

ALASKA LEGISLATURE

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Craig Dorman

Vice President for Research

Dr. Craig E. Dorman joined the University of Alaska as Vice President for Research in March 2002. Prior to joining the University of Alaska, Dr. Dorman was a senior scientist at the Applied Research Laboratory of Pennsylvania State University. From Penn State, he was detailed on an Intergovernmental Personnel Act assignment to the Office of Naval Research, where he served first as Chief Scientist and Technical Director of the International Field Office, headquartered in London, and then as Special Assistant and Chief Scientist at ONR Headquarters in Arlington, Virginia. Dr. Dorman is also a director of Maritrans, Inc., Tampa, Florida; and a board member of several non-profit educational and research institutions.

Dr. Dorman attended Dartmouth College on a Naval ROTC scholarship, receiving his BA in Geography (summa cum laude; Senior Fellow) and commission as Ensign, USN, in 1962. His naval career comprised service with the Underwater Demolition and SEAL Teams, and as a Program Manager. While in the Navy, he received his MS and Ph.D. in Oceanography, respectively at the Naval Postgraduate School (1969) and the Massachusetts Institute of Technology-Woods Hole Oceanographic Institution (MIT/WHOI) joint program (1972). He retired from the Navy in the rank of Rear Admiral in February 1989, to accept the position of Director of Woods Hole Oceanographic Institution, Woods Hole, Massachusetts. Following his tour as director, Dr. Dorman spent two years as deputy director for Laboratory Management, Defense Research and Engineering, before joining Penn State.

THE ECONOMICS OF UNIVERSITY RESEARCH

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1. RESEARCH ACTIVITY IN THE UNITED STATES AND ALASKA

United States

Research and Development (R&D) is a \$284 billion business in the United States, accounting for 2.5 percent of the Gross Product.¹ The output of this spending is new knowledge—advances in basic understanding of the world and technological and other improvements in the way we produce goods and services. The increases in productivity that come from research account for a large share of the overall growth in the economy. Capital investment and increases in the quantity and quality of the work force account for the rest.

California leads the nation in research spending with \$48 billion followed by Michigan, New York, Texas, and Massachusetts (Table 1). However R&D accounts for a larger share of the economy in several smaller states, as measured by the ratio of spending to Gross Product, including New Mexico, Rhode Island, and Maryland.

Table 1. Top Research and Development States in 1999

	Share Amount (Billion \$)		Share of GSP (Percent)
1 California	\$48.0	New Mexico	6.4
2 Michigan	\$18.8	Michigan	6.1
3 New York	\$14.1	Rhode Is	5.1
4 Texas	\$12.4	Mass	4.6
5 Mass	\$12.2	Maryland	4.6

Source: National Science Foundation, *Science Resource Statistics*, June 2002

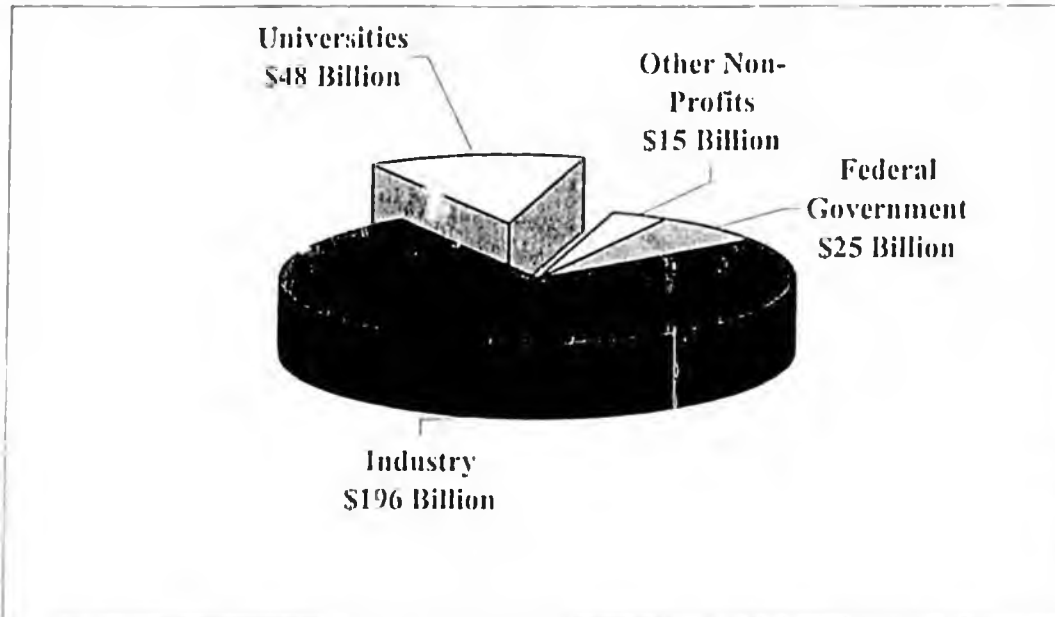
Most (69 percent as measured by dollars spent) research and development is done directly by private industry (Figure 1). About 14 percent takes place within the federal government and non-profits. Universities and Colleges account for the remaining 17 percent—about \$48 billion in 2003 (including Federally Funded Research Development Centers administered by Universities).

While Industry is also the source of most funding for research and development, the federal government provided 30 percent (Figure 2). Universities contributed only 4 percent and other non-profits the remaining 3 percent.

Basic research accounted for 19 percent of total spending, but 55 percent was conducted by universities with 61 percent of the funding provided by the federal government. In contrast most applied research, which accounted for 24 percent of the total was performed by private industry. Development expenditures, 57 percent of the total, were primarily spent by private industry.

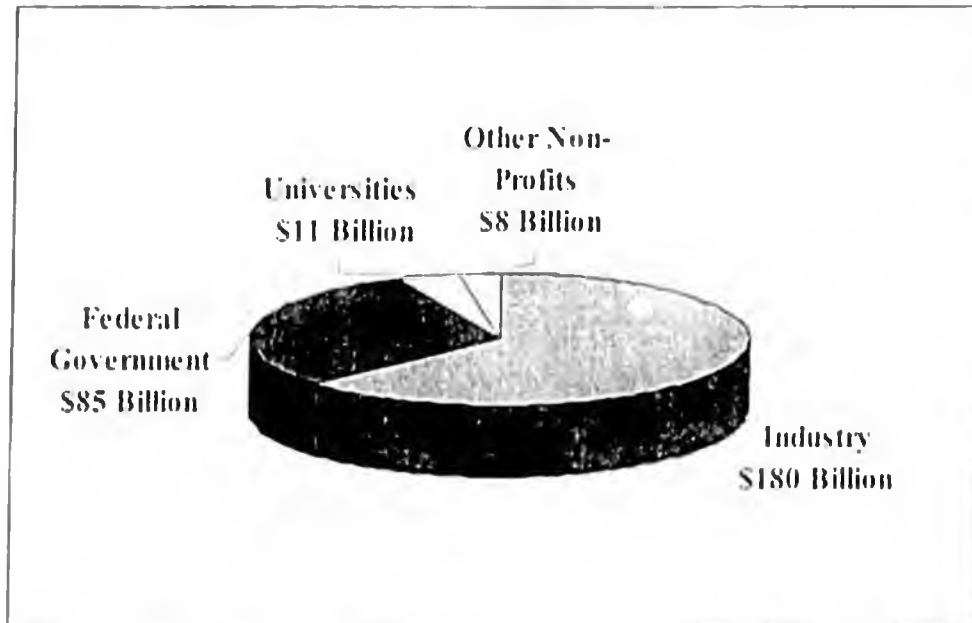
¹ Data for 2003 from National Science Foundation, *Science Resources Statistics*

Figure 1. National Expenditures for Research and Development, 2003



Source: National Science Foundation, National Patterns of Research and Development Resources, 2003

Figure 2. Sources for Research and Development Funding, 2003



Source: National Science Foundation, National Patterns of Research and Development Resources, 2003

Alaska

Alaska ranks near the bottom among the states in the total amount of R&D activity. Most research in Alaska is conducted by the University of Alaska and directly by the federal government, and very little is done by industry. Alaska ranks 47th among the states in total research, 50th in industry research, and 42nd in University research (Table 2).

Alaska's performance is better in per capita terms, but spending on R&D per person is only half the U.S. average. Only federal R&D is above the per capita U.S. average. In terms of the "intensity" of R&D spending (R&D/Gross Product), Alaska is ranked number 41. About 1 percent of Alaska Gross State Product is devoted to R&D spending.

The small amount of private industry spending on R&D in Alaska is due to several factors. The first is the absence of manufacturing industry within the state, except for seafood processing. Second is the dominance of the public sector within the economy both in terms of jobs and resource ownership. Third is the absence of Alaska based resource businesses large enough to financially support investments in R&D. Finally Alaska has not been an attractive location for private research facilities due to cost and distance from clients and customers.

Table 2. Alaska Research and Development Profile

Indicator	Rank	Amt	% U.S. Average	Date
Total R&D (mill \$)	47	\$196		2000
Industry R&D (mill \$)	50	\$9		2000
Academic R&D (mill \$)	42	\$116		2001
Population (% US)	48	0.22%		2002
Total R&D (\$ per capita)	32	\$467	49%	2001
R&D Intensity (R&D/GSP)	41	1.04%	38%	2001
Federal R&D (\$ per capita)	13	\$335	116%	2001
Fed R&D / Total Fed \$	22	3.30%	72%	2001
SBIR Awards	51	9		97 to 01
Patents	51	50		2001

Source: National Science Foundation, Science and Engineering State Profiles, 2000-2001

Note: SBIR is the Small Business Innovation Research Program of the Small Business Administration.

2. UNIVERSITY RESEARCH IN THE UNITED STATES AND ALASKA

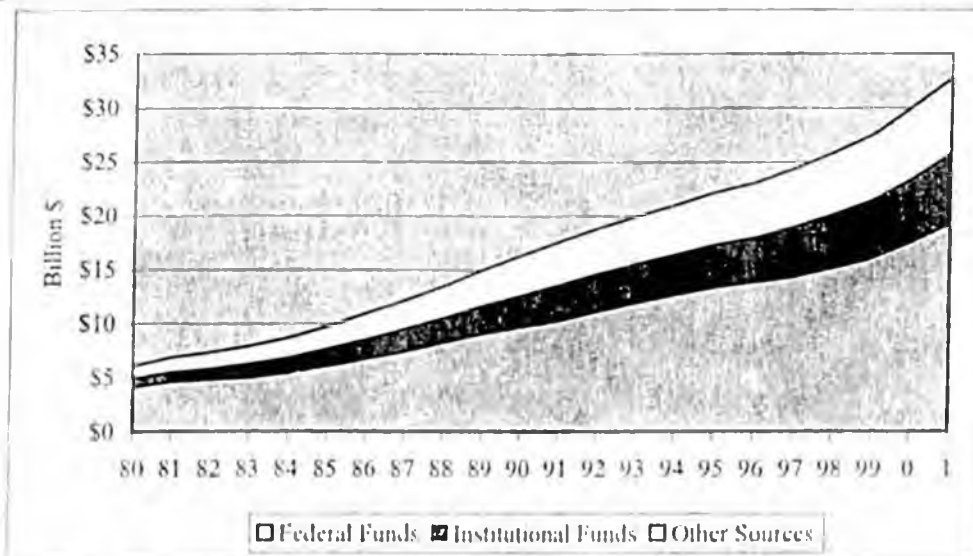
United States

University R&D is a growth industry. Since 1980 University R&D spending has increased at an average rate of 7.6 percent a year, compared to a 6.3 percent growth rate for the economy in total. Furthermore, University R & D spending has increased in every year while the overall economy has gone through two recessions during that period (Figure 3).

The federal government supplies the majority of funding for University R & D (59 percent in 2001). This funding source continues to grow, but its share of the total is falling as other sources grow in importance. Institutional funds supplied directly by the Universities account for 20 percent of total funding and industry, state and local government, and non-profit providers account for the remainder.

Institutional support for University R&D has been increasing as a share. In the early 1980s Universities spent 16 cents of their own money for every \$1 of research funding attracted from outside academia (from federal, private, and non-profit sources). By 2000 institutions committed on average 25 cents for every \$1 attracted from outside.

Figure 3. University Research and Development by Funding Source



Source: National Science Foundation

The majority of University research (75 percent) is basic rather than applied.

The largest research University in the nation, Johns Hopkins, spent \$1 billion on R&D in 2002 (Table 3). The next largest research Universities—each with more than half a billion in research spending—were public institutions: UCLA, University of Wisconsin,

University of Michigan, and University of Washington. The University of Alaska at Fairbanks was ranked 95th with spending of \$110 million.

Table 3. University R&D Spending: 2002

Rank	Institution	Budget (Million \$)
1	Johns Hopkins	\$999
2	UCLA	\$693
3	U of Wisconsin	\$604
4	U of Michigan	\$601
5	U of Washington	\$590
95	U of Alaska Fairbanks	\$110

Source: National Science Foundation, Science Resources Statistics

Alaska

Total R&D revenue generated at the University of Alaska in 2003 was \$133 million, primarily at Fairbanks and its associated campuses (Table 4).² However Anchorage and Juneau were also sites of research activity. The research budget not only funded the activities directly associated with research (\$121.6 million), but also contributed \$11.5 million to the general support of the University budget through payments to other departments within the University (redistributed indirect cost recovery (ICR)).

Table 4. University of Alaska Research Revenue in 2003

	(Thousand \$)
UA Anchorage	\$11,529
UA Fairbanks	\$108,948
UA Southeast	\$1,110
UA Total	\$121,587
Plus: Redistributed Indirect Cost Recovery	\$11,496
TOTAL	\$133,083

Source: University of Alaska, Statewide Budget and Institutional Research

Growth in University R&D in Alaska has been strong and consistent. It has increased from \$77 million in FY98 to \$133 million in FY03—an increase of 73 percent in 5 years (Table 5). This growth has consistently exceeded the national average.

² The University defines research to include program evaluation and training, both of which contribute to productivity growth in organizational structure and the labor force.

Table 5. Growth in University of Alaska Research Revenue

(In Thousands of Dollars) Growth Rate

FY98	\$77,204	
FY99	\$81,458	5.5%
FY00	\$90,664	11.3%
FY01	\$109,407	20.7%
FY02	\$119,753	9.5%
FY03	\$133,083	11.1%

Source: University of Alaska Statewide Budget and Institutional Research

A small share of funds for research comes from the state General Fund as part of the University of Alaska appropriation, but the majority comes from other sources (Table 6). In 2003 there was \$8 of total research spending for each \$1 of State General Fund support for research (Total R&D / General Fund). This "General Fund Multiplier" has been growing over time from a level of 5.1 in 1998.

Table 6. University of Alaska Research Revenue: Sources of Funds

(in Thousands of Dollars)

	State General Fund	All Other	Total	General Fund Multiplier (Ratio: Total / General Fund)
FY98	\$15,058	\$62,146	\$77,204	5.1
FY99	\$12,956	\$68,502	\$81,458	6.3
FY00	\$15,392	\$75,272	\$90,664	5.9
FY01	\$16,313	\$92,890	\$109,407	6.7
FY02	\$16,322	\$103,431	\$119,753	7.3
FY03	\$16,618	\$116,465	\$133,083	8.0

Source: University of Alaska Statewide Budget and Institutional Research

Most outside funding for University research comes from the federal government (Table 7). In 2003 University research expenditures totaled \$109.9 million.¹ \$98.8 million came from the federal government--\$80.6 million directly and \$18.1 million indirectly through state agencies and other sources, mostly private. Private sources directly accounted for \$9.2 million (plus \$15.7 million that originated with the federal government but was channeled through private sources). The state accounted directly for \$2 million, plus \$2.4 million of federal funding channeled through government.

¹ Accounting definitional differences result in total expenditures being slightly less than revenues.

Table 7. University of Alaska Research Expenditures by Funding Source for FY2003
(In Thousands of Dollars)

FUNDING SOURCE	Direct			Federal Indirect Through		TOTAL
	Federal Agency	State Agency	Other Sources	State Agency	Private, Local, Other	
GRAND TOTAL	\$80,650.0	\$2,011.2	\$9,200.2	\$2,423.6	\$15,685.7	\$109,970.7
FEDERAL	\$80,650.0			\$2,423.6	\$15,685.7	\$98,759.3
STATE		\$2,011.2				\$2,011.2
PRIVATE, LOCAL, OTHER			\$9,200.2			\$9,200.2

Note: These numbers represent research expenditures (including ICR) and not the awarded amount. Excludes state General Fund support. Keep in mind that many grants are multi-year awards and so are the expenditures associated with them.

Source: University of Alaska, Statewide Budget and Institutional Research.

Among federal agencies the largest contributors to University research in 2003 were the National Science Foundation, NASA, the Department of Defense, and NOAA (Table 8).

Table 8. Largest Federal Funding Sources for University of Alaska R&D in 2003

	(Thousand \$)
National Science Foundation	\$24,685.3
NASA	\$15,595.4
Dept of Defense	\$11,528.2
NOAA, Dept of Commerce	\$9,893.5
National Institutes of Health, Dept HSS	\$5,842.0
US Geological Survey, Dept of Interior	\$4,119.6
Cooperative State Research Service, Dept of Agriculture	\$3,726.4
Subtotal	\$75,390.5
All Other Federal	\$23,368.8
TOTAL	\$98,759.3

Source: University of Alaska Statewide Budget and Institutional Research

Private, local and other sources directly contributed \$9.2 million as well as \$15.7 million through federal agencies

Corporations and other universities are the largest non-government sources of funding, although a majority of the funds they provide originate with the federal government (Table 9).

Table 9. Largest Non-Government Funding Sources for R&D in 2003

	(Thousand \$)
Other Corporations	\$7,659.5
Other Universities	\$5,666.5
University Foundations	\$2,343.2
Other Nonprofit Organizations	\$1,664.8
International Corporations	\$40.9
Native Corporations	\$2.4
Other	\$7,508.5
TOTAL	\$24,885.8

Source: University of Alaska Statewide Budget and Institutional Research

The state contributed \$4.4 million for specific studies over and above the General Fund appropriation. The largest state agency contributors to University research were the Departments of Health and Social Services and Fish and Game. Some of this funding also originated with the federal government.

About 2/3 of University research takes place through the organized institutes and centers. Faculty and staff within the different schools and departments account for the remainder (Table 10). Most research funding is obtained through the competitive process, although some is earmarked for specific purposes, and thus obtained non-competitively.

Table 10. New Research Awards to University of Alaska in 2003 by Type

	Organized Research		Other Sponsored Activities		Total FY New Awards	
	# of Grants	Grant Amt (\$ 000)	# of Grants	Grant Amt (\$ 000)	# of Grants	Grant Amt (\$ 000)
Total 2003	322	\$66,935.0	323	\$39,956.4	645	\$106,891.4
Competitive	212	\$53,096.8	174	\$22,299.2	386	\$75,396.0
Non-Competitive	88	\$11,279.1	104	\$11,170.2	192	\$22,449.3
Other	22	\$2,559.0	45	\$6,487.0	67	\$9,046.1

Source: University of Alaska Statewide Budget and Institutional Research

University of Alaska research is concentrated in several areas, as can be seen by its national rank for expenditures by discipline. The University of Alaska Fairbanks is 12th in the nation in the field of Mathematics and Computer Science, largely due to the Arctic Region Supercomputing Center (Table 11). It also ranks high in spending for research in the field of Atmospheric, Earth, and Oceanography Science. In contrast it ranks low in Life Science research.

Table 11. University of Alaska Fairbanks R & D Profile for 2001

Indicator	Rank	Amount (Million \$)
Total R&D	95	\$110.0
Math and Computer Science	12	\$16.3
Atmospheric, Earth, Oceanography	16	\$30.5
Physical	54	\$13.6
Life Science	150	\$16.6
Federal Funding	105	\$55.3
Total R&D --All UA Campuses	68	\$115.0

Source: National Science Foundation

In 2003 new awards totaling \$106.9 million were concentrated in Science, Mathematics & Technology and in Education (Table 12).

Table 12. Number and Value of New Research Awards in 2003
(in Thousands of Dollars)

	Organized Research		Other Sponsored Activities		Total	
	#	Value	#	Value	#	Value
Total	322	\$66,935.0	323	\$39,956.4	645	\$106,891.4
Science, Math & Technology	191	\$55,503.1	35	\$2,238.0	226	\$57,741.1
Education	7	\$380.1	87	\$14,563.6	94	\$14,943.7
Social Sciences	38	\$3,401.0	46	\$6,423.2	84	\$9,824.3
Other	17	\$1,822.0	49	\$6,645.2	66	\$8,467.2
Health & Medicine	22	\$2,781.6	22	\$2,725.9	44	\$5,507.5
Cooperative Extension	3	\$74.9	22	\$2,181.2	25	\$2,256.1
Business, Management & Commerce	5	\$263.6	21	\$1,854.7	26	\$2,118.3
Agriculture & Food Sciences	7	\$260.4	5	\$1,441.5	12	\$1,701.9
Inter-Disciplinary	10	\$768.0	13	\$726.2	23	\$1,494.2
EPSCoR Research Focus Area	8	\$1,293.1			8	\$1,293.1
Engineering	9	\$188.8	3	\$555.8	12	\$744.7
Arts and Humanities	2	\$132.7	20	\$601.2	22	\$734.0
Energy	3	\$65.4			3	\$65.4

Source: University of Alaska Statewide Budget and Institutional Research

Research spending is concentrated in a handful of institutes on the campus at Fairbanks, with lesser amounts broadly distributed across many organizations on all campuses of the University (Table 13).

Table 13. Research Revenue by Campus and Program in 2003
(in Thousands of Dollars)

TOTAL	\$133,082.6
UA Fairbanks	\$108,948.0
Geophysical Institute	\$32,013.4
School of Fisheries and Ocean Sciences	\$20,602.3
Institute of Arctic Biology	\$13,469.4
Arctic Region Super Computer	\$9,500.7
International Arctic Research Center	\$9,397.7
School of Natural Resources and Agric Sciences	\$7,113.5
Institute of Northern Engineering	\$4,538.8
College of Science, Engineering, and Mathematics	\$4,298.1
Mineral Industries Research Laboratory	\$1,494.8
Museum	\$845.5
Petroleum Development Lab	\$813.3
Alaska Native Language Center	\$165.0
School of Management	\$73.3
Center for Cross Cultural Studies	\$0.4
College of Rural Alaska	
Other	\$4,621.8
UA Anchorage	\$11,529.0
Institute of Social & Economic Research	\$3,835.2
Environment and Natural Resources Institute	\$1,620.5
Institute for Circumpolar Health	\$1,469.7
Psychology	\$785.8
School of Engineering	\$630.4
Alaska Natural Heritage	\$624.2
Justice Center	\$532.6
Center for Alcohol and Addiction Studies	\$312.2
Community & Technical College	\$136.4
Biomedical Program	\$74.2
Other	\$1,507.9
UA Southeast	\$1,109.5
UA Total	\$121,586.5
Plus: Reallocated Indirect Cost Recovery	\$11,496.0

Source: University of Alaska Statewide Budget and Institutional Research

3. UNIVERSITY RESEARCH AS AN ECONOMIC ENTERPRISE

Economic Impact

The overwhelming majority of money funding University research in Alaska comes from sources outside the state. For this reason University research can be viewed as an economic enterprise similar to the metal mining industry, the seafood industry, the timber industry, or the oil and gas industry. Each sells its output to customers outside the state and each brings new dollars into the state in the process.

These new dollars lead to expansion of the economy of Alaska. They pay the salaries of Alaska workers and support sales to Alaska businesses. Their economic impact extends beyond the direct effect of paying for the cost of research. Through the mechanism of the economic multiplier, employment, payroll, and sales are generated in the private economy throughout the state.

Over half of the University research budget in 2003⁴ was paid out in wages and benefits to 1,228 full and part time University employees (Table 14). The next largest budget item was contracted services, comprising a diverse array of services from computer and aircraft maintenance, to facilities rental, to freight services. Capital equipment purchase was largely computer related and miscellaneous research equipment, but also included less esoteric items such as safety and transportation equipment. Commodity purchases included things like field camp supplies, food for animals, and fuel for planes and boats. Travel included both instate and out-of-state travel. Small amounts were budgeted for student aid and miscellaneous expenses.

Table 14. UNIVERSITY RESEARCH AS AN ECONOMIC ENTERPRISE

DIRECT ECONOMIC IMPACT IN 2003 (Million \$)

TOTAL UA RESEARCH	\$121.6
Wages	45.2
Benefits	17.5
Contracted Services	33.6
Capital Equipment	8.4
Commodities	8.1
Travel	5.7
Student Aid	2.0
Miscellaneous	1.0

Source: University of Alaska Statewide Budget and Institutional Research

⁴ This excludes the \$11.5 million of indirect cost recovery that provided general University support

Although some of these purchases, like computer and other research equipment, were made outside the state and had little impact on the Alaska economy, most of the research budget does result in either wages to Alaska workers or purchases from Alaska businesses. Because of this, the total impact on Alaska's economy is large relative to the total amount spent on University research.

Adding to the direct impact of University research on the economy is the spending associated with visiting scholars who travel to Alaska to conduct their own research activities funded through their home academic institutions in other states.⁵ The economic impact of these visitors is exactly analogous to that of tourists visiting Alaska from other parts of the world, bringing outside money into the state and spending it to the benefit of the Alaska economy.

The total economic impact of University Research can be measured in jobs created, payroll produced, and total business sales generated within the state (Table 15). More than 2,300 jobs can be traced back to University research spending. About 1,200 are within the University—faculty, staff, student assistants, and others—and nearly 1,100 are in a large variety of businesses in the private economy scattered throughout the state—from construction, to transportation and trade, to services.

The total payroll associated with these jobs is more than \$80 million, with a little over half going to University employees and the rest to workers in the private economy.

We estimate direct instate procurement of \$42 million associated with the University research budget. As indicated, this includes purchases of a wide array of services, and commodities as well as some construction and transportation services. Employees spending their paychecks and companies (who do business with the University) making local purchases from other businesses generated an estimated \$65 million more in business sales within Alaska.

⁵ For example Toolik Field Station every year hosts large numbers of non-resident researchers during the summer field season.

⁶ University and other research facilities in Alaska also attract other visitors to the state, and help to enhance the quality of the experience of visitors. Examples include the Sealife Clater in Seward and the Museum at the University in Fairbanks.

**Table 15. UNIVERSITY RESEARCH AS AN
ECONOMIC ENTERPRISE
TOTAL ECONOMIC IMPACT IN 2003**

JOBS	
Total	2,310
University	1,228
Private	1,082
PAYROLL (Million \$)	
Total	\$80.3
University	\$45.2
Private	\$35.0
PRIVATE BUSINESS SALES (Million \$)	
Total	\$106.8
Direct Procurement	\$42
Other Sales	\$64.8

Source: ISER Calculations.

Industry Characteristics

Viewed as an economic enterprise, University research has a number of attractive features including:

- **Labor Intensive**—Over 1/3 of the revenues from this industry (37 percent) went directly into payroll.
- **High Wage**—Although faculty make up only a portion of jobs in this industry, the average wage is higher than the economy-wide average.
- **Quality Jobs**—Most jobs in the industry come with a full benefits package that adds considerable value over and above the wage.
- **Year Round Employment**—Although some jobs are seasonal, most are not, and tend to offset the summer seasonal decline in teaching activity at the University.
- **Diverse Job Mix**—The variety of research activities generates a diverse job mix in the private economy dependent on research spending.
- **High Resident Job Share**—Residents hold most of the jobs in University research.
- **Stable**—The level of spending on University research nationally has increased each year for at least the last 20 years.

- **Growing**—Growth in spending on University research has outpaced growth in the overall US economy.
- **Footloose**—Most research can be conducted wherever there is a decent laboratory with support for the scientists. It need not be located in proximity to resource deposits, as is the case for our natural resource industries, or close to markets, as is the case for most services.
- **Environmentally Benign**—University research is a clean industry with minimal impacts on the quality of the environment.
- **Low Burden on Government**—Government regulation and oversight of the industry is not required.
- **Non-Competitive with Other Industry**—Unlike oil and gas, mining and our other natural resource industries, University research does not generate conflicts over appropriate and conflicting uses of the environment and natural resources.
- **Stable Potential Tax Base**—Although it does not directly create a product that is taxable, the large payroll and instate procurement per dollar of spending on research create potential tax bases of personal and business income.
- **Backward Linkages**—Unlike some industries (like oil and gas and rural tourism) that are “enclaves” physically located in Alaska but not linked to the rest of the economy through purchases of local inputs, the large procurement budget and urban location for most research activities result in strong backward linkages that foster economic activity in support industries.
- **Forward Linkages**—There are no direct forward linkages in the form of sales to other sectors of the economy, but this is a characteristic of most of our resource industries as well.
- **Value Added “Spin-offs”**—The objective of private businesses is profit and they create spin-offs that benefit other industries only indirectly or by chance. In contrast, the objective of University research is new knowledge that can be applied to increase productivity in business and government. New knowledge can also be applied to the non-profit sector to improve economic and social well-being. These value added spin-offs are the most unique feature of University research, an added bonus that other industries do not provide.

Benefit to Cost Comparison

The State General Fund appropriation to the University for general support of research in 2003 was \$16.6 million, about 8 percent of the total University general fund budget of

\$211 million. Total University research expenditures in that year were \$121.6 million, producing 2,310 jobs and \$80.3 million in payroll.⁷

If we think of the State General Fund appropriation for research as “seed money”, then we can calculate the return to the economy from that expenditure as the jobs and income created. Specifically the “Bang Per Buck” for each \$1 million of General Fund appropriation for research was 139 jobs and \$4.8 million in payroll within the state.

There are indirect benefits to the University from research activities as well. World-class research⁸ adds prestige to the University which in turn leads to a greater demand from students and an increased ability to attract quality faculty.

The General Fund appropriation to University research also generates value added “spillovers” that we will address in more detail below.

Comparisons to Other Selected Alaska Private Sector Basic Industries

Each Alaska basic sector industry has different features and characteristics. In this section we review some features of selected industries simply to provide some comparisons with University Research as an economic enterprise.

Each of these industries receives support from state government, just as does University Research, through a variety of mechanisms. These include operating expenditures for management, tax expenditures, capital expenditures, and loans. We have not attempted to quantify the support provided each industry to make any comparisons with our “Bang per Buck” calculation for University Research as such data is not readily available for most industries.

Metal Mining. The value of metal minerals production in Alaska, primarily zinc, gold, and silver, was \$823 million in 2002, generating a payroll of \$77 million in the industry, and annual average employment of 1,153 in the mining sector. Mining is very capital intensive (as reflected in the low ratio of payroll to value of production), high wage, resource dependent (and subject to market price fluctuations and location dependent), and environmentally sensitive. It produced \$2.5 million in revenues to the state in 2002 as well as additional revenues to local governments and resident resource owners.⁹

⁷ Not counting the impact of the \$1.5 million of reallocated indirect cost recovery.

⁸ For example the research of Brian Barnes of the Institute of Arctic Biology has been highlighted on the cover of Science magazine. The first Rasmuson Chair in Economics was held by Dr. Vernon Smith, a Nobel Prize Laureate.

⁹ Alaska's Mineral Industry 2002, Division of Geological and Geophysical Surveys, and Alaska Department of Labor.

A legislative research study done in the 1990's calculated that the revenues to the state generated by mining at that time (\$4 million) were exceeded by the direct government cost to manage the resource (\$8 million).¹⁰

Tourism. Non-resident vacationers spent \$811 million in Alaska in 1998, directly generating 12,835 wage and salary jobs and 3,584 proprietor jobs for a total of 16,419 jobs. Wages were \$249 million and proprietor income was an additional \$65 million.¹¹ These jobs were concentrated in the lodging, restaurant, retail, and transportation services sectors of the economy. Tourism related employment tends to be highly seasonal with a large non-resident share. Tourism is a rapidly expanding industry and the growth potential is significant for Alaska.

There has not been a comprehensive analysis of either the public expenditures or public revenues associated with the tourism industry in Alaska. However, continued expansion of this industry will require substantial public investments in infrastructure, marketing, and other services.

Seafood. The annual value of the Alaska seafood harvest exceeds \$1 billion and after processing it has a wholesale value in excess of \$2 billion. During 2000 45,550 people were engaged in commercial fishing and processing in Alaska, including the adjacent federally managed waters. This was equivalent to 27,877 full time jobs, of which Alaskans held 36 percent. Total personal income was \$437 million.¹² Taxes from fishing activity averaged \$47 million in the 1990s, with about half going to local communities.¹³

A 1996 analysis calculated state revenues of \$67 million from commercial fishing and \$21 million from sport fishing, compared to \$102 million in fisheries-related state expenditures.¹⁴

International Air Cargo. Employment associated with international air cargo operations at Ted Stevens International Airport in 2000 has been estimated to be 3,058 with a payroll of \$126 million.¹⁵ The operation is labor intensive and is part of a rapidly expanding industry. It is somewhat sensitive to environmental issues and the business cycle, as well as technological developments that could impact the relative attractiveness of Anchorage as a location for air cargo services.

Air cargo operations produce revenues for the airport, but the amount of revenue generated for the state general fund has not been calculated. State expenditures in

¹⁰ State of Alaska Natural Resource Revenues and Expenditures in FY 95, Legislative Research Series, June 1996.

¹¹ Alaska Visitor Industry Economic Impact Study, 1999 Update, McDowell Group, 1999.

¹² Alaska Economic Performance Report 2002, Alaska Department of Community and Economic Development, 2003.

¹³ Ibid.

¹⁴ State of Alaska Natural Resource Revenues and Expenditures in FY 95, Legislative Research Series, June 1996.

¹⁵ Ted Stevens Anchorage International Airport: Economic Significance 2000, ISER, 2001.

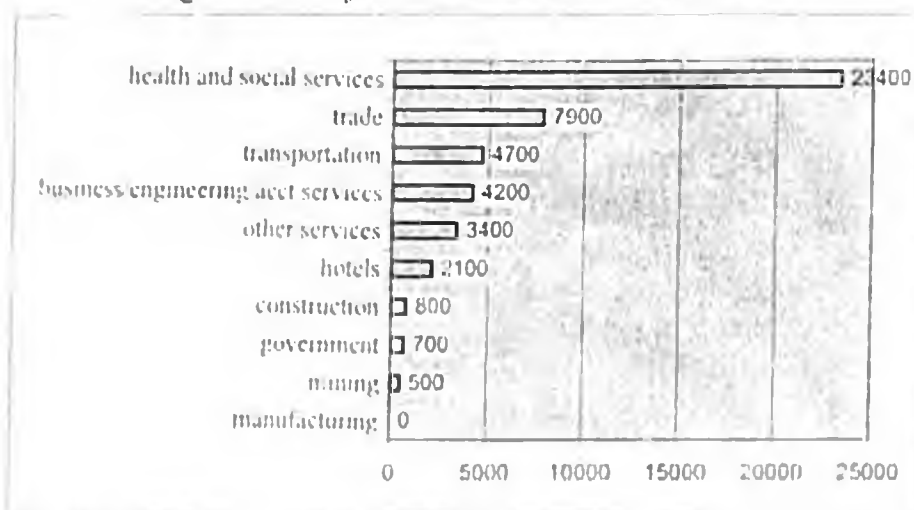
support of the industry have also not been specifically studied, but are probably modest, although the industry does enjoy a tax advantage on fuel sales.

4. FUTURE GROWTH OPPORTUNITIES FOR ALASKA UNIVERSITY RESEARCH

Jobs and income have been growing in Alaska, but much of the growth is tied to federal spending which has increased rapidly in the last 5 years and cannot be counted on to continue expanding or even to stay at its current high level. Strength in the tourism, international air cargo, and mining sectors has also contributed to the strong economy, but timber, seafood, and oil and gas have been struggling because of global competition and other challenges.

Looking ahead, the Alaska Department of Labor projects employment to increase by 48 thousand (1.6 percent growth per year) between 2000 and 2010. Compared to the 40 thousand jobs added in the previous decade this would be a solid performance. However, the Department expects that 97.5 percent of new jobs will be in service producing industries and only 2.5 percent in the goods producing industries of mining (including oil and gas), construction, and manufacturing (including seafood processing and timber) (Figure 4).¹⁶ Most new jobs will be in health and social services (49 percent) and trade (17 percent). These new jobs will have a lower wage than the current average, consequently pulling down the economy-wide average as time passes.

Figure 4. Projected Job Growth 2000-2010



Source: Alaska Department of Labor, May 2002

Because of its attractive characteristics, expansion of university research as an enterprise can contribute to strengthening of the economy in the future. It can contribute to diversity of the economic base, growth in high wage employment, and stability in the

¹⁶ Alaska Economic Trends, May 2002. This projection includes construction of a gas pipeline by 2010.

work force without adverse impact on the environment, little conflict with other industries, and minimal government administrative cost.

The growth potential for University research as an enterprise comes from several factors. First, University R&D spending nationally has been increasing faster than growth in the total economy for two decades. Second, Alaska University research is under-represented in several important and high growth areas, in particular, the life sciences. Third, a considerable share of research about Alaska-specific questions is currently being conducted by Universities in other parts of the country. The University of Alaska could be capturing a larger share of that research—and be benefiting to a much larger degree than it currently is by simply hosting visiting scholars who come for a short time and return to their homes outside Alaska with information collected here. Fourth, the University of Alaska could capture a larger share of research on the Arctic currently done outside Alaska.¹⁷ Finally, there is research that Alaska governments, businesses, and non-profits fund. Some of this research is done at the University of Alaska, but much of it is exported to Universities in other states. This represents another growth opportunity for expansion of Alaska University research.¹⁸

A large share of University research funding comes from the federal government, either directly, or through other agencies, as is the case in other Universities in other states. Some federally funded research at the University of Alaska is the result of earmarks—research money allocated to the University non-competitively. It is University policy to use these earmarks to build research capacity within the state in order to compete more effectively for research funds in the future.

Not all funds earmarked for Alaska research is conducted in Alaska or by the University of Alaska. Some earmarked funding for Alaska research goes to support research conducted directly by agencies of the federal government like the National Marine Fisheries Service and the Department of Defense. Also some of the research funded through those agencies is placed with organizations outside of Alaska. Because a share of Alaska research earmarks is spent outside the state, the risk to the Alaska economy from a reduction in earmarked research is less than it might otherwise appear to be.

5. VALUE ADDED SPILLOVERS FROM UNIVERSITY RESEARCH: WHAT CAN WE "TAKE TO THE BANK" FROM APPLIED RESEARCH?

Much University research is "basic" meaning it has no immediate practical application, but rather increases our understanding of the world we live in. But such research may lead to important and exciting breakthroughs in unanticipated ways. For example,

¹⁷ A Web site listing of National Science Foundation grants for Arctic Natural Sciences Research accessed March 3, 2004 identified \$3.6 million out of a total of \$46.2 million going to researchers affiliated with the University of Alaska.

¹⁸ Capturing some of this exported research would be equivalent to "import substitution" as characterized in the economic development literature.

research on hibernation in small mammals, conducted at the University of Alaska Fairbanks, could provide insights into treatments for stroke patients or applications in the military.

However a considerable share of the research at the University provides a more direct benefit to Alaska over and above its value as an economic enterprise. There are several ways that University research, unlike other economic enterprises within the state, produces value added in the form of knowledge that can be applied to problems. For many of these applications a monetary value might be calculated, although this is rarely done in practice. Below we discuss some of the links between the University and economic development from applied research and give examples of each. This discussion is illustrative rather than exhaustive because of the multitude of projects underway at any time within the University research community.

- **COMMERCIAL SPINOFFS**—Sometimes a new invention discovered at the University, a new way of doing something, or a new application of knowledge results in the creation of a new business startup.¹⁹ To many people this is the essence of the link between University research and economic development—epitomized by the experience of places like Silicon Valley. While important, this is only one of many aspects of the link between University research and economic growth and development. In Alaska this is a small, but potentially growing, part of that link.
 - **ABR Inc.**, an environmental research and services firm was founded in Fairbanks in 1976 by University of Alaska Fairbanks graduate Bob Ritchie. ABR Inc. is an example how expertise gained doing university research translates to private sector growth and the export of specialized services. ABR Inc. now has 40 employees serving the federal and state government, Native organizations, engineering firms, oil and gas industry, timber, utility, and other for-profit organizations, universities, and non profit groups, primarily those managing or using natural resources. Twelve of the 15 senior scientists have higher degrees from UAF. Degrees include wildlife management, natural resource management, marine biology, ecology and botany. Most of the other technical staff also have degrees from UAF. Each higher degree graduate is currently involved in research similar to, or related to, the theme of their thesis. Ritchie has continued to do wildlife surveys, primarily of raptors, which he'd done while a student at UAF. ABR Inc. scientists have used their specialized knowledge to develop an expertise using radar to monitor avian use around transmission lines and other facilities. They've exported this expertise outside of Alaska, adding an Oregon office in 1995. That office's revenues and research programs are still very dependent on radar investigations and the client base has expanded to include the military. ABR Inc. has developed a solid niche in Alaska and their services are often selected over 'outside' competitors.

¹⁹ A new business startup could either add to the export base of the economy, or generate economic growth through import substitution.

- RFID is an example of movement of research outside traditional natural resource applications. Radio frequency identification has application in national defense, home electronics, medicine, and other fields where it can be used to more efficiently track inventory and cargo. University researchers are working with private industry on installation of RFID systems and developing computer programs to link information to a secured Web-based system. In addition to research that helps businesses use RFID technology, UAF's Center for Nanosensor Technology, in partnership with private industry and North Dakota State University, is building a sterile lab for research and development of high-end, custom RFID tags.
- **BUSINESS INNOVATION**—A lot of applied University research involves investigating specific problems encountered in Alaska natural resource industries. Solutions to these problems reduce the cost of doing business, increase the opportunities for business expansion, and can lead to the development of new products and ways of doing business.
 - **Fisheries**—A commercial geoduck harvest in southeast Alaska has historically supported the export of about 400,000 pounds of processed geoducks annually to the Pacific rim. University researchers helped develop a PSP (Paralytic Shellfish Poisoning) monitoring system that has allowed harvesters to ship their product to market live rather than processed. Since the market price for live geoducks is potentially \$5 to \$10 per pound compared to \$.80 for processed products, this change is having a dramatic effect on the profitability of this industry. Furthermore it opens up the opportunity for an entirely new enterprise—geoduck farming—that is beginning to develop at sites in southeast Alaska. When fully developed the industry could be shipping 1 million pounds or more of live geoducks annually.²⁰
 - **Mining**—The manager of the Fort Knox gold mine near Fairbanks moved there specifically to work with the Mineral Industry Research Lab at the University and he is currently working towards his PhD at UAF. His work involves modeling that assists in making production more cost effective. University research contributed to a \$6.7 million expansion on the Fort Knox plant that has increased recovery by 2 percent—\$3.8 million dollars.²¹ Other employees at the Fort Knox Mine are working on degrees at MIREL and using classes to explore problems they encounter at work.
- **PUBLIC INFRASTRUCTURE EFFICIENCY**—University research is involved in many areas looking at ways to reduce the costs of providing public services in Alaska. Innovations reduce the cost of government and ultimately the cost of doing business in the state.
 - **Engineering Roads**—Alaska roads from Glenallen and all points north are subject to the settling heaves of thawing permafrost. Permafrost

²⁰ Julie Decker, Southeast Alaska Dive Fisheries Association, personal communication.

²¹ John Holloway, mill manager, personal communication.

typically takes 50 years to thaw completely making maintenance expensive. A new embankment material developed by Prof. Doug Goering at the Institute of Northern Engineering at UAF is designed to keep permafrost under roads frozen and to prevent the settling heaves. The material, which can cost up to 10 percent more than current embankment material, is being used in new road construction in Fairbanks. The Alaska Department of Transportation plans to use the material on other new road construction where it will save money over the life of the road, even though initial installation is more expensive than traditional methods.

- **Telemedicine**—Delivery of medical services to rural Alaska is expensive and time consuming—often requiring patients and health care workers to travel great distances to see each other. University research developed a method for transporting images over existing telephones lines. This technology is being used by health aides in rural Alaska who take pictures of patients and send them to doctors hundreds of miles away at considerable savings to all involved. Telemedicine is used by the Alaska Federal Health Care Access Network. (AFHCAN), which has 235 sites throughout the state and coordinates between public health nurses, the Coast Guard, Veterans Administration, military and Native community. University researchers presented a report on Alaska's telemedicine project to the eight-nation Arctic Council so that this technology could benefit other countries where great distances make it difficult to deliver health services. There are plans to expand into telepsychology, teleradiology, and teledermatology.²²

- **PUBLIC ASSET MANAGEMENT**--University research helps to sustain and enhance the value and productivity of Alaska's natural resources.
 - **Seafood**-- The UAF Fishery Industrial Technology Center (FITC) in Kodiak is working to increase the value of Alaska's fishing industry and marine resources through research, technological development, education and service. FITC two main programs are Sustainable Harvesting and Seafood Processing.
 - **Energy for Alaska Communities**--Scientists at the Arctic Energy Technology Development Laboratory at UAF are working closely with the power generation, coal, oil and natural gas industries to design and fund research projects that will make a difference for Alaska. They are particularly emphasizing proposals that involve UAF and industry collaborations.
 - **Coal**—A Coalbed Methane Project is underway to find coal seams in remote villages where importing energy is very expensive. A Coalbed Methane Project in Fort Yukon is being undertaken with support from the Department of Natural Resources.
 - **Oil and Gas**— the unbiased nature of University research often makes it desirable to private industry. This is true of a project undertaken by

²² Prof. Carl Hild, Associate Director, College of Health and Social Welfare, personal communication

UAF's Institute of Northern Engineering to study the environmental impact of draining tundra ponds to create ice roads on the North Slope. BP is interested in the project because it not only provides valuable information on roads the company is using to conduct business, but it also provides "unbiased" research the company can use to respond to environmentalists' concerns. The project has funding from the Department of Energy and BP is providing a cost share.

- **Methane Hydrates**—the University is conducting research on energy sources that can be used when fossil energy supplies are depleted, 50-80 years from now. This forward-looking research—which BP is supporting with money and expertise—is concentrated on extracting methane from frozen methane hydrates. Methane is a pure chemical compound from which natural gas is produced. There is as much methane in methane hydrates as in all known natural gas reserves.
 - **Membrane Separation Technology**—University researchers will be junior partners in research that is planned by BP and its stakeholders to find a cheaper method to separate CO₂ from natural gas. Before natural gas may be shipped through a pipeline CO₂ must be separated out. Costs for building a gas separation plant are currently estimated at \$2.5 billion. This project would develop a process that could save \$500 million from the total cost.
 - **Prospects for future research**—Alaska is becoming less and less attractive to large oil companies that can extract oil other places more cheaply. This will mean smaller oil companies coming to Alaska. These smaller companies will have less in-house research capability (unlike BP that has its own geology department) and will be more likely to turn to University research to support their work.
- **INFORMATION FOR BETTER BUSINESS DECISIONMAKING**--The University provides nonproprietary information available to all for use in aiding business and government decision making.
 - **GINA**, the Geographic Information Network of Alaska, that makes digital data associated with geographic coordinates, available to scientists, policy makers and the Alaskan public.
 - **Alaska Sea Ice Atlas**, a website of ice information used for logistical and engineering-type decisions in ice covered water.
 - **ISER** economic projections produced by the Institute for Social and Economic Research are used by government, individuals and businesses to make investment and planning decisions.
 - **EXPERTISE**--Expertise gained doing University research provides a source of experts on issues of importance to industry and to the public process.
 - **Seafood Markets**—Prof. Gunnar Knapp has spent many years researching Alaska fisheries issues and specifically Alaska's salmon industry for the Institute of Social and Economic Research. His expertise has been used by the Alaska Seafood Marketing Institute. Alaska salmon

processors have also relied upon Prof. Knapp's expertise, most recently in a class action antitrust case brought against them in 2003. Salmon processors relied upon Prof. Knapp as an unbiased expert since he testified based on research conducted for the University and received no pay for his testimony. Prof. Knapp's testimony helped the jury understand the downturn in the salmon markets, resulting ultimately, in the processors prevailing in court. The jury's decision preserved thousands of processing jobs and saved Alaska processors millions of dollars.²³

- **Grant Assistance--**University faculty are experienced in developing grant proposals and use this expertise to help teach community members how to apply for grants. The Institute for Circumpolar Health Studies assisted the Aleutian Pribilof Island Association in getting a grant to study contaminants in subsistence foods. The Association was the first tribal body to obtain, independently, a competitive grant from the National Institute for Health Sciences Environmental Research.²⁴ They in turn contracted with the University to evaluate the program and other services. By providing expert advice—and evaluation services—University researchers enabled community members to conduct research of benefit to themselves.
- **TRAINING--**Researchers trained in Alaska do a better job than those imported from outside Alaska. Many private and public offices have close ties to University departments graduating students in their field. These students not only bring innovative ideas, up-to-date knowledge, and sensitivity to Alaska issues and problems, but they are also more likely to stay on the job thereby reducing the costs of turnover to employers.
 - **Lead Removal from Contaminated Soils—**Brice Environmental, a Fairbanks range maintenance and remediation firm, hired staff trained at UAF's Mineral Industry Research Lab (MIRL) when it made the transition 15 years ago from construction work to soil remediation. University expertise helped Brice to blend its "dirt moving" capabilities with technical lead remediation to provide clients with environmental services. The firm continues its association with MIRL—consulting with faculty, benefiting from research papers and staff taking courses. Now, ninety percent of Brice's work is done outside of Alaska. They've completed projects at the Twin Cities Army Ammunition Plant, Fort Polk Louisiana, Massachusetts Military reservation, and Fort Dix New Jersey among others. They've also done work at Fort Greeley.²⁵
- **TOURISM ENHANCEMENT--**University research facilities such as the Alaska SeaLife Center, Poker Flat Research Range, and UAF Museum contribute to the

²³ Letters in support of Prof. Gunnar Knapp's testimony and research sent to University of Alaska President Mark Hamilton June 2003 from Don Giles, President & CEO Icelife Seafoods, Inc, Alec Brindle, Chairman Wards Cove Packing Company; and Charles H. Bundrant, President & CEO Trident Seafoods Corporation.

²⁴ Prof. Carl Hild, College of Health and Social Welfare, personal communication.

²⁵ Tom Benjamin, Brice Environmental, personal communication.

attractions that bring tourists to Alaska. Ongoing research provides interesting displays and current information making these institutions vital and interesting to tourists looking for uniquely Alaskan experiences.

- **INVENTIONS AND LICENSING**—the Intellectual Property and Technology Transfer Office is encouraging the licensing, patent and copyright of products of University research and is working with government and industry to find support for University research. It is encouraging inventions and helping with marketing. In addition to Prof. Doug Goering's road embankment material that prevents permafrost thaw, other licenses have recently been issued for musk ox feed rations; a genetic switch in bacterial form; three nanoscale sensors; a method for softening both saline and freshwater ice with biodegradable materials that will have application in the frozen food industry; and an acoustical tree/log imager to find flaws in standing timber. Joint inventor projects include a new design for a flow field that may have use in the medical industry as well as reverse osmosis industry that may have application in the fuel cell industry. Although Prof. Goering's embankment material is being used, as is the musk ox feed, other inventions and procedures licensed may take longer to find their niche in the market and to bring financial returns.
- **NATIONAL SPILLOVERS**--Research that has a "spillover effect" providing benefits to the rest of the nation and the world, enhances the University's reputation. University of Alaska research is internationally recognized in a large number of fields within engineering, space physics, climate change and policy research. Much of this research is conducted at the Big Institutes on the UAF campus: the Geophysical Institute, International Arctic Research Center, Institute of Arctic Biology, School of Fisheries and Ocean Sciences, School of Natural Resources and Agricultural Sciences, and the Arctic Region Supercomputing Center.

6. THE BIG 6 INSTITUTES

- **GEOPHYSICAL INSTITUTE**--The Geophysical Institute conducts research from the center of the earth to the center of the sun. The largest institute on the UAF campus—with seven research groups and ten research centers—GI has a world class reputation in marine and terrestrial geophysics and receives a total of nearly \$30 million in research funds from NASA, the National Science Foundation, the Department of Energy, USGS in addition to other public agencies and private industry. The products of research at the Geophysical Institute—which includes Space Physics; Atmospheric Science; Snow, Ice and Permafrost; Seismology; Volcanology; Tectonics and Sedimentation; and Remote Sensing—is exported throughout the world. Examples include:
 - **SAR**-- One of the major projects at GI is the Alaska SAR (Synthetic Aperture Radar) Facility. NASA uses SARs data to study changes in the

earth's surface, including a recent project mapping the destruction of the Amazon rainforest.

- **Sedimentary Research**—Private industry is interested in GI research such as basic sedimentary research in the Brooks Range which is being conducted with funding from the oil industry.
 - **Poker Flat Research Range**—The Geophysical Institute is home to the Poker Flat Research Range—the largest land-based rocket range in the country and only University-based rocket range.
-
- **INTERNATIONAL ARCTIC RESEARCH CENTER (IARC)**--Jointly established by the Japanese and United States governments the International Arctic Research Center conducts research vital to understanding climate change, global warming and Arctic phenomena. While the economic benefits of this research may not be realized for a long time, the work of IARC in determining the balance of natural and human factors contributing to global warming will be of great interest to industry as well as governments. The results may very well determine how industry conducts business in the future. Examples of activities include:
 - **CO2 Protocols**—IARC research helps countries develop CO2 protocols to address global warming.
 - **International Research**—The Center integrates the work of more than 90 international researchers.
-
- **INSTITUTE OF ARCTIC BIOLOGY**--The Institute of Arctic Biology has six major programs that include research in neuroscience, infrastructure research, Native health research, an Experimental Program to Stimulate Competitive Research (EPSCoR), ecological research programs; and a Resilience and Adaptation Graduate Program. These programs bring in research money from NIH, NSF, the National Center for Research Resources, among others. Program examples include:
 - **Arctic Ground Squirrel Hibernation**--University research on the hibernation of Arctic ground squirrels has been featured in national magazines such as *Nature* and created a great deal of interest. Understanding how the squirrels can nearly stop their hearts during hibernation could lead to methods for preventing tissue damage in humans during strokes, as well as many other possibilities.
 - **Toolik Field Station**—The Toolik Field Station on the north slope of the Brooks Range attracts researchers from around the world interested in high latitude ecological and global change research.
 - **Experimental Program to Stimulate Competitive Research**—EPSCoR, a University-state partnership, is intended to build Alaska-based research to support training of students for 21st century technologically based economy.

- **SCHOOL OF FISHERIES AND OCEAN SCIENCES**—Alaska's oceans supply over half the seafood for the nation and the School of Fisheries and Ocean Sciences (SFOS) has seven units and five research programs that conduct vast amounts of research to support the ocean harvest. The research done in this school is of great benefit to Alaska's seafood industry—which is the largest private employer in the state. SFOS not only provides help in the management of the resource it also contributes to expanding the resource with innovations in product and machinery. Examples of activities include:
 - **Fisheries Management**--Studies on the Steller sea lion and fishing gear impacts on endangered seabirds help with management of the fisheries—allowing fishermen to make a living and also preserving the environment.
 - **Expanding the Resource**--A new state law opened up 100 leases to shellfish aquaculture that includes clams and mussels. University research is providing information on the best way to grow shellfish and also providing information on different species that might thrive in Alaskan waters.
 - New technology**--Research at the Fishery Industrial Technology Center in Kodiak is focused on finding innovations in product and machinery for the fishing industry.

- **SCHOOL OF NATURAL RESOURCES AND AGRICULTURAL SCIENCES**—The School of Natural Resources and Agricultural Sciences continues to focus research on problems related to sustainable agriculture and forestry in relation to economic, social and cultural needs. This research helps Alaskans develop crops, livestock and feed in our challenging environment.
 - Turfgrass performance for golf courses in Southeast Alaska and the development of a new feed mix for musk ox are recent research projects conducted in the School of Natural Resources and Agricultural Sciences.

- **ARCTIC REGION SUPERCOMPUTING CENTER**—ARSC provides computational resources to hundreds of scientists and researchers in Alaska and across the nation. These researchers tackle enormous computational problems for some of the Arctic's greatest challenges including global climate change, bioinformatics, permafrost, ocean circulation and sea ice. Completely funded by the Department of Defense, ARSC also brings in significant research dollars from outside Alaska. In the future ARSC may be used by private businesses, which would bring additional revenue to the University.



Water & Environmental Research Center University of Alaska Fairbanks

North Slope Watershed Investigations

WERC-Fact Sheet-03-01

Project Partners

- ◆ GW Scientific
- ◆ BP Exploration
- ◆ ConocoPhillips Alaska
- ◆ Alaska Department of Natural Resources
- ◆ Alaska Department of Fish and Game
- ◆ U.S. Bureau of Land Management

Introduction

For many years, the oil industry and support services have built ice roads and pads for increased access to remote sites with decreased maintenance costs. This technique is quite important to the oil industry in that it allows oil field development or maintenance while avoiding the environmental disturbance associated with construction of gravel roads and pads. Construction on ice-roads and pads begins in December or January when the tundra mat is adequately frozen to support construction traffic and continues through April (depending upon weather). Recently numerous questions have been raised regarding the potential environmental consequences of such pumping. Possible effects of pumping include impacts to the water balance, impacts to aquatic organisms (including fish and invertebrates), and impacts to the lake water chemistry.

Physical, Biological and Chemical Implications of Mid-Winter Pumping of Tundra Lakes

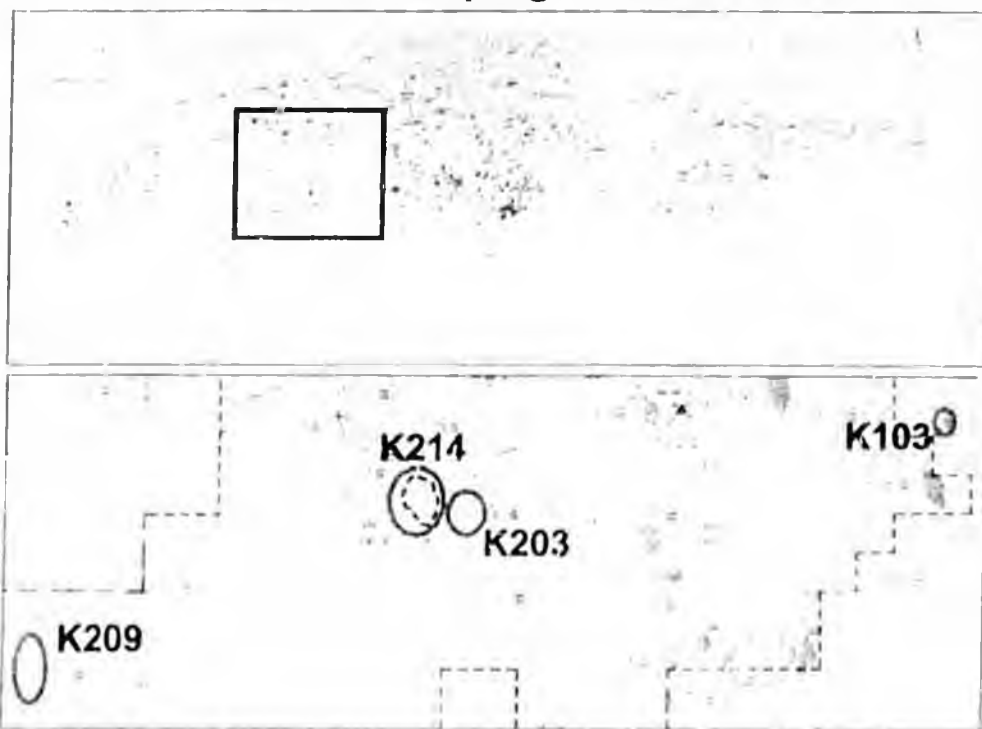


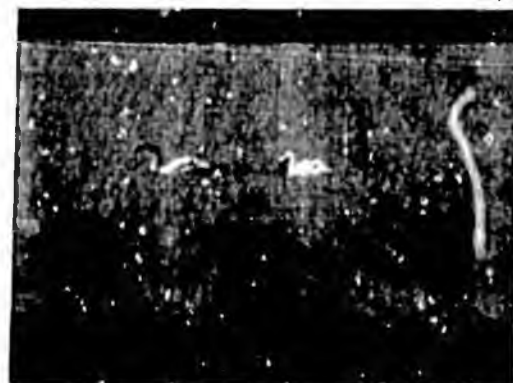
Figure 1. North Slope map indicating current study area (top) and map indicating the four existing monitored lakes (image courtesy BP Exploration).

Project Information

In the Fall of 2002, the University of Alaska Fairbanks Water and Environmental Research Center, together with other project cooperators, initiated a study to obtain baseline information about the physical, biological, and chemical characteristics of North Slope tundra lakes in order to help assess some of the major questions related to winter pumping of lakes. Data from the project is available to the public on the web site. Automated data collection stations on lakes provide 15-minute data which is updated on the dominate at hourly intervals. This project is funded in part by the U.S. Department of Energy through a grant provided by the University of Alaska Fairbanks

Arctic Energy Technology Development Laboratory (AEDTL). Additional funding is provided by project cooperators in the form of financial and in-kind match.

Figure 2. Many North Slope lakes are breeding areas for Tundra Swans (photo - D. Karo).



Project Goals

- ◆ *Collect baseline environmental data on pumped and non-pumped tundra lakes*
- ◆ *Define recharge areas to the lakes*
- ◆ *Initiate distributed modeling analyses of broad area tundra pond water balance*
- ◆ *Determine the implications of pumping the lakes*
- ◆ *Provide data and project reporting to project website*

Parameters Monitored

- ◆ *Continuous lake water levels and temperature*
- ◆ *Continuous specific conductance and dissolved oxygen*
- ◆ *Individual measurements of pH, alkalinity, specific conductance, turbidity, ice thickness*
- ◆ *Individual measurements of water chemistry parameters: Calcium, Magnesium, Nitrate, Potassium, Sodium*

Figure 5. Researchers collect water quality and water chemistry data on a lake during the winter.

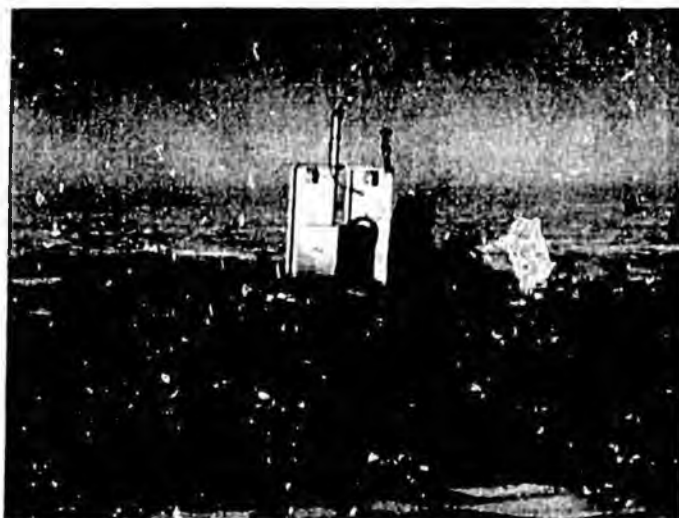


Figure 3. Transporting the hydrologic data collection station to the lake. Stations are designed to float on the lake during the summer months. They are solar powered and data is transmitted to a base station and uploaded to the internet for near real time reporting.

Figure 4: Ice road construction begins when the active layer is satisfactorily frozen. Snow is packed and then pumped water is sprayed onto the snow surface until a sufficient road thickness is attained (photo — W. Morris).



For More Information:

If you would like to find out more about this project, visit the following website.

http://www.uaf.edu/watc/projects/northslope/lake_recharge/index.html

Or contact:

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Galena Electric Power – a Situational Analysis



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Pre-Publication Draft – Subject to Change

EXECUTIVE SUMMARY

Purpose

The purpose of the investigation is to compare the economics of various electrical power generation options for the City of Galena. Options were assessed over a 30-year project period, beginning in 2010, and the final results were compared on the basis of residential customer electric rates (\$/kWh).

Galena's electric utility currently generates power using internal combustion diesel engines and generator sets. Nearby, there is an exposed coal seam, which might provide fuel for a power plant. Contributions to the energy mix might come from solar, municipal solid waste, or wood. The City has also been approached by Toshiba, Inc., as a demonstration site for a small (Model 4S) nuclear reactor power plant.¹ The Yukon River is possibly a site for in-river turbines for hydroelectric power. This report summarizes the comparative economics of various energy supply options.

This report covers:

- thermal and electric load profiles for Galena
- technologies and resources available to meet or exceed those loads
- uses for any extra power produced by these options
- environmental and permitting issues and then
- the overall economics of each of the primary energy options.

Loads

Currently, the city buildings, school, swimming pool, and health clinic space heating needs are met by capturing the heat rejected by the diesel electric generators (DEGs) and transferring the hot water to the buildings (all close to the power plant). We have assumed an existing average cogeneration load of 400 K Btu/hr for 8 months per year plus a 300 K Btu/hr [commercial/residential boiler load] for other buildings in town for eight months. This gives a total yearly cogeneration thermal load [CTLoad] projected for the future of about 4 B Btu. (Northern Resource Group, 2004). We have distributed these over a year using Fairbanks heating degree days [HDD] data. Analysis shows that allowing for expansion and additional customers for heat (the Air Station), the heat delivered annually could be about 8 B Btu in the future.

In Figure ES.1, we see the monthly electric energy generated. This results in an annual load slightly under 10 M kWh. The average monthly load was around 800 kW in July and over 1 MW in January.

¹ Subsequent to release of this report in draft form, Toshiba has offered clarifications to their proposal. First, due to current US regulations and fuel availability, the fuel would probably be manufactured and the reactor charged in a US nuclear facility (i.e. Argonne National Laboratory). Toshiba's assumption is that the reactor would be returned to that location for decommissioning. Second, the capital cost would be borne by a third party (to be determined) that would become the plant owner and responsible for decommissioning. Changes to the text have been made to reflect these assumptions.

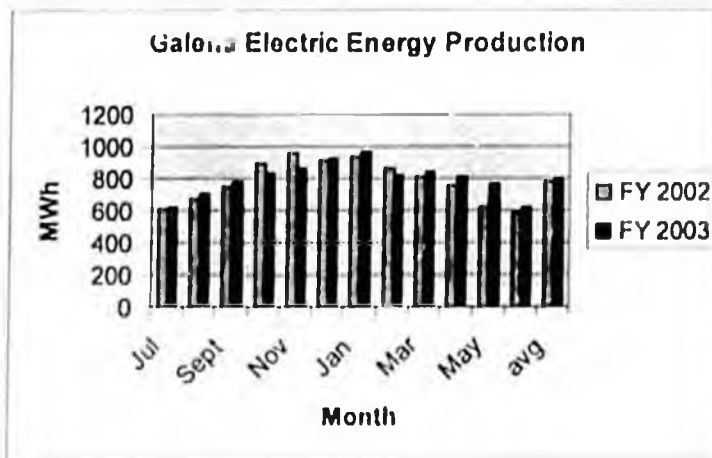


Figure ES.1. Monthly electric generation for Galena

Taking the equivalent projected heating loads and adding the electric loads over the year yields the load requirements displayed in Figure ES.2. for the year 2010.

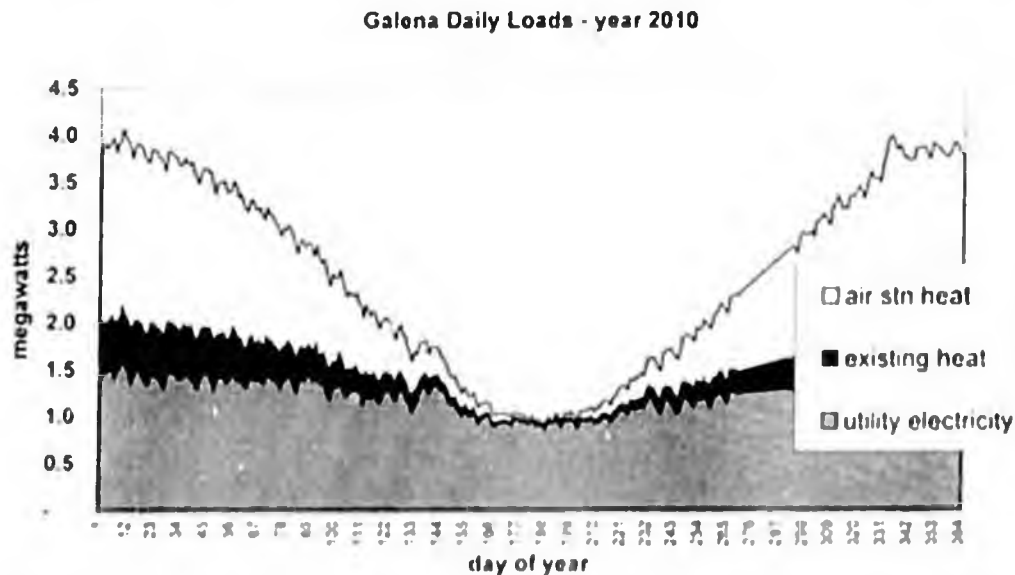


Figure ES.2. Combined heating and electrical loads based on current use in Galena

The various generation options available have different output capacities. For example, the Toshiba 4S system has a generation capacity of 10 MW. Thus, extra power would be available. If the rates were sufficiently low, residential space heating might be an option, as would commercial activities including greenhouses and aquaculture. Figure ES.3. illustrates a possible profile using the base loads from Figure ES.2 with the addition of some of these options for the year 2039. The power requirements are about 8 MW. This would still leave extra power for other uses.

Galena Daily Loads - year 2039

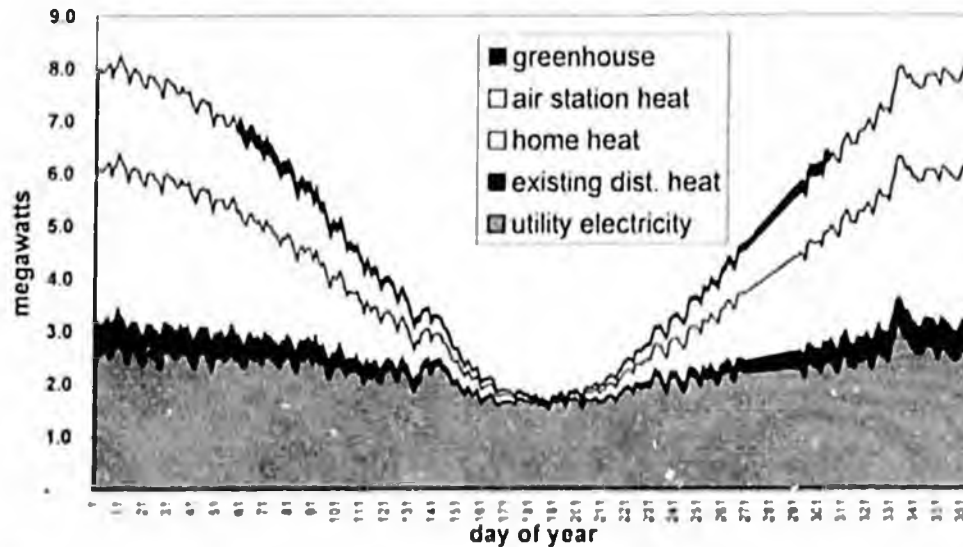


Figure ES.3. Projected combined loads for 2039 with residential space heating and one 2000 ft² greenhouse.

Power Generation Options

The three systems assessed in depth were enhanced diesel, coal (mine and power plant), and the Toshiba 4S nuclear reactor. In the later two cases, backup diesel generators were retained to provide power during any time the primary system was down for repairs or maintenance. All economic analyses included the cost of the backup diesel system.

Enhanced Diesel. According to the Rural Alaska Energy Plan (MAFAa, 2002), the most efficient village sized DEGs available today are capable of achieving peak efficiencies in the 15.8 kWh/gal range. With a fuel oil having a heating value of 135 K Btu/gal, this is equivalent to converting 40% of the energy in the fuel to electric power. For the past two years, the Galena average monthly electrical generation efficiency varied from about 13.2 to 14.8 kWh/gal and averaged 13.76 kWh/gal. For this analysis, we assumed that the units currently in use will continue to perform at 14 kWh/gal and any upgraded or new units will operate at 15 kWh/gal.

Coal (Mine & Power Plant). Exposed coal seams are about 18 road miles upriver from Galena near the Loudon town site. This deposit is not well-understood. Before much further analysis is attempted, the deposit must be explored to determine its size and very importantly its depth below the surface. Samples have been analyzed and have shown an estimated heating value averaging 9.4 K Btu/lb (18.6 M Btu/ton), sulfur content less than 0.5%, ash averaging 9% [range 2 – 16%], and moisture content averaging 19% [14 to 28%]. One exposed seam is about 9 feet high and 2,000 feet across. [Phillips and Denton, 1990]. If a 1-MW coal-fired plant were to operate with an efficiency of 25%, it would require about 0.68 tons/hr of coal or about 12,000 ft³/month. If a 100-foot width were taken from this 9-foot-high coal seam, 13 ft³/month or 166 feet/yr

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would have to be excavated. This coal might be delivered to Galena for an estimated \$100 to \$128/ton.

Atmospheric fluidized-bed combustion (AFBC) boilers are now well-established as a mature power generation technology with more than 620 AFBC units in operation worldwide in the size range 20 to 300 MW. Current operating experience shows that AFBC boilers meet high environmental standards and are commercially viable and economically attractive. For more information on AFBCs see <http://www.epri.com/journal/details.asp?id=627&doctype=features>

These plants burn a range of fuels, including bituminous and subbituminous coal, coal waste, lignite, petroleum coke, biomass, and a variety of waste fuels. In many instances, units are designed to fire several fuels (including biomass fuels), which emphasizes one of the technology's major advantages: its inherent fuel flexibility.

While no AFBC coal power plants in the small size range required at Galena have been built and operated at this time, small AFBC boilers have been used to provide heat for industrial processes. Adaptation to power production requires the addition of a steam turbine and ancillary equipment.

The U.S. Department of Energy (DOE) initiated a study in 1998 (Northern Economics, 2001) to investigate the capital and operating costs of small coal-fired power plants (300 kW to 2 MW). The installed capital costs were estimated at from \$3.0K to \$4.3K/kW and an electricity cost of \$0.22 to \$0.77/kWh.

A 2003 feasibility study on a barge-mounted 5-MW AFBC power plant (Bonk, 2004) estimated capital costs from \$20M to \$25M and electricity costs of \$0.20/kWh minus a credit for heat delivered using Galena coal.

J.S. Strandberg (1997) did a feasibility analysis of an 800 kW AFBC coal plant in McGrath plus a 125 kW DEG. The analysis estimated a total project budget of about \$14 million, which included the power plant, coal mine development, haul road, and an expanded district heating system. The estimated electricity cost was \$0.176/kWh, which included a \$0.077/kWh credit for heat delivered. Over half the total cost was for coal and limestone. A major issue was the high parasitic power required (over 155 kW), and the estimate for it was increased as the study was completed.

Phillips and Denton (1900) calculated costs for a 483 kW coal-fired model cogeneration facility producing 6.8 M Btu/hr of heat. The costs of electricity ranged from \$0.11 to \$0.22/kWh for a base load plant to as much as \$0.80/kWh for a lightly loaded plant. Of the 21 M Btu/hr fuel input, 46% went to the production of electricity. Of the total capital cost of \$7.5 M, \$2.0 M was allocated to electrical and +\$5.5 M to heat. For a plant in Galena using Loudon coal, the electricity costs were estimated to range from \$0.26 to \$0.36/kWh.

A coal-fired plant should be a base-load plant sized to run near its capacity all of the time except for planned shutdowns for maintenance and repair.

Toshiba 4S Nuclear Plant. The 4S Model power plant concept is based on a design for a Small Innovative Reactor (SIR), which is a sealed unit. Unlike conventional

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reactors, the 4S concept is for the sealed reactor to be delivered at the site, installed with the generator system, operated for the prescribed design life, removed, and replaced with the sealed assembly intact. Thus, there would be no emissions (other than steam), no release of radioactivity, and minimum chance of radiation exposure when the reactor assembly is buried. Toshiba has approached the City with a proposal to provide the reactor and power plant so that the 4S can have a reference site and gain operational experience. The capital cost would be borne by a third party to be identified. Some expense may be incurred by the City for site preparation and installation.

The 4S has no mechanical systems internal to the sealed assembly. Electromagnetic pumps move the cooling fluid. The reflecting shield that controls the reaction is also moved electromagnetically. This greatly reduces the potential for mechanical and equipment problems. Cooling and heat transfer is accomplished using liquid sodium metal. Heat is transferred to a steam generation loop and the resulting steam drives the turbine to generate electricity with rejected heat in the condensed water available for district heating or other uses. For district heating, the steam can be used directly. Problems that have occurred in sodium-cooled plants design have been in sections of the plant other than the reactor.

In this concept, the nuclear reactor is planned to be installed up to 100 feet below grade and capped with reinforced concrete. This provides a nearly impenetrable barrier that cannot be lifted by any heavy equipment available in Galena. The 4S also uses a nonproliferation fuel that cannot be used to produce a nuclear weapon without first undergoing isotopic enrichment, an extremely costly and technologically challenging process.

The projected 4S capital cost is projected to be \$2,500/kW for the 50-MW model when developed. If these assumption scales for a 10 MW unit, the capital cost would be \$25 million.² If fully utilized, electric power from the 50-MW unit is estimated by the vendor to be \$0.065/kWh. Our economic analysis proved to be highly sensitive to the number of plant personnel required. A reasonable number of operations personnel are required for efficiency and safety, but it is not known how many security personnel may be required. A detailed safety and security risk assessment, required by the Nuclear Regulatory Commission licensing process, will determine the necessary staffing levels. The time required for the NRC licensing process is not known at this time. It may add a significant period before the plant can be started, but for purposes of this analysis, we assumed a start date in 2010. The experience gained from the Galena project will be used to refine capital and installation cost estimates for future installations.

Other Generation Modules

Although, other options for power were considered, they were not viable for large-scale deployment by the utility. These include solar, wind, in-river turbines, biomass, fuels cells, and coal bed methane.

In-river Turbines. Prototype turbines have been developed but have not been demonstrated in arctic settings. Calculations of the power output from candidate models

² Toshiba presented this estimate with slides describing the 50-MW plant. We have used the cost per kW figure and applied it to the smaller size. Due to economies of scale, this approach may understate the cost of the smaller, 10-MW plant. However, we are unaware of a direct cost estimate for the 10-MW size.

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indicate the output would be relatively low at Galena (22.5 kW for a unit with two 3m diameter turbines). For these reasons, we did not pursue or recommend installation of in-river turbines at this time.

Solar. Much of interior Alaska has a good solar resource for as much as eight months of the year, including the springtime when there is a large need for both heat and electricity. A downside to using solar energy is the intermittent nature of the resource. Hence, as with any intermittent resource, storage can be a key issue. Solar technologies take two forms, solar-electric (photovoltaic) and solar thermal. Photovoltaic devices convert sunlight directly to electricity at efficiencies as high as 25%, although 10% is typical. Installation of a 100 kW module in a Galena setting could cost \$2M. Solar thermal technologies use the heat in sunlight to produce hot water, heat for buildings, or electric power. In Galena, solar technology would best serve individual home or business owners. Its impact on the utility was determined to be limited.

Biomass. Biomass can be wood from trees as well as plant residue, animal waste, and the paper portion of municipal solid waste (MSW). The dispersed nature of this resource makes the energy and time involved in harvesting an important issue. We determined the contribution from this source to be too small for a stand-alone unit. However, MSW could be burned in the AFBC of the coal power plant.

Wind. Galena is located in a low wind resource region – Class 1. For wind turbines to work efficiently and contribute significantly to a utility, they must operate in a Class 5, 6, or 7 region. Thus, wind was not considered.

Fuel Cells. This technology is under intense development but has not been commercialized. While some demonstrations are underway, fuel cells are not available for utility applications at this time.

Coal Bed Methane. Gas has been produced commercially from coal beds in the lower 48. Development of resources in other parts of Alaska is in a preliminary stage. Because information to develop CBM in arctic conditions is insufficient, CBM cannot be considered for Galena. If considered for development, extensive work is required to delineate local reserves before development could occur.

Conservation

Conserving energy can reduce loads for utilities and reduce consumer power bills. Utilities have a role in providing information on conservation to their customers. This report discusses measures that can be taken by end-users to conserve.

Uses of Extra Power

Some power plant options have optimum sizes that would provide power over and above current and projected electrical consumption. For those cases, possible uses studied included district heating, residential electric baseboard heating, transmission to nearby villages, production of hydrogen, and horticulture/aquaculture. Use of all energy produced by generation options is essential to realize the full economic potential of generation systems.

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District Heating/Heat Sales. Currently, DEGs provide heat to City buildings, the school, and swimming pool. This is assumed to continue in all of the scenarios considered. Some expansion is assumed. Also considered is the sale of heat through a hot water pipeline to the Air Station. To provide space heating, the Air Station consumes about the same volume of fuel oil each year as the electric utility. The value of the heat supplied is equivalent to the value of the displaced fuel oil.

Electric Space Heating to Residences. If electric rates can be lowered sufficiently, residents will begin to use more electricity in their homes. With sufficiently low rates, many will convert to electric baseboard heating systems. The only reasonable option here is the 4S nuclear plant. If this situation were to be realized, retrofitting the homes and upgrading the distribution system would result in economies of scale, increased convenience, and enhancement of in-door air quality. In considering the economics of the 4S option, the costs of retrofitting and installation were included in the capital cost to the utility.

Hydrogen Production. Projected electric and heat loads over the 30-year life of this analysis indicate that extra power will still be available. In considering other potential uses, we assessed the production of hydrogen for fuel. Transportation of hydrogen for sale outside the City was determined to not be economical. However, under certain conditions, converting City vehicles, school district buses, and Air Station heavy equipment may be economically feasible. It might also provide the City the opportunity to be a test-bed for production and use of hydrogen in remote arctic settings. Hydrogen production may be feasible but not economically viable without subsidies. No credit was taken for the oxygen that is coproduced, but it could be captured and compressed for local use.

Transmission to other villages. An analysis of estimated construction costs of transmission lines to the villages nearest to Galena revealed that the capital costs were several million dollars greater than the revenue that could be collected over the 30-year period. This option is therefore not considered feasible from an economic standpoint.

Greenhouses and Aquaculture. The extra heat produced by new power plants may give rise to private entrepreneurial activities. We briefly looked at the potential of greenhouses and aquaculture. Many other activities may be viable. If the cost for the heat (in the form of heated water) were low enough, these ventures appear to have merit.

Environmental Issues and Permitting

Issues related to permitting were surveyed for the generation options considered viable. The critical considerations are

- Air pollution control
- Water pollution control
- Waste management
- Disturbance of lands/habitat

After considering all issues and potential emissions, the 4S option appears to be the least problematic (this depends on the Nuclear Regulatory Commission) from the

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standpoint of ease of gaining new permits. Opening a coal mine and building a coal-fired power plant appears to be the most difficult.

Economic Analyses

Estimating the cost of power to the consumer is the primary objective of this project. We considered the three options: improved diesel, coal (mine & power plant), and the Toshiba 4S nuclear power plant. In all cases, the base case was taken as the continuation and improvement of the diesel-based system now in place. The most critical parameters for each option are shown below.

In the base case, two extremes were taken. First, the continuation of diesel generation with a fuel cost of \$1.50/gal at a flat rate (no escalation). The second case took the cost of fuel at \$2.15/gal and escalated it at 2%/year. These cases were used to compare all the others. For the coal option, the delivered cost of the fuel and the conversion efficiency of the plant were the variables on which the power cost most depends. For the 4S option, the staffing levels (the plant operation staff was held constant, but the number of security personnel was varied) required were the most important.

Table ES.1. Most critical parameters for each option considered.

	units	low value	high value
Diesel fuel price in 2010	\$/gallon	1.50	2.15
Diesel fuel price increase (over and above general inflation)	% per year	0.0%	2.0%
Coal price (delivered to Galena)	\$/ton	100	125
Coal plant average efficiency		30%	40%
Nuclear plant security staff	positions	4	34

Numerous scenarios were run showing the effect of various assumptions. The power plant sizes, optimized for the various technologies, were taken with the load and energy uses, and the total project cost, as well as the electricity cost to the consumer, was calculated. The figures below show the results for various scenarios beginning in 2010. The coal and nuclear systems assumed that DEGs would be employed as back-up for maintenance and emergency shutdowns. Therefore, the price of diesel fuel affects the economics of those systems.

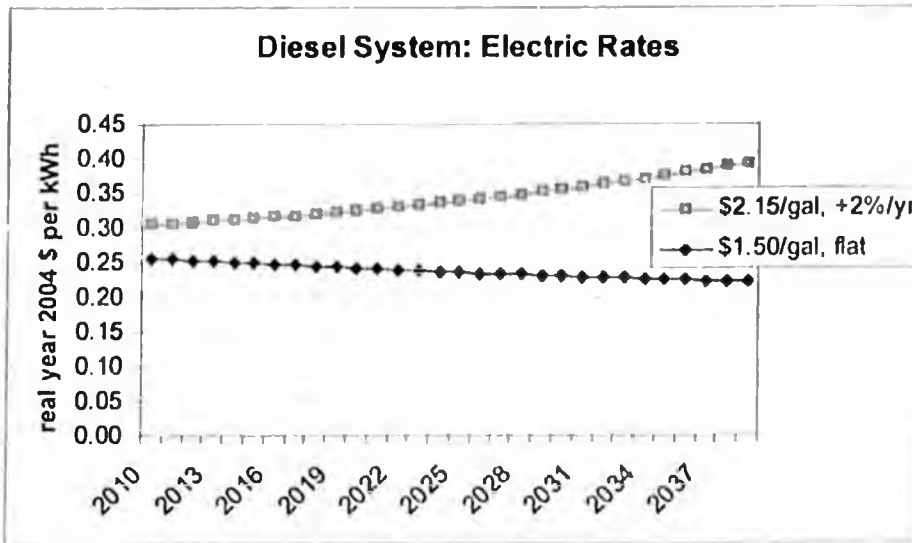


Figure ES.4. Projected future electric rates with a diesel system.

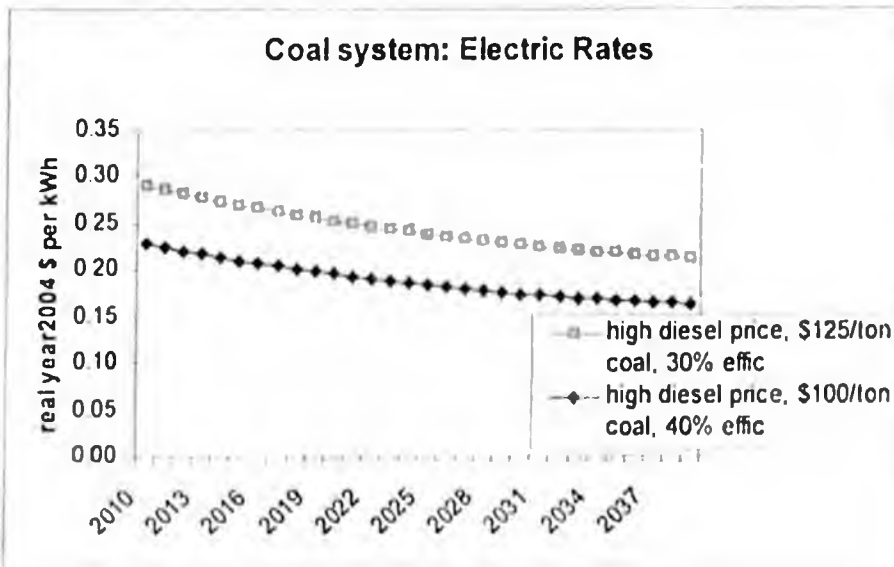


Figure ES.5. Projected future electric with rates with coal system.

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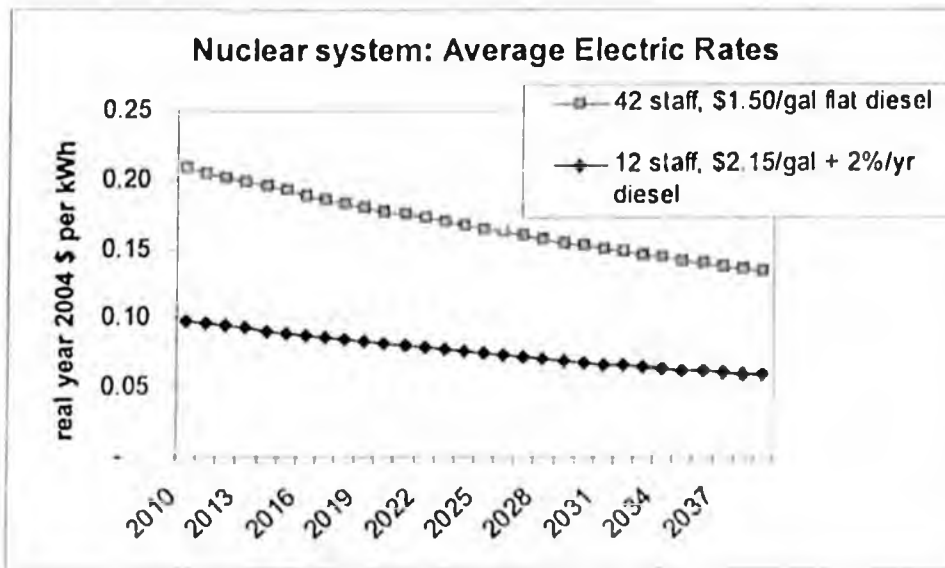


Figure ES.6. Projected future electric rates with nuclear system.

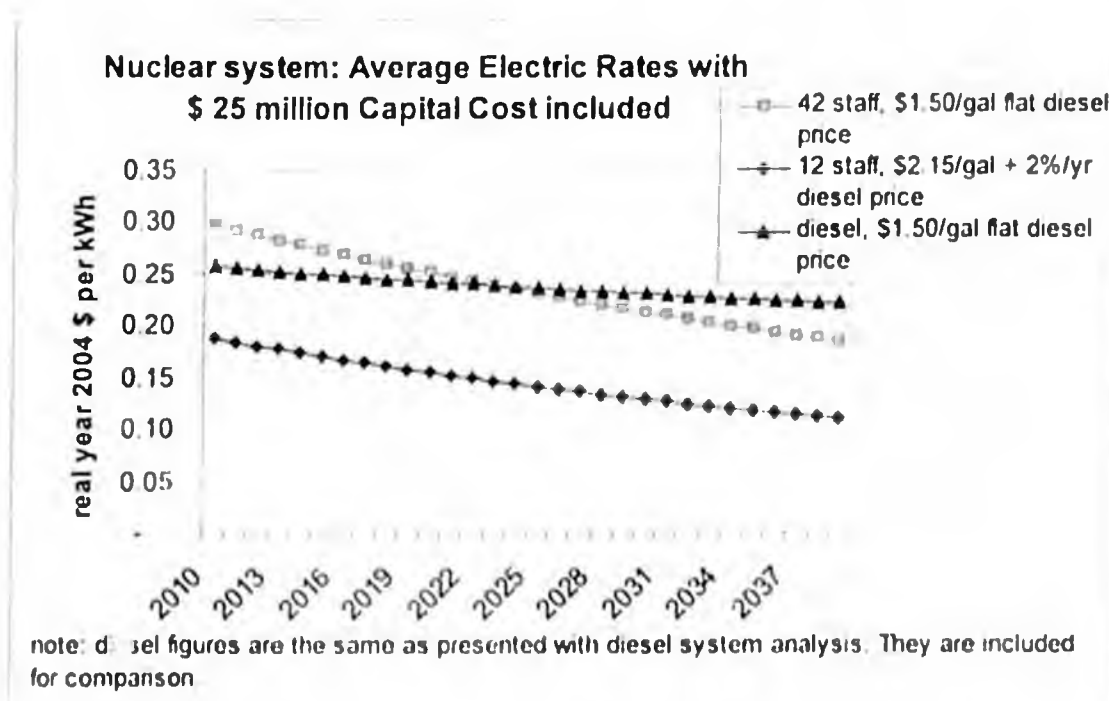


Figure ES.7. Projected future electric rates with nuclear capital costs included in rates.

ES.2. Summary of results of the economic evaluations

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	Diesel	Nuclear	Coal
Loads served:			
utility electricity	X	X	X
existing district heat	X	X	X
residential electric space heat		X	
greenhouse		X	
air station district heat		X	[sometimes]
Life-cycle total cost (\$million)			
low value	38	(7)	23
high value	59	35	36
Net benefits compared to diesel (\$million)			
low value		3	3
high value		67	36
Average electric rate in 2010 (\$/kWh)			
low value	0.26	0.10	0.23
high value	0.30	0.21	0.29
Average electric rate in 2030 (\$/kWh)			
low value	0.23	0.07	0.17
high value	0.36	0.15	0.23

The economic evaluations included the costs of diesel backup generators for coal and nuclear.

In all cases, the nuclear system will provide the lowest cost power to the consumer. The coal option will beat the diesel option in some scenarios.

Conclusions and Recommendations

On the basis of environmental permitting, the nuclear plant appears to be a clear winner. Obtaining permits for the coal plant appears to be the most difficult. The validity of this conclusion depends on the process and length of time required to gain a license from the NRC. All assumptions regarding costs and timing require validation.

The economic analysis reveals that the 4S option will provide the lowest cost power if the assumptions hold. In the Galena case, the assumption is that capital cost will be borne by an outside party and that reasonable staffing levels will result from the licensing process. The coal option may be economic in some scenarios compared to enhanced diesel systems, so the coal option should not be entirely dismissed.

Even though installation of the 4S nuclear plant presents a potential long-term solution to Galena's critical energy issues from economic and environmental permitting standpoints, other aspects, such as safety analyses, remain to be performed as part of the licensing process. Ultimately, the selection of the best energy option must consider these analyses and other factors. Specifically, regarding the 4S nuclear plant option, safety relating to potential accidents involving the reactor core and the use of liquid sodium as a heat transfer medium must be adequately addressed. If this technology is successfully deployed in Galena, its economic viability in other Alaska villages and elsewhere depends on the actual life cycle costs yet to be quantified.

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Benefits associated with adoption of one or more of the technologies discussed in this report go beyond their ability to meet Galena's thermal and electric energy loads.

We see the potential for Galena to serve as a training center for rural Alaskans interested in using similar technologies in their villages. We also see the potential for use of additional cogeneration leading to economic development such as the development of horticulture and aquaculture. Enhancement of local employment associated with these activities is another benefit. With today's uncertain energy situation, many communities are diversifying their energy options. This includes adding renewably based technologies to lessen dependence on fossil fuels. Adding a few tens of kW of PV arrays, for example, could help Galena insulate itself against fluctuations in the price and supply of diesel fuel.

Therefore, the recommendations are:

- ◆ Proceed with refining the 4S evaluation process in conjunction with the NRC
 - It may be advantageous for Galena to enlist an independent organization to estimate the time required for licensing and permitting
 - Toshiba and Galena should consider partnering with a U.S. organization or National Laboratory to assist in the process
- ◆ Retain the current diesel systems (with scheduled upgrades) until a decision is made regarding the installation of a replacement by about 2010.
- ◆ Retain the option of a coal mine and power plant until it is determined if the 4S system can be permitted and licensed. If the 4S cannot be realized, then the coal option appears feasible (with a favorable coal resource assessment result).

4/27/05

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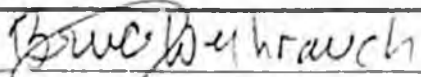
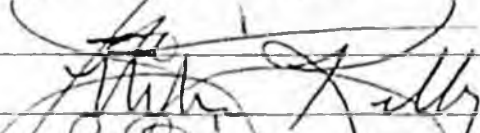
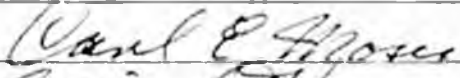

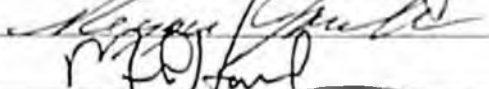
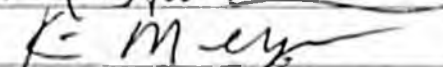
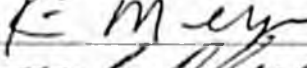
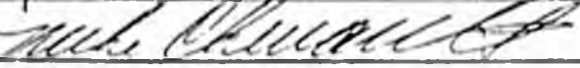
CONFIRMATION COMMITTEE REPORT

Action date: April 27, 2005

The Finance Committee has reviewed the qualifications of the following Governor's appointee and recommends that this name be forwarded to a joint session for consideration:

Alaska Mental Health Trust Authority Board of Trustees
 Ms. Margaret Lowe - Anchorage
 Appointed: 4/13/2005 Term Expires: 3/1/2010

This does not reflect intent by any of the members to vote for or against this individual during any further sessions for the purposes of confirmation.

Signature:	Printed Last Name
	WEYHRAUCH
	HOLLY FOSTER
	MOSES
	CROFT
	Reggie Soule
	Howard
Chair: 	Meyer
Chair: 	Cherry H.

Please return to the Chief Clerk's office.

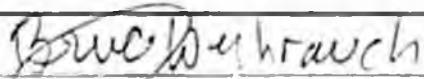


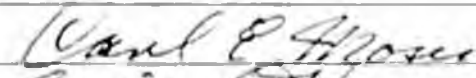
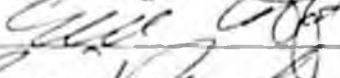
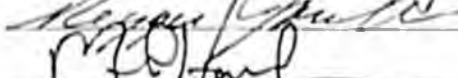
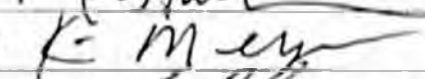
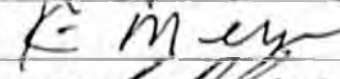
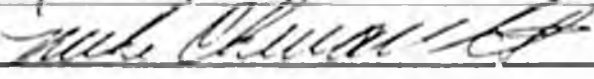
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Signature:	Printed Last Name
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	HOLM
	Kelly FOSTER
	MOSES
	CROFT
	Reggie Taul
	Howard
Chair: 	Meyer
Chair: 	Chernoff

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Official Business

Alaska State Legislature

House of Representatives


Office of the Chief Clerk

State Capitol, Room 216
Juneau, AK 99801-1182
Phone: (907) 465-3725
Fax: (907) 465-5334

MEMORANDUM

Date: April 19, 2005

To: Representative Chenault, Co-chair
Representative Meyer, Co-chair
Finance Committee

From: Suzi Lowell 
Chief Clerk

Subject: Governor's Appointment

Speaker Harris referred the following Governor's appointment to the Finance Committee:

Alaska Mental Health Trust Authority Board of Trustees
Ms. Margaret Lowe - Anchorage
Appointed: 1/13/2005 Term Expires: 3/1/2010

The resume and committee report are attached for your use.

Attachments as noted

MARGARET R. LOWE
1519 W. 15th Avenue
Anchorage, AK 99501
Phone 907-277-2815
Fax 907 272 8794
e-mail mloweak@AOL.com

EDUCATION

B Sc Education	University of Minnesota	1951
	Early childhood, Primary, Elementary	
Masters Education	University of Alaska Fairbanks	1955
	Special Education	
Educ. Specialist	University of Alaska Anchorage	1974
	School Administration	
	Doctoral level program	

WORK EXPERIENCE

Executive Director, The Arc of Anchorage	June 1999-2001
Associate Director, The Arc of Anchorage	September 1996
Executive Director, Foundation of the Arc	September 1996
Owner, Humanitarian Services Consulting Company	December 1994
Commissioner of Health and Social Services, Alaska	November 1993
Director, Division of Mental Health/Developmental Disabilities	February 1991
Faculty, UAA School of Education	September 1986
Teacher, Principal, Program Administrator Anchorage School District	1959-1986
Writer/Presenter KTVA TV, Fairbanks Daily television show for preschool/primary	1960-62
Part time adjunct faculty UAA	1974-86
Four years classroom teaching prior to 1955 First teacher at AK Native Medical Center	

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GENERAL EXPERIENCE AND RESPONSIBILITIES

Continuous professional growth through special course work, conferences and specific training regimens

Specialization in autism; credentials for training teachers and parents

Certification in Total Quality Management

As Commissioner of Health and Social Services, responsible for all health and social services for the State of Alaska, including the welfare system, juvenile detention system, child protection, Medicaid system, certification of hospitals, nursing homes and institutions, oversight for planning and building a new hospital and management of other State of Alaska leases, rental, etc.

Broad experience in research and publication of articles, educational documents and information reports

Strong experience in working with families of children and adults who experience disabilities; planning programs, group and individual and advocating and developing legislation

Travel to Russian Far East and Moscow area for research, consulting and program development; eight trips since 1991

Long history of serving on boards and commissions and private, nonprofit organizations frequently chair or officer

Qualifications Brief

MARGARET R. LOWE

1519 West Fifteenth Avenue - Anchorage, Alaska 99501 - tel. (907) 277-2915

SUMMARY OF EXPERIENCE

An educator since 1951, active in the field of special education, particularly the training of providers and parents, program evaluation and consultation, program administration, school administration, and classroom teaching, as well as a practitioner in the fields of early childhood and elementary education. Retired from the Anchorage, Alaska, School District in 1985 after 20 years of service which included initiating and administering most of the District's special education programs. Additionally, since 1975, have been an adjunct instructor in the School of Education, University of Alaska Anchorage, teaching several courses on exceptional children and, for the 1985-1986 school year, administering and teaching in the graduate program in counseling and guidance. Also am an in-service teacher trainer as well as program evaluator and consultant in special education for several Alaska school districts and the State of Minnesota, and have been recognized professionally through various awards and appointment or election to the boards of directors of several education associations.

SPECIAL EDUCATION TRAINING OF PROVIDERS AND PARENTS

Interim Coordinator Graduate Program in Counseling and Guidance, 1986, and Adjunct Instructor, 1975-Present, University of Alaska Anchorage School of Education.

Workshop Presenter to Educators and Parents on teaching autistic and behavior-disordered children, Anchorage, Alaska, School District, 1974-1986.

School In-Service Trainer, Northern Institute, Anchorage, Alaska, for the Kenai Peninsula Borough, Alaska, School District, 1975-1979.

SPECIAL EDUCATION PROGRAM EVALUATION AND CONSULTATION

Consultant, State of Minnesota Department of Education, 1985, 1986.

Consultant to various School Districts in Alaska: Fairbanks North Star Borough, 1974, 1978; Kenai Borough, 1976, 1977; Ketchikan-Gateway Borough, 1976; Mat-Su Borough, 1978; Nome, 1978; and Juneau City and Borough, 1972.

Consultant, Resource Access Project, Anchorage, Alaska, 1978, 1981.

SPECIAL EDUCATION PROGRAM AND SCHOOL ADMINISTRATION

Supervisor, Anchorage, Alaska, School District Blind and Visually-Impaired Program, 1976-1986.

School Principal, Anchorage, Alaska, School District Whaley Center for Learner Assistance, 1975-1982, 1984-1985.

School Administrator, Anchorage, Alaska, School District Alaska Native Medical Center School, 1975-1985.

School Principal, Anchorage, Alaska, School District Rigel Special Services Preschool, 1982-1984.

Special Education Elementary Program Administrator, Anchorage, Alaska, School District Denali Elementary School, 1972-1975.

CLASSROOM TEACHING

Special Education Elementary Teacher, Anchorage, Alaska, School District Denali Elementary School, 1969-1972.

Special Education Elementary Teacher, Fairbanks North Star Borough, Alaska, School District, 1964.

Televised Preschool and Kindergarten Teacher, Northern Television, Fairbanks, Alaska, 1960-1962.

Elementary School Teacher: Lansing, Michigan, School District, 1955-1956; Anchorage, Alaska, School District Alaska Native Medical Center School, 1954-1955; Anchorage, Alaska, School District Woodland Park Elementary School, 1953-1954; and Northfield, Minnesota, School District, 1951-1952.

OTHER SIGNIFICANT EXPERIENCE

Congregation President, Central Lutheran Church, Anchorage, Alaska, 1983.

Design Collaborator and Board Representative for construction of sheltered workshop, Association for Retarded Citizens, Anchorage, Alaska, 1975-1977.

Developer of Preschool Handicapped Curriculum Guide, State of Alaska Department of Education grantee, 1976.

Developer of Para-Professional Competency-Based Training Modules on the mentally-retarded, the learning-disabled, and the socially-maladjusted child, University of Alaska Anchorage School of Education, 1975.

Author of Federal Grant for Title VI-B funds to State of Alaska from U.S. Bureau of Education for the Handicapped and Consultant to State of Alaska for administration of the grant, 1975.

Author of Three-Year Grant in collaboration with the Northern Institute, Anchorage, Alaska, to train personnel for autistic, emotionally-disturbed and severe multi-handicapped populations, U.S. Bureau of Education for the Handicapped and State of Alaska Department of Education, 1975.

Author of State Plan for Mental Retardation, State of Alaska Department of Health and Social Services, 1968.

Administrative Assistant, State of Alaska Office of the Governor, Anchorage, Alaska, 1966-1967.

Oversight Responsibility for Preschool Implementation and Licensing by the State of Alaska for the Association for Retarded Citizens, Anchorage, Alaska, 1966.

Organizer and Founder of Preschool, Association for Retarded Citizens, Fairbanks, Alaska, 1963.

Consultant for Establishment of Laboratory Preschool Program, University of Alaska Fairbanks School of Education, 1962.

PROFESSIONAL AWARDS

Alaska State Parents of Autistic Children's Service Award, 1986.

PADD (Protection and Advocacy for the Developmentally-Disabled) Distinguished Service Award, 1986.

National Speakers Bureau on the Handicapped Nominee, 1986.

Pacific Lutheran University, Tacoma, Washington, President's Award, 1982.

Association for Retarded Citizens, Anchorage, Alaska, Outstanding Member of the Year Award, 1975.

Association for Retarded Citizens, Fairbanks, Alaska, Service Award, 1964.

FORMAL EDUCATION

Education Specialist: Public School Administration, University of Alaska Anchorage, 1974. Field Project: a curriculum-management system for developmentally-disabled students.

M.A. in Education, concentration in Special Education, University of Alaska Fairbanks, 1965. Field Project: development of curriculum for pre-school handicapped children.

B.S. in Education, University of Minnesota, Minneapolis, Institute of Child Welfare NSKP, 1951.

SELECTED CONTINUING EDUCATION

Administrative Training Program, 1976; Teacher Training Program, 1975; Judevine Center for Autistic Children, St. Louis, Missouri. The teacher training program was under a career-development leave grant from the Anchorage, Alaska, School District.

Education of the Developmentally Disabled Workshop, University of Washington, Seattle, 1976.

Title VI-B Workshop, State of Alaska representative, U.S. Bureau of Education for the Handicapped, Dallas, Texas, 1975.

Developmental Disabilities Workshop, University of Oregon, Eugene, 1975.

The Severely-Handicapped Workshop, Portland, Oregon, 1974.

Community Service for the Handicapped Workshop, Alaska Department of Vocational Rehabilitation, Los Angeles, California, 1966.

PROFESSIONAL ACTIVITIES

Council for Exceptional Children, Board of Governors 1984-1987.

Council for Exceptional Children, Anchorage, President 1971, Board of Directors 1972-1974, 1983.

National Association of State ESEA Advisory Councils, Alaska State representative 1979-1982, financial manager 1980-1982.

Alaska Department of Education Title III ESEA Advisory Council, member 1973-1974; Title IV ESEA Advisory Council, member 1974-1981, chair 1977-1981. Member and chair of the successor organization, the Alaska State Federal Block Grant Committee, 1981-1984.

Alaska Governor's Council on Mental Retardation, Governor's appointee and chair 1966-1971. Presided over transition of the Governor's Council into the Alaska Developmental Disabilities Council, 1971; member of the Developmental Disabilities Council 1971-1972.

Alaska Governor's Manpower Planning Council, Governor's appointee 1979-1981.

Alaska State Blind and Visually-Impaired Program Advisory Board, member 1978-1983.

Alaska State P.R.A.S.E. Advisory Board, member 1985-Present

Alaska Resource Access Project Advisory Board, member 1978-1986.

Association for Retarded Citizens, Alaska State, charter member 1967, member to present.

Association for Retarded Citizens, Anchorage, Alaska, member 1965-present.

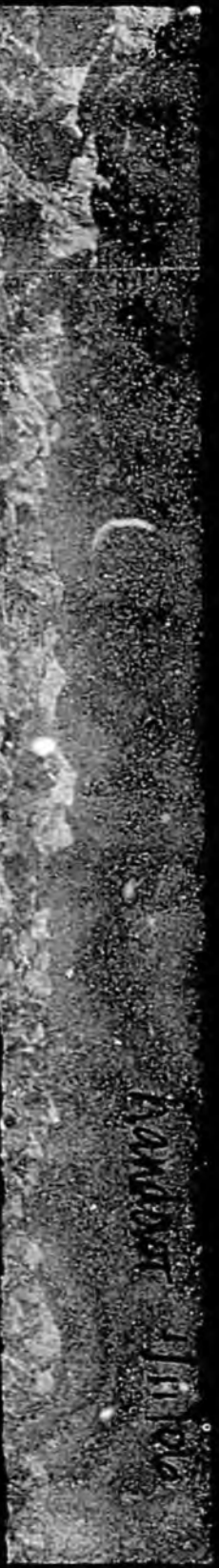
Association for Retarded Citizens, Fairbanks, Alaska, charter member 1963.

1/11/06

OVERVIEW:
KNIK ARM &
GRAVINA
ISLAND
BRIDGES

HFIN

FILE



KNIK ARM BRIDGE AND TOLL AUTHORITY



KNIK ARM CROSSING PROJECT

KABATA is governed by a seven-member Board comprised of three private citizens, two regional legislators and two state commissioners. The Alaska State Legislature authorized KABATA, the project proponent, to undertake the permitting, design, financing, and construction and then to own, operate, and maintain the crossing as a toll road.

This Annual Report is submitted in compliance with AS 19.75 to inform the Governor and the Legislature on the status and prospects of the project. This Annual Report will be available to the public on the project web site at www.knikarmbridge.com, or through the KABATA office at 907-269-6698.

Pursuant to AS 44.99.210, this publication was released by the Knik Arm Bridge and Toll Authority at a cost of \$2.30 per copy to provide information and encourage participation, and was printed in Anchorage, Alaska.

PROFESSIONAL PHOTO CREDITS

Ken Graham / AccentAlaska.com
Figg Bridge Engineers, Inc.
Michael Jones / AlaskaStock.com

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Mission The Knik Arm Bridge and Toll Authority will develop, stimulate, and advance the economic welfare of the state and further the development of public transportation systems in the vicinity of the Upper Cook Inlet with construction of a bridge to span Knik Arm and connect the Municipality of Anchorage and the Matanuska-Susitna Borough.

It is my pleasure and honor to present the Alaska Legislature with the 2005 Annual Report on the progress of the Knik Arm Crossing Project. This marks the second full year of activity for the Knik Arm Bridge and Toll Authority (KABATA) established by the legislature in 2003 to oversee the project. It has been a busy and fruitful year in moving the project closer to reality.

In January 2005 the Federal Highway Administration (FHWA) published the Notice of Intent on the project and proceeded to develop an Environmental Impact Statement (EIS). FHWA moved promptly to assemble 10 cooperating agencies and 13 participating agencies to form the core group for compliance with the National Environmental Policy Act (NEPA), as applied to the Knik Arm Crossing Project.

Throughout the spring and summer FHWA and KABATA organized and conducted a public involvement program with many presentations to and discussions with the public and community groups. Working with the cooperating and participating agencies they organized an interdisciplinary team to closely examine environmental, scientific, and geophysical aspects of the project including potential short-term and long-term impacts on Anchorage and Mat-Su communities and the natural environment. A noteworthy effort was the government-to-government negotiations with Alaska Native Tribes in the Upper Cook Inlet region.

Providing the structure and mandate for an effective process with dedication to information sharing, FHWA is to be commended for its capable leadership of the project. The "Scoping Summary Report: Comments, Issues and Alternatives" was published in November 2005 and a draft EIS, submitted in December 2005, is currently undergoing FHWA review.

As the year ends, KABATA is focused on developing a realistic and comprehensive financing plan that reflects accurate cost estimates specific to the chosen crossing alternative. Legislative approval of project financing will be necessary in this session to keep the project on schedule.

As Chairman, I am proud of the work done this year and look forward to 2006. We are moving closer to the reality of a bridge that both fills a current need and creates a bridge to the future.



George Wuerch
Chairman

Meeting the Need

Alaska is growing. Living in a state with vast space and few roads, Alaskans are gifted and cursed with breathtaking beauty and few roads to explore and set roots in the far-reaching lands. Population is growing, and the link between Anchorage, the Mat-Su Valley and beyond is rapidly being outpaced by increasing traffic and a growing concern for safety.

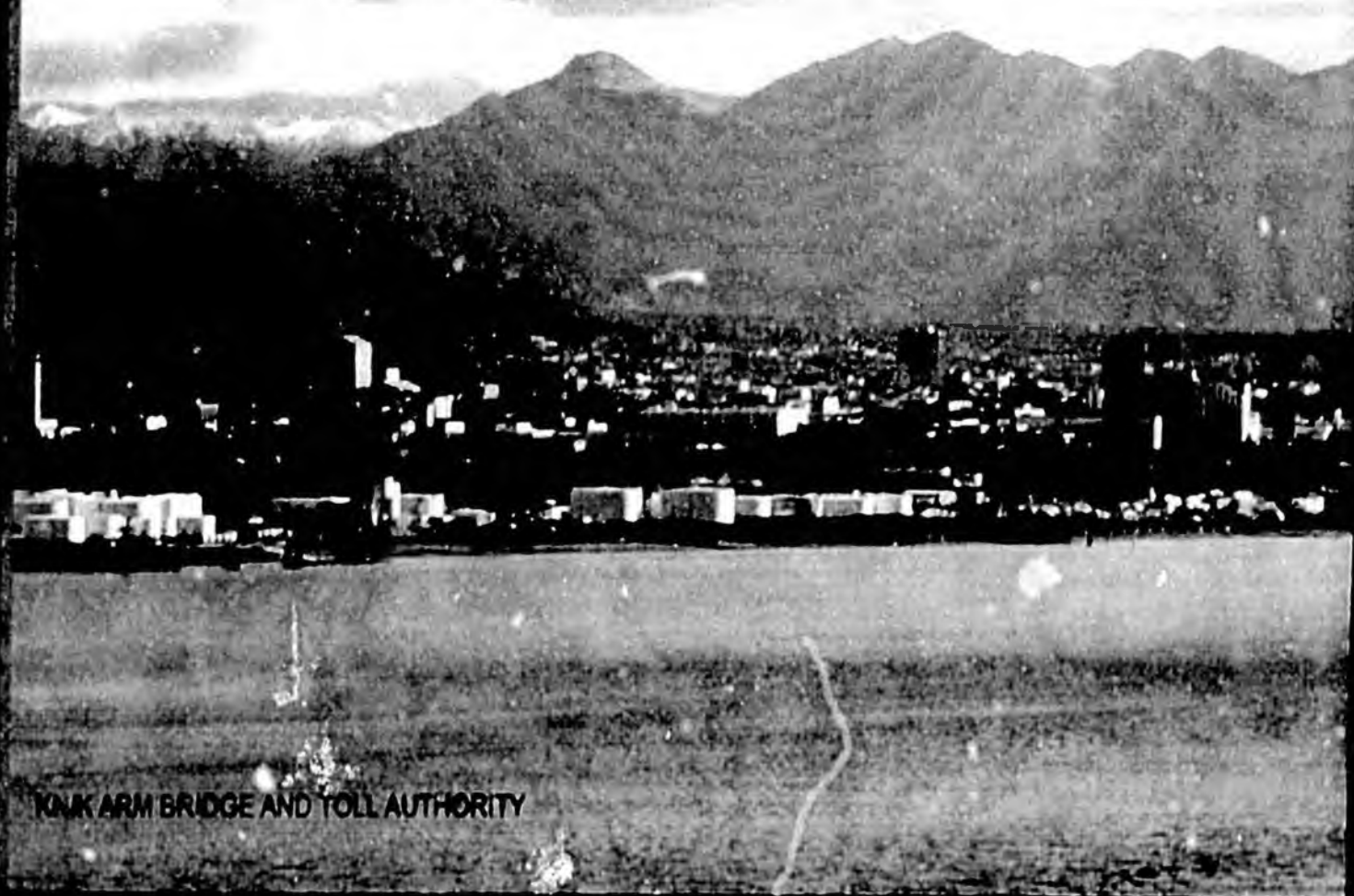
Anchorage is approximately two miles from Port MacKenzie and its adjacent industrial Port District in the Matanuska-Susitna (Mat-Su) Borough across the Knik Arm. Although this physical separation consists of a short span of waterway, the only current surface transportation access between the Municipality of Anchorage (Anchorage) and the Port MacKenzie area is by 80 miles of existing roadway around the head of the 30 mile-long Knik Arm.

More than 80 years of documented transportation, land use, and economic plans and studies for the Upper Cook

Inlet region of Alaska have addressed the need to connect Anchorage with the Mat-Su by providing an efficient and convenient means to cross the Knik Arm. After years of discussion by those who know Alaska best—its residents—the project is again under consideration.

Access to both the undeveloped areas, and more intensively developed centers of economic and cultural activity in Southcentral Alaska may soon be a reality as the proposed Knik Arm Crossing Project is designed, permitted, financed and constructed.

This report outlines current and future development steps leading to a new access route between Anchorage and the Mat-Su. Engineers and planners have been busy studying Knik Arm and its surrounding physical, human and natural environment. What they are finding is that a safe, cost-affordable and environmentally sound bridge can be built.



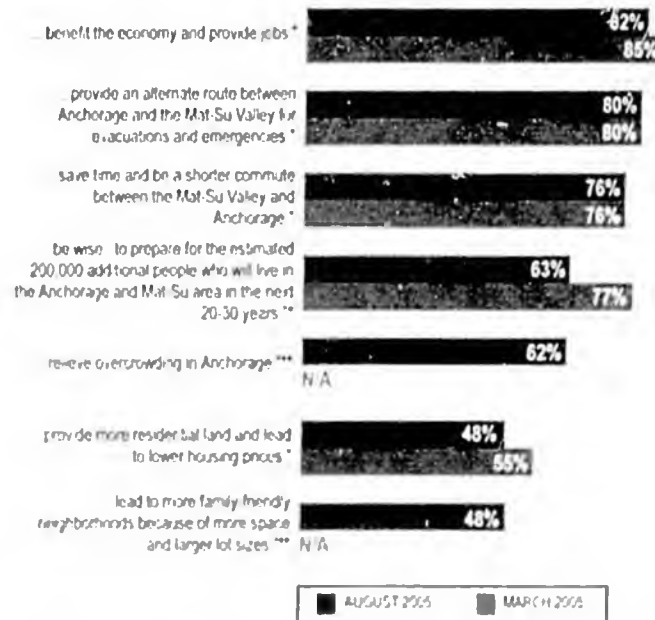
The Right Track

Area-Wide Survey

Alaskans want to be sure that projects reflect their needs. Residents want to be assured and have confidence that funds are used appropriately, that projects are done safely, and that the design will be environmentally sound, and built to last. KABATA commissioned resident and commuter surveys to evaluate public opinions about the proposed project.

Results of the March and August 2005 surveys show overwhelming concern about current traffic congestion, potential emergency access and future population growth. Over eighty percent of people interviewed supported the project to encourage economic growth and provide jobs. Additionally, in terms of safety, eighty percent of residents surveyed believe that an alternative access route is necessary for evacuation and emergencies.

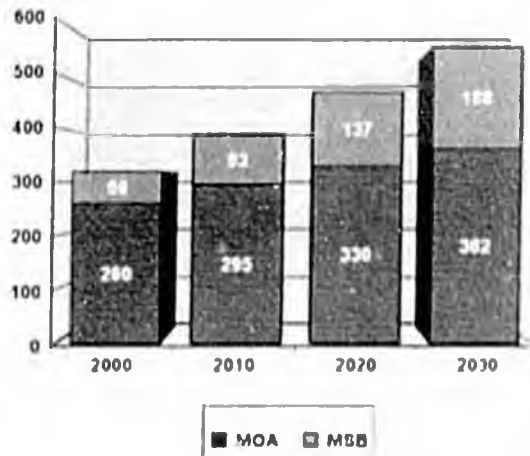
The Knik Arm Crossing Project would...



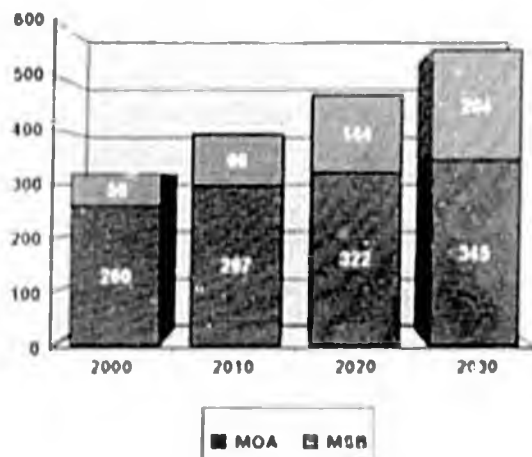
- * Question asked as "be a wise investment to prepare for future population growth" in March 2005
- ** Question was asked only in August 2005

Find these surveys on the KABATA website (www.knikarmbridge.com) under the "Library" then "Project Documents" links

Population Forecast - No Bridge



Population Forecast - With Bridge



While the Municipality of Anchorage (MOA) has grown at a compound rate of 2.4% per year, the Mat-Su Borough (MSB) has grown nearly three times as fast - at a rate of 7.3% per year. In 2000, the combined MOA and MSB population was approximately 320,000. In 30 years, the regional population is expected to increase by an additional 194,000 people. Furthermore, economists believe that the primary employment center will remain in the MOA while the MSB will be home for more and more of our growing population. The result equals more traffic on an already crowded Glenn Highway and increasing housing prices as competition for good, accessible land grows.

Traffic planners project that Glenn Highway traffic north of Muldoon will be 65,640 vehicles per day with the project, and 93,100 vehicles per day without the project in 2030.

Source: "Memorandum on the Economic and Demographic Impacts of a Knik Arm Bridge," Institute of Social and Economic Research, University of Alaska, September 2005, prepared for the Northern Economics as input to the KABATA EIS.

Purpose and Need

The proposed project would further the development of transportation systems in the Upper Cook Inlet region by providing improved vehicular access and surface transportation connectivity between Anchorage and the Mat-Su, through the Port MacKenzie District. A financially feasible and efficient crossing would meet the needs for:

- ▶ Improved regional transportation infrastructure to meet existing and projected population growth and locally adopted economic development, land use, and transportation plans, and as directed by the Alaska State Legislature in Alaska Statutes chapter 19.75;
- ▶ Regional transportation connectivity for the movement of people, freight and goods to, from, and distribution between Anchorage, the Mat-Su, and Interior Alaska; and,

Safety and transportation system redundancy for alternative travel routing and access between regional airports, ports, hospitals, and fire, police, and disaster relief services for emergency response and evacuation.

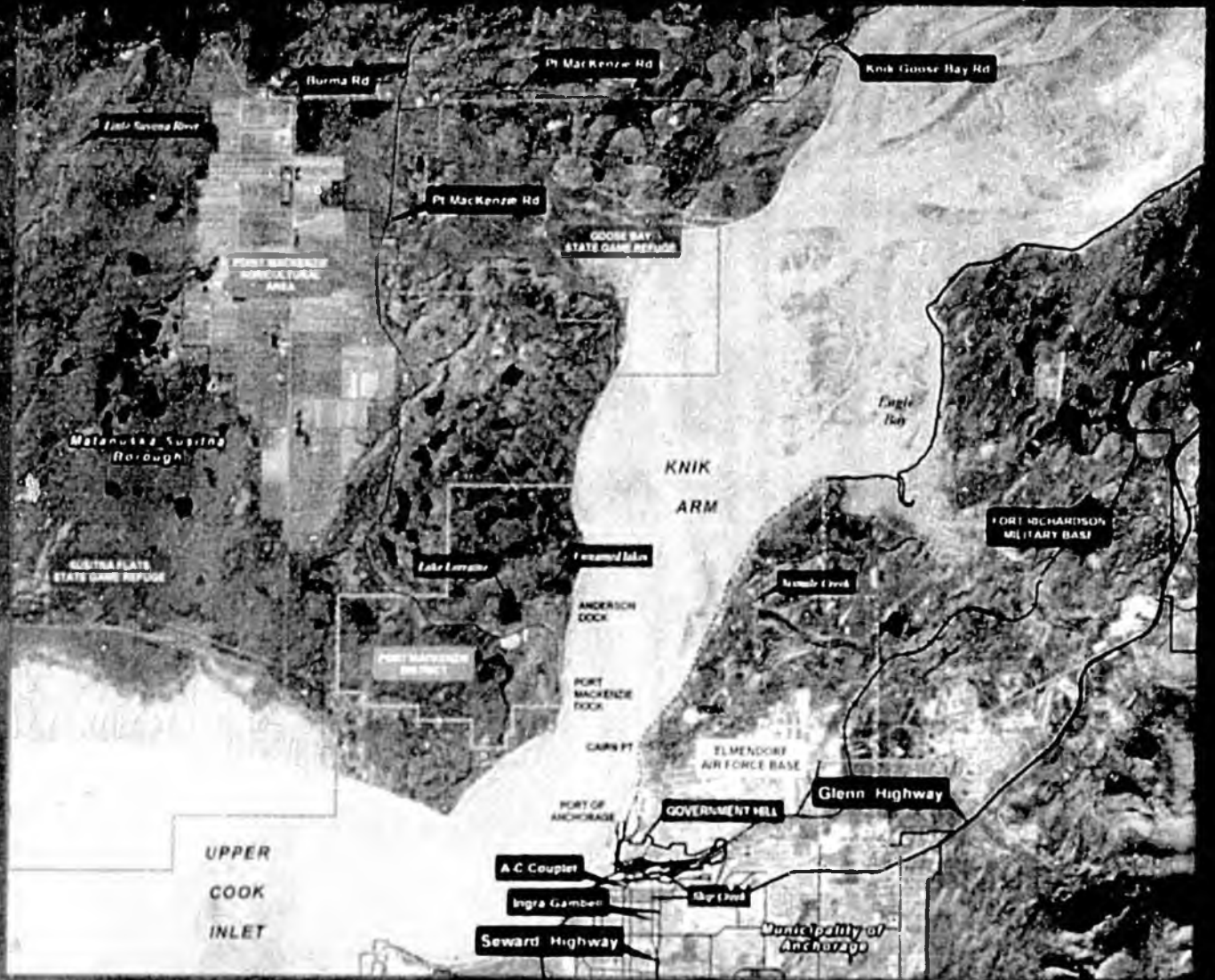
“

The congestion issues are not going away. In fact, with projected population growth, traffic issues will only worsen unless we create alternatives that safely provide relief.

”

Debbie Ossiander
Anchorage Assembly
AMATS Committee
Regional Transportation Planning
Organization

Study Area for the Knik Arm Crossing



This year brought shape and breadth to a project intended to solve many transportation challenges facing Alaskans. The investigation, completed in 2005, established a firm foundation of project information. This work was done through the objective and regulated National Environmental Policy Act (NEPA) process, which required an Environmental Impact Statement (EIS).

The EIS Scoping Process determined the range of actions, alternatives, and resulting impacts to be considered in the EIS. Input was solicited from the public, agencies, local government and tribes. More than 1,000 comments were received, prompted by a wide variety of outreach tools. This extended scoping process was established to allow the project to respond and evolve based on public input.

The "Summary Scoping Report, Comments, Issues and Alternatives" was published in November 2005, and is available at www.knikarmbridge.com. The Draft EIS, completed in December 2005, is currently undergoing FHWA review. It is expected to be available to the public in January 2006 with another series of public meetings. Copies of the Draft EIS will be available electronically as a CD or online, and in hard copy at area libraries.

The following list of events and tools highlights the intensity of the scoping process.

- Agency interdisciplinary team meetings (6)
 - Agency one-on-one meetings (13)
 - Comment database (1,000)
 - Community Council presentations/attendance (8)
 - Government-to-Government (tribal) consultation (1)
 - House hold surveys (2)
 - Mailing list (3,104)
 - Media outreach
 - Meeting advertisements and other notifications
 - Native Corporation meetings (1)
 - Newsletters (4)
 - Newspaper inserts (2 statewide)
 - Public Scoping meetings (2 locations, 2 times)
 - Press releases (4)
 - Principals Working Group meetings (5)
 - Study area tours (24)
 - Small group (agency and other entities) meetings (41)
 - Speakers' Bureau and presentations (20 organizations)
 - Tribal scoping meetings/workshops (6)
- Project website: www.knikarmbridge.com

“
I am confident that the National Environmental Policy Act process has been open, inclusive, comprehensive and responsive.
”

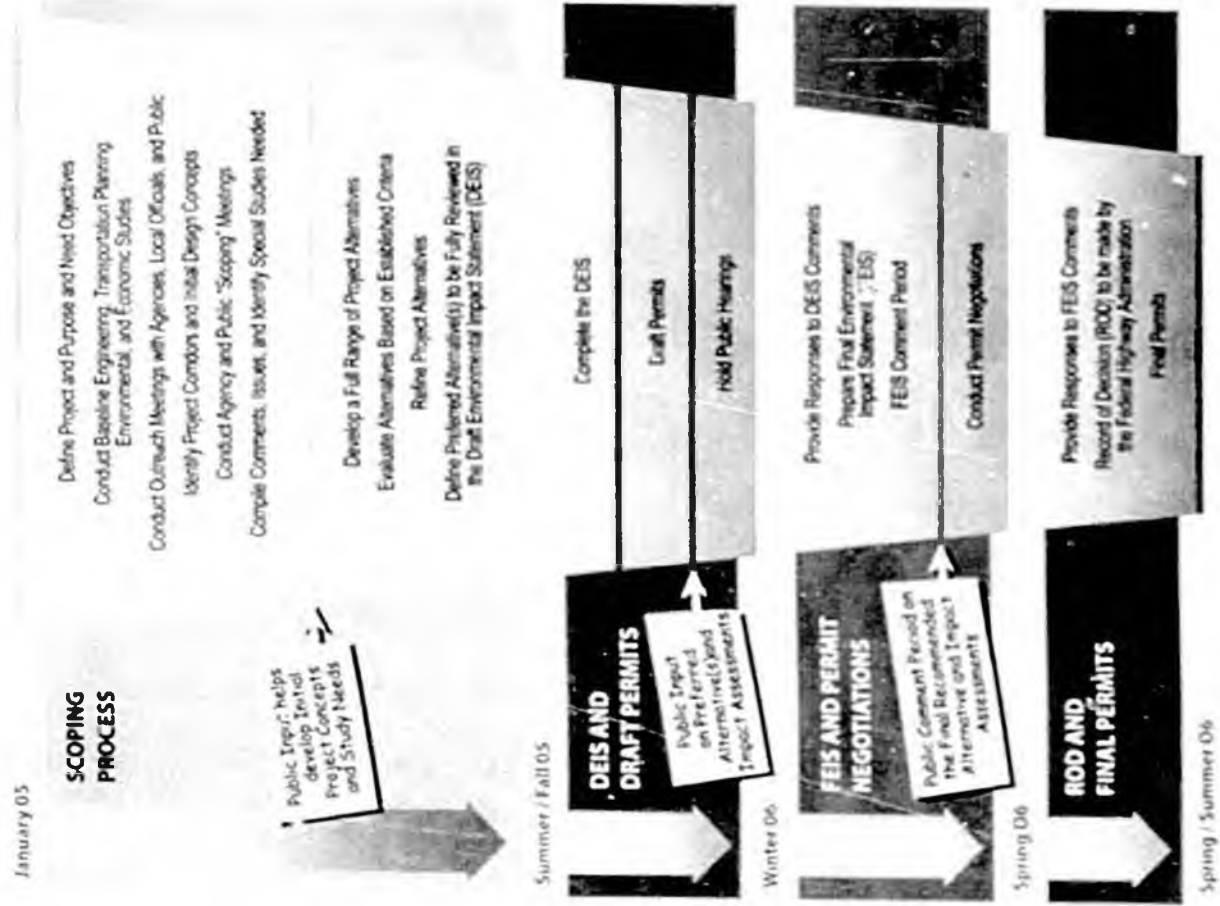
Edne Vinson
Environmental Project Manager
for FHWA

2005 YEAR IN REVIEW - The NEPA Process

All Alaskan NEPA Project Team

Process

Knik Arm Crossing Environmental Impact Statement & Permitting Process



Studies and Fieldwork

From wildlife biology to seismic design criteria, the EIS is a comprehensive and thorough analysis of issues related to development of the Knik Arm Crossing Project. Directed by FHWA, information is carefully collected, compiled, and made available to the public, as well as local, state and federal agencies.

As an outcome of the project, many studies initiated through this project will serve future generations with observations and information added to knowledge of the Knik Arm area. Technical Reports on shorebirds, belugas, fisheries and hydrology will be released in early 2006.

Birds to Whales

Five species of salmon were collected (Chinook, pink, chum, sockeye, and coho) as well as the invertebrates that they eat. During ice-free conditions between summer of 2004 and 2005, marine life was sampled at eleven different sites in the Knik Arm.



Observers studied baseline conditions to characterize beluga whale movement patterns and habitat use. Whale movements were found to be influenced by tides and season. The highest sighting rates in Knik Arm were in September. Whales appear to ride the ebbing tide down the Knik Arm, and the flowing tide up the Knik Arm.

Gulls, ducks, and shorebirds shared the area with eagles nesting along the tidal flats. Local bird experts provided spotting and identification skills as well key insights into habitat requirements.

Physical Studies

Geotechnical borings from previous work on the dock at Port MacKenzie, and a detailed site-specific seismic analysis, provided insights into the probability and magnitude of earthquakes in the project corridor.

Gravelly soils are more than satisfactory for construction, and not Bootlegger's Clay found to the south. No earth faults were identified in this area. The bridge would be designed to meet seismic standards, and to resist the forces of ice, currents, tides and wind, while protecting current port facilities.

Human Studies

Agency, tribal and other local experts defined the presence of cultural and historical resources, considered designs to mitigate potential impacts, and proposed additional special studies for the Draft EIS. With military staff, the project team analyzed security requirements and protection of military mission and facilities in the Port of Anchorage and Elmendorf Air Force Base areas.

Socioeconomic Studies

Traffic planners collaborated with local government to develop the first regional transportation planning model integrating Mat-Su and Anchorage area traffic patterns and information.

A geographic information systems (GIS) model was developed by the project team. Anchorage and Mat-Su. This tool

profiled land use changes over time, noting that population growth would continue to increase with or without a Knik Arm Bridge.

Households and commuters were surveyed to measure public support and identify potential concerns. Over 66 percent were in favor of the project, citing the need to open more land, shorten commutes and stimulate economic development.

“
We created the first integrated traffic model as a tool that accurately reflects future growth and transportation needs across the region.
”

John McPherson
HDR Transportation Planner

Engineering

The engineering team worked with the regulatory agencies to define the proposed bridge location, length and type. The location was determined based on considerations of military operations and existing facilities, logical landing points on both sides, and the relationship to existing ports and roads. The bridge orientation would be aligned with the currents in the Knik Arm to minimize challenges from ice floes and scour.

The minimum length of the bridge would be about 8,200 feet. Hydraulic analyses have found that there would be no appreciable increase in current tidal flow with the 8,200-foot bridge option, which is key to protecting against scour. The bridge would be concrete or steel with piers and a low profile to minimize

impacts to surrounding military and civil air and marine operations. The Coast Guard and other area-wide vessel operators have helped to determine the minimum bridge deck height to allow at least 50 feet of clearance for vessels.

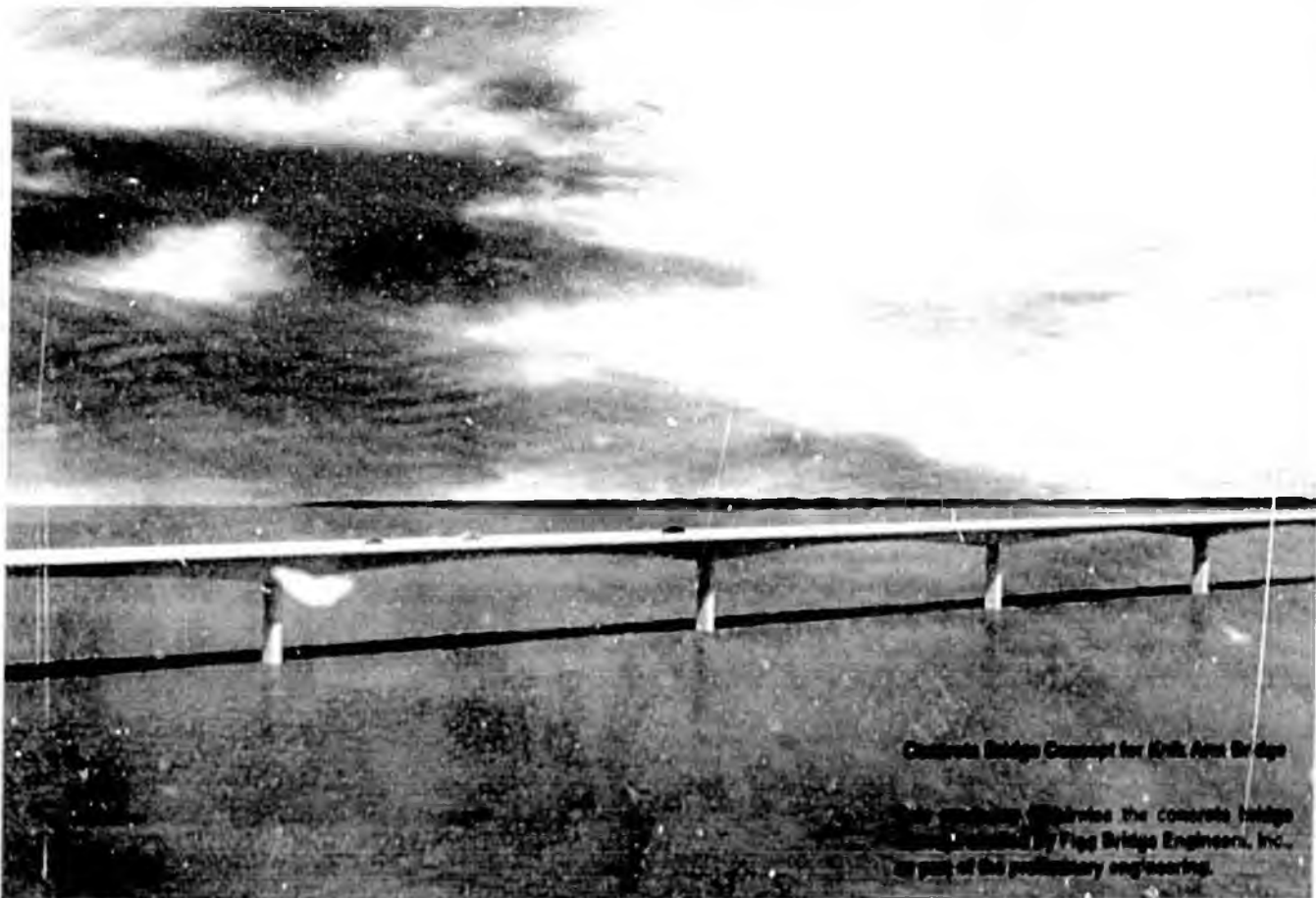
The bridge is designed to be expandable to accommodate four lanes of traffic. It would be two to three lanes on day of opening. Expandability and cost are key factors in defining the final bridge design.

Cost Estimates

The past several years have proven a challenge for controlling construction costs. Steel, concrete and petroleum-based construction commodities and activities have been increasing at two to three times the historic rate, including commodity spikes associated with

the 2005 hurricane season. Currently, day of opening project cost estimates are around \$600 million. This cost is based on estimates of engineering and quantities from three separate engineering firms. This cost includes construction of the bridge itself; the approaches east to Government Hill and the A/C Couplet, and west to Burma Road; design; project management; and right-of-way acquisition. Options to materially reduce total project costs are actively and continually being pursued. As alternative routes are evaluated, there will be a continued evaluation of alternative project delivery methods, cost-sharing strategies and potential sources of lower cost construction materials.

With continued cost-control discipline, an affordable Knik Arm bridge could be constructed.



Concrete Bridge Concept for Knik Arm Bridge

The rendering illustrates the concrete bridge design provided by Figg Bridge Engineers, Inc., as part of the preliminary engineering.

Review and Development of Alternatives

The goal of KABATA is to build a safe, affordable, and environmentally sensitive Knik Arm bridge. The project team has reviewed and evaluated a large number of alternative routes, crossing concepts, and engineering data.

The project team developed preliminary corridors based upon an initial study area. The public and agencies were instrumental in helping to develop the range of modes, termini options and roadway alternatives analyzed for the Knik Arm Crossing Project.

The interactive scoping process led to more than 20 new alternatives in response to public and agency comments.

Alternative modes were expanded to include assessment of ferry and rail.

A future corridor connection to Ingra Gambell Couplet was added to respond to concerns of community cohesion, traffic and mobility.

A Northern Access Corridor was added to the northern side of Port MacKenzie District, to avoid adverse impacts to the port's operations.

A Southern Crossing Corridor was added to increase the separation from beluga whale activity and from critical military operations.

Additional roadway alternatives were added to minimize impacts to the Port of Anchorage, the Government Hill community, downtown businesses, and the intertidal area of Knik Arm.

A bored tunnel was included, in addition to a cut-and-cover tunnel access through Government Hill.

Bridge types and lengths were added to respond to concerns of cost and environmental impact.

After substantial study and consultation with stakeholders, several of the roadway alternatives were screened out because they proved unacceptably disruptive to military mission and operations, or were not technically reasonable to build. Evaluation of alternative routes will continue to maintain focus on an affordable, buildable and environmentally sound crossing project.

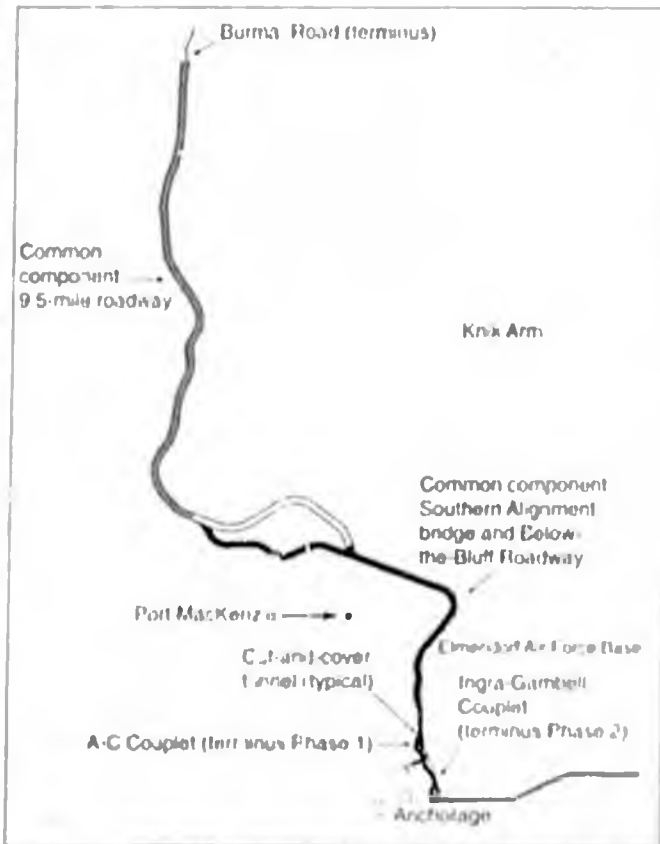


Figure 1 The proposed project begins at Burma Road with two approach corridors near Port MacKenzie, and ends in Downtown Anchorage.

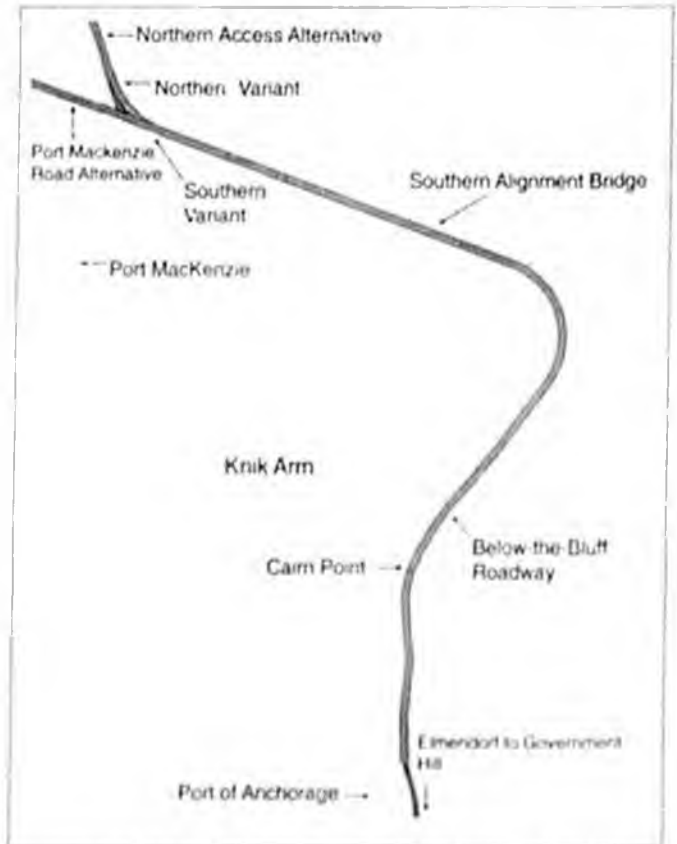


Figure 2 The Southern Alignment bridge alternative and Below-the-Bluff Roadway alignment are highlighted in orange.

Reasonable Alternatives Carried Forward for Draft EIS

FHWA based its choice of reasonable alternatives on the ability to meet projected traffic demand, provide the greatest flexibility and opportunity to travel, provide the shortest travel times, lowest user costs, and least impacts on the communities in the Study Area.

The project team screened a wide range of possible alternatives against criteria for (1) purpose and need and (2) technical merit. The roadway mode with a pile-supported span bridge was found to be the most reasonable mode for the proposed project. Roadway alternatives could accommodate mass transit and ride-sharing transportation options, which are important to regional mobility.

The project team determined that the following corridors were reasonable for linking Anchorage and the Mat-Su through a bridge across Knik Arm and through associated approach roadways.

Figure 1: Mat-Su Approach Corridors

Point MacKenzie Road
Northern Access Road

Figure 2: Crossing Corridor

Southern Crossing including the Below-the-Bluff Roadway

Figure 3: Anchorage Approach Corridors

Erickson Street Alternative including Ingra/Gambell and A/C Couplets

Figure 4: Degan Street Alternative

Including Ingra/Gambell and A/C Couplets

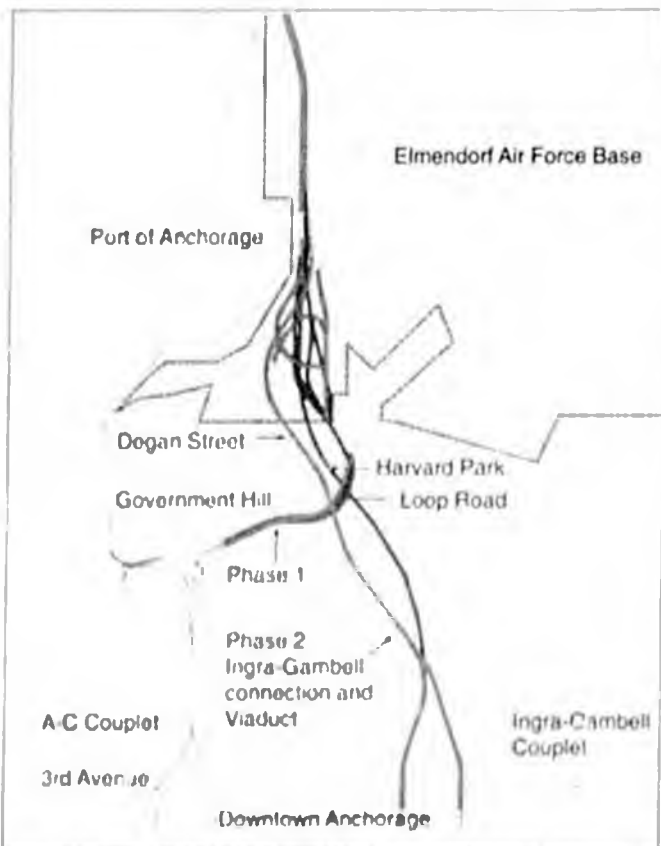


Figure 3 The Erickson Street Alternative alignment is shown in orange. Phase 1 connects to the A/C Couplet, while Phase 2 connects to the Ingra/Gambell Couplet.

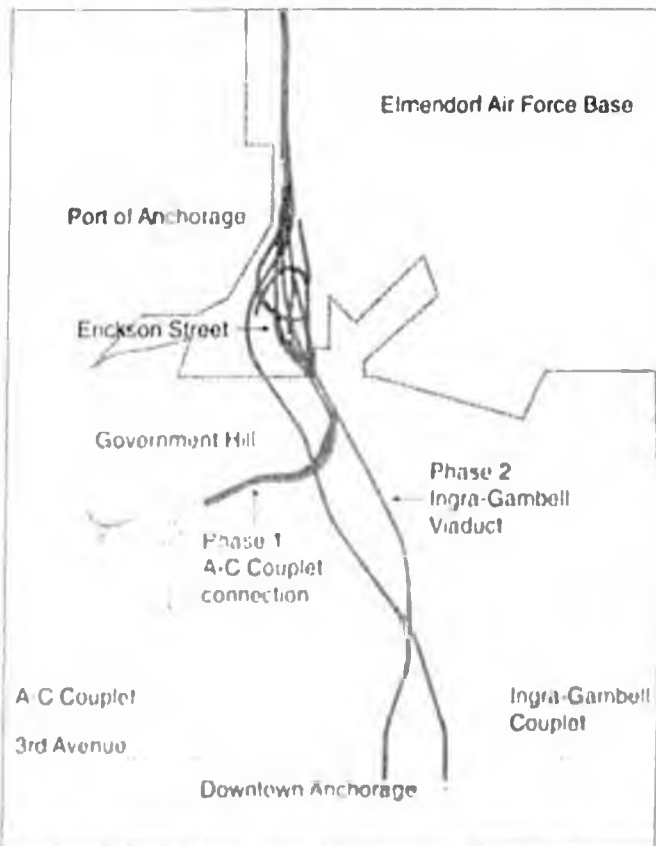


Figure 4 The Degan Street Alternative alignment is shown in orange.

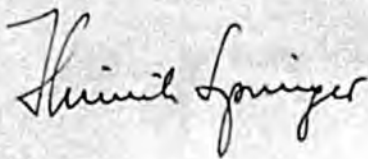
LETTER FROM THE EXECUTIVE DIRECTOR

The Knik Arm Bridge and Toll Authority (KABATA) will produce independently audited financial statements at the completion of the planning, design, and construction phases when toll operations formally commence, or sooner if financing arrangements to be entered into require such independent audit of KABATA. For periods prior to such independent audit requirement, the State of Alaska Department of Transportation & Public Facilities (DOT&PF) budget, accounting, and reporting procedures are being used by KABATA.

KABATA entered into a Memorandum of Agreement (Agreement) with the DOT&PF effective September 30, 2004. The Agreement pertains solely to the pre-construction phase of the project, including transportation planning, preliminary engineering, environmental and permitting, final engineering design and reconnaissance, utilities and right-of-way phases of the project. It also sets forth procedures and responsibilities for interacting with FHWA.

In addition to other responsibilities under the Agreement, DOT&PF provides technical, professional, administrative and clerical support to KABATA to meet both the State and Federal financial and other regulatory requirements. An audit covering both State and Federal requirements is part of DOT&PF's yearly internal review and audit procedure performed by their internal review function in the Office of the Commissioner.

Respectfully Submitted,



Heinrich Springer
Executive Director

KABATA Contracts with Financial Advisor

The Knik Arm Bridge and Toll Authority (KABATA) has entered into a professional services contract with Kevin Hemenway to serve as Senior Financial Advisor. A resident of Anchorage, Alaska, Mr. Hemenway brings fifteen years of practical experience as a Chief Financial Officer, Treasurer, Controller, and Consultant, and six years of hands-on experience as a Certified Public Accountant. Mr. Hemenway most recently worked at Alaska Communications Systems. Prior to moving to Alaska, Mr. Hemenway served as Chief Financial Officer, Treasurer, and Controller at Atlantic Tele-Network, Inc., in St. Thomas, U.S. Virgin Islands. He previously held positions as a Certified Public Accountant at both Deloitte & Touche and Grant Thornton.

As Senior Financial Advisor, Mr. Hemenway will provide independent financial advisory services to KABATA related to the authorization, sale, issuance, and delivery of commercial revenue bonds. He will also aid KABATA with the selection of its bond counsel, audit team, underwriting team and banking institution.

Wilbur Smith Associates Analyzes Toll Revenues

Wilbur Smith Associates (WSA) prepared for KABATA an analysis of potential toll revenues, to determine their capacity to support debt service on proposed bonds for construction of the bridge and approaches. WSA worked with the technical studies produced for the DEIS, including regional traffic models, survey information from households and commuters, and forecasts of population and employment. The WSA analysis included development of maintenance and operations costs, preliminary operating expenses and capital costs for a toll collection system, and estimation of potential toll revenues.

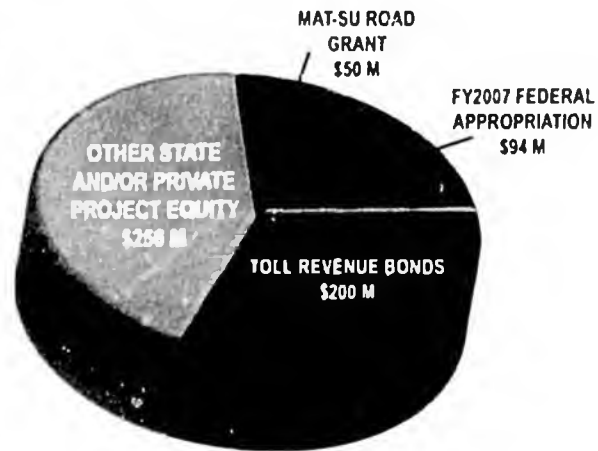
The conclusion of the Preliminary Traffic and Toll Revenue Study was that the net toll revenue stream would be satisfactory to support bonding for approximately \$200 million in debt, and to pay for operations and maintenance over the life of the Knik Arm Crossing, assuming a toll of \$3 to \$5 per passenger vehicle.

Complete report is available on the website
www.knikarmbridge.com

Fund Sources

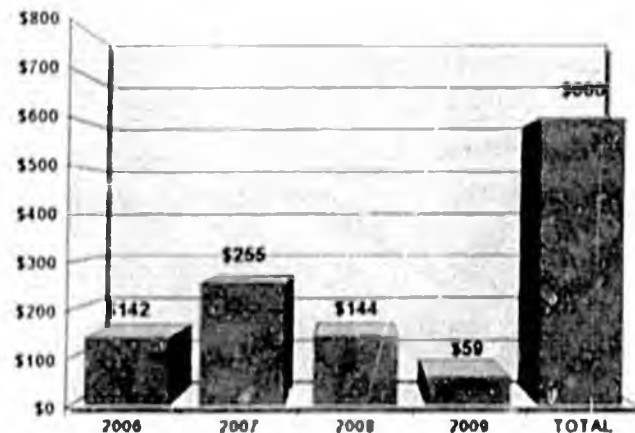
Construction cost for the Knik Arm Crossing Project is estimated at approximately \$600 million in opening day dollars. As discussed, the WSA analysis indicates \$200 million of that cost could be funded by toll revenue bonds, or other toll-backed debt financing sources. Congress allocated over \$2.1 billion of Federal Highway funds to Alaska in the SAFETEA-LU transportation bill, to be paid out over five federal fiscal years. In the administration's FY2007 budget submission, Governor Murkowski has requested of the legislature that \$94 million of this federal transportation funding be committed to the Knik Arm Crossing Project, representing 4% of Alaska's federal transportation allocation. KABATA has also suggested that a separate grant of approximately \$50 million be provided to the Mat-Su Borough to upgrade and pave the Port MacKenzie Road to provide a modern, safe and convenient connection to the west side of the project. This is included in the \$600 million estimate. An additional \$256 million would need to be generated from other State or private equity sources in order to complete project funding.

PRO FORMA PROJECT FUNDING - \$600 MILLION



DRAFT STATE TRANSPORTATION PLAN (STIP)
Anticipated Project Spending by Federal Fiscal Year

The draft State Transportation Improvement Plan (STIP) for the Knik Arm Crossing Project has anticipated \$600 million to be spent over the next four federal fiscal years ending September 30, 2009. The STIP for the Knik Arm Crossing Project is a planning document of the Alaska Department of Transportation and Public Facilities. Actual funding of the project is subject to State and Federal budget appropriations and the ability of KABATA to issue bonds or other debt financing backed by toll revenues. The chart below depicts the anticipated spending by federal fiscal year.



AUTHORIZATIONS

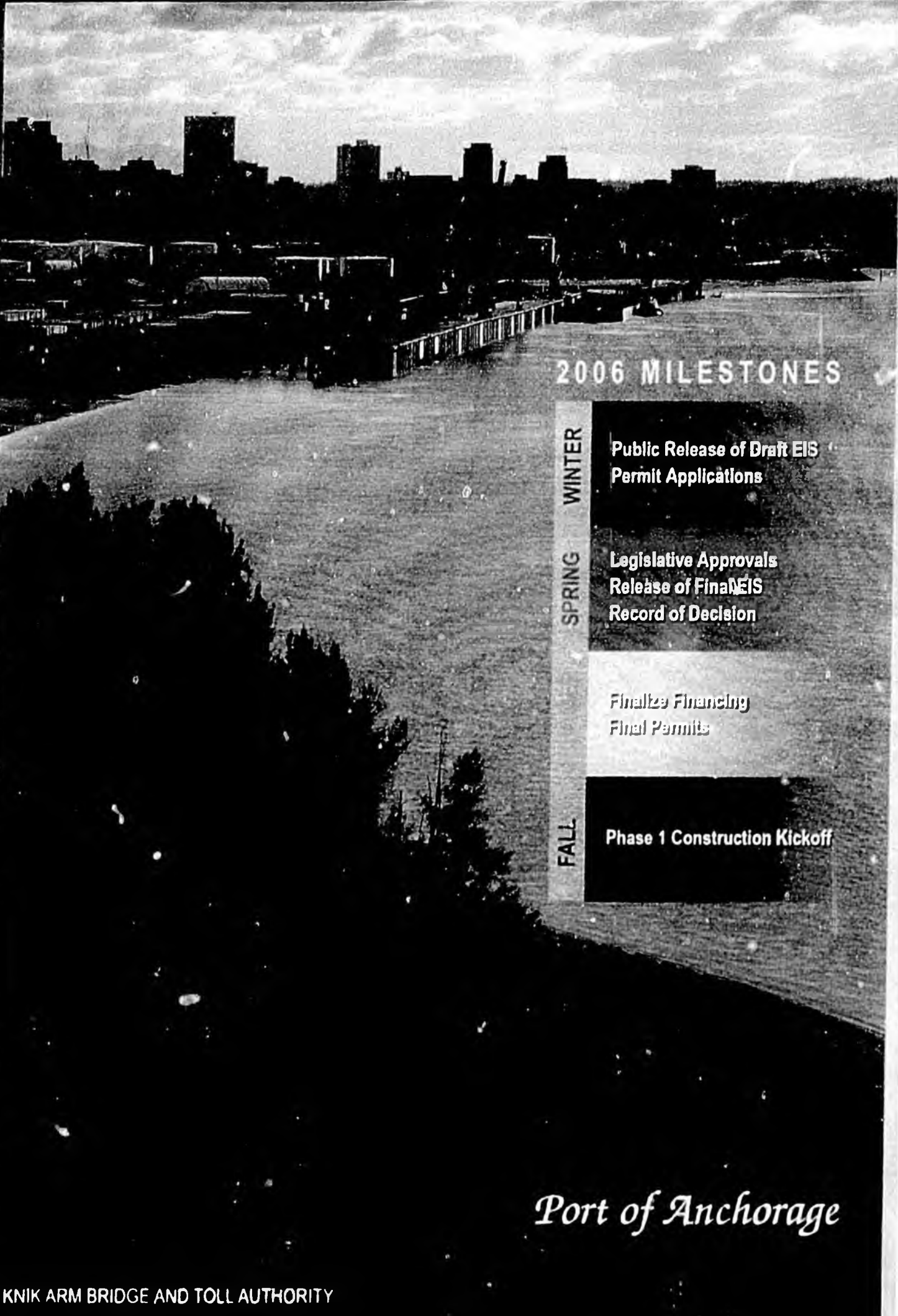
	Millions
The Federal Highway Administration (FHWA) has authorized reimbursement of advanced construction funds for the planning and environmental phases of the project, of which \$10.6 million was repaid through two special earmark appropriations and \$7.6 million will be repaid through future appropriations.	\$ 18.2
SAFETEA-LU FHWA Earmark for 2005	2.0
Total Authorizations	\$ 20.2

EXPENDITURES

	Millions
2002/2003 Expenditures, Primarily by DOT&PF	\$ 1.1
2004 Expenditures, Primarily Contracted Professional Services	3.8
2006 Forecast Expenditures, Primarily Contracted Professional Services	12.1
Total Expenditures	\$ 17.0
Estimated Project Cost Through Construction	\$ 600

HIGHLIGHTS of 2005 and 2004 EXPENDITURES

Contractor / Subcontractor	Thousands	
	Forecast 2005	Actual 2004
HDR Alaska, Inc.	\$ 4,058	\$ 611
URS Corporation	2,150	541
LGL Alaska Research Associates, Inc.	1,276	505
PMO Incorporated	1,184	615
Northern Economics	587	35
RISE Alaska, LLC	467	236
All Others (approximately 23 in 2005, 12 in 2004)	1,866	600
Sub-Total Contractors	11,388	3,143
KABATA General and Administrative Costs	750	619
Total Expenditures	\$ 12,138	\$ 3,762



2006 MILESTONES

WINTER

Public Release of Draft EIS
Permit Applications

SPRING

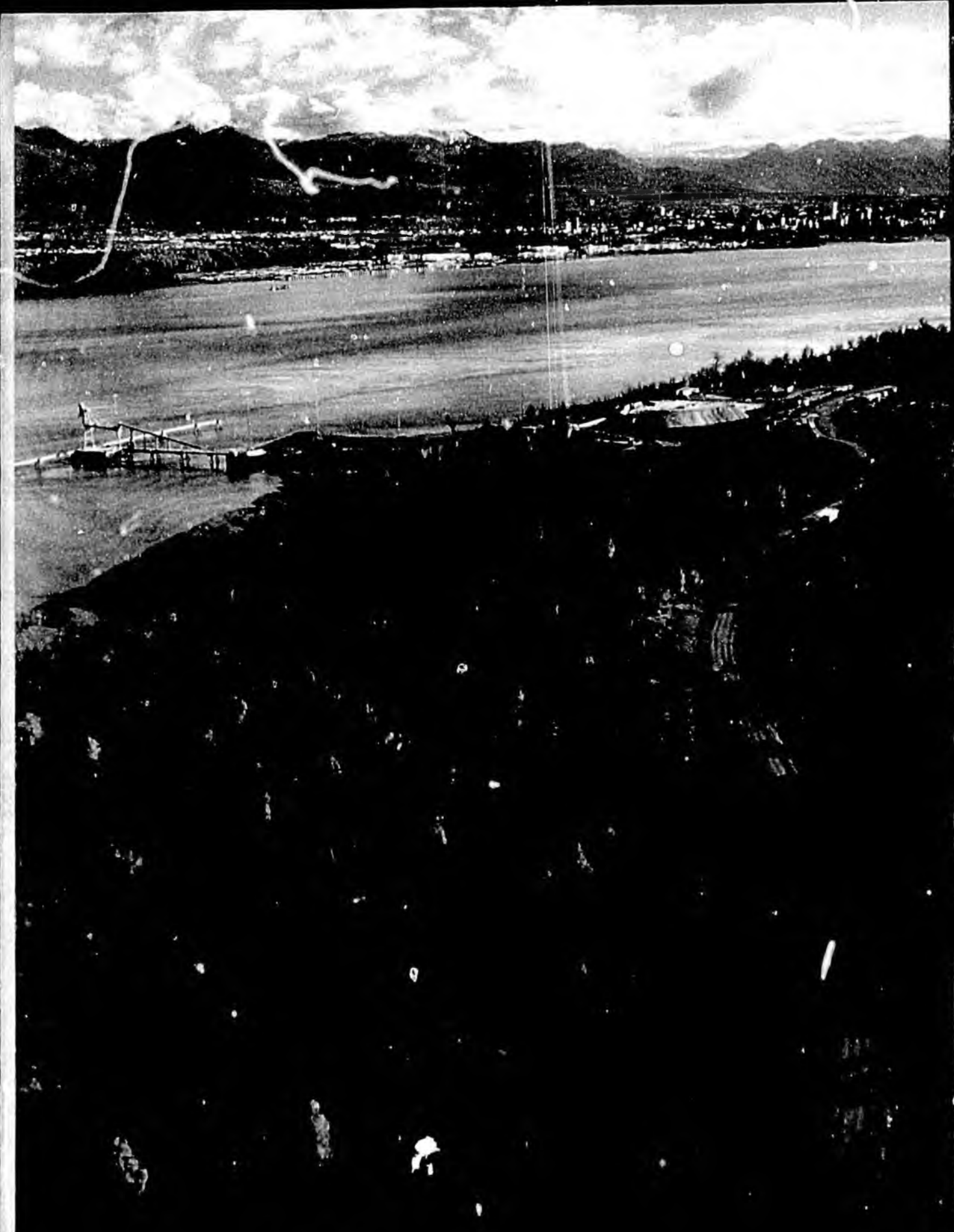
Legislative Approvals
Release of Final EIS
Record of Decision

Finalize Financing
Final Permits

FALL

Phase 1 Construction Kickoff

Port of Anchorage

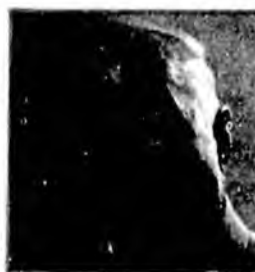


Port MacKenzie

KABATA BOARD AND STAFF



George Wuerch
Chairman



Henry Springer
Executive Director
Staff



Darcie Salmon
Vice Chairman



Darryl Jordan
Deputy Executive Director/
Program Manager
Staff



Senator Lyda Green



Dale Paulson
Director of Regulatory and
Environmental Affairs
Staff



Representative
Bill Stoltze



William A. Greene
Project Counsel



Mike Barton
Commissioner of DOT&PF



Betty Fauber
Administrative Manager
Staff



Bill Corbus
Commissioner of Revenue



Amanda Torres
Administrative Clerk
Staff



Dave Haugen
Vice President
Lynden, Inc.



A Bridge to Alaska's Future Moves Forward

Dear Fellow Alaskans:

A little over two and one-half years ago the Alaska Legislature created the Knik Arm Bridge and Toll Authority to build a bridge to connect the Municipality of Anchorage with the Matanuska-Susitna Borough. The Knik Arm Crossing Project will serve over 50 percent of Alaska's population and create new opportunities for businesses and provide access to attractive residential neighborhoods for the expected growth in population.

Last summer, Congress passed the transportation bill, the Safe, Accountable, Flexible, Efficient Transportation Equity Act: A Legacy for Users (SAFETEA-LU). The Alaska Congressional Delegation: Senator Stevens, Senator Murkowski, and Congressman Young, are all to be thanked for their help in obtaining funding for Alaska's transportation needs.

The Federal Highway Administration is also to be commended for preparing a Draft Environmental Impact Statement in a timely and effective manner. With their help as the federal lead agency, this project will soon be a reality.

Expanding the state's transportation infrastructure is a high priority in my administration. A good road network is essential to economic prosperity. I am confident that the Legislature's decision to form a toll authority for this project will produce a bridge to Alaska's future.

Sincerely yours,

A handwritten signature in cursive script, reading "Frank H. Murkowski".

Frank H. Murkowski
Governor





KNIK ARM BRIDGE and TOLL AUTHORITY

550 West 7th Avenue, Suite 1850

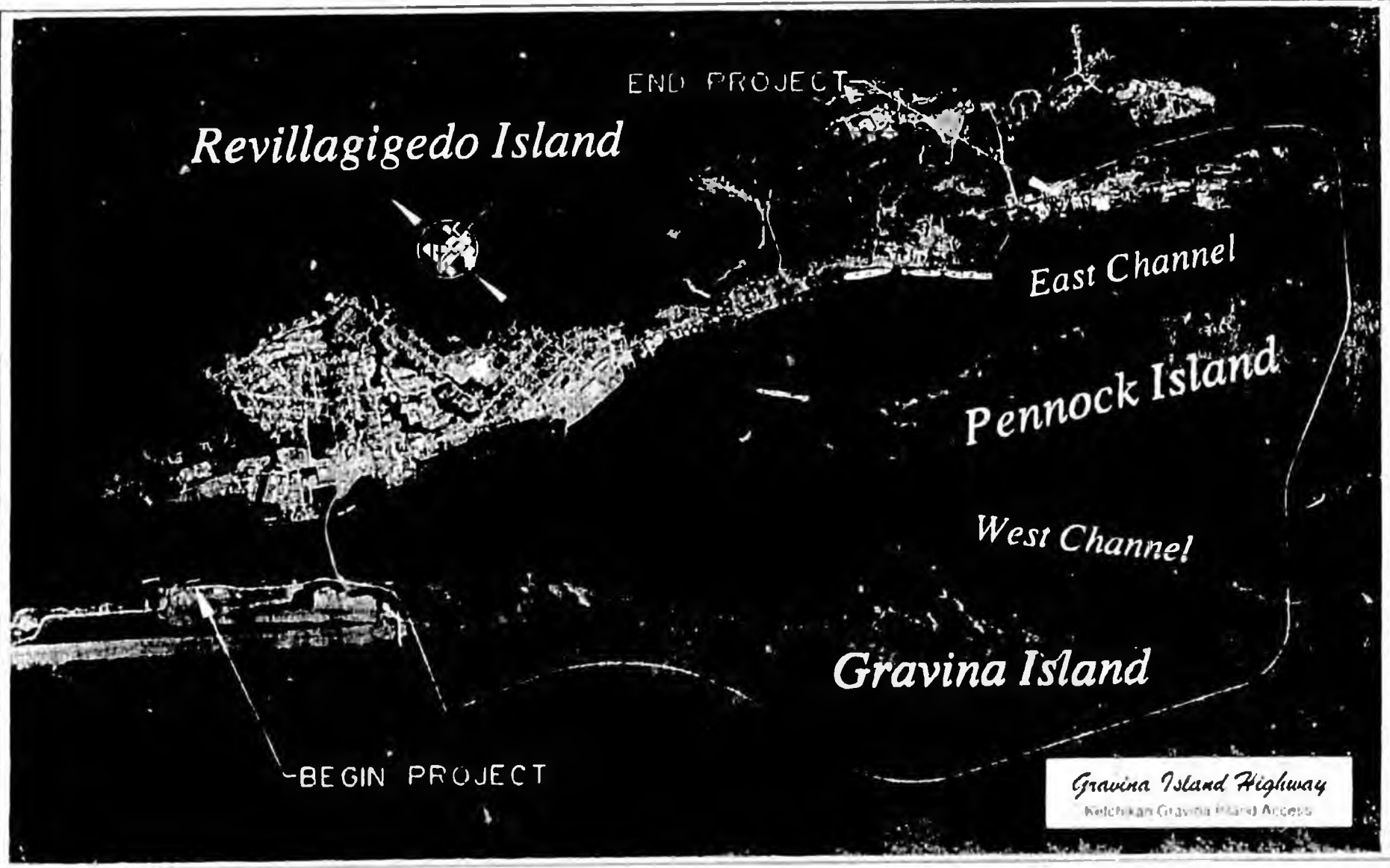
Anchorage, AK 99501

Phone: (907) 269-6698

Fax: (907) 269-6697

www.knikarmbridge.com

KABATA



END PROJECT

Revillagigedo Island

East Channel

Pennock Island

West Channel

Gravina Island

BEGIN PROJECT

Gravina Island Highway
Ketchikan-Gravina Island Access



Gravina Island Highway

CONTACTS

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 Project Manager
 DOT&PF, SE Region
 6360 Glacier Highway
 Juneau, Alaska 99801
 907-465-1799

Mark R. Dalton
 Contract Manager
 HDR Alaska
 2525 C Street, Suite 305
 Anchorage, Alaska 99503
 907-544-2500
 800-478-2514

G R A V I N A I S L A N D H I G H W A Y O V E R V I E W

PROJECT DESCRIPTION

With the publication of the final environmental impact statement (EIS) and federal approval received in September 2004, the Alaska Department of Transportation has begun the final step in the project to construct access from Revillagigedo Island to Gravina Island. This project is intended to provide a roadway link from Ketchikan to Gravina Island across the two channels of *Tongass Narrows*, an active waterway used by vessels that range in size from recreational craft to large ocean-going cruise ships. The waterway is also an active year-round seaplane basin.

The proposed Gravina Island Highway (see map on back) begins at the *Ketchikan International Airport* parking lot on Gravina Island and extends south around the end of the runway and up the hill to an intersection with the *Seley-Lewis Reef Road* (to be built in 2005 by the Department). From here, the Gravina Island Highway proceeds southeasterly to the *West Channel bridge* crossing of *Tongass Narrows*. After crossing the channel, the roadway traverses *Pennock Island* easterly and crosses the *East Channel bridge* to *Revilla Island*. Here, the highway turns northwest, side hilling its way down to an intersection with the *South Tongass Highway*. The total length of the new roadway is 7.0 miles, incorporating almost 1.2 miles of structures.

EXISTING FACILITIES

The principal modes of transportation to Ketchikan are airplane, including floatplane, and ship, no "hard link" surface transportation is available between Revilla and Gravina islands, or to other locations in Alaska or Outside. Currently the borough-

operated ferry system provides the only transportation to Gravina Island. Regularly scheduled airline service and ferry connections by the *Alaska Marine Highway System* link Ketchikan to rest of the State and the Lower 48.

PROJECT PURPOSE AND NEED

For some time, there has been keen interest in building a bridge access to Gravina Island.

The purpose of the project, as defined in the EIS, is to improve surface transportation between Revilla and Gravina islands.

The need for improving access is threefold.

- To provide Ketchikan and its residents more reliable, efficient, convenient, and cost-effective access for vehicles, bicycles, and pedestrians to borough lands and other developable or recreation lands on Gravina Island in support of the borough's adopted land use plans.
- To improve the convenience and reliability of access to the Airport for passengers, airport tenants, emergency personnel and equipment and shipment of freight.
- To promote environmentally sound, planned long term economic development on Gravina Island.

POPULATION AND TRAFFIC

The current population of Ketchikan is about 14,800, with future projections for 2025 of 18,300 residents. The figures reflect a medium level economic scenario that best reflects a reasonable growth in the Borough. These forecasts were used as the basis for the Project traffic analysis. By 2025, the Gravina Island Highway is anticipated to

attract more than 8,000 vehicle trips daily between Ketchikan and the Airport and adjacent development areas on Gravina Island.

ALIGNMENT AND TYPICAL SECTION

The landscape of Gravina Island is a gently rolling wetland with relief that varies only slightly from the Airport to the East Channel bridge. The maximum desirable grade is 7 percent, but the majority of the grades are well below this limit. The grade on Revilla Island is more difficult; it rises steeply from *Tongass Narrows*, with elevations exceeding several thousand feet. The approach from the East Channel bridge will proceed downhill on an 8 percent grade to South Tongass Highway.

The Gravina Island Highway will be a paved rural facility with two 12-foot driving lanes and 8-foot shoulders, for a total width of 40 feet within a controlled-access corridor. The speed limits will most likely be 55 MPH on Gravina and Pennock Islands, and 40 MPH on Revilla Island.

The structures crossing *Tongass Narrows* will be of near record proportions. The potential bridge type and height are dictated by the larger vessels and the presence of Airport and floatplane operations.

SCHEDULE

To ensure a timely delivery, the Department expects this project to be advertised for design and construction to progress concurrently – known as a design-build procurement. A multi-disciplined team will be awarded the contract to develop the work for substantial completion by 2009, with final Departmental acceptance in 2010.



Gravina Island Highway

CONTACTS

James A. Lowell, PE
Project Manager
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907-465-1799

Mark R. Dalton
Contract Manager
HDR Alaska
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Anchorage, Alaska 99503
907-644-2000
800-478-2514

GRAVINA ISLAND HIGHWAY OVERVIEW

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handout 1/11/06



November 18, 2005

Representative Kevin Meyer
Co-Chair, House Finance Committee
716 W. 4th Avenue Ste 310
Anchorage, Alaska 99501-2133

Dear Representative Meyer:

Enclosed you will find a copy of Resolution No. 05-2160 in support of funding and construction of the Gravina Island project, which was unanimously adopted by the Ketchikan City Council last evening.

First, the City is requesting that the Governor and Legislature use these funds for the Gravina Island and Knik Arm projects and include funds for both the projects in the upcoming state capital budget.

Second, we have heard repeated concern that the Alaska Department of Transportation has inappropriately used the STIP process to distort the impact that the two projects would have on other state priorities in the next few years. People who are familiar with DOT actions with respect to the bridge projects, including inflated cost estimates, inaccurate schedules for funding requirements, and misleading public pronouncements (including per capita comparisons, a technique which has been rejected even by federal transportation planners), have described the Department's actions in sum as "developing a worst case scenario and shouting it from the rooftops." The result has been unnecessary alarm in other communities about the potential loss of local projects. We expect the final STIP to be a realistic and accurate planning document.

Finally, I would be remiss if I did not express the opinion of many people in Ketchikan that we are tired of seeing national media, politicians from other states, and various groups malign Alaskans in general, and residents of Ketchikan in particular, as nobodies from nowhere. Your efforts to prove them wrong will be appreciated.

Sincerely,

Bob Weinstein
Mayor

Ketchikan City Council