OIL PIPELINE DISASTER IMPACTS

A Working Paper

Michael J. SCOTT
Assistant Professor of Economics

Institute of Social and Economic Research
Anchorage Fairbanks Juneau

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Introduction

This paper discusses the impact on the Alaska state economy when several "disasters" of varying plausibility appear in the trans-Alaska oil pipeline project, now nearing completion. It should be emphasized at the outset that the events described as the basis for the scenarios are highly unlikely events. Therefore, this paper might be described as a study of whether "insurance" in the form of compensating state policies is necessary, assuming that the events described actually take place.

Methodology

The Man-in-the-Arctic Program statewide econometric model (STMOD) and the MAP SCENARIO model were used to generate the results reported in this paper. The assumptions used in the MAP petroleum scenarios, which describe the timing and the intensity of Alaskan petroleum development, the price of oil, taxes and royalty rates applicable, employment, and level of production by field and year are fed into the SCENARIO model, which is described in an appendix to this paper. The SCENARIO model, when simulated, generates the exogenous petroleum-related data necessary to run STMOD: bonus revenues, state recurrent revenues (taxes plus royalty payments), exogenous mining (oil and gas: SIC code 13) and exogenous construction employment. The SCENARIO model was designed to facilitate experimentation with the timing and intensity of petroleum development in Alaska, and to make the time-consuming calculations necessary to generate the data series required to run STMOD and REGMOD (the MAP regional model).

The basic run for this paper was the so-called Accelerated Development scenario, with oil selling at $7 per barrel at the well-head. This includes existing petroleum development, plus the federal lands in the Western and Eastern Gulf of Alaska, Lower Cook Inlet, NPR4, and areas on state and Native lands adjacent to these areas. In addition, it includes a second oil pipeline, a trans-Canada gas pipeline, and at least two gas liquefaction plants on the Gulf coast. The base case was then modified by several changes in assumptions, the SCENARIO model was re-simulated to generate new exogenous data for STMOD, and the new STMOD run was compared to the base case, with the differences in the various variables calculated as impacts of the "disaster" behind the change in assumptions.

The Disaster Scenarios

A series of four "disasters" of differing types and intensity was run through SCENARIO and STMOD. The first was called WELD, since the hypothesis behind it is that the pipeline weld controversy currently extant, combined with certain recurring problems such as the Tonsina River crossing (requiring reburial of pipe) will result in a one-year delay in pipeline completion date to July, 1978, but will not affect other projects under consideration. This is probably an overstatement of the time required to make all repairs, which is not expected to delay the startup date more than a few weeks at the outside, as this is written.

The second disaster assumed to befall the line is called BUST, and it derives its name from the assumption of a catastrophic 8.8 Richter earthquake in the Valdez area, which destroys several Valdez storage tanks and breaks the pipeline in several places in the passes north of Valdez, in spite of construction precautions, and generates an unprecedented tsunami which wipes out the Valdez terminal area. Due to continuing reconstruction requirements north of the Yukon, and the necessary reconstruction at and near Valdez, the pipeline is closed for two years while repairs involving 8,000 construction employees take place. The disaster in this admittedly improbable scenario is assumed not to affect other concurrent or subsequent oil and gas development in Alaska.

In the third scenario, called SUPERBUST, the same disaster occurs as in BUST, but in addition, environmental and licensing authorities stop all leasing on Alaskan lands between 1978 and 1980, which results in up to two years of delay in some fields' being brought into production. The two years are used for intensive seismic review of all producing and potential producing areas and existing environmental guidelines. Existing producing areas are allowed to continue production, if able to do so, but no North Slope oil reaches the market for nearly two years.

In the fourth and final scenario, designated LOWPROD, difficulties in marketing North Slope oil because of a combination of requirements to market only in the U.S., a continuing PAD5 oil surplus, and difficulties in getting a pipeline built from the West Coast inland, leave the producers at Prudhoe Bay no choice but to lower their ultimate target production from 1.75 down to 1.2 million barrels per day, and to reduce the pace at which they proceed to achieve that production. This may be the likeliest "disaster" of all; which may be disturbing, since it also has the largest negative impact on Alaskan growth over the long run.

Simulation Results

The results of the various simulations are discussed in this section. To facilitate comparison of the impacts, a variable-by-variable approach is used. This highlights the differences between the cases. The section leads off with a short discussion of the base case, and then proceeds to discuss the differences between the base case and each of the disaster cases for a small number of key variables. The overall results are reported here; more detailed industry-by-industry results, the impact on wages and salaries, and additional detail on state revenues by source and expenditures by function are available, but are not shown here.

The Base Case

The base case, as mentioned before, involves fairly substantial development of Alaska's petroleum resource. By 1990, as Table 1 shows, the value of gross output measured in constant dollars will have expanded to over two-and-a-half times its 1976 level, while total employment grows by 68 percent to reach 367 thousand wage earners. A large part of this expansion is fueled by the increase in the size of state government budgets. Oil development itself has a transitory effect on employment, as can be seen from the projected reduction in employment following completion of the trans-Alaska oil pipeline in 1977. State revenues increase to $5.4 billion per year in 1990, nearly five times the projected 1976 level (even allowing for several projected 1976 leasing developments which will probably not now occur, making the difference even greater). After 25 percent of recurrent petroleum revenues are allocated to the state's Permanent Fund, and even though 50 percent of bonus revenues are also placed in this fund, current expenditures are still enormous. Compared with a FY 1975 expenditure level of $751.9 million (and a projected calendar year 1976 total of $1.032 billion), expenditures in 1990 reach $4.6 billion--over six times the FY 1975 level, and 4.4 times CY 1976. Even in real

Table 1

VALUE OF KEY MEASUREMENT VARIABLES,
BASE CASE, 1976-1990

	XX99	EM99	R99S	E99S
1976	2202.58	218.126	1082.65	1032.65
1977	2508.09	200.324	1325.63	1075.63
1978	3174.73	210.027	1492.74	1272.22
1979	3440.61	231.204	2144.22	1675.06
1980	4515.18	255.052	2360.68	1929.63
1981	4773.	271.789	2443.42	2053.06
1982	4915.18	303.511	3014.08	2506.29
1983	5108.7	325.221	3560.47	2952.17
1984	4942.71	325.337	3984.83	3305.39
1985	5026.13	331.664	4307.2	3572.93
1986	5126.66	338.618	4614.44	3835.53
1987	5333.45	347.785	4856.71	4052.22
1988	5599.57	356.219	5044.45	4231.91
1989	5595.29	362.536	5240.64	4419.4
1990	5546.04	367.443	5395.37	4576.28

	GFBAL	POP	PIRPC
1976	357.3	429.404	3958.9
1977	607.3	417.844	3746.06
1978	827.815	435.546	3837.53
1979	1296.97	468.058	3989.13
1980	1728.03	506.119	4157.42
1981	2118.4	537.884	4242.13
1982	2626.18	589.259	4382.8
1983	3234.48	630.996	4434.28
1984	3913.92	647.087	4372.26
1985	4648.19	669.088	4368.76
1986	5427.1	691.105	4377.04
1987	6231.58	715.263	4404.24
1988	7044.11	738.28	4431.73
1989	7865.35	758.402	4448.32
1990	8684.44	776.26	4463.18

<u>Key</u>: XX99 = Gross State Product, Millions of 1958 Dollars
EM99 = Employment, Thousands of Wage Earners
R99S = Total State Revenues, Millions of Dollars
E99S = Total State Expenditures, Millions of Dollars
GFBAL = General Fund Balance, Millions of Dollars
POP = Population, Thousands of Persons
PIRPC = Real Per Capita Personal Income, 1967 Dollars

per capita terms, 1990 spending by state government is 1.42 times the 1976 level, or about $5,900 per person in 1990 dollars.

The rising level of personal income in Alaska brought about by state spending, and the large increase in employment opportunities, induce massive population inmigration. Compared with the Department of Labor's July, 1975, estimate of Alaska's population at 406 thousand, the 1990 population is 776 thousand. The population influx prevents the state from substantially increasing personal incomes, even though nominal dollar spending jumps 4.4 times over, between 1976 and 1990. The last column of Table 1 tells the story. Even though economic output increases 2.5 times in real terms, and even though total real personal incomes double, in per capita terms, the average Alaskan in 1990 earns $4,463, about 12 percent more in constant dollar terms than his father in 1976.

Gross Product

This is the baseline against which the impacts in this paper are measured. In Table 2, the impacts on gross state product, the value of goods and services produced in the Alaskan economy, are shown. WELD, the delay in pipeline startup because of normal project delays and weld problems, has fairly large impacts in the early years of the projection period (particularly 1978, when the combination of late startup and reduced 1977 state revenues combine to reduce output by $163 million). However, by the end of the period, the difference is

Table 2

GROSS OUTPUT IN EACH DISASTER SCENARIO, 1976-1990

(Millions of 1958 Dollars)

Values

	WELD	BUST	SUPERBUST	LOWPROD
	SA7W1	SA7W2	SA7W3	SA7W4
1976	2202.58	2202.58	2202.58	2202.58
1977	2454.3	2508.09	2508.09	2508.09
1978	3011.83	3217.25	2991.74	3110.84
1979	3391.71	3379.35	3080.84	3319.82
1980	4467.	4330.13	3463.51	4326.78
1981	4760.42	4733.52	4476.29	4639.2
1982	4907.84	4896.49	4639.59	4767.25
1983	5095.25	5086.23	4968.87	4948.13
1984	4935.18	4921.21	5180.41	4777.06
1985	5020.04	5010.59	5011.48	4865.87
1986	5121.07	5112.43	5115.68	4966.27
1987	5328.15	5319.71	5078.8	5171.45
1988	5594.53	5586.19	5319.97	5435.75
1989	5590.51	5582.17	5540.94	5430.
1990	5541.47	5533.36	5611.	5379.57

Difference From Base Case

	WELD	BUST	SUPERBUST	LOWPROD
	XX99	XX99	XX99	XX99
1976	0.	0.	0.	0.
1977	-53.792	0.	0.	0.
1978	-162.906	42.5176	-182.991	-63.8972
1979	-48.9055	-61.2559	-359.768	-120.793
1980	-48.1836	-185.051	-1051.67	-188.402
1981	-12.5742	-39.4805	-296.711	-133.793
1982	-7.34375	-18.6875	-275.594	-147.93
1983	-13.4414	-22.4687	-139.824	-160.566
1984	-7.52734	-21.4922	237.703	-165.645
1985	-6.08594	-15.5352	-14.6523	-160.258
1986	-5.58984	-14.2227	-10.9805	-160.387
1987	-5.30078	-13.7344	-254.652	-161.996
1988	-5.03906	-13.375	-279.598	-163.812
1989	-4.77344	-13.1133	-54.3477	-165.289
1990	-4.57031	-12.6836	64.9609	-166.469

less than one-tenth of one percent of total 1990 output, which is probably not significant. BUST, the catastrophic rupture of the line by earthquake in June, 1978, results initially in a small increase in gross product, since it is assumed that 8,000 people are needed to accomplish all the pipeline repairs, and their output has a larger impact in the first year than would the state revenues received from an operating pipeline. This sanguine situation immediately turns melancholy in 1979 and all subsequent years, since the total gross product falls below the base case by about two percent in 1979, four percent in 1980, and then begins to recover, coming within two-tenths of one percent of the base case total.

SUPERBUST has a different effect than either of the two previous cases, since the delay in field development occasioned by the review of environmental and engineering safeguards actually leads to a small increase in 1990 gross state product. However, the large and persistent earlier losses of revenue probably mean that at normal discount rates, the present value of the output difference would be a net loss, even if all subsequent years showed increases like that in 1990. Finally, the LOWPROD case shows a large and increasing divergence from the base case. This is in contrast to the three temporary disasters, all of which show recovery of the economy from interruption of the flow of oil. By 1990, gross product is about $5.38 billion, or three percent less than in the base case. Further, because of the continuing nature of the impact on state funds, gross product can be expected to continue to diverge, well into the period when Prudhoe Bay field would have otherwise been exhausted.

Employment

The impacts on total employment in the state are shown in Table 3. The first case, WELD, extends for one year the period of pipeline employment in Alaska at 4,000 people, one-third the historical level. This is offset by lost business generated by oil revenues from Prudhoe Bay, and total employment falls to 96 percent of the base case 1977 value and 93 percent of the base case 1978 value. Another way to look at the situation is that instead of a fall of 18,000 jobs between 1976 and 1977, the fall is much steeper, some 26,000 jobs. As with gross product, a recovery takes place so that by 1990, the difference is 557 fewer jobs than the base, about one-tenth of one percent. In the BUST case, the result is much the same, with a slight increase in employment in 1978, severe falling off in 1979 and 1980 because of lost production, and subsequent recovery to a 1990 value of 365,900 jobs, 99.5 percent of the baseline total for 1990.

In the SUPERBUST case, the difference between the disaster scenario employment and base case employment is less systematic than either of the previous cases because of the changed timing in field development. In 1984, for example, there is actually an increase in the number of people employed. Overall, however, employment in SUPERBUST varies

Table 3

TOTAL EMPLOYMENT IN EACH DISASTER SCENARIO, 1976-1990

(Thousands of Wage Earners)

Values

	WELD	BUST	SUPERBUST	LOWPROD
	SA7W1	SA7W2	SA7W3	SA7W4
1976	218.126	218.126	218.126	218.126
1977	192.39	200.324	200.324	200.324
1978	195.088	210.615	208.255	200.714
1979	223.76	216.56	204.065	213.918
1980	248.099	228.723	226.389	228.611
1981	270.097	266.385	254.225	253.445
1982	302.559	301.034	284.382	283.661
1983	323.468	322.279	316.151	304.046
1984	324.376	322.548	331.901	303.705
1985	330.896	329.68	330.102	311.007
1986	337.916	336.82	336.111	318.194
1987	347.124	346.067	340.666	327.413
1988	355.596	354.562	348.816	335.865
1989	361.949	360.929	357.996	342.221
1990	366.885	365.899	365.532	347.188

Difference From Base Case

	WELD	BUST	SUPERBUST	LOWPROD
	EM99	EM99	EM99	EM99
1976	0.	0.	0.	0.
1977	-7.93396	0.	0.	0.
1978	-14.9391	0.587936	-1.7717	-9.31297
1979	-7.44402	-14.6443	-27.1389	-17.286
1980	-6.9528	-26.3292	-28.6628	-26.4412
1981	-1.69214	-5.40381	-17.5636	-18.3433
1982	-0.952637	-2.47729	-19.1292	-19.8506
1983	-1.75317	-2.94238	-9.0708	-21.1753
1984	-0.961426	-2.78979	6.56396	-21.6321
1985	-0.768311	-1.98413	-1.5625	-20.6575
1986	-0.70166	-1.79736	-2.50684	-20.4238
1987	-0.6604	-1.71753	-7.11841	-20.3716
1988	-0.623291	-1.65674	-7.40332	-20.3535
1989	-0.586914	-1.60742	-4.54028	-20.3154
1990	-0.557129	-1.5437	-1.9104	-20.2542

from 13 percent lower than the base case in 1979 to six-tenths of one percent low in 1990. Total employment in SUPERBUST declines over a longer period (to 1979) following pipeline construction than in either BUST or WELD, although the downturn is less severe than in WELD. Long-term growth in employment is also less steady in this case, and the total is a fraction of a percent lower by 1990.

LOWPROD is again revealed as the case where the Alaskan economy grows the slowest. Although the post-construction employment downturn is not as severe as in WELD, it matches or surpasses SUPERBUST in length and intensity. Furthermore, the Alaskan economy does not recover. As compared with the base case, the initial loss is 9,300 jobs, which escalates to 20,000 jobs by 1990. In relative terms, employment is 5.6 percent below what it otherwise would have been, if Prudhoe Bay is restricted to 1.2 million barrels per day.

State Revenues and Expenditures and the General Fund Balance

The influence of the hypothetical disasters on state aggregate finances is shown in Tables 4, 5, and 6, following. The severity of the impact in all three variables increases from left to right, as one reads across the tables. That is, WELD has the least impact on state revenues, hence least effect on both expenditures and the general fund balance, since in this case each bears a fixed relationship to the others. BUST has the next largest effect, then SUPERBUST, then LOWPROD, which has the largest impact on revenues ($608 million per year by 1990, about 11.3 percent of the baseline total of $5.4 billion). Another way to put the problem would have been to try to maintain expenditures at their projected levels for the base case, and run down the general fund balance. In such a case, GFBAL would decline more rapidly relative to the base case, even though Gross Product and Employment would hold to their base case values and would generate more revenue than in the present disaster scenarios. Alternatively, one could hold the GFBAL accumulation rate at its base case values, but this could only be done at the cost of increased saving, less expenditure, and lower growth than is seen in Tables 1, 2, and 3.

Comparing revenues in the various cases in Table 4, note that in all cases except LOWPROD, annual revenues in 1990 are between $5.3 billion and $5.4 billion, within two percent of the total in the base case. Looking at the lower half of the table, however, it is evident that the negative impacts on total revenue differ by an order of 4 to 5 in the late 1970's, and by an order of 10 in some years in the early and middle 1980's. Peak negative impacts on state revenue are a loss of $563 million compared with the base case for WELD in 1977 (42 percent of the base), $944 million for BUST in 1979 (44 percent of the base), and $1.35 billion for SUPERBUST in 1979 (63 percent of the base). LOWPROD generates somewhat lower transitory losses of revenue in the late 1970's; however, the negative impact grows

Table 4

TOTAL STATE REVENUES IN EACH DISASTER SCENARIO, 1976-1990

(Millions of Dollars)

Values

	WELD	BUST	SUPERBUST	LOWPROD
	SA7W1	SA7W2	SA7W3	SA7W4
1976	1082.65	1082.65	1082.65	1082.65
1977	1175.39	1325.63	1325.63	1325.63
1978	929.872	1034.26	1034.26	1247.36
1979	1930.81	1200.45	792.493	1697.01
1980	2164.9	1629.81	1999.42	1668.05
1981	2416.71	2363.42	2329.43	1997.94
1982	2995.88	2968.58	2869.	2504.97
1983	3515.44	3491.94	3346.14	3010.69
1984	3964.63	3919.22	3762.08	3408.09
1985	4289.46	4264.55	4175.96	3750.42
1986	4597.	4573.27	4470.04	4049.9
1987	4839.3	4815.71	4731.58	4281.98
1988	5027.02	5003.37	4936.84	4458.93
1989	5223.19	5199.44	5141.04	4644.07
1990	5377.89	5354.01	5329.45	4787.58

Difference From Base Case

	WELD	BUST	SUPERBUST	LOWPROD
	R99S	R99S	R99S	R99S
1976	0.	0.	0.	0.
1977	-150.234	0.	0.	0.
1978	-562.866	-458.473	-458.473	-245.382
1979	-213.416	-943.77	-1351.73	-447.215
1980	-195.786	-730.872	-361.261	-692.636
1981	-26.7092	-79.9971	-113.992	-445.479
1982	-18.1985	-45.5007	-145.076	-509.112
1983	-45.0215	-68.5264	-214.329	-549.774
1984	-20.1992	-65.6069	-222.749	-576.738
1985	-17.7422	-42.6523	-131.238	-556.786
1986	-17.4375	-41.1641	-144.398	-564.538
1987	-17.4102	-41.	-125.129	-574.727
1988	-17.4258	-41.0742	-107.609	-585.516
1989	-17.4531	-41.207	-99.6016	-596.574
1990	-17.4766	-41.3594	-65.918	-607.785

in absolute terms during most of the period, and the $4.8 billion annual revenue figure in 1990 is over 11 percent lower than the base case.

Expenditures follow a comparable pattern. Except for the years 1976–1982, both WELD and BUST show dollar-for-dollar reductions in expenditures; however, until 1982 the negative impact on the general fund balance grows steadily. This is due to the fact that some expenditures can be financed out of current petroleum revenues, which are the same as in the base case for these scenarios after 1982 (see Tables 5 and 6). SUPERBUST features a larger decrease in expenditures than either of the two previous cases; however, the fact that oil fields are delayed and current petroleum income postponed reduces current petroleum income in this case relative to the base case in all years of the projection period. As a consequence, dissaving finances some expenditures, and the general fund balance continues to fall. By far the largest negative impact occurs in the LOWPROD case, where expenditures decline $493 million by 1990, relative to the base case, but the general fund balance is still adversely affected to the tune of $1.465 billion. The negative impacts of the disaster scenarios on the general fund balance in 1990 are: WELD, minus 2.7 percent; BUST, minus 6.2 percent; SUPERBUST, 8.2 percent; LOWPROD, 16.9 percent.

Table 5

TOTAL STATE EXPENDITURES IN EACH DISASTER SCENARIO, 1976-1990

(Millions of Dollars)

Values

	WELD	BUST	SUPERBUST	LOWPROD
	SA7W1	SA7W2	SA7W3	SA7W4
1976	1032.65	1032.65	1032.65	1032.65
1977	925.392	1075.63	1075.63	1075.63
1978	847.385	928.368	928.368	1088.19
1979	1507.66	966.635	760.581	1335.2
1980	1776.88	1370.9	1538.6	1400.53
1981	2026.35	1973.06	1945.95	1702.26
1982	2488.09	2460.79	2380.04	2109.07
1983	2914.16	2890.66	2772.44	2521.3
1984	3285.44	3245.64	3124.02	2851.
1985	3555.19	3530.28	3468.43	3130.5
1986	3818.09	3794.36	3715.49	3385.16
1987	4034.81	4011.22	3945.56	3591.67
1988	4214.49	4190.84	4134.64	3760.58
1989	4401.95	4378.2	4327.45	3937.01
1990	4558.8	4534.92	4511.49	4082.67

Difference From Base Case

	WELD	BUST	SUPERBUST	LOWPROD
	E99S	E99S	E99S	E99S
1976	0.	0.	0.	0.
1977	-150.234	0.	0.	0.
1978	-424.838	-343.855	-343.855	-184.037
1979	-167.407	-708.43	-914.484	-339.861
1980	+152.751	-558.729	-391.024	-529.1
1981	-26.7092	-79.9971	-107.107	-350.801
1982	-18.1985	-45.5007	-126.245	-397.219
1983	-38.0051	-61.51	-179.725	-430.865
1984	-19.9497	-59.7524	-181.373	-454.39
1985	-17.7422	-42.6523	-104.507	-442.435
1986	-17.4375	-41.1641	-120.031	-450.361
1987	-17.4102	-41.	-106.662	-460.55
1988	-17.4258	-41.0742	-97.2734	-471.337
1989	-17.4531	-41.207	-91.9531	-482.397
1990	-17.4766	-41.3594	-64.7891	-493.608

Table 6

STATE GENERAL FUND BALANCE IN EACH DISASTER SCENARIO, 1976-1990

(Millions of Dollars)

Values

	WELD	BUST	SUPERBUST	LOWPROD
	SA7W1	SA7W2	SA7W3	SA7W4
1976	357.3	357.3	357.3	357.3
1977	607.3	607.3	607.3	607.3
1978	689.787	713.197	713.197	766.469
1979	1112.94	947.016	745.109	1128.27
1980	1500.96	1205.93	1205.93	1395.8
1981	1891.32	1596.3	1589.41	1691.48
1982	2399.11	2104.08	2078.37	2087.38
1983	3000.39	2705.36	2652.06	2576.76
1984	3679.58	3378.94	3290.12	3133.85
1985	4413.85	4113.21	3997.66	3753.77
1986	5192.76	4892.12	4752.2	4418.5
1987	5997.24	5696.6	5538.21	5108.8
1988	6809.77	6509.13	6340.41	5807.16
1989	7631.01	7330.37	7154.	6514.22
1990	8450.1	8149.46	7971.96	7219.13

Difference From Base Case

	WELD	BUST	SUPERBUST	LOWPROD
	GFBAL	GFBAL	GFBAL	GFBAL
1976	0.	0.	0.	0.
1977	0.	0.	0.	0.
1978	-138.028	-114.618	-114.618	-61.3457
1979	-184.037	-349.959	-551.865	-168.7
1980	-227.072	-522.101	-522.102	-332.236
1981	-227.071	-522.1	-528.986	-426.913
1982	-227.071	-522.101	-547.817	-538.805
1983	-234.089	-529.119	-582.423	-657.717
1984	-234.339	-534.974	-623.799	-780.067
1985	-234.34	-534.977	-650.531	-894.42
1986	-234.34	-534.977	-674.898	-1008.6
1987	-234.34	-534.977	-693.363	-1122.77
1988	-234.34	-534.977	-703.699	-1236.95
1989	-234.34	-534.977	-711.348	-1351.13
1990	-234.34	-534.977	-712.477	-1465.31

Population

As might be expected, the lower is state spending, and the worse are the potential employment opportunities, the lower is the level of population, relative to the base case. This is, of course, because migration in response to income differentials and employment growth is the primary source of Alaskan population growth. Table 7 reveals that even with the disaster scenarios in effect, population still grows to over 700 thousand people by 1990. All cases are characterized by a one-year period of net outmigration in 1977, but vary in the strength of this phenomenon, and in the relative strength of the population increase that follows. By 1990, WELD's population total is about four-tenths of one percent off the baseline total, a difference of 3,100 people, approximately. The corresponding percentages for BUST, SUPERBUST, and LOWPROD are 0.7 percent, 1.3 percent, and 5.7 percent, respectively.

Personal Income and Social Well-Being

A fairly surprising thing happens in Table 8. That is, measuring "benefits" of growth only in terms of real per capita income, it turns out that to the average Alaskan in the long run, the disaster scenarios may not turn out to be "disasters", after all. While it is true that, on balance, the total of real incomes earned in Alaska are less than they would have been in the base case, in per capita terms most of the cases show actual increases after 1980, when the transitory effects of

Table 7

TOTAL POPULATION IN EACH DISASTER SCENARIO, 1976-1990

(Thousands of Persons)

Values

	WELD	BUST	SUPERBUST	LOWPROD
	SA7W1	SA7W2	SA7W3	SA7W4
1976	429.404	429.404	429.404	429.404
1977	408.038	417.844	417.844	417.844
1978	415.817	436.272	433.356	424.035
1979	455.635	450.687	434.791	445.249
1980	493.595	472.732	467.448	469.585
1981	531.331	526.861	508.995	508.041
1982	583.84	581.595	556.565	555.783
1983	624.887	622.911	608.987	594.225
1984	642.14	639.289	644.284	608.155
1985	664.642	662.396	658.16	629.817
1986	687.	684.843	679.686	650.838
1987	711.453	709.306	698.666	673.929
1988	734.74	732.596	721.217	695.958
1989	755.109	752.961	744.73	715.217
1990	773.186	771.065	766.048	732.321

Difference From Base Case

	WELD	BUST	SUPERBUST	LOWPROD
	POP	POP	POP	POP
1976	0.	0.	0.	0.
1977	-9.80615	0.	0.	0.
1978	-19.7285	0.726563	-2.18994	-11.5107
1979	-12.4229	-17.3711	-33.2673	-22.8091
1980	-12.5242	-33.3872	-38.6709	-36.5334
1981	-6.55298	-11.0229	-28.8892	-29.843
1982	-5.4187	-7.66382	-32.6936	-33.4756
1983	-6.1084	-8.08496	-22.0083	-36.771
1984	-4.94702	-7.79785	-2.80273	-38.9321
1985	-4.44629	-6.69189	-10.9282	-39.2712
1986	-4.10449	-6.26221	-11.4194	-40.2666
1987	-3.80981	-5.9563	-16.5972	-41.3335
1988	-3.54004	-5.68359	-17.0627	-42.3218
1989	-3.29272	-5.44019	-13.6716	-43.1848
1990	-3.07495	-5.19507	-10.2124	-43.9397

Table 8

TOTAL REAL INCOME PER CAPITA, IN EACH DISASTER SCENARIO, 1976-1990

(Constant 1967 Dollars Per Person)

Values

	WELD	BUST	SUPERBUST	LOWPROD
	SA7W1	SA7W2	SA7W3	SA7W4
1976	3958.9	3958.9	3958.9	3958.9
1977	3687.62	3746.06	3746.06	3746.06
1978	3762.84	3895.29	3871.21	3771.58
1979	3974.49	3939.9	3850.07	3888.83
1980	4153.75	4010.88	3989.44	4033.75
1981	4269.72	4249.23	4185.98	4201.53
1982	4411.01	4406.8	4344.15	4357.47
1983	4455.29	4453.81	4473.82	4416.78
1984	4394.1	4389.91	4493.29	4356.36
1985	4388.8	4388.23	4424.32	4364.89
1986	4394.95	4395.16	4421.72	4380.09
1987	4420.23	4420.75	4418.26	4413.29
1988	4446.01	4446.71	4444.06	4445.54
1989	4461.13	4461.89	4476.39	4465.5
1990	4474.71	4475.57	4502.07	4483.07

Difference From Base Case

	WELD	BUST	SUPERBUST	LOWPROD
	PIRPC	PIRPC	PIRPC	PIRPC
1976	0.	0.	0.	0.
1977	-58.4395	0.	0.	0.
1978	-74.6826	57.7615	33.688	-65.9502
1979	-14.636	-49.2283	-139.061	-100.296
1980	-3.67578	-146.544	-167.986	-123.673
1981	27.5937	7.10156	-56.1523	-40.5977
1982	28.2148	24.	-38.6445	-25.3281
1983	21.0117	19.5273	39.543	-17.5039
1984	21.8398	17.6484	121.031	-15.9023
1985	20.0391	19.4727	55.5547	-3.87109
1986	17.9062	18.125	44.6797	3.05078
1987	15.9883	16.5078	14.0156	9.05078
1988	14.2852	14.9805	12.332	13.8086
1989	12.8164	13.5742	28.0742	17.1836
1990	11.5352	12.3906	38.8984	19.8906

the disaster (including outmigration) are over. All cases show a modest increase in per capita real personal income by the year 1990. This would mean that the slower rate of growth which occurs in the disaster scenarios actually improves the condition of the average Alaskan in the long run, if real per capita income were the sole criterion for judging Alaskan welfare.

There are at least two things wrong with this notion, however. In the first place, each case shows substantial decreases in personal incomes in the short run. This, combined with a projected drop in total employment relative to 1976, which persists over two to three years, and forecast outmigration, suggests that in each disaster scenario, the period 1977-1980 may be very unpleasant in Alaska. The fall in employment may not be reflected in a rise in unemployment, since the model projects outmigration whenever this happens, in effect "exporting" unemployment, with no accompanying measure of the disruption of human lives at times the outmigrants can least afford it, and at times the state is under financial pressure to reduce services. The second thing that is wrong with using per capita income (or disposable personal income) as the sole measure of social well-being is that it is only one of several dimensions in which people measure their satisfaction. Personal incomes, or disposable personal income, measures a capacity for private spending, but it says nothing about the social environment in which the spending takes place, e.g., the sorts of public services provided by state and local spending.

As a rough index of social well-being which presumes all government spending produces a unit of service which is equally valuable to a unit of private spending, one could equally weight real per capita income and real state and local spending per capita, and combine them to form a single value measure of "welfare". This is done for illustrative purposes only, since the more each person's evaluation of his well-being departs from the assumed relationship in Table 9, the more inaccurate the measure will be.

It should be noted in particular that Table 9 contains no direct evaluation of unemployment and its attendant human suffering, that the timing of losses relative to gains is not considered, and that it is assumed that projected outmigration in the face of unemployment prospects would actually take place. Consideration of these factors would tend to make the index in Table 9 excessively optimistic. Nevertheless, Table 9 still shows a difference from Table 8. When state and local spending is taken into account along with personal income, the negative impacts of the disaster are shown to be larger and more persistent; and in the case of LOWPROD, the average Alaskan is shown to be "worse off" in 1990 than in the base case.

Table 9

IMPACT ON COMBINED REAL PERSONAL INCOME PER CAPITA,

AND REAL STATE AND LOCAL GOVERNMENT SPENDING PER CAPITA*

(1967 Dollars)

	WELD	BUST	SUPERBUST	LOWPROD
1976	0	0	0	0
77	- 188.121	0	0	0
78	- 451.358	- 285.058	- 301.007	- 211.197
79	- 104.957	- 630.253	- 876.761	- 336.878
80	- 89.240	- 503.771	- 379.736	- 451.907
81	22.837	- 40.606	- 67.940	- 229.754
82	32.055	14.286	- 31.272	- 195.040
83	17.573	7.575	- 13.062	- 171.667
84	25.375	8.158	24.540	- 158.319
85	24.083	16.595	44.144	- 125.335
86	21.430	16.188	22.049	- 106.163
87	18.736	14.399	14.170	- 91.730
88	16.301	12.526	13.894	- 80.631
89	14.264	10.904	22.605	- 71.586
90	12.505	9.434	37.368	- 64.566

*Impacts on each category are given equal weight

Summary

This paper has utilized the MAP program SCENARIO and STMOD models to analyze the effects of a specific series of disasters on the economy of Alaska. It has been shown that while natural disasters have sharp and serious short-run effects, if they are temporary interruptions in the growth path, the economy appears to recover within 5 to 10 years. However, persistent marketing problems of a more permanent nature seem to have much greater and persistent negative effects on Alaska's economy in the long run, even if the transitory effects are smaller. The effects demonstrated in this paper point out the sensitivity of Alaska's economy to state spending of petroleum revenues. What the state decides to do with its petroleum money may literally determine whether and to what extent Alaska's future is a "boom" or a "bust".

OVERVIEW

This model derives values for RP8S, RPBS, and regional and statewide EMP9 and ECONX, to be used to generate input into the regional (REGMOD) and statewide (STMOD) models. It mechanizes the process we have been using to construct scenario data, aggregating data from schedules, ie. employment and production associated with development of each field or construction of each pipeline. It does not contain any stochastic equations.

TROLL files

MODEL-SCENARIO	
DATA-SCENARIO DSET-SCENARIO	Contain data series for Limited $7 Case for 1974-1990. There is no historical data.
CONST-SCENARIO	
DATA-ACC-SCENARIO	Contains data series to be added via BINDATA for the Accelerated and Maximum Cases.
DATA-MAX-SCENARIO	Contains data series to be added via BINDATA for the Maximum Cases only.
DATA-DOLLAR-SCENARIO	Contains data series to be added via BINDATA for $5 and $9 oil prices.
MACRO-BINDA MACRO-NEWDA	Bindings and new data for SCENARIO for Accelerated Cases.
MACRO-BINDM MACRO-NEWDM	Bindings and new data for SCENARIO for Maximum Cases only (ie. must also use BINDA and NEWDA for Maximum Cases.)
MACRO-BIND5 MACRO-BIND9 MACRO-NEWBPRIC	Bindings and new data for SCENARIO for $5 and $9 oil.
MACRO-SCENRPRT	Print SCENARIO model output on wide paper at terminal. Only variables that are input into REGMOD are printed.
MACRO-SCENSPRT	Print SCENARIO model output at terminal. Only variables that are input into STMOD are printed.
MACRO-REGIN	CRDATA to create files to be used as input into REGMOD.
MACRO-STIN	CRDATA to create files to be used as input into STMOD.

ECONX Component

DEFINITION

ECONXR1-R7	Exogenous construction employment for each of the 7 regions, input into REGMOD, ECONXRr == TAPS1Rr + Σ(ECONXAnn * CNAnnRr) Ann=A01-A10 (ECONXR5X is also added for R5 only.)
ECONX	Exogenous construction employment for the state, input into STMOD.

EXOGENOUS

* ECONXA01-A10	Construction employment for as many as 10 areas. See attached sheet for the name of the area associated with each number.
TAPS1R1-R7	Construction employment for trans-Alaska Pipeline based on historical data and estimates supplied by Alyeska. Zero in R1-3.
ECONXR5X	Management personnel based in Anchorage related to construction employment. Non-zero starting in 1978.

PARAMETER

† CNA01R1-CNA10R7	Regional allocation (percentage) of exogenous construction employment for each area.

---

* Default data series are for limited case. Other cases built on limited using BINDATA. When an area is not developed, the data series is zero.

†Parameters for all areas are in the file. Thus to run different scenarios, it is not necessary to BINDCONST unless one wants to change the regional allocation. When development of an area has no impact on a region, the parameter is zero.

EMP9 Component

DEFINITION

EMP9R1A-R7A — Field development component of mining employment for each region except R5 which is management employees in Anchorage for both field development and pipeline operation.

$$EMP9RrA == \Sigma_{Fnn=F01-F30}(EMP9Fnn * P9FnnRr)$$

$$\text{except } EMP9R5A==P9R5 * EMP9A98 - EMP9A98(-1) + EMP9R5A(-1)$$

EMP9R1B-R7B — Pipeline component of mining employment for each region.

$$EMP9RrB== \Sigma_{Pnn=P01-P10}(EMP9Pnn * P9PnnRr)$$

$$\text{except } EMP9R5B==\emptyset$$

EMP9A98 — Subtotal - field development and pipeline mining employment for all regions except R5. Mining (management) employment in R5 is a function of the change in the level of this variable, i.e. employment in the field.

EMP9R1-7 — Total mining employment for each of the 7 regions, exogenous input into REGMOD.

$$EMP9Rr == EMP9RrA + EMP9RrB + EMP9RrX$$

EMP9 — Total mining employment for the state, exogenous input into STMOD.

EMP9 Component (Cont.)

EXOGENOUS

* EMP9F01-F30	Mining employment for as many as 30 fields. See attached sheet for identification of the field associated with each number.
* EMP9P01-P10	Mining employment for as many as 10 pipelines. See attached sheet for identification of the pipelines associated with each number.
EMP9RrX	Non-petroleum mining employment in each region. Now using 1974 mining employment.

PARAMETER

† P9F01R1-P9F30R7	Regional allocation (percentage) of field development mining employment for each field.
† P9P01R1-P9P10R7	Regional allocation (percentage) of pipeline mining employment for each pipeline.
P9R5	Percentage of change in mining employment subtotal used to calculate change in management overhead in R5.

---

*See note on data series in "ECONX Component."

†See note on parameters in "ECONX Component."

RPBS Component

DEFINITION

SCHEDA — Combination of Bonus Production Schedule 1 and Discount Multipliers Schedule 2, for field operation for 20 years.

$$SCHEDA == \sum_{nn=01-20} (RPBSB1nn * RPBSD2nn)$$

SCHEDB — Combination of Bonus Production Schedule 2 and Discount Multipliers Schedule 2, for field operation for 20 years.

$$SCHEDB == \sum_{nn=01-20} (RPBSB2nn * RPBSD2nn)$$

Value of leases this year determined by projected production, for a 20 year period, of fields that are leased this year:

RPBSFED — - Federal leasing for as many as 15 fields over the period the model is run.

$$RPBSFED == RPBSPCT * BPRICE2 * 365 * \left(\sum_{Fnn=F01-F04,F06-F13} (PEAKFnn * SCHEDA * LEASEFnn) + \sum_{Fnn=F05,F14-F15} (PEAKFnn * SCHEDB * LEASEFnn) \right) /1000$$

RPBSST — - State leasing for as many as 10 fields over the period the model is run.

$$RPBSST == RPBSPCT * BPRICE2 * 365 * \left(\sum_{Snn=S01-S08} (PEAKSnn * SCHEDB * LEASESnn) + \sum_{Snn-S09-S10} (PEAKSnn * SCHEDA * LEASESnn) \right) /1000$$

RPBSNAT - Native leasing for as many as 10 fields over the period the model is run.

$$RPBSNAT == RPBSPCT * BPRICE2 * 365 * \left(\sum_{Nnn=N01-N08} (PEAKNnn * SCHEDB * LEASENnn) + \sum_{Nnn=N09-N10} (PEAKNnn * SCHEDA * LEASENnn) \right) /1000$$

RPBS Adjusted petroleum bonus revenues; total reduced by Native claim payments; exogenous input into REGMOD or STMOD.

RPBS == RPBSST - DNCSPB

EXOGENOUS

* BPRICE2 Price of oil/barrel for bonus revenue calculations

PEAKann Peak field production in 10^3 bbls/day. See description under "RP8S Component."

Lease year, set to 1 in year in which field is to be leased and 0 otherwise:

* LEASEF01-F15 - Lease years for up to 15 federal fields.

* LEASES01-S10 - Lease years for up to 10 state fields.

* LEASEN01-N10 - Lease years for up to 10 Native fields.

PARAMETERS

RPBSB1<u>01</u> - <u>20</u> Bonus Production Schedule 1

RPBSB2<u>01</u> - <u>20</u> Bonus Production Schedule 2

*See note on data series for "ECONX Component."

*[1] RPBSD201 - 20 Discount Multipliers Schedule 2

RPBSPCT Percentage of projected field revenues that are paid as lease bonus.

*[1] Discount Schedules 1 and 3 are attached. They are not in the CONST file because they are not used now.

RP8S Component

DEFINITION

RP8SFTOT — Total revenues from federally owned fields for as many as 15 fields.

```
RP8SFTOT == BPRICE * 365*Σ((PEAKFnn*PCTFnn))/1000)
                        Fnn=F01-F15
```

RP8SFROY — Federal royalties

```
RP8SFROY == RP8SFTOT * FEDROY
```

RP8SFST — Federal royalties returned to state through revenue sharing.

```
RP8SFST == RP8SFROY * REVSHR
```

RP8SSTTA — Total revenues from state-owned fields covered under ANCSA for as many as 10 fields.

```
RP8SSTTA == BPRICE * 365*(Σ(PEAKSnn*PCTSnn)+RP8SPRUD/1000
                          Snn=S01-S10
```

RP8SSADJ — Adjusted revenues from state-owned fields covered under ANCSA total reduced by Native claims payments.

```
RP8SSADJ == RP8SSTTA - DNCSP8
```

RP8SCOOK — Revenue from Cook Inlet (State owned). Not covered by ANCSA and oil price controlled.

```
RP8SCOOK == BPRICE 3 * 365 * PRODCOOK/1000
```

RP8SSTOT — Total taxable revenue from state-owned fields.

```
RP8SSTOT == RP8SSADJ + RP8SCOOK
```

RP8SSROY — State royalties.

```
RP8SSROY == RP8SSTOT * STROY
```

RP8SSTAX — State production taxes.

```
RP8SSTAX == RP8SSTOT * STTAX
```

RP8SNTOT — Total revenues from Native-owned fields for as many as 10 fields.

```
RP8SNTOT == BPRICE * 365*Σ((PEAKNnn*PCTNnn)/1000)
                        Nnn=N01-N10
```

RP8SNROY Native royalties.

RP8SNROY == RP8SNTOT * NATROY

RP8SNTAX Native taxes - transferred to state.

RP8SNTAX == RP8SNTOT * NATTAX

RP8SPTAX State tax on pipeline property for as many as 10 pipelines.

$$RP8SPTAX == LINETAX * \sum_{Pnn=P01-P10} Pnn$$

RP8S Total state recurrent revenues, exogenous input into REGMOD or STMOD.

RP8S == RP8SFST + RP8SSROY + RP8STAX + RP8SNTAX + RP8SPTAX + RP8SRTAX

EXOGENOUS

* BPRICE Price of oil/barrel for current revenue calculations.
* BPRICE3 Price of oil/barrel for Cook Inlet revenue calculations.

Peak field production in 10^3 bbls/day (also used to calculate bonus revenues):

PEAKF01-F15 - for as many as 15 federally-owned fields.

PEAKS01-S10 - for as many as 10 state-owned fields.

PEAKN01-N10 - for as many as 10 Native-owned fields.

Petroleum production schedules as a percentage of peak production:

* PCTF10-F15 - for as many as 15 federally-owned fields.

---

*See note on data series for "ECONX Component."

*	PCTS01-S10	- for as many as 10 state-owned fields.
*	PCTN01-N10	- for as many as 10 Native-owned fields.
		Royalty tax rates:
	FEDROY	- for federally-owned field production.
	STROY	- for state-owned field production.
	NATROY	- for Native-owned field production, presently same as state rate.
		Production tax rates:
	STTAX	- for state-owned field production.
	NATTAX	- for Native-owned field production, presently same as state rates.
	REVSHR	Percentage of federal royalties returned to state through revenue sharing.
	RP8SPRUD	Production of Prudhoe Bay (state-owned) in $\$10^3$ bbls/day.
	PRODCOOK	Field production from Cook Inlet (state-owned) in 10^3 bbls/day.
	LINETAX	State property tax rate on pipeline property.
*	P01-P10	Cumulative value of pipeline property for as many as 10 pipelines.
	RP8SRTAX	Reserves tax and tax credit.

*See note on data series for "ECONX Component."

DNCS Component

ANCSA specified that variable payments be made each year to the Native Corporations of 2 percent of the total of bonus petroleum revenues and the value of oil produced in that year. The cumulative payment to the Native Corporations shall not exceed $500 million. For purposes of our model, we have assumed that in the year when payments reach $500 million, the payments will be deducted from current oil production first, up to a maximum of 2 percent.

At the present time, the DNCS component of the model covers only the variable payments from the state to the Native corporations for the purpose of calculating RP8S and RPBS, but presumably this could be expanded to incorporate other payments to the Native Corporations and regionalization of DNCS. It also makes the approximation that the variable payments will total $500 million.

DEFINITION

DNCSP8A — 2 percent of the value of oil produced, all of which will be paid to the Native Corporations until the cumulative payments to the Native Corporations is equal to $500 million.

```
DNCSP8A == RP8SSTOT * .02
```

DNCSP8 — Actual payment to Native Corporations from current petroleum revenue.

```
DNCSP8 == DNCSP8A  if DNCSP8A + DNCSTOT(-1) < 500
       or 500 - DNCSTOT(-1)  if  DNCSTOT(-1) <500
       or 0
```

DNCSPBA — 2 percent of state petroleum bonus revenues. The amount paid to the Native Corporations depends upon the level of DNCSP8 and DNCSTOT(-1).

```
DNCSPBA == RPBSST * .02
```

DNCSPB — Actual payment to Native Corporations from petroleum bonus revenue.

```
DNCSPB == 0          if DNCSPBA = Ø
       or DNCSPBA  if DNCSPBA+DNCSP8+DNCSTOT(-1) < 500
       or 500-DNCSTOT(-1)-DNCSP8  if DNCSP8+DNCSTOT(-1) < 500
       or 0
```

DNCSA — Total state variable payment to the Native Corporations.

```
DNCSA == DNCSP8 + DNCSPB
```

DNCSTOT — Total to date of cumulative variable payments to the Native Corporations.

```
DNCSTOT == DNCSA = DNCSTOT (-1)
```

1R7

RPBS			RPBS & RP8S	
Bonus Production & Discount Sched.[3]	Lease Year[1]		Peak Production 10^3 bbls/day[2]	
SCHEDA	LEASEF01	1976	PEAKF01	1200
SCHEDA	LEASEF03	1976	PEAKF03	200
SCHEDA	LEASEF02	1977	PEAKF02	600
SCHEDB	LEASES01	1977	PEAKS01	200
SCHEDB	LEASES02	1976	PEAKS02	260
SCHEDB	LEASEN01	1976	PEAKN01	200
SCHEDB	LEASES05	1980	PEAKS05	200
SCHEDA	LEASEF04	1979	PEAKF04	200
SCHEDB	LEASEF05	1979	PEAKF05	2000
SCHEDB	LEASEN02	1979	PEAKN02	200
SCHEDB	LEASES03	1979	PEAKS03	200
SCHEDA	LEASEF07	1978	PEAKF07	600
SCHEDA	LEASEF06	1977	PEAKF06	200
SCHEDB	LEASES04	1979	PEAKS04	400
SCHEDB	LEASEN03	1977	PEAKN03	200
SCHEDB	LEASES06	1981	PEAKS06	200
SCHEDA	LEASEF08	1981	PEAKF08	1000
SCHEDB	LEASEN04	1980	PEAKN04	200
SCHEDB	LEASEN05	1981	PEAKN05	200
SCHEDB	LEASEN06	1982	PEAKN06	200
SCHEDB	LEASEN07	1982	PEAKS07	200
SCHEDA	LEASEF09	1980	PEAKF09	2000
SCHEDA	LEASEF10	1982	PEAKF10	1800
	(LEASEF11-15)		(PEAKF11-15)	
	(LEASES08-10)		(PEAKS08-10)	
	(LEASEN07-10)		(PEAKN07-10)	

;count 2; SCHEDB = Bonus 2 x Discount 2

RP8S

Oil Flow Start Date	&	Production Schedule	Pipeline Property Value[1]	=	Start Year	&	Pipeline Property Schedule
1983		1					
1980		1					
1984		1					
1980		2					
1980		2					
1979		2					
			P01		1974		3
			P02		1978		2
1983		2					
1985		1					
1983		2					
1982		2					
1983		2					
1984		1					
1981		1					
1981		2					
1980		2					
			P03		1981		3
1985		2					
1987		1					
1983		2					
1985		2					
1986		2					
1986		2					
1986		1					
1988		1					
			P04		1982		3
			P05		1985		1

(P06-10)

Years after Lease Date	% of Peak Production: Bonus Production Schedule 1		Bonus Production Schedule 2		Discount Multipliers: Discount[1] Schedule 1	Discount Schedule 2		Discount[1] Schedule 3
1	RPBSB101	0	RPBSB201	0	.909	RPBSD201	.870	.833
2	RPBSB102	0	RPBSB202	0	.826	RPBSD202	.756	.694
3	03	0	03	0	.751	03	.658	.578
4	04	0	04	.10	.683	04	.572	.482
5	05	0	05	.30	.620	05	.497	.402
6	06	.05	06	.50	.564	06	.432	.335
7	07	.10	07	.70	.513	07	.376	.279
8	08	.18	08	.80	.466	08	.326	.233
9	09	.28	09	.90	.424	09	.284	.194
10	10	.38	10	1.00	.385	10	.247	.162
11	11	.46	11	1.00	.350	11	.215	.134
12	12	.53	12	1.00	.318	12	.187	.112
13	13	.58	13	1.00	.289	13	.162	.094
14	14	.63	14	1.00	.263	14	.141	.078
15	15	.68	15	1.00	.239	15	.122	.065
16	16	.73	16	1.00	.217	16	.107	.054
17	17	.78	17	1.00	.197	17	.093	.045
18	18	.83	18	1.00	.179	18	.081	.038
19	19	.88	19	1.00	.163	19	.070	.031
20	RPBSB120	.92	RPBSB220	1.00	.148	RPBSD220	.061	.026

[1] Discount Schedules 1 and 3 are not in the CONST file because they are not used now.

RP8S

PETROLEUM PRODUCTION SCHEDULES

Year	Percentages of Peak Production	
	Schedule 1[1]	Schedule 2[2]
1	.05	.10
2	.10	.30
3	.18	.50
4	.28	.70
5	.38	.80
6	.46	.90
7	.53	1.00
8	.58	1.00
9	.63	1.00
10	.68	1.00
11	.73	1.00
12	.78	1.00

[1] For OCS fields, based on data presented in Council on Environmental Quality, OCS Oil and Gas--An Environmental Assessment, Vol. 4 (Washington, D.C.: Government Printing Office, 1974), Appendix I, "OCS Oil and Gas Recovery," Exhibit I-3, Offshore Development Timetable for Gulf of Alaska - High Recovery, pp. 1-7.

[2] For onshore and nearshore (state territorial waters) fields. Mike Scott's estimates.

CUM. VALUE OF PIPELINE PROPERTY (10^6\$)

Year	Sched 1 3/	Sched 2 2/	Sched 3 1/	Sched 4 4/	Sched 5 5/
1	38.0	27.8	33.0	819.4	433.0
2	81.4	84.3	815.0	2297.5	815.0
3	931.8	269.3	3505.0	3023.0	3505.0
4	2053.1	500.7	5850.0	3316.7	5850.0
5	3022.1	687.2	7020.0	3417.0	2500.0
6	3968.3	652.8	7059.0	3246.1	6000.0
7	3769.8	618.5	7741.5	3075.3	7741.5
8	3571.4	584.1	6630.0	2904.4	6630.0
9	3373.0	549.8	6240.0	2733.6	6240.0
10	3174.6	515.4	5850.0	2562.7	5850.0
11	2976.2	481.0	5460.0	2391.9	5460.0
12	2777.8	446.7	5070.0	2221.0	5070.0
13	2579.4	412.3	4680.0	2050.2	4680.0
14	2381.0	378.0	4290.0	1879.3	4290.0
15	2182.5	343.6	3900.0	1708.5	3900.0
16	1984.1	309.2	3510.0	1537.6	3510.0
17	1785.7	274.8	3120.0	1366.8	3120.0

1/ Historical data for '74, '75: estimate of 80% complete by Jan. 1, 1977 for 1977, 90% complete for Jan 1, 1978; 95% complete by Jan. 1, 1979; 100% complete by Jan. 1, 1980. (\$7.8 billion). Offsetting depreciation of 5% per annum on value in place beginning in 1978. Value = actual cost until start date, then actual cost less 5% depreciation on historical cost (assumes 20 year field life).

2/ Figure at Alaska Arctic Gas estimate, (DOI's final EIS), escalated by 5% per year from 1974 base. FEIS, p. 19, Alaska volume.

3/ As stated by El Paso Alaska and reported by ISER in the Aerospace Corp. study, "Impact on the Alaska Economy of Alternative Gas Pipelines," A Report, April 1975; State of Alaska Dept. of Revenue. Inflated by 5%, compounded annually for 2 years, to reflect a Jan. 1, 1978, starting date, and 6 year construction schedule.

4/ Equals 1.5 times the predicted cost of the Alcan gas pipeline, Alaska section, to allow for extensive use of insulating and vertical support members.

5/ Allows interruption of property tax payments on Trans Alaska pipeline, due to disaster.