority.

Commercial electric sales have risen rapidly over time with the growth in economic activity in the region. The long term upward trend is shown in Figure 25. as well as the annual rate of change in sales. The annual growth rates for 10 year intervals are shown in Table 17.

TABLE 17. KETCHIKAN COMMERCIAL ELECTRICITY SALES-- INDICATOR GROWTH RATES			
	sales	customers	sales/customer
1960-1970	5 %	na	na
1970-1980	2.9 %	.9 %	2.0 %
1980-1990	7.7 %	5.1 %	2.5 %
1990-1995	1.8 %	-1.2 %	3.1 %

FIGURE 25.



HISTU5.WK4

Like residential sales, commercial sales growth has been positive with the exception of one year in the mid 1980' and three of the last four years. The annual change has become more volatile over time so that the years of negative growth have been largely offset by years when sales increased by particularly large amounts.

Growth in the number of customers has accounted for the larger share of growth in sales in recent years. As shown in Table 17. and Figure 26. growth in the number of customers was particularly strong in the 1980's, averaging 5.1 percent annually. Since 1990 there has been a slight decline in the number of commercial customers.

The ratio of KPU commercial electric customers to employment in the Ketchikan Gateway Borough has fluctuated between .09 and .13 since 1980. Most recently it has been at the lower end of that range. The more rapid growth in customers compared to jobs in the mid 1980's may be attributable to rapid economic growth and the associated growth in the number of small firms.

Annual commercial electric sales per customer have been steadily increasing since at least 1970 from about 43,000 to about 80,000 kwh. (Figure 27.) Sales per customer have fluctuated substantially from year to year, possibly partially in response to annual fluctuations in weather patterns.

4.c. Total Electric Sales

Total electric sales is the sum of residential, commercial, and a small amount of other sales. In recent years the Other Sales category has been in the range of about 2 thousand MWH, or less than 2 percent of total sales. (Other sales as reported to the Alaska Power Authority in most years has been approximately equal to Harbor Electric Sales reported on the KPU monthly revenue report.) Growth in total sales has been strong, particularly in the 1980's as reflected in the annual growth rates of total sales reported in Table 18.

TABLE 18. TOTAL KETCHIKAN ELECTRICITY SALES ANNUAL GROWTH RATE	
1960-1970	5.1 %
1970-1980	2.9 %
1980-1990	5.8 %
1990-1995	1.3 %

Figure 28. shows the relative size of each component of electric sales as well as the trend in growth in each component. Since the mid 1980's commercial sales has been increasing more rapidly than residential sales, and commercial sales now constitutes a larger share of total sales than residential. Figure 29. contrasts the number of residential and commercial customers as well as the sales per customer in the two classes.