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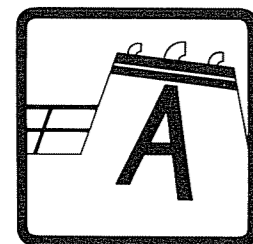
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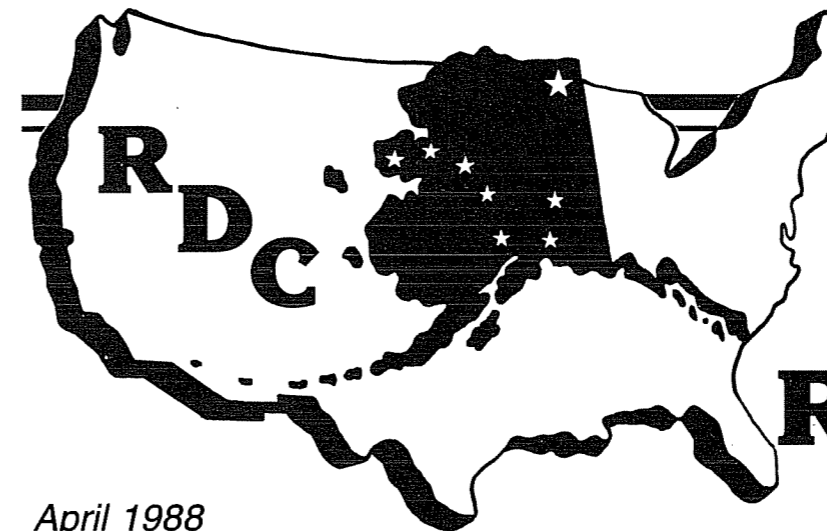
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Resource Review

April 1988

Repeal of ELF could deal economy a severe blow

Now is not the time to raise taxes on industry

A growing state budget has prompted some legislators in Juneau to support legislation which would increase taxes on the oil industry, despite the fact that Alaska's tax rate at Prudhoe Bay is among the highest in the nation.

At issue is the controversial Economic Limit Factor (ELF), a tax formula which encourages new drilling, exploration and development. The ELF is a form of oil production tax initiated in 1977 and revised in 1981. As written, it raised severance taxes at Prudhoe Bay to 15 percent — the highest in the nation. The 1981 law provided for the payment of high severance taxes on oil fields in Alaska during their early years of production, with lower taxes applying in later years as the fields mature and become more expensive to operate.

In crafting the ELF, the legislature in 1981 handed Alaska's primary industry its eleventh tax hike since 1967, resulting in increased tax revenues for the state government through last year. As promised, the incentive portion of ELF kicked into place last year to encourage producers to squeeze more oil out of aging North Slope fields.

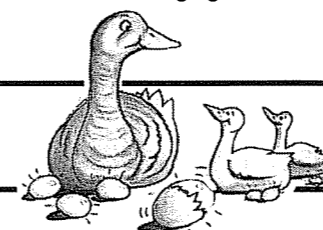
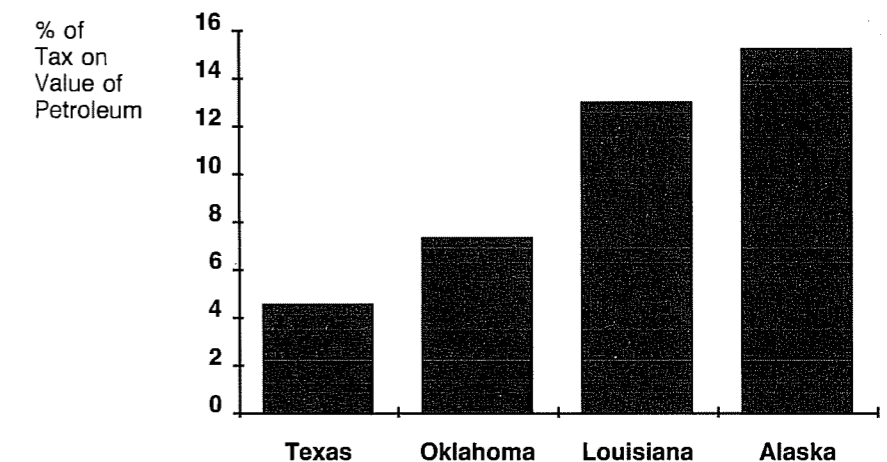
With the ELF in mind, North Slope producers have launched expensive projects aimed at pushing back the decline of America's largest oil fields. Over a hundred new wells have been drilled to maintain throughput of crude into the Trans-Alaska Pipeline and hundreds of people are going

back to work. Overall, ELF has been extremely effective in extending the life of the Prudhoe Bay field.

But, state officials and members of the Alaska House who want a partial repeal of the ELF claim the incentive is costing the

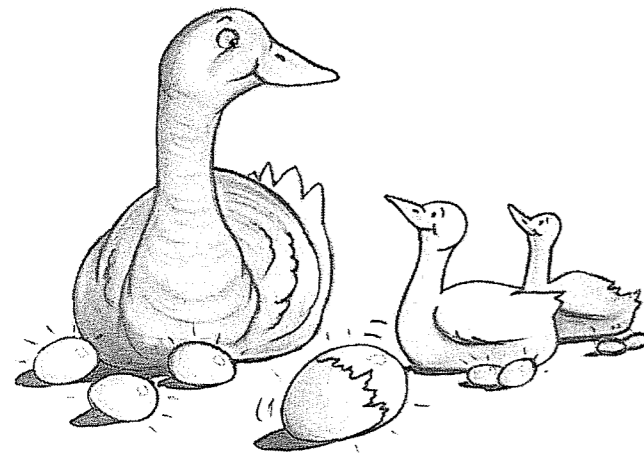
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Severance taxes on Prudhoe Bay would be highest in the U.S. without ELF



The Fabled Golden Goose ... Page 2

Message From the Executive Director will return next month.
Please enjoy our special feature.



Cast of Characters

- ARCSAP — Prudhoe Bay Oilfield
- Kuppie — Kuparuk
- Lizzie — Lisburne
- Ruling Body — Alaska Legislature
- WOP food — World Oil Price
- Magic ELF formula — ELF
- Geese keeper — Alaska Oil Industry
- Crafty Member — Unnamed past members of Legislature, any similarity to Legislators living or dead is purely coincidental.

ARCSAP: The Fabled Golden Goose

Once upon a time a group of people lived in a land of the far north. They were a hearty, hardworking, resourceful people who eked a living out of their land by harvesting its resources of fish, timber and minerals. They didn't have a lot of money, but their Ruling Body managed to provide them with the necessary social services like education for their children, police protection and civil justice.

One day a great goose, named ARCSAP, landed in the bleak northern edge of the territory. ARCSAP scratched around, built a huge nest, and began to lay golden eggs and give them to people. ARCSAP sustained herself on a special food called WOP, which was manufactured principally by companies in a land far away on the other side of the world.

The people gave the golden eggs to the Ruling Body and told it to use the gold to make their life better. The Ruling Body had never seen so much wealth, and it was unsure about what to do. It hired some advisors to tell it what to do with the gold. The advisors hired more advisors to advise it, and the original advisors became chief advisors. The new advisors decided there was so much gold to spend that they too needed advisors, so they became deputy-chief advisors and hired more advisors. The new advisors decided that they needed some studies done so they hired some outside consultants to study how to spend the gold. When the bill for the chief advisors and the deputy-chief advisors, the advisors and the outside consultants was given to the Ruling Body, they found out they had spent all the gold.

The Ruling Body was concerned because the gold was gone, and they had lots of studies on how to spend the gold to help the people, but now had no gold. Then, a Crafty Member of the Ruling Body said "I know how to get ARCSAP to give us more gold. If we put a noose around ARCSAP's neck and squeeze her real tight, she will have to lay more golden eggs." "But won't that kill ARCSAP," asked another member of the Ruling Body in one of its closed meetings. "No," said the Crafty Member, "ARCSAP can stand the tight noose for 10 years, after that time, when she starts to get old and weak we'll keep her alive by the magic ELF formula."

So the Ruling Body ordered the noose tightened around ARCSAP's neck and she indeed did begin to lay more golden eggs. But the strain of the tight noose and the extra golden eggs made ARCSAP very weak, and she might have died, but the makers of the WOP food in the land on the other side of the world greatly increased the strength of the food. ARCSAP became strong in spite of the tight noose. The new WOP food kept increasing in strength.

As time passed, ARCSAP gave birth to smaller geese who also laid golden eggs. Kuppie laid medium-size golden eggs and Lizzie laid small golden eggs; but both newborn geese were sickly and in ill health in spite of the strong WOP food. The Crafty Member of the Ruling Body knew what to do. He ordered that Kuppie and Lizzie be given the magic ELF formula right away. The magic ELF formula worked amazingly well for Kuppie and Lizzie, and they became healthy. Of course, the new strength WOP food also helped Kuppie and Lizzie.

With all the large golden eggs from ARCSAP, the medium-sized ones from Kuppie and the small ones from Lizzie, the Ruling Body had enough gold to pay the chief advisors, the deputy-chief advisors, the advisors, and outside consultants and still do some things to make life better for the people. The Ruling Body gave gold to the people to invest in business, gold to build large buildings, gold to pay their power bills and all sorts of things. Of course, with all the golden eggs, the Ruling Body had to hire more chief advisors, deputy-chief advisors, advisors and outside consultants. In fact, the Ruling Body was able to hire so many people to advise it, the people began to neglect their mining, fishing and timber businesses. With so much gold for the many jobs of chief advisors, deputy-chief advisors, advisors and outside consultants, the Ruling Body had no reason to worry about the lean times.

At the end of about nine years, the makers of the WOP food in the far away land decreed a massive reduction in the strength of the food. When they decreased the strength of the food, ARCSAP, Kuppie and Lizzie, became very ill, and the amount of golden eggs (large, medium and small) was greatly reduced. The Ruling Body faced a very serious problem because it didn't have enough gold to pay all the chief advisors, the deputy-chief advisors, the advisors and the outside consultants. When the Ruling Body asked the advisors and consultants what to do, the advisors said "Make ARCSAP, Kuppie and Lizzie produce more gold! Then you can pay us and do all the wonderful projects we have advised you to do for the good of the people." The Crafty Member of the Ruling Body said "If we don't give the magic ELF formula to ARCSAP, she'll produce more golden eggs, and we can take the magic ELF formula away from Kuppie and Lizzie, and they will also lay more eggs." At that time, the keeper of the geese burst into the closed meeting of the Ruling Body and said "the decrease in the strength of the WOP food manufactured in the far away land has made ARCSAP, Kuppie and Lizzie very weak. If we don't give them the magic ELF formula, I think they will die!"

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ELF: Classic battle erupts in Juneau

(continued from cover)

state hundreds of millions of dollars in lost tax revenues. They believe the ELF should not be applied at this time to large fields such as Prudhoe and Kurparuk.

If enacted, a House proposal repealing ELF would bring \$150 million in additional tax revenues to the government in its first year and \$1.2 billion over the next five years.

Proponents of ELF warn that repeal of the long-promised incentive would dampen the economics of continuing projects — investments which cost industry hundreds of millions of dollars and made with the Economic Limit Factor in mind. These projects mean more jobs, exploration, development and production, but all of this progress could be threatened if taxes under ELF are increased.

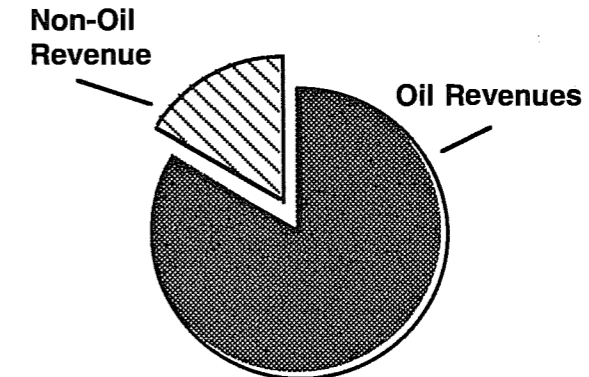
Although Prudhoe Bay may not be considered a marginal field, industry sources maintain that the application of the ELF at America's largest oilfield is appropriate because new industry activities there are marginal. The easy oil has already been produced, and "marginal projects" aimed at pushing back Prudhoe's decline will hold the key to additional production and state oil revenues.

Senator Mitch Abood, Chairman of the Senate Committee on State Affairs, pointed out that any negative effect of the ELF formula is currently offset by increased revenue to Alaska from additional drilling and production. Abood stressed that ELF is working just as it was originally intended.

"It is creating jobs, stimulating new economic activity and increasing recoverable oil reserves," Abood said. In addition, "it will increase the amount of oil and gas revenue the state will collect in the long run," the Senator added.

However, state officials claim that because ELF has created an incentive for operators to drill more wells, tax revenue "losses" are greater than anticipated. As a result, the Cowper administration and members in the Alaska House of Representatives want ELF out. Abood and his fellow senators point out such action would penalize industry for increasing production and generating new revenues for Juneau.

The ELF controversy has set up a classic battle between the Alaska House



The petroleum industry now accounts for 88% of all state revenues

and Senate. Alaska's struggling private sector appears to be lining up behind the oil industry, which supplies 88 percent of all state revenues and accounts for 94 percent of all taxes paid in the 49th state.

Industry warns that the legislature will deal the state's economy a severe blow if it repeals the ELF.

Bill Wade, president of ARCO Alaska, Inc., estimated industry is prepared to invest up to \$25 billion in Alaska during the next ten years, but warned that an increase in oil taxes will make oil companies think twice about making such large investments. He said repeal of ELF would send the wrong signal to the industry, especially when it is going through such turbulent times.

Wade said his company plans to invest \$7 billion in the state, but tax stability is the key to seeing those investments become a reality during a time of unstable oil prices.

Tom Williams, Manager of Tax Planning

for Standard Alaska Production Company, said the ELF issue today centers around whether oil taxes should be increased so that the state can continue spending at present levels for one more year.

If the state repeals ELF, Williams asked, "What will they do two years from now when Prudhoe Bay starts running out of oil? Raise taxes again?" Williams continued, "The power to tax is the power to destroy."

"Unless we decide to sacrifice the oil industry on the altar of state spending, our elected officials will have to cut government back sooner or later, and they should start doing it now," Williams added.

RDC members need to express their support for a stable tax policy. Tell your Legislators and Governor Cowper to support ELF. A free 50-word public opinion message (POM) may be sent to Juneau by simply dictating your message over the telephone. Call 561-7007 to send your message.

Valdez refinery still alive

Four proposed amendments to the Omnibus Trade bill which would have eliminated all exports of Alaska crude and halted the construction of a new Valdez refinery were killed recently by members of the U.S. House and Senate Conference Committee negotiating a final trade bill.

Congressmen Don Bonker, D-Washington, and Howard Wolpe, D-Michigan, had led the effort to place a series of restrictions on the export of Alaska oil and the construction of the Alaska Pacific Refinery in Valdez.

However, Bonker was successful in passing an amendment which would limit refined exports to no more than 50 percent of the average an-

nual output for new refineries in Alaska. The 50 percent limit places an export ceiling of 70,000 barrels per day on new Alaska refineries.

Congressman Don Young was pleased with the Alaska congressional delegation's success in killing the amendments, but expressed dissatisfaction with the export limit, which he labeled discriminatory and unjustifiable.

The compromise will allow Alaska to export 50,000 barrels of North Slope crude to Canada and continue to export Cook Inlet crude abroad. Most importantly, it allows the Valdez refinery project to go forward.

Resource Development Council, Inc.

The Resource Development Council (RDC) is Alaska's largest privately funded nonprofit economic development organization working to develop Alaska's natural resources in an orderly manner and to create a broad-based, diversified economy while protecting and enhancing the environment.



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Carl Portman
Editor & Advertising Manager

Tongass tampering

There was no surprise whatever as the House Interior Committee voted to repeal a 1980 federal law regulating timber harvesting in the Tongass National Forest in Southeastern Alaska.

The legislation is a major goal of the environmental lobbies. They have made it a national crusade — and, naturally, used it as a marvelous fund-raising tool for their own organizations. The Tongass campaign is a counterpart to their same efforts and same fund-raising goals to prevent any oil and gas exploration on the coastal plain of the Arctic National Wildlife Refuge in north-eastern Alaska.

Fortunately, the battle isn't over — on either issue, as a matter of fact.

But the vote in the house committee points out clearly the difficulty Alaska faces in trying to carve its own destiny.

Many congressmen, sad to say, regard Alaska as less than a state than as a national preserve and zoo.

Alaska, to some, is a perfect opportunity to compile a wonderful environmental voting record — without endangering economic development and jobs in his or her home district. It matters not to them that their votes might close down economic opportunities in Alaska, so long as they don't have to cast votes to do the same back home.

Couple that attitude with the disturbing knowledge that all too many congressmen are ill-informed and uninformed about Alaska, and a feeling of almost overwhelming frustration results.

In the case of the Tongass, all of Congress has been inundated with emotional

pleadings that paint totally erroneous pictures of what logging in Southeastern Alaska is all about. And many have been persuaded by half truths and deliberate misstatements.

One of the more disturbing things about the whole affair is that the forestry activities now under attack are the very same that were agreed to by the environmentalists at the time the law was passed — under a compromise that created huge wilderness expanses covering 5.4 million acres of the area.

One congressman called the Tongass "almost a scandalous operation."

There's something scandalous afoot here, all right. But it's not the existing law or the harvesting operations.

Republican Rep. Don Young of Alaska summed it up by saying the House committee plan "basically shuts down the mills." That represents 6,000 jobs, says Mr. Young, "a commitment made to the state of Alaska."

Unfortunately, Alaskans know all too well about the lack of permanency in congressional commitments to Alaska.

What is happening on the regulation of the Tongass is but another sickening example of how environmental lobbies manipulate members of Congress, and in the process feed their own treasuries with mail order appeals for money from gullible but well-meaning members of the public who know little or nothing of the real issues in Alaska.

— *The Anchorage Times, March 31, 1988*

RDC opposes primitive land use proposal

The Resource Development Council strongly opposes the Alaska Center for the Environment's proposal to create a new primitive land use classification for state land.

"Clearly the Alaska Constitution is at odds with this proposal," said Becky Gay, the Council's executive director. Gay said the multiple-use, sustained-yield mandate of the Constitution places any such restrictive administrative action in grave jeopardy to legal challenge.

Alaska has some of the strongest environmental protection statutes and regulations of any state. RDC maintains the state does not need a primitive classification to ensure the availability of options and opportunities for future generations. Existing laws are specifically designed for that purpose.

RDC firmly believes Alaska's future is directly linked to the economic activity generated from state lands. More than any other resource in its control, state lands give Alaska the best opportunity to influence the quality of life of all residents.

Showdown approaching, "full court press" needed to open ANWR leasing

The long and hard-fought battle to open the Arctic National Wildlife Refuge to oil and gas development may reach a climax in June, and the outcome may depend largely on the pressure government officials and business leaders apply on their associates in the Lower 48 to convince Congress to act favorably toward Alaska development.

While pro-development forces are encouraged by recent trends in the House, congressional sources warn that a possible showdown on the House floor in June is likely to end in a very close vote. As a result, the next several weeks are critical with organizations supporting development scurrying to encourage business associates and members outside Alaska to change the minds of congressmen opposed to development.

A new bill allowing oil and gas exploration and development leasing in the 1.5 million-acre Coastal Plain of the refuge will be introduced in the House later this month.

The compromise bill, the fifth piece of House legislation dealing with the refuge, would split the royalty revenue evenly between the state and federal government and designate the National Petroleum Reserve west of Prudhoe Bay a wildlife refuge.

Under the 50-50 split, half would go to the state treasury, 10 percent to the federal treasury and 40 percent to federal environmental programs that may otherwise go unfunded given current budget constraints. The legislation would also provide funding for energy conservation and alternative energy research.

Although the bill designates the petroleum reserve a wildlife refuge, provisions would allow for oil and gas exploration.

The new House bill, which provides for strict environmental standards protecting the wildlife, air and water quality, is currently under mark-up in Congressman Gerry Studd's Subcommittee on Fisheries, Wildlife Conservation and the Environment. Speaker of the House Jim Wright has indicated he wants the legislation on the floor no later than June.

The brighter prospects of moving the bill from subcommittee to the full House Merchant Marine and Fisheries Committee, and eventually to the House floor is an encouraging development for Alaska, where some 80 percent of the population supports development in the refuge. Ear-

lier it appeared the chances for moving an ANWR development bill through the Democratic-controlled House were very slim. However, the new legislation offers a strong compromise many Congressmen seem willing to support.

Another factor influencing possible House action on ANWR this spring is that both House and Senate leaders have gained a much better understanding of the issue and are beginning to realize that development does not necessarily harm wildlife nor does it need to occupy but a tiny fraction of the 19 million-acre refuge. In fact, reports have shown exploratory drilling would affect less than 1 percent of the refuge.

The unwillingness of environmental forces to budge from their position of total Wilderness designation for the Coastal Plain hasn't helped their case in Washington where compromise is the name of the game. Most of the refuge is already off-limits to development and nearly half of it has already been designated Wilderness, including some 450,000 acres of Coastal Plain lands immediately adjacent to the area proposed for oil and gas leasing.

Meanwhile, the Senate Energy Committee has reported a bill to open ANWR to development. An amendment to Committee Chairman Bennett Johnston's development bill, offered by Senator James McClure, requires a 15-month study of future energy needs and orders the Secretary of the Interior to develop leasing plans that can be acted upon 21 months after Congress passes the ANWR bill.

The Senate bill would also split the royalty income evenly between Alaska and the federal government. The federal government would put 25 percent of its income in the Land and Water Conservation Fund, 5 percent in the Migratory Bird Conservation Fund and 20 percent in the U.S. Treasury.

The Committee's bill will likely be used with a House bill in reaching a compromise on ANWR in a House/Senate Conference Committee.

RDC urges its members and friends to send letters and post cards to members of the **House Merchant Marine and Fisheries Committee, the House Committee on Interior and Insular Affairs and the Senate Committee on Energy and Natural Resources.** Ask them to support the opening of ANWR to responsible oil and gas development.



Caribou don't seem to mind oil production facilities at Prudhoe Bay.

Environmentalists ignore data

A highly critical "report card" of Alaskan North Slope oil operations focused on out-dated technology and failed to provide any scientific evidence that major environmental damage has occurred at Prudhoe Bay as a result of oil industry operations, according to Bill Wade, president of Arco Alaska, Inc.

Wade, responding to the report by several environmental groups, pointed to industry's successful track record and consistently improving technology over the past decade. "That is proof that oil exploration and production can be done in an environmentally compatible way on the Coastal Plain of ANWR." He said the report "selectively ignores extensive air and water monitoring data that indicates there have been no biologically important impacts to air and water quality."

"We have worked closely with state and federal regulatory agencies to assure that operations on the North Slope meet or exceed established guidelines."

Wade noted that industry continues to improve its environmental record. Second-and-third generation fields on the North Slope have been built with the benefit of the Prudhoe Bay experience.

Responding to charges of widespread oil spills on the North Slope, Arco said since oil wells and production facilities are built on gravel pads, most spills never reach the underlying tundra.

From 1981 to 1986, more than 90 percent of the spills resulting from oil production occurred on gravel pads. The 10 percent which spilled onto the tundra was completely cleaned up with minimum disturbance to the land.

The company also noted that less than one percent of the surface acreage at Prudhoe Bay and Kuparuk has been directly affected by oil field pads, roads and gravel sites. Even though some wildlife habitat has been lost, wildlife populations on the North Slope continue to grow.

Fable has two endings ...

(continued from page 2)

The Ruling Body now had to make a decision, and at this point, our story has two different endings.

ONE:

The Ruling Body took the advice of the Crafty Member and its advisors and didn't give the magic ELF formula to ARCSAP or the other geese. ARCSAP continued to produce golden eggs at the same rate; but without the formula, she became weaker and weaker. Kuppie and Lizzie began to produce more golden eggs when they were taken off the magic ELF formula. With the new gold, the Ruling Body kept all the chief advisors, deputy-chief advisors, the advisors and the outside consultants employed. As the years passed, ARCSAP, Kuppie and Lizzie became weaker and weaker until they finally died! When the golden eggs stopped, most of the chief advisors, deputy-chief advisors, the advisors and the outside consultants all left the northern land and went back where they came from. The northern people had forgotten how to mine, fish and log and lived in poverty, entirely dependent upon pittances given to them from the great king who lived in Washdc located thousands of miles to the east. It was a miserable existence because the powerful king at Washdc didn't really understand the

people of the north and why they had killed ARCSAP and the other geese.

TWO:

The Ruling Body believed the geese keeper and gave ARCSAP the magic ELF formula and allowed Kuppie and Lizzie to continue to use the formula. All three geese recovered and continued to produce golden eggs, although not as many as before when the WOP food made in the far away land was stronger. The Ruling Body could no longer afford so many chief advisors, the deputy-chief advisors, advisors and the outside consultants, so they fired many of them. Those people all went back to live where they originally came from. The northern people used the time of reduced golden egg production to re-learn how to mine, fish and log, and they became self-sufficient and no longer entirely dependent upon the golden eggs.

After awhile, when the WOP food got a little stronger, ARCSAP hatched a new goose called Sak. Sak needed huge doses of the magic ELF formula but produced numerous small golden eggs. With the help of the Ruling Body, the geese keeper and ARCSAP also hatched ANWR which produced more large golden eggs and the people of the north lived happily ever after.

Conference leaves fresh resolves for new growth

By Joseph R. Henri

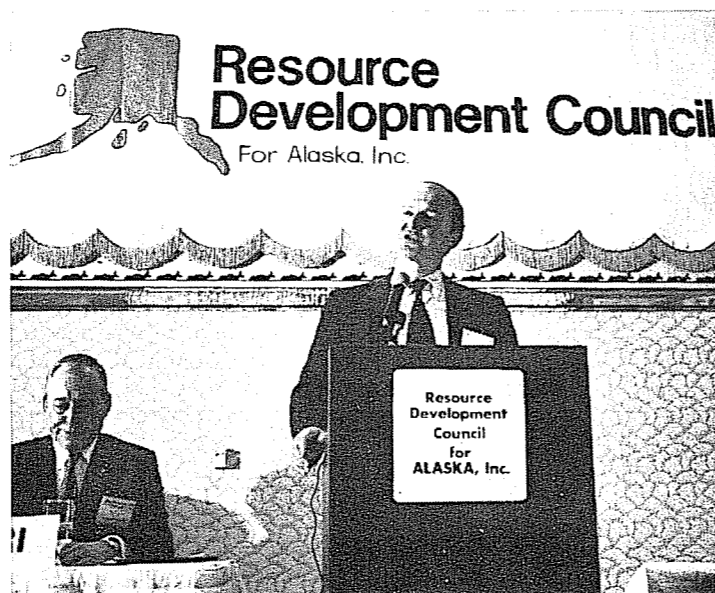
Editor's Note: The Proceedings of the "What Alaska Can Do For America" conference will soon be available at a cost of \$20 per copy. The 200-page document includes a thorough executive summary, the text of each speaker's presentation and a list of all conference attendees. Call RDC at 276-0700 to order this useful reference document. First come — first served.

The stirring insights, the evocative phrases, the learned dissertations of the dozen speakers, and the gathering of 400 Alaskans, are now shining memories. The Resource Development Council's Eighth Annual Conference, "What Alaska Can Do For America," was held in Anchorage February 26-27. I personally had thought the 49th State could do a great deal, but in retrospect, my enthusiasm for Alaska's possible contributions to the USA outran that of some of those who spoke.

It is understandable that this should be so; it is not dismaying. After all, we invited learned and important people from distant places, not only to hear from them, but so that they could gain better understanding of us — of Alaska, her abilities and possibilities. By being with us and of us for two intensive days, the out-of-town experts caught the contagion of the Alaskan resource development enthusiasm. The attendees learned, and so did the speakers. And all those present learned from each other, fortified each other, took fresh resolves for economic growth and development in the reinforcing presence of each other.

Those were two very good days. They were capped off, highlighted, and summed up in the closing session by Dr. William Ransom Wood, President Emeritus of the University of Alaska, and tireless, intrepid promoter of the economic well-being of Fairbanks, and really of all Alaska. Bill Wood is the father of the modern University of Alaska.

In reflecting on Robert Horton's keynote address, Dr. Wood expressed the shocked reaction of most of us to the Chairman of BP America's observation that Alaska has very little the world wants, and very little that is "utterly indispensable **UNLESS Alaska can find ways to produce the things the world wants at a price competitive with non-Alaska producers.**"



Robert B. Horton, outgoing Chairman and Chief Executive Officer of BP America, stressed that one of Alaska's greatest assets and potential contributions to America is its bright minds.

During the past four decades, Alaska has fallen into and stayed in the category of "high-cost producer." Our remoteness from supply, our enormous land mass so thinly populated, our sparse to non-existent infrastructure throughout the length and breadth of the land, our arctic and sub-arctic climates, high cost of living and resultant high labor costs, our lack of cohesiveness in the common purpose of producing a sound, enduring, rewarding economic structure fulfilling all legitimate human desires — except warm, balmy, year-round sunshine — have all contributed to our undesirable, "high-cost" reality. Further, both Dr. Wood and Chairman Horton reflected that we have not fully developed, utilized, or retained the young people or our state who could effectively work at reducing our "high-cost" problem through technology and better statecraft. Robert Horton reminded us that "bright minds are the greatest competitive advantage in the world."

Our Resource Development Council Education Foundation was formed to educate Alaskans and Americans in general about the resources and advantages of Alaska. Dr. Wood and Governor Cowper have proposed legislation in the Alaska House of Representatives, H.B. 390 and 391, which would contribute to the proof of Alaska's bright minds, helping us achieve the competitive advantage of young, energetic, eager and intelligent Alaskans. On a long range basis, this better education must be one of our primary goals.

What about the rest of the effort? How can we "produce the things the world wants at a price competitive with non-Alaska producers?" The Canadian provinces seem to offer examples of what to do. For example, British Columbia has a well developed road system, a vast hydroelectric generation and grid system, coal mines producing vast tonnages for export and local consumption, a timber industry which is the economic backbone of the three million people who make their home there, a sizeable output of placer gold, hard-rock gold, and other hardrock minerals. In a word, British Columbia has an enviable resource development economy. The province has been generous in providing infrastructure and other inducements to industry. The Canadian federal government has also encouraged its citizens in developing the country. Over the years, British Columbia has had a plan, and it has stuck to it well enough to create a great jurisdiction.

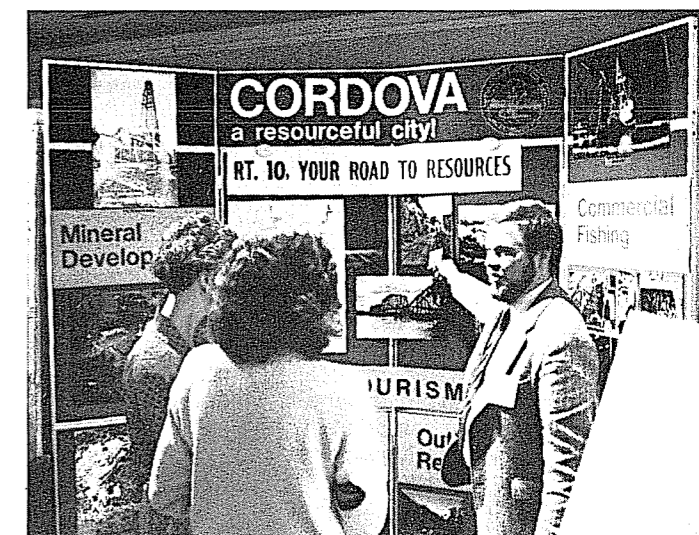
By contrast, Alaska has had a number of projects, but hardly any overall plan worthy of the name. As Dr. Wood reminded us, "we're so busy with projects that we don't have any programs and we have no priority guidelines and no policy, but we have projects." The sage doctor observed that "we concentrate upon distribution and pay practically no attention to how you create more wealth so you have a bigger pie to cut up. It doesn't make any sense."



Long-time prominent Alaskans Joe Usibelli, Sr., Chairman of Usibelli Coal Mine and David Heatwole, an Arco Alaska vice president, were positive, informative and optimistic in spite of regulatory and commodity pricing uncertainties. President Henri listens.



The All-Alaska Expo featured a variety of exhibits. At left, Easy Gilbreth of the Alaska Oil and Gas Association makes a strong pitch for opening ANWR to Rod Koone of the Port of Tacoma while RDC board member Rex Bishopp listens. At right, Mayor Erling Johanson of Cordova makes his case for the new highway to Cordova.



Contrary to the example of British Columbia, Alaska has no infrastructure program. Once in a while we do something; more often we talk about something for a great long time through a series of studies covering years, and then drop the project. Susitna Dam is a perfect example. That generating capability was first ready to go to bid in 1952, under the presidency of Harry S. Truman. The succeeding Eisenhower Administration announced a hydroelectric policy of "no new starts," and that was the first time that the Susitna Dam project was abandoned. Southcentral Alaska would not be in an abject depression today had we had the fortitude and resourcefulness to proceed with Susitna. As Bill Wood said, "We circle the wagons and shoot one another . . . no matter how good the idea is, three meetings later it is dead."

Alaska has a very large income, including almost \$1 billion per year which the Permanent Fund earns. With creativity and ingenuity, our vast income could support capital improvements based upon a long-range plan of economic development. Unless we do adopt a highly intelligent and forceful plan, and pursue it vigorously, in season and out, Alaska's economic future cannot be expected to substantially improve.

Conference speaker Dr. Charles Ebinger of the Center for Strategic International Studies, Washington D.C., reminded the conference that the crude oil reserves of the world had increased by 27% during 1987, the OPEC countries alone having added 165

billion barrels. OPEC holds 82% of the world's proven oil reserves. Unless the American government and the Alaskan government encourage investment in oil and gas through lower taxes, reduced regulatory and statutory barriers, and by granting tax credits for actual oil and gas development, we cannot rationally expect oil and gas to give Alaska a new bonanza. America's foreign trade imbalances dictate great attention to a larger volume of domestic production to decrease our nation's trade deficit. The OPEC oil will be cheap and alluring, and we are in danger of becoming grossly dependent.

There is so much that must be done in the 49th state to give its citizens a good economy; there is so much that can be done here to give the United States the resources it needs, the foreign trade exports it desires, and substantial added revenues to the U.S. Treasury through the expansion of Alaskan commerce and industry. Alaskans are a bright people; we are well educated as a group; but we are divided and of many counsels as to how to proceed. RDC's 1988 conference has given us a thumbnail sketch of a good plan. I hope we are competent enough and resolved enough to capitalize on the ideas, to do the hard work and spend the long hours it will take to adopt a workable economic development plan, and to begin to see the fruits of our labors in the near future.

Workers' Compensation Reform

By Stephen M. Rehnberg, CMA

In 1988, Alaskan employers received a record 25% average increase in workers' compensation insurance premiums after a 14% average increase the previous year. The skyrocketing premiums have forced many Alaska-based businesses to close, resulting in a loss of jobs for Alaskans.

For the past 18 months, individuals representing Alaskan employers and Alaska's labor unions met as a combined labor-management task force to study and recommend changes in the workers' compensation statutes. The goal of the task force was to reduce the cost of workers' compensation in Alaska, but not at the expense of the injured worker. Specialists from inside and outside Alaska were consulted. Representatives from the State Division of Insurance and Workers' Compensation assisted in task force deliberations and the review of claims data. The result of the labor-management task force work was a carefully crafted, balanced and fair reform legislation introduced concurrently in the Senate by Senator Tim Kelly, SB322, and in the House by Representative Dave Donley, HB352.

The Senate, recognizing the importance of this legislation to both business owners and labor, passed the workers' compensation reform bill unanimously with only minor technical corrections. The reform measure is now slowly working its way through the House Judiciary Committee where opponents have proposed amendments that are designed to kill the measure or will result in increased costs to employers with no resulting increase in benefits to injured workers. The bill drafted by the labor-management task force and passed by the Senate has been endorsed by chambers of commerce around the state, labor unions and employers. Main opponents of the bill have been chiropractors and attorneys who earn significant incomes from the present workers' compensation system.

Alaskan employers are urged to write or call their elected representatives to encourage them to support the workers' compensation reform bill as passed by the Senate. The workers' compensation bill is necessary to assure Alaska's business competitiveness and to save Alaskan jobs.

A Study of Bowheads

(Continued from page 5)

about 0.12 to 5.7 miles, and at three different directions from the ship (port side, bow aspect, and starboard side).

Sound levels were measured in various frequencies in the range of 20–1000 Hertz (cycles per second). The frequency range was chosen because bowhead calls are predominately in this range.

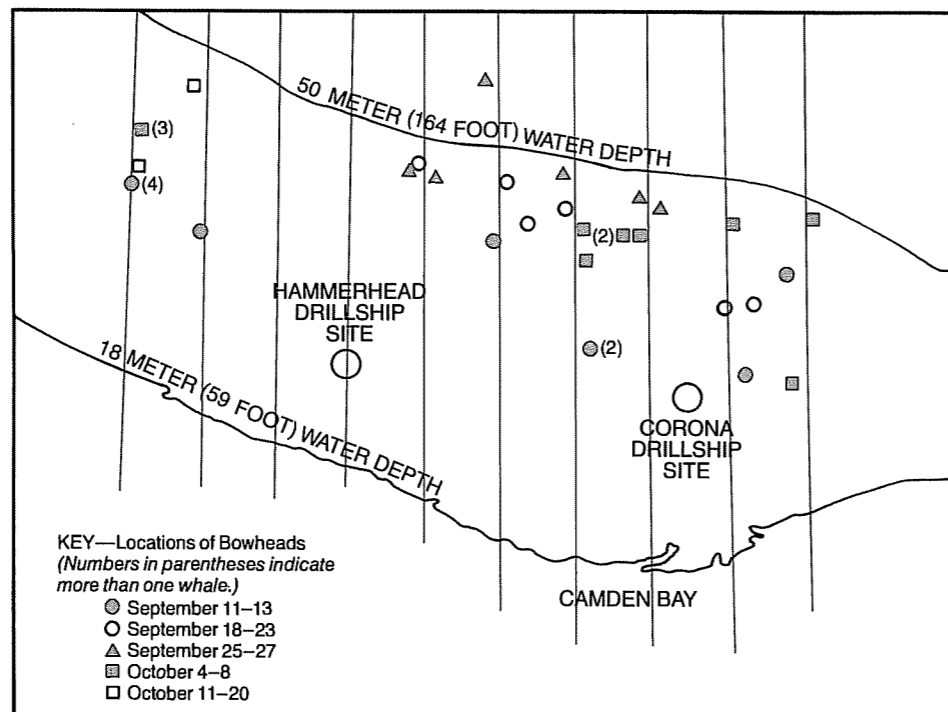
In general, the noise level was found to increase as hydrophone depth increased. Noise levels along the port and starboard sides were comparable and slightly higher than levels on the bow.

In general, the rate at which sound levels diminished with increasing distance from the drillship was not rapid and was less than expected (based on previous studies in the Canadian Beaufort Sea), but certain components of the sound that apparently originated at or near the drillship did decrease at the expected rate. A significant level of sound apparently generated by a support ship with damaged propellers may have biased these acoustic results.

In addition to the hydrophone monitoring system, an array of five anchored acoustic buoys was installed about 6.8 miles east of the Hammerhead site and operated for nine days in September until it was destroyed by ice.

The acoustic-buoy system was designed for two purposes: (1) to test the feasibility of tracking bowheads through monitoring their calls and (2) to measure variations in drilling-related noise over time.

Unfortunately, no bowheads were heard because none appeared to be in the area during that period of the study



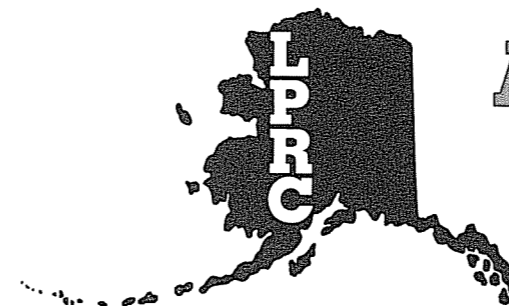
This map shows the locations of migrating bowhead whales sighted during the study involving drillship operations described in the article beginning on page 1. Whales are shown by blue symbols. The straight blue lines indicate the routes flown by an aircraft with observers aboard to spot the whales. Five flights, each covering all these routes, were flown between September 11 and October 20, 1985.

(as revealed by the aerial survey), so it was not possible to test the system capability for tracking whales. Nevertheless, the researchers found that calibration tests involving industrial sounds showed that the system had good localization capability and appeared to be a viable monitoring tool. They concluded that industrial noise could mask the detection of distant whale calls as far away as about 6–7 miles from the drillship.

The buoy system also was used to

evaluate temporal variation in noise surrounding the drilling site. Sound levels and composition were determined for segments of 8.5 seconds taken once each hour for 176 hours.

For 95% of the hours studied, noise levels exceeded natural sounds that would be expected under gale weather conditions, called “sea state six” conditions on the Beaufort Scale. Noise levels in the 20–1000 Hertz band fell below 113 decibels only 5% of the time. ■



ALASKAN UPDATE

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A Study of Bowheads and a Drilling Site in the Beaufort Sea

Among several recent studies by oil companies of bowhead whales in Alaskan offshore areas is a 1985 investigation of underwater noise from a drillship operation and the location of whales in relation to the drillship site during their fall migration.

The study took place at and around an exploratory well drilled by Unocal in 1985 at the Hammerhead prospect about 13 miles north of Flaxman Island in the central Alaskan Beaufort Sea. This was the first well drilled in the Alaskan Beaufort Sea by a drillship, although drillships have been working in the Canadian Beaufort Sea since 1976.

The ice-strengthened drillship *Canmar Explorer II* and several support vessels were on the site.

(Continued on page 3)

Air Quality at North Slope Oil Fields in Alaska

The quality of air in the vicinity of oil fields on Alaska's North Slope, including Prudhoe Bay, always has been far better than federal and state standards for the area, according to two publications by Standard Oil and ARCO, operators of Prudhoe Bay Oil Field.

Government data summarized in these publications also refute recent allegations by some environmentalist groups that the oil industry has created severe pollution there, comparable to that in large U.S. cities.

The two publications are “Air Quality Issues: The Prudhoe Bay Oil Field in Perspective,” June 1987, by Standard Oil; and “Air Issues on the North Slope of Alaska,” 1987, by Jim A. Ives and G. Scott Ronzio of ARCO.

Following in this article are reviews of several aspects of North Slope air quality discussed in these publications, including:

- government standards for emissions on the North Slope and elsewhere;
- sources of emissions;
- monitoring of ambient air quality;
- comparisons of Prudhoe Bay air quality with other U.S. areas;
- the phenomenon called arctic haze.

Government Standards for Air

North Slope air quality must meet standards set by both the federal government and the State of Alaska.

In 1970, Congress passed the Clean Air Act, which established national ambient air quality standards.

The U.S. government sets standards for allowable levels of ambient amounts of six pollutants:

- nitrogen dioxides
- carbon monoxide
- ozone
- sulfur dioxide
- total suspended particulates
- lead

There are two standard levels for each area: primary and secondary.

In 1977, an amendment to the Clean Air Act set limits on increases in pollutants in areas that met the national standards. This was to ensure that air quality does not deteriorate because of new construction or new pollutant sources. These are called attainment areas. When these allowable increases in pollutants are added to the previously existing baseline concentrations, new standards that are more stringent than the national ambient air quality standards often are created.

The entire North Slope is such an attainment area and therefore has more stringent standards.

The North Slope and most of the United States has been assigned Class II standard rank, allowing for moderate growth. Class III areas are heavily industrialized, and increments allow for significant growth. Class I areas are pristine environments where minimal increases are allowed, such as Denali National Park in Alaska.

In an attainment area, both existing and new emission sources are required to use the “best available control technology” to minimize emissions. A new source must meet national limits, be analyzed for impact, and undergo start-up tests.

Emission Sources

The main source of emissions on the North Slope is facilities which burn natural gas. Natural gas is produced along with oil from the field and is used as fuel for turbines, which generate electricity and drive pumps, and for heaters, which heat facilities for personnel and prepare oil for transport by pipeline. (Oil processing is described in the Q & A article on page 4.)

(Continued on page 2)

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Air Quality at North Slope

(Continued from page 1)

Natural gas is one of the cleanest-burning fuels available. It contains no lead. During combustion, it produces minimal amounts of carbon monoxide, ozone, sulfur dioxide, and particulates. The only pollutants that it can emit in undesirable quantity are nitrogen oxides.

Nevertheless, even nitrogen oxide levels at Prudhoe Bay are well below the federal limits, as is shown in the next section.

Monitoring of Air Quality

Two methods of monitoring determine compliance with national standards: (1) equipment is "stack-tested" to check actual emissions and (2) ambient air is tested for pollutants.

Stack-testing: New equipment must undergo stack-testing procedures of the Environmental Protection Agency. On the North Slope, a third-party independent contractor runs these tests. A representative of the Alaska Department of

Environmental Conservation (ADEC) usually has been present as a monitor.

Gas-fired turbines produce most of the nitrogen oxide emissions. In the Standard Oil publication previously cited, a chart shows how stack tests of Prudhoe Bay turbines of various horsepower have determined that nitrogen oxides are well below the maximum levels allowed.

Ambient air monitoring: Again the Environmental Protection Agency sets monitoring procedures and requires special monitoring before new facilities can be installed.

For example, the EPA required a monitoring program in 1979-80 before granting permits for new facilities at Prudhoe Bay. At that time, all pollutants were found to be well below national limits, with the exception of a one-time exceedance for particulates. This isolated event was attributed to wind-blown dust caused by high winds, not to equipment emissions.

Several years after the 1979-80 monitoring, the ADEC took over responsibility for air-quality permitting in Alaska. The ADEC, in consultation with the EPA, decided to require post-construction monitoring. This began in 1986 and extended into 1987.

Both a "near-field" monitoring station and a "far-field" station were used at Prudhoe Bay and Kuparuk oil fields. The near-field stations were placed at the maximum source of impact on air quality, and the far-field stations were several miles downwind of facilities.

The charts on the opposite page show the results of measurements taken at Prudhoe Bay for the main pollutant of concern, nitrogen dioxide, as well as for ozone, sulfur dioxide, and particulates. In all cases, the charts show that Prudhoe Bay concentrations were well below the national standard (limit). Kuparuk results were similar.

Lead was not measured because it is not a factor at Prudhoe Bay. The ADEC did not require monitoring of carbon monoxide for the 1986-87 Prudhoe Bay study, but carbon monoxide was measured there in a 1979-80 program (see data in next section).

Comparison of Prudhoe Bay Air with That of Large Cities

An examination of the ambient air quality concentrations at Prudhoe Bay shows that none even approaches the levels in large cities.

The national standard for carbon monoxide is 9 parts per million (ppm) for an 8-hour period. New York City,

Los Angeles, Washington, D.C., Denver, and Anchorage regularly exceed this with levels as high as 17, 22, 14.6, 26, and 10-12 ppm respectively. At Prudhoe Bay, maximum concentrations measured have not exceeded 1 ppm (this data is based on the 1979-80 monitoring program).

The national hourly standard for ozone is 235 micrograms per cubic meter. New York City, Los Angeles, Washington, and Denver can have up to 370, 764, 292, and 285 respectively. The all-time maximum in Anchorage is 78; during a 1985 monitoring, monthly averages were 10-37. At Prudhoe Bay, ozone has averaged 55 and has never exceeded 175.

The national standard for sulfur dioxide is 365 micrograms per cubic meter (24-hour maximum). New York, Los Angeles, Washington, Denver, and Anchorage do not exceed this standard. New York has reached as high as 198. Los Angeles averages 60 and Denver 78. Washington can reach 125 and Anchorage 23. However, the maximum Prudhoe Bay concentration is below 16.

The national standard for nitrogen dioxide is 100 micrograms per cubic meter. New York averages 68, Los Angeles 118, Washington 74, and Denver 94. Anchorage levels are so low that the EPA no longer requires monitoring. Monthly average concentrations at Prudhoe Bay are below 15.

Arctic Haze

The phenomenon called arctic haze is another air-quality issue that has been widely examined recently.

Arctic haze was first described in 1956, long before any North Slope oil facilities were built.

A process for "fingerprinting" emissions particles has shown that the haze comes from industrial pollution produced in Europe and Asia. Smelting and coal combustion are sources of the haze. The Ural Mountains industrial complex in the U.S.S.R. has been suggested as the source. Other researchers identify central Eurasia as the primary winter source and Europe as the spring source.

Also, because the haze is found at high altitudes over Prudhoe Bay, scientists believe that North Slope sources are not contributing.

During an overflight at Prudhoe Bay in 1980, NOAA found no contribution to the haze from oil and gas production facilities. Air emission data gathered at the ground then did not match the arctic haze "fingerprint." ■

reinjecting into rock formations beneath the permafrost; the rest is reinjected into the oil-producing formation to aid oil recovery. In some other U.S. areas, separated water is carried to government-approved disposal zones where it is allowed to evaporate or is reinjected into subsurface formations.

Produced gas and water disposal is regulated by the state and/or federal agencies that monitor the oil field.

Handling of Separated Oil

In most oil fields, separated crude oil is stored in steel tanks with a bottom drain for removing BS&W (basic sediment and water) that fall to the bottom and collect there.

The crude oil must be measured and tested before transport by pipeline or tanker ship.

The volumes of oil (as well as gas and water) produced on each lease area are measured by the operator every 24 hours or are monitored constantly.

This may be a government requirement when the rate of oil production is set by state or federal regulations.

These "allowables" are based on a rate of production that will protect the oil-bearing formations so that the maximum amount of oil can be recovered over the life of the field. Too rapid a rate can damage the formation and decrease ultimate recovery.

In addition, records must be kept for financial reasons, including payment of royalties and taxes.

The quality and viscosity of the crude oil also must be measured. Oil delivered to pipeline or transport companies must meet their standards.

Samples are tested for BS&W content, temperature, and "API gravity." API gravity is a standard industry measurement for the viscosity of crude oil at 60° F, set by the American Petroleum Institute. It is measured with a hydrometer.

The crude oil from each field is distinctive in viscosity, as well as in its different hydrocarbon components. General terms used to classify viscosity are light, intermediate, and heavy. West Texas Intermediate is the benchmark crude oil used for reporting current (spot) oil prices in the daily news.

Note: the oil from each field commands its own price, depending on its viscosity, components, and other factors.

Today, at most oil fields, the separation, measurement, and testing processes are highly automated and computer-controlled.

When oil is produced from an offshore platform, all of the processes just described usually take place on the platform so that the crude oil leaves the platform in similar condition to that transported from fields on land. ■

A Study of Bowheads

(Continued from page 3)

Aerial Monitoring of Bowheads

An airplane with at least two observers aboard to spot bowhead whales on the surface of the water flew over the area in a pattern of straight lines several times during the study. Lines flown near where whales were spotted are shown in blue on the map on page 6. Locations of the 35 whales seen during five flights along these lines at various times are shown by blue symbols.

Aerial surveys cannot detect all bowhead whales, only those at the surface. Studies are still going on as to what percentage of whales may be at the surface at any one time. A survey in September 1985 in the eastern Alaskan Beaufort Sea estimated 12%.

During 1985 around the time that the aerial surveys for this study were conducted, three other aerial surveys were carried out by other organizations—one to the east, another to the west, and a third in the same general vicinity.

In all four surveys, whale densities were very similar (0.0046 whales per square kilometer).

In 1985, all but one of the whales migrated through an area similar to areas identified in previous years, but they tended toward deeper water than in some previous years. In 1985, no bowheads were spotted in water less than about 98 feet deep. In previous years, whales generally have been spotted in the 59-98 foot depth range.

Likewise, in two other 1985 surveys (those to the east and west of the Hammerhead and Corona sites) few whales were spotted in water less than about 98 feet deep.

Most bowheads passed the Hammerhead site after the drillship had left and moved east to the Corona site.

As a result of all this information, the researchers concluded that the absence of whales in water less than about 98 feet deep or near the Hammerhead site should not be attributed to noise at the site, but to a natural, overall pattern for the 1985 migration.

Underwater Sound Studies

Two systems were used for underwater acoustic monitoring: hydrophones and acoustic buoys.

For the first, four hydrophones (one each at depths of about 9.8, 19.7, 29.5, and 59 feet) measured underwater noise. They were placed at various distances from the drillship, ranging from

(Continued on page 6)

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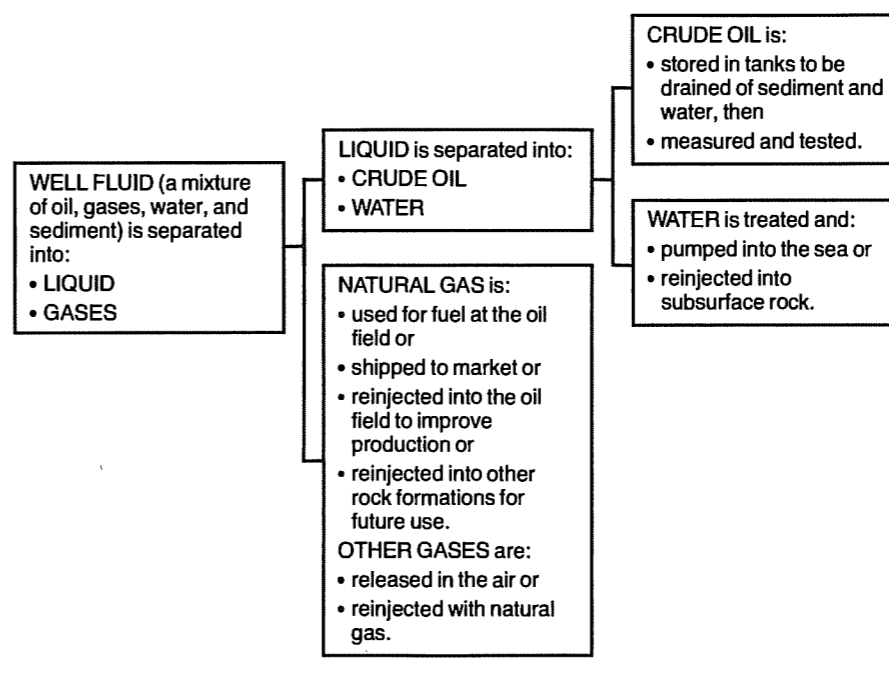
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STEPS IN PREPARING CRUDE OIL FOR TRANSPORT



Q & A

How Do They Prepare Crude Oil for Transport to Refineries by Pipeline or Ship?

This is the thirteenth in a series of articles designed to answer basic questions about the petroleum industry.

These articles may be photocopied for distribution or use in schools. Back issues are available.

The fluid that comes out of an oil well usually is a complex mixture of crude oil, gases, water, and a small amount of sediment (solids).

Before the oil can be shipped to refineries by pipeline or tanker ship, it must be separated from the other fluid components, measured, and tested. In addition, the non-oil components must be used or disposed of in ways that are both economical and safe for the environment.

For the separation process, a system of treatment facilities and holding tanks is required. The process is summarized in the chart on the opposite page and is described in the following sections.

The Separation Process

The first step is to separate the liquid components from the gaseous by passing the well fluid through a separator system.

In the first chamber of the system, well fluid is swirled to make oil-laden liquid particles collect on the walls. In addition, gravity causes oil-laden liquid to drop to the bottom of the chamber. The separated gases rise and are removed.

The separated gases still contain some small oil and water particles, so they must be swirled again in another chamber of the system to remove as much oil and water as possible.

The separated liquid also still contains some gases and is run through a second separator (or through a third or more operated at successively lower pressures) to obtain the maximum purity possible.

After gases are separated from the liquid, then the liquid must be separated into water and crude oil.

Part of the water, called free water, separates easily in a vessel where the lighter oil rises and floats on the heavier water. But another part of the water may not separate naturally because it is

trapped in an emulsion with the oil (where minute globules of one fluid are distributed throughout the other). This happens when the fluid is agitated as it flows from the well in the presence of substances called emulsifying agents, such as asphalt and resinous materials which occur naturally in the well fluid.

Some oil-water emulsions break down easily, but others are stable and must be treated by neutralizing the properties of the emulsifying agent with heat, chemicals, and/or electricity, usually in a device called a heater-treater.

Disposal Processes for Gas and Water

A variety of methods may be used to dispose of the gas and water removed during the separation and treatment process or to make use of them. Disposal must cause no harm to the environment.

Several methods make good use of most of the gas, which is natural (hydrocarbon) gas.

Sometimes the gas is of commercial or fuel quality, so it is used to power equipment at the oil field, is piped off to market, or is liquefied for shipment.

Other times, the gas is injected into the fluid columns inside oil wells to aid removal of the oil. This process is called gas lift and was described in the Q & A article in the Spring 1987 issue of *Alaskan Update*.

In other situations, the natural gas is pumped directly into the pore spaces of the oil-bearing rock formation to aid removal of more oil than could be obtained otherwise. This process was described in the Q & A article in the Summer 1987 issue of *Alaskan Update*.

In still other situations where there is no need for the gas in oil production and no way to get it to market (as on a remote offshore platform), the gas may be reinjected into other subsurface rock formations for future use.

At the oil fields on Alaska's North Slope such as Prudhoe Bay, separated natural gas (called "produced gas") either is consumed as fuel for engines and generators or is reinjected into the oil field to aid recovery through the methods just described. This means that generally there is no need to burn gas in a flare system.

However, flares have been installed at a number of facilities to serve as a safety relief system should a potentially dangerous situation develop like fire, power loss, or equipment failure. Then high-pressure hydrocarbon gases being processed must be discharged and burned in a flare.

Flares burn gas at high temperatures in the open air and leave very little or no ash residue. They have combustion efficiencies of up to 98%.

Under ordinary combustion conditions, flares produce little or no visible smoke. When they are used during facility start-up or emergency situations, they may emit black smoke, which is unsightly but of little harm to air quality. The blackness results when gas is incompletely burned, leaving carbon particles, not harmful pollutants. In addition, situations that produce black smoke rarely take place and then for a brief time.

In the gas separation process, small quantities of other gases may be removed along with natural hydrocarbon gas. Some of these like carbon dioxide are natural components of air and may be released into the atmosphere. Or, these gases may be reinjected into a subsurface rock formation along with reinjected natural gas.

In some fields, a gaseous component is hydrogen sulfide, which at certain concentrations is very toxic to human beings. It also is very corrosive to metals. Whenever this gas is present in well fluids, all subsurface and surface systems are especially designed to protect against its various hazards.

Disposal methods for water removed from well fluids depend on several factors, including salinity and geography. Usually, separated water contains many salts dissolved from the formation rock and may be as salty as sea water. For this reason, in some offshore areas, this water may be treated and then safely pumped into the sea.

In other offshore areas and most on-shore areas, separated water is treated and reinjected into subsurface rock formations, sometimes the oil-bearing formations. On Alaska's North Slope, part of the separated water is treated and

PRUDHOE BAY AIR QUALITY

These four charts show measurements of four types of air pollutants at the Prudhoe Bay Oil Field taken from late 1986 through early 1987. Note that none of the pollutants even approaches the limits set by the federal government for the Prudhoe Bay area.

An article about Prudhoe Bay air quality, which explains the meaning of these charts further, begins on page 1.

Key to Charts: Measurements were taken at two monitoring stations: a near-field station at the source of maximum-possible pollution and a far-field station some distance downwind.

KEY:
 □ Near-field Station □ Far-field Station

A Study of Bowheads

(Continued from page 1)

A drillship is a self-propelled vessel which is designed to serve as an off-shore platform for drilling oil wells. It is outfitted with a drilling rig and all other necessary equipment. For arctic waters, the hull is "ice-strengthened" with extra steel to resist the forces of sea ice.

Six oil companies funded the drillship study. Contractor LGL Ltd. and sub-contractor Greeneridge Sciences Inc. carried out the study.

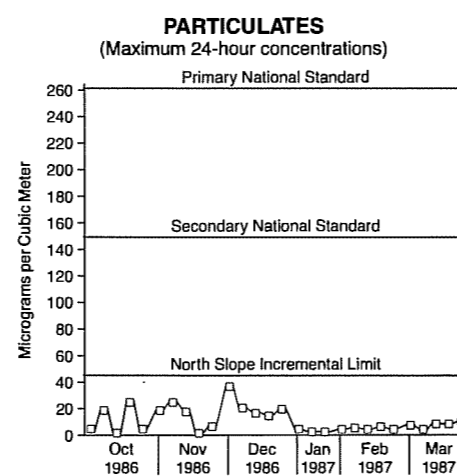
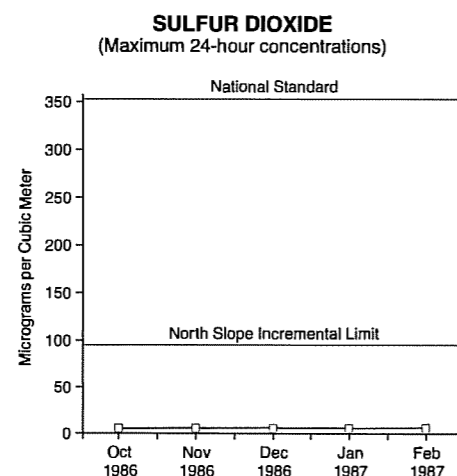
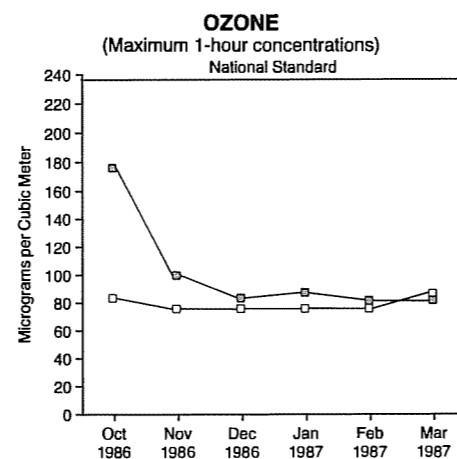
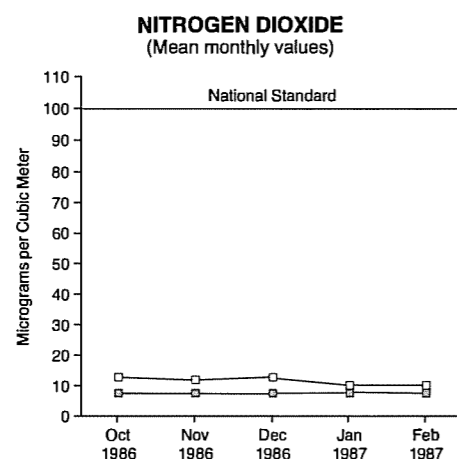
Objectives were to determine:

- the location of whales in relation to the drilling site,
- underwater noise levels and characteristics generated by the drillship operation,
- variations in noise levels over time.

Whales were monitored by aerial surveys and an acoustic system.

The study could not cover actual well-drilling noise at the Hammerhead site because the federal government prohibited drilling in that area during the 1985 bowhead migration season. At that time, no direct studies had been made of whether noise from exploratory drilling harms bowheads, but the restriction prevented drilling at a time when such studies could be made.

(In the next year, 1986, the government allowed drilling during the fall whale migration for the first time, and Shell commissioned LGL to study whale reaction to drillship noise at the Hammerhead site and at Corona, another drilling site to the east. Results of the 1986 study are not included here.)



In 1985, the year of the study reported here, drilling at the Hammerhead site was completed before the fall whale migration began. But the drillship and support vessels were still on site involved with well testing during the early part of the migration, so some useful information about the noise characteristics of drilling operations could be gathered.

In addition, the drillship and support vessels moved east to the Corona site during the middle and end of the migration. At the Corona site, well preparation activity was permitted during the migration. The aerial surveys of whale locations extended far enough east to include the Corona site as well.

So, even though the study could not cover direct tests of whale responses to drilling, it could cover measurements of some drilling-related noise sources. Noise from the drillship site included that from the drillship during well testing and also that from a Class 3 ice-breaker and two ice-reinforced supply ships, which were quite active because sea ice conditions in 1985 were severe.

The researchers also monitored where whales migrated in the area and

counted them through aerial surveys. Then they compared this information with other whale observations that year and from previous years.

Note: In the fall migration, bowheads move from their summer feeding grounds in the Canadian Beaufort Sea westward to the Chukchi Sea and then south to their wintering grounds in the Bering Sea.

The study took place between August 27 and October 20, 1985. Acoustic monitoring went on between August 27 and September 15. Aerial surveys were conducted between September 5 and October 20.

The first bowheads in the study area were spotted September 11. Observers from the National Marine Fisheries Service officially declared that the fall migration began September 24.

The study report is entitled *Bowhead Whales and Underwater Noise near a Drillship Operation in the Alaskan Beaufort Sea, 1985*. The project is listed as #330 in a research record book maintained by the Alaska Oil and Gas Association in Anchorage.

(Continued on page 5)