

Solid Waste Disposal and Minimization – Overview

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I'm going to be presenting somewhat of an overview of the history of waste management on the North Slope of Alaska. But as a preface to that, bear in mind as I go through this presentation that environmental regulations in the U.S. have evolved simultaneously with the development of oil and gas on the North Slope of Alaska. When we started out to develop oil and gas on the North Slope, there was basically no environmental regulation. So in looking at some of these past practices, you immediately would ask why practices were used that appear to be negligent. The reason is that those practices were the accepted practices at the time they were implemented on the North Slope. So keep that in mind as we work through this progression.

BP's Commitment to Health, Safety & Environmental Performance
Everybody who works for BP, anywhere, is responsible for getting HSE right. Good HSE performance is critical to the success of our business.

Our goals are simply stated - no accidents, no harm to people, and no damage to the environment.

We will continue to drive down the environmental and health impact of our operations by reducing waste, emissions and discharges, and using energy efficiently. We produce quality products that can be used safely by our customers.

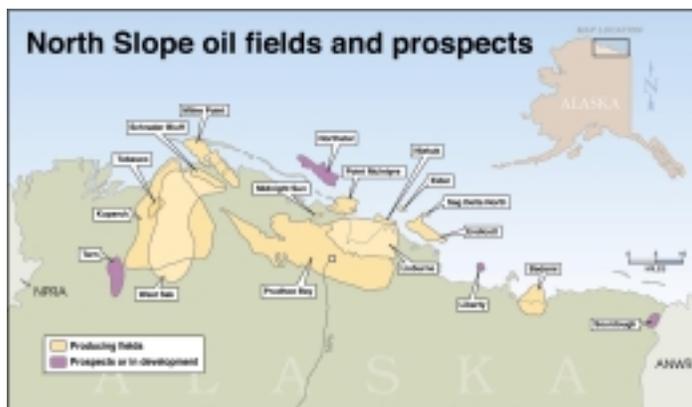
Wherever we have control or influence we will:

- **consult**, listen and respond openly to our customers, neighbors, and public interest groups.
- **work with others** - our partners, suppliers, competitors, and regulators - to raise the standards of our industry,
- **openly report** our performance, good and bad,
- **recognize** those who contribute to improved HSE performance.

Our business plans include measurable HSE targets. We are all committed to

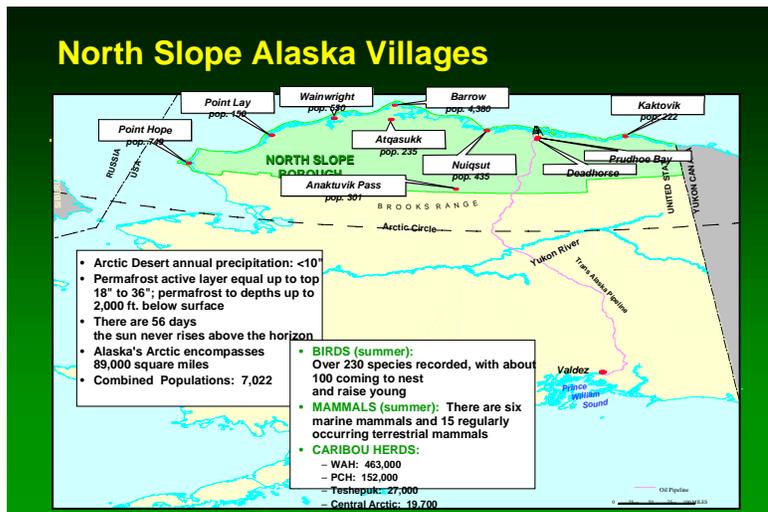
In starting off, I just want to put up BP's Health, Safety, and Environmental policy. This isn't specific just to BP - it is really specific to the North Slope of Alaska - all of ARCO's operations are conducted in effect according to a similar, equivalent policy. Basically what this policy says with respect the environment is that we will conduct our operations, at least today, in a manner such that it doesn't have any significant adverse impact to the

environment. That is very significant in the evolution of environmental policy, because it has only been within the last three of four years that we have seen that kind of commitment emerge in corporate America. This has generally been driven by the fact that corporate America has gradually crossed over this peak of recognizing that good environmental performance makes good economic sense, and generally it is the economics that drive the situation.



As an overview, this is a map of the oil fields of the North Slope. Many of you are familiar with what I'll be presenting, but some of you may not be familiar with the newer fields - Badami, North Star, Alpine and so forth. Of course you have Prudhoe Bay and Kuparuk, which are the first and second largest oil fields in North America. In looking at the total area of

development, the human population is very low in size - there are only about 7000 people living on the North Slope. Yet there are many, many species of birds that use the North Slope area for summer habitat, for nesting and raising their young, and there are various species of mammals, some of which are resident year round and some of which are migratory. And there are fairly large caribou herds on the North Slope. As a result of this, the primary emphasis in environmental protection is geared toward protecting habitat and the species that use that habitat. Now by that I don't mean to imply that there is not an active emphasis to protect human health - there is. Its just that we don't have the large resident human population close in and around the oilfields the same way you do elsewhere in the world, where you might have large cities near the oilfields. Therefore on the North Slope, the emphasis is on the species that use this habitat.



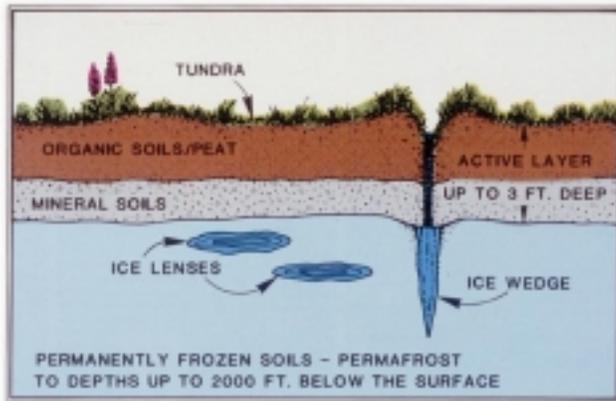
Here is an example of what the development areas look like in summer. These caribou, by the way, have grown up in and around these facilities - they don't know any different. Now, there is a certain amount of controversy over the effects of facilities on calving caribou, and the scientific community is kind of split on this issue. But if one looks

at it, they generally come to the conclusion that there is really very little impact on the caribou from these facilities.



I want to focus just briefly on a couple of species where we haven't done in my opinion as good a job as we should have – specifically bears and foxes. One could talk a great deal about the management of wastes and waste streams on the North Slope and the impact that those waste streams through the method of handling may have had on the species or the habitat that use that habitat. When it comes right down to it, the most severe

impacts of development on the North Slope haven't had to do with process wastes at all, but has had to do with simple, ordinary garbage - the same wastes that everybody in Alaska has to deal with as far as the species that may be impacted. Here is a prime example of how we have impacted this species through inadequate management of simple sanitary garbage or food wastes that are generated by the population. This is a severe problem with respect to these bears, because as Fish and Game will readily tell you, once a bear becomes habituated to human garbage, there is not a whole lot you can do with it.



Cross section shows active layer and permafrost. The active layer freezes during the winter, thaws in summer. Ice lenses may occur throughout permanently frozen soils. Ice wedges develop in shrinkage cracks.

Arctic fox is another example of a species where we have not been successful in mitigating the impacts of our wastes have. And this is not necessarily just waste – it is our employees throwing a sandwich or a cookie or whatever to these cute, cuddly little foxes. Try as we may, we have not been very successful at stopping that. The problem is simply due to the fact that you are changing or habituating the animals to human garbage as well as

creating a safety hazard, because many of these foxes are rabid.

In looking at the habitat that we are trying to protect, basically there is a very thin active layer, only about 18 inches thick. Below that you have permanently frozen soils down to about 2000 feet. We have no groundwater to deal with, which is a major plus in waste management since around the country, most of the impact from improper waste management has been on groundwater.



What types of wastes are we really generating on the North Slope? Here I have divided them according to the regulatory scene, in other words under the current RCRA, wastes produced from the production of oil and gas and geothermal energy are exempt from Subtitle C of the hazardous waste regulations, and are managed under programs established by the State under subtitle D of RCRA. But we do have some wastes that are

generated on the North Slope that are not exempt, and those are managed according to prescriptive regulation under subtitle C as warranted. Those are basically nonhazardous wastes that are pretty similar to those generated by any industrial operation. A small amount of hazardous wastes are shipped out, but most of the wastes fall under the exempt wastes statutes, and those are the wastes that I am going to be talking about.

Back in the late 80s, the oil companies made a major effort to convince the U.S. Congress to open up the coastal plain of the Arctic National Wildlife Refuge to oil and gas development. As a result of this, the opposition, and they were very, very effective in this, countered by saying "lets look at the management of wastes on the North Slope -

Congress, do you want this kind of scenario in what is the last untouched, pristine arctic ecosystem in Alaska?" And obviously, it was easy to convince congressmen that you don't want that in the coastal plain of ANWR. As a result of that effort, the public's expectations led us into some major changes in the way we are doing business.



Here is a prime example of not meeting the public's expectations – of what you wouldn't want in the middle of the coastal plain of ANWR. Heck, you don't want this anywhere. This is a pure example of oil companies not paying attention to the public's expectations. Now this practice might have been acceptable, and you would be able to find things like this all over the U.S. But the public at a point in time says, "look, this is no longer acceptable, and we

will no longer accept this on public land." It took a long time for the industry to come around to the recognition that if we don't meet the public's expectations, the public will change the rules on us. And that is what led to this change in environmental regulation.



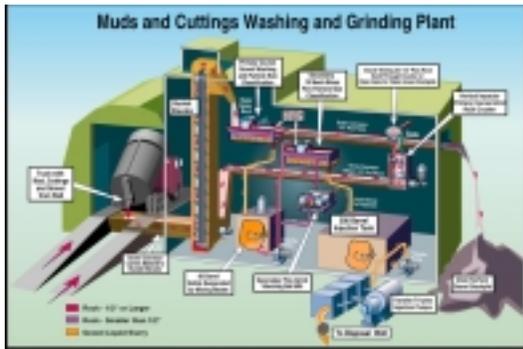
Here is just another example of industry's methods that were left behind that just did not meet the public's expectation. This one, by the way, was an exploratory well down in the Wrangle – St. Elias area in southeast Alaska. Here is another one.

In this case the site is actually operated or is at least the responsibility of the federal government - the Sagwon air strip which we, in conjunction with the Bureau of Land Management and the DEC, are doing a voluntary cleanup. It was a staging area used by everyone, including the governments, for many, many years. It is just one of many sites that have been left behind due to a lack of consideration for the expectations of the public.



Back to the waste management scenario, these were the large waste pits that were not acceptable to the public. Basically they are nothing more than an open pit surrounded by gravel berms. The pits leaked, and the oil companies were sued in the late 80s over this leakage. As of 1994, we have totally eliminated the use of reserve pits. The

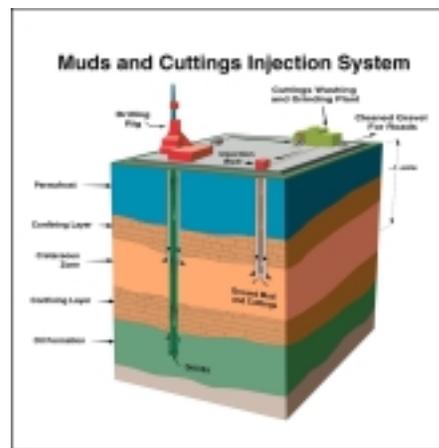
activity that we initiated at that time was basically to make the pits impermeable, to look for ways to get out of the surface waste disposal business, and to eliminate not only the real impacts from surface wastes disposal, but also to change the public's perception on the way we do our business. We put a lot of effort into trying to come up with a method of managing wastes that would eliminate surface waste disposal. In fact we looked world wide, and that technology was not available, so we developed the technology ourselves. Basically the technology that we developed was grind and inject – a very simple technology, but highly effective.



This is a schematic of a grind and inject facility – it is really nothing more than mechanical equipment to grind up rock or solid particles into a fine slurry, high pressure pumps and disposal wells. You pump the slurry into confined formations that are similar to the confined formations that the oil is in – the oil has been there for millions of years in the confined formations, so there is nothing more environmentally satisfactory than putting these wastes

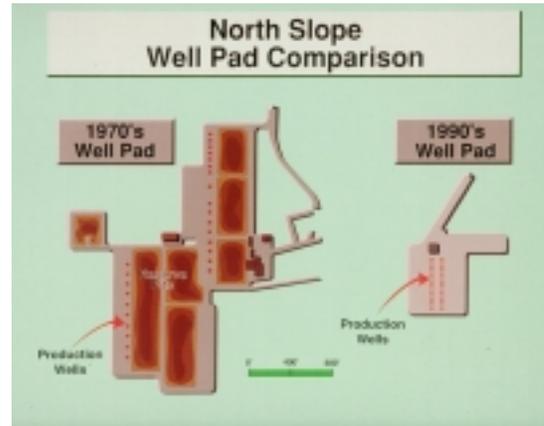
which came up out of the ground back into the same formations that they came out of.

This is a simple schematic of a G&I facility. The material comes up either from producing oil out of the reservoir or from drilling the well. The waste goes over to the cuttings grinder, and is reinjected back in. Most of it is going into the Cretaceous formations because that is a very large fluidized formation, and we have found that we can put a tremendous amount of material down a single well without the well plugging up, and so on. These are just some of the technical aspects that we had to work over in coming up with a solution.



This graph shows the decrease over time in surface waste disposal. As you can see by the end of 1994 we had met our goal of zero surface waste. This applies to the whole North Slope.

As for the impacts, we've heard other speakers talk about the impacts from these changes, from eliminating surface waste disposal as well as improvements in technology - directional drilling, closer well spacing, and a conscious effort to reduce the habitat loss. You can see the comparison between the central well pad at Prudhoe Bay versus the state of the art well pad today – there has been about a 70 to 80 percent reduction in habitat loss. Now, one could say that although this is true, there is also some economic benefit to the industry. And yes, there are some definite economic benefits. There is an economic benefit because you have to move less gravel, there is an economic benefit because the cost of handling wastes are less due to grind and inject than they were to construct and maintain the pits and to close those pits out. This is a photograph of the state-of-the-art pad today – the Prudhoe Bay P-pad. Notice the close well spacing and of course the absence of production pits.



Where are we today? As I have mentioned, we have achieved our goal of zero surface waste disposal, we have eliminated the use of the pit, and we are in the process now of removing all of these large waste pits. All of the contents are being dug up, ground up into a fine slurry, injected, and ultimately these pits will be returned back to suitable habitat of one type or another. Before we are through, and it will take about 12 years, we will eliminate all of the process wastes that have been deposited on the surface within the existing oilfield.



This is a picture of an earlier example I mentioned - the Service City site. Because of the horrible image that was there and the impact it was having on the industry, BP, ARCO, and Exxon did a voluntary cleanup of the site. Now this was not created by the oil companies. It was created by service companies who went bankrupt during the drop in oil prices in the 1980s and walked away from it through no

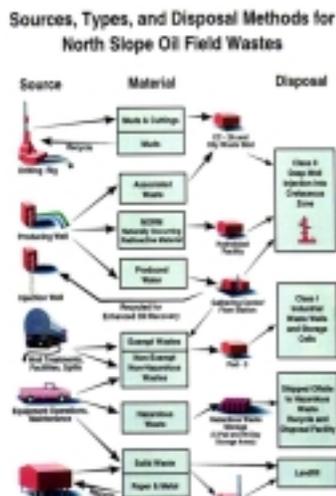
other choice. We felt like there was sufficient political liability to warrant that we clean it up. The same with the site down in southeast Alaska. And this is just another example of a site, this time offshore in the Arctic Ocean underneath the ocean floor. We went out in the wintertime, removed the ice, dug up the contamination, hauled it to shore and incinerated it.



Abandoned Site Cleanup		Cost (millions)
Ruby Creek (Kenne cott)		0.5
Service City		2.0
Malispina		2.0
Deadhorse - Childs Pad		0.5
Cordova (Kenne cott)		9.0
Niakuk Island		5.0
Sagwon		est. 2.0 - 3.0

We've done a lot of voluntary cleanups. This is a list, and it is part of our efforts to improve the perception of the way we are doing business. In other words, in order to change that perception, not only do you have to change the way you are doing business today, but you have to look at your past practices – to make amends or corrective actions on past practices. Not all of these are necessarily associated with the oil industry – some are associated with

the mining industry. But these are just examples of voluntary cleanups which BP, ARCO, and Exxon have done over the last several years. Bear in mind, there was no legal requirement as a result of liability on the oil industry to clean up any of these sites. One could argue that Service City, maybe, due to the fact that it was caused by subcontractors to the oil companies, but under the strict joint shared liability, the oil companies were not responsible for these sites. But, there was that political responsibility if we were to meet the public's expectations. Most of our goals have been achieved, but that doesn't mean that we are not still striving for continued improvement, which we are, and I anticipate that we will seek to continue to improve not only in waste management, but also in other aspects of the way we're doing business.



One can surmise that waste management shouldn't be a difficult issue, but in many respects it is a very difficult issue. This has to do largely with the way the regulations are written, and the fact that we are regulated by several congressional acts that are not consistent with one another. We have the Resource Conservation and Recovery act (RCRA), the Safe Drinking Water Act (SDWA), the Clean Water Act (CWA), all of which regulate wastes on the North Slope, as well as the Alaska Department of Environmental Conservation and the North Slope Borough. Out of this you end up with a very, very complex regulatory scenario. This is an example that is used in our Training Manual for all employees that work on the North Slope.

I would like to point out at this point that all of you have heard about the problem with the BP contractor called the Endicott Waste Case where this contractor allegedly injected wastes down the annulus of a well. In defense of what happened, as we went through this transition from where we were at in the 80s to where we are at today, we systematically took away the options for the day to day people who were working on the Slope. At one time we had the large pits, and you simply threw whatever wastes you had into those pits. But as the regulations changed, as they became more complex, as we narrowed down the options, it led people into a state where they were looking for alternatives – what are our options? And it was as a result our training program, where we were trying to train the people to get over these difficulties, that actually led to the discovery that wastes were improperly being disposed. Now I'm not going to defend people for doing that, but I am going to defend them from

the standpoint that there was no impact to the environment from this - it was a technical violation, and it came about as the result of trying to improve waste management on the North Slope.

To give you an idea of how complex this is, and at times how illogical it is, and I know that this isn't necessarily totally relevant, but I wanted to point it out. For example, in dealing with these various wastes, there is the issue of what is exempt and what is nonexempt, because the method of disposal and handling or treatment is different for the different types of waste. Here is an example of where you get into some real ambiguity and conflict and lack of understanding, lack of reasonability, in dealing with regulations. If we spill diesel fuel as a result servicing a vehicle, this is a nonexempt waste and it has to be handled under Subtitle C, the hazardous waste regulations. In other words, it has to be cleaned up, shipped off to a hazardous waste recycling or disposal facility. But if the same diesel fuel is spilled as the result of reworking a well, it is exempt. I simply have to clean it up and I can put it right back in the processing facilities or I can grind it up and dispose of it. When you are out on the front line trying to explain this to the guy who is doing the work, you rapidly lose your credibility. These are some of the difficulties that we encounter day in and day out in trying to come up with scenarios whereby we can manage these wastes in a way that is satisfactory to the regulators and satisfactory to the public. And there are several other various examples I could give you.

10-year Investment in Waste Management	
• Environmental Monitoring and Assessments	\$8.35 million
• Abandoned Site Cleanup and Remediation	\$19.40 million
• Evaluation and Engineering Design	\$5.08 million
• Waste Management Facilities	\$38.00 million
TOTAL	\$70.83 million
• Estimated Reserve Pit Closure	\$150.00 million
	-200.00 million

Expenditures do not include BP internal costs

In summary, this gives you an idea of the amount of money that has been spent to change waste management practices. Bear in mind that even though we are under immense pressure because of the public's expectations, we did this because it makes good economic sense. It was still voluntary, but there has been a tremendous amount of money put in to change

waste management. In fact, this change in the waste management practices on the North Slope is now spreading worldwide, and we anticipate, within several years down the road, it will be the number one method for waste management within the oil industry worldwide.

With that I'll thank you very much.