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MUD IS THE KEY TO DRILLING SAFETY*

by

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One of the questions frequently asked when a well is to be drilled is "How will the effluents such as drilling muds be disposed of and won't disposal in the marine waters kill the marine life?"

The answer is "No."

The main components of mud are water, clay, barite and lignosulfonate and when properly disposed of in the marine environment it will not kill the marine life. The disposal is carefully regulated, prohibiting disposal of mud containing harmful quantities of oil or toxic substances. Permit applications must be made to federal and state agencies and the disposal requirements must be followed. Studies in Alaskan waters and throughout the world have consistently shown how mud, very much like the natural sediments in Alaskan waters, disperses within a few meters of the rig, and that clean mud can be discharged at sea without harming the environment or fisheries resources.

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WHAT DOES DRILLING MUD DO?

During the drilling of an exploratory or development well, the wellbore is filled with a special fluid, called drilling mud. Drilling mud is essential to drilling operations, performing a number of important functions including:

- removal of rock cuttings from the beneath the bit and transport of the cuttings to the surface;
- cooling and lubrication of the drill bit and string;
- formation of a filter cake on the wellbore, to reduce loss of drilling fluid into permeable formations;
- control of subsurface pressure, preventing high pressure flow into the well bore (primary well control) from the formation;
- maintain suspension of cuttings and weight material when circulation is interrupted;
- help support the weight of the drill string and provide a non-interfering fluid for accurate well logging.

DRILLING FLUID COMPONENTS

In order to provide the special functions required to maintain a well, mud compositions will vary with both the well depth and location. The primary component of water based fluids is water. Fresh, salt, or brackish water compose 30 - 85% by weight of the fluid. The chemical components commonly used in water-base drilling muds are barite, bentonite, lignosulfonate and lignite. These four components account for about 90 percent of the total tonnage of drilling mud solids.

Barite is a naturally occurring mineral. It is used to increase the density of drilling mud to balance and control the pressures in the formation being drilled using between 25 and 200 pounds per barrel (lb/bbl).

Bentonite is a naturally occurring clay. When mixed with water, clay has the ability to gel when suspended and be fluid during pumping. This ability to gel helps sweep cuttings from the borehole, maintain the cuttings in suspension if circulation is interrupted and carry the cuttings up the well. Bentonite also helps by forming a filter cake, controlling loss of fluids to the formation. Bentonite concentrations average between 5 and 20 lbs/bbl.

Lignosulfonate acts as a thinner and is used to reduce viscosity. Up to about 15 lbs/bbl may be used.

Lignite is a naturally occurring substance and is used to control filtration rates with up to 10 lbs/bbl being used.

As drilling proceeds, specific downhole requirements may call for specialty products or other additives. These may include lubricants, defoamers, hydrogen sulfide scavengers, corrosion inhibitors, salts -to control formation damage- or lost circulation materials. Starch may be used as a thickening agent in water based drilling muds, but usually requires a biocide to control bacterial growth in order to maintain the correct mud composition. Polymers are more frequently used now as a thickening agent and additionally are used to control troublesome formations. Caustic soda is normally used to maintain a pH of 10 to 12.

Additives are formulated to meet specific drilling requirements. Normally only a few are used in a well and they are used in low concentrations -generally less than 10%- of the total materials used. A mud log is maintained of all components and additives used on each well.

DISPOSAL OF WASTE DRILLING MUDS AND CUTTINGS

The drilling mud system is basically a semi-enclosed circulating system. Cuttings, cut up rock particles from the drilled hole, are removed during the drilling operation. Occasionally, it is necessary to add materials to

the mud system during drilling to maintain the proper density and chemistry. The added material increases the total volume, so some of the fluid must be removed from the system and disposed of. Additionally bulk mud discharges occur intermittently, for example if the mud system requires a complete change such as from salt to fresh water, or at the end of the well.

Common practice in offshore areas, in full accordance with regulations which prohibit disposal of mud containing harmful quantities of oil or toxic substances, is to discharge waste drilling muds and cuttings into offshore waters. Where it is determined that onsite discharge is not approved, the waste drilling muds and cuttings must be disposed of in an alternate, approved manner.

The appropriate discharge criteria for offshore disposal is a current concern in Alaska. The Federal Environmental Protection Agency (EPA) has been working with the State Department of Environmental Conservation (ADEC) and the industry during the last year to draft general permits for the areas in the Beaufort Sea and Norton Sound. EPA has issued general permits in other offshore areas of the United States. These general permits allow for a number of minor discharges in one area to be regulated under one permit for all operators.

The discharge of mud is regulated by general mud types with ratio's of components for each type. Additives are regulated for disposal based on toxicity and concentration in muds to be disposed of in offshore waters.

EFFECTS OF DISCHARGE OF MUD AT SEA

Numerous studies are available on drill muds and cuttings fate (where the mud disperses to) and effects in the environment. Several recent studies in the Alaskan marine environment include Cook Inlet, the Beaufort Sea and Norton Sound. Worldwide and Alaskan studies have found no significant short-term harm and no measurable long-term harm to the environment nor to marine resources in the affected areas. Long term low level toxic effects have not been observed, even in such areas as the Gulf of Mexico where extensive, long-term oil and gas operations have occurred.

BEAUFORT SEA DRILLING EFFLUENT DISPOSAL STUDY

This study, performed by Nortec, was started in early 1979 by Sohio on behalf of the Reindeer Island Participants (i.e. "Reindeer Island Study"). The study addressed the disposal of drilling muds and cuttings in the shallow arctic waters of the Beaufort Sea. The comprehensive program considered below- and above-ice disposal tests, biological studies including bioassay testing and benthic effects studies.

Below-ice disposal tests showed rapid mixing of drilling mud, with concentrations less than 1% and solids settling rapidly to the seafloor. Above-ice disposal tests show that muds are slowly released during breakup, combining with the natural sediments frozen in sea ice during freezeup and released during breakup creating naturally high turbidities.

Bioassay Tests confirm that drilling mud is relatively non-toxic to arctic marine organisms and the arctic organisms do not accumulate large amounts of trace metals (short term). Benthic Studies show that discharging 100 barrels of drilling mud and cuttings below the sea ice do not change benthic communities.

BEAUFORT BIOASSAY TEST RESULTS

Drilling fluids are not toxic to marine organisms in the arctic environment as shown by numerous tests performed on mud components and used mud. To test the organisms and have the information comparable to other studies we were required to use what is called the "LC-50" test. This EPA standard test is defined as the mixture of drilling mud and seawater which kills half the test organisms in four days (50 percent represents the average susceptibility of the population of organisms).

The results of these tests showed that the organisms had to be subjected to large concentrations of drilling fluids in order to die even in the test. Worms, snails, small shrimp-like organisms and five species of fish were tested. The most sensitive organism, the four-horned sculpin (a fish) required four days constant exposure to four times the maximum amount of drilling muds measured on direct discharge under the ice (approximately one percent) before they began to show effects. Organisms which live on the bottom such as snails and worms, required 30 to 60 times the maximum discharge concentration to show effects under test conditions. In reviewing the information on toxicity from this and other studies, the Alaskan species are shown to be hardier while all studies showed that muds approved for discharge are not toxic.

ABOVE-ICE DRILLING EFFLUENT DISPOSAL MONITORING

Nortec, for Sohio, conducted the monitoring activities for the above-ice drilling effluent disposal associated with the Sag Delta No. 7, 8, and Challenge Island No. 1 exploratory wells in the Beaufort Sea during 1980-81. Specific objectives of the study included; assessing the dilution of drilling effluents in the above-ice disposal sites through

breakup, the effects of berming in areas subject to river overflowing and measuring the effects and possible bioaccumulation of trace metal levels in seafloor sediments beneath and adjacent to the disposal sites, and in benthic communities.

A number of experiments were installed to monitor the disposal sites during the breakup period. Seafloor sediment and biological samples were collected at the disposal sites in order to quantify physical and chemical effects of drilling effluent disposal. Data were limited due to the limited number of organisms in the area.

The studies concluded that above-ice disposal of drilling mud and cuttings had no noticeable effect on the melting process of the sea ice adjacent to the disposal site and only caused localized changes to the surface melting in the disposal sites. Thick layers of effluents melt more slowly and berming had little effect in preventing river overflowing.

MUD DISPERSION STUDY-NORTON SOUND COST WELL No. 2

The Norton Sound C.O.S.T. Well No. 2 mud dispersion study was conducted by ECOMAR for ARCO Alaska Inc, on behalf of the C.O.S.T. well participants. This dispersion test, as predicted by data from previous tests, concluded that except near the discharge source, drilling fluids have a negligible effect on ocean water quality during high rate, high volume discharges in shallow (16 meter) marine areas. The temporary effect that the discharges create in sediment loading is significant only within 50 meters of the point of discharge.

CONCLUSIONS

In the Alaska studies, the only effects have been found in the immediate vicinity of the discharge generally from larger cuttings particles, settling to the bottom and smothering the benthic organisms directly under the discharge. The dispersion rates into the open water and broken ice conditions, as well as above-ice disposal are very rapid. Mixing and dispersion in below-ice disposal is somewhat slower depending on the water depth, but generally very adequate in water greater than 8 meters (24 feet). The muds are for the most part composed of chemical compounds that are common to nature, easily mixing with the high natural sediment loads present in the majority of Alaskan waters, causing no effects.

FATE AND EFFECTS OF DRILLING DISCHARGES IN THE MARINE ENVIRONMENT

By

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Introduction

Prior to 1977 there was little research information available on the fate and effects of water base drilling discharges in the marine environment. A great deal of historical information was available. At that time 23,000 wells had been drilled in the Gulf of Mexico and Offshore California over a period of several decades with no noticeable impact on fisheries. However, little confirming research results were available to answer questions posed by concerned regulators as the industry moved into frontier areas where drilling had not occurred before.

Since 1977 a large body of research information has been developed by government and industry. Research is still continuing, however, a great deal has been learned regarding both the nature of the discharges and their impact. This paper summarizes the results of this research.

Before considering the research results it will be useful to review the nature of drilling discharges. A schematic diagram of a drilling mud circulation system is shown in Figure 1(1). The mud components are added through the hopper and mixed in the mud tanks. Drilling mud is pumped from the mud pits down the drill string and through the bit. Here it sweeps the crushed rock cuttings from beneath the bit and carries them back up the annular space between the drill string and the borehole or casing to the surface. This action permits drilling to continue and is the fluids' most important function.

Back at the surface, the drilling mud is passed through mechanical separation equipment to remove the formation drill solids or cuttings. The solids control equipment is an integrated system that consists of shale shaker screens that remove the coarse particles and hydrocyclones that remove the sand and silt fractions from the mud. The drill solids separated by the solids control equipment are discharged to the ocean. This type of discharge is continuous in the sense that it occurs while drilling is in progress. Typically, this is 20-50 percent of the time the rig is on location.

The rates of this type of discharge vary from about one to ten barrels per hour. The higher number is more characteristic of the shallow part of the hole when drilling is fast and the bit diameter is large. Over the life of a well some 3,000-6,000 barrels of wet solids from the solids control equipment are discharged.

After the mud passes through the solids control equipment and the solids are separated, it goes back to the mud pits for recirculation. Here another type of discharge may be required. The solids control equipment cannot remove the fine clay and colloidal sized particles that are generated from the formation solids that are drilled up. As time goes on, the concentration of these fine particles continues to increase and eventually reaches a point where the mud becomes too viscous. At this time a portion of the mud is discharged and the discarded volume is replaced with water and appropriate quantities of mud additives. This is done to bring the concentration of fine solids down to an acceptable level. This method of reducing the concentration of fines in the mud system is called the "Dilution Method". On a less frequent basis, bulk mud discharges occur if the mud type needs to be changed prior to penetrating a particular formation or if a formation is encountered which contains soluble salts (e.g. sodium chloride, calcium sulfate) in high enough concentrations to adversely affect mud properties. In addition, it is also necessary to discharge the entire mud system at the end of each exploratory well.

Bulk mud discharges occur only intermittantly. These discharge volumes normally range from 100-1,000 barrels. Typically, every one to three days a small volume, 100-200 barrels, might be discharged. The 1,000 barrel type discharge is more characteristic of what occurs at the end of the well or if it is necessary to charge out the mud system.

Bulk discharge rates are normally in the 500-2,000 barrels per hour range and only last for a few minutes. Over the life of an exploratory well some 5,000-30,000 barrels of mud are discharged. Because development wells are normally shallower, smaller in diameter and require less time to drill, the quantity of mud discharged is somewhat less.

The range of mud volume discharged is broad primarily because of economic factors. For lightly treated, low density muds which are not expensive the dilution method (discharge and make up) is a cost efficient way to control the concentration of fine solids. Discharge volumes will usually be higher for this type of system since most of the material discharged is water and the make up cost is low. On the other hand, for heavily treated, high density muds which are expensive it is desirable to minimize bulk mud discharges. This is accomplished by more extensive use of solids control equipment (centrifuge) and by increasing the concentration of chrome lignosulfonate to deflocculate the fine clay particles and reduce mud viscosity. In these cases, discharge volumes will be low compared to the inexpensive, low density mud systems.

The well to well variation in quantities of discharged material becomes considerably less if one considers only the quantity of solids -everything but water - that is discharged. Including both bulk mud and solids control equipment discharges, about 1000 cubic meters (2,000 tons) of dry solids (formation solids plus mud additives) will be discharged

over the life of a typical exploratory well. Mud additives account for roughly half of this value and formation solids account for the other half.

Composition of Discharge

Solids control equipment discharges and mud discharges have different compositions. The former contains primarily formation solids and the latter contains primarily mud additives. The composition of a representative shale shaker discharge obtained from a well drilled in the Mid-Atlantic is illustrated in Table 1(2). The small amount of barium sulfate results from barite particles that have adhered to the cuttings particles. The montmorillonite clay comes from both added bentonite and from formation clays. The remaining material is representative of the formation being drilled at that time and consists primarily of clays, quartz, and low concentrations of calcite, pyrite, and siderite. This particular shale shaker sample contained 65% solids and 35% water. Typically, the water content of these discharges falls in the 20-40% range.

Mud composition varies with both depth and location. In the shallow portion of the hole the mud will consist of low concentrations of bentonite and caustic soda in seawater. As hole depth increases the system may be converted to fresh water and more bentonite and caustic plus lignite, lignosulfonate and barite are added. Also, if hole

problems occur, low concentrations of specialty chemicals may be required. Total usage rates for these materials are low (barite, bentonite, lignite, lignosulfonate, and caustic soda account for 92% of drilling mud additives⁽³⁾). Moseley has discussed specialty chemicals used in drilling mud formulation⁽⁴⁾.

The vast majority of muds discharged on the OCS will resemble the two representative mud compositions shown in Table 2^(2,5). The high density example was the final mud composition used in a well in the Gulf of Mexico and the low density example was the mud composition used in the latter stages of a Mid-Atlantic well. The high density mud weighs 2.1 grams per cc and contains 62% barite and 30% water. The low density mud weighs 1.2 grams per cc and contains 15% barite and 76% water. The concentration of the other ingredients—low gravity solids, chrome lignosulfonate, and lignite are similar. The low gravity solids consist of bentonite clay plus formation solids.

Trace metals in drilling discharges originate from both formation solids and mud additives. Representative metal concentrations for a shale shaker sample and a mud sample taken from a well in the Mid-Atlantic are shown in Table 3⁽²⁾. The presence of barite causes the barium concentration to be much higher than any of the other metals. The other metal that is higher than what is normally seen in formation solids or sediments is chromium. The source of the chromium is chrome lignosulfonate. Approximately 3% of the chrome lignosulfonate is chromium which is present in the trivalent state. Both barium and chromium

concentrations are higher in the mud than in the shale shaker sample. This is because the source of these metals are mud additives and only a small amount of mud components adhere to the cuttings when they are screened out. The other metals shown in Table 3 are present in concentrations comparable to levels that are normally found in formation solids or sediments.

Fate and Effects of Drilling Discharges

This field of research has taken two lines of investigation, both of which are necessary. Laboratory studies are needed to determine mud concentrations where toxic effects occur. Field studies are needed to determine exposure; that is what are the concentrations of mud components in the marine environment and how long do they persist at elevated concentrations. Field studies are also needed to determine actual impacts on organisms in the marine environment.

Laboratory Studies

Most of the work to date has been directed toward determining acute toxicity. In these tests, organisms are subjected to different concentrations of mud for a set time, usually 96 hours. By observing mortality rates, the concentration required to kill 50% of the test organisms which are present in an aquarium in 96 hours is determined.

This is called the 96 hour LC₅₀. This type of test is useful because it is comparatively rapid and inexpensive and produces a single number to help make a judgement on toxicity. Chronic tests are similar to the acute tests except that the organisms are exposed to lower concentrations for longer periods of time - weeks to months.

In addition to the mortality tests several studies have addressed sublethal effects. For example, investigators have measured concentrations where changes in reproduction, growth rates and respiration occur.

In more sophisticated experiments, mud solids or mud components are either layered on or mixed with natural sediment and then unfiltered seawater passed through the aquaria. Comparisons are made between these and aquaria containing only natural sediment to learn how changes in the substrate can alter recruitment of settling planktonic larvae and the biological community that develops. These studies are of interest because subtle differences may be detected, however it is hard to distinguish toxic effects from physical effects and interpretation is difficult.

Estimates of drilling mud metals bioavailability are made by exposing organisms to various concentrations of mud or mud components for several days. After an appropriate gut depuration period the metals concentrations in the test organisms are determined and the results compared with concentrations in control organisms.

Detailed literature reviews of the laboratory research results are available(6,7). Only a brief summary will presented here.

Table 4 shows typical 96 hour LC₅₀ results for major mud components, and drilling mud(1). Barite and bentonite are essentially non-toxic while lignite and lignosulfonate respectively would be classified as practically non-toxic and moderately to slightly toxic(8,9) (Table 5). Of course drilling muds, not components, are discharged and the toxicity of the mud itself is of primary importance. Clay -chrome lignosulfonate muds - the basic compositions of which is shown in Table 3 - are used in over 95% of the wells drilled in the OCS. Petrazzuolo has summarized test results from 40 different muds, primarily of this type, using 48 species of marine organisms representing several classes at various growth stages from the Gulf of Mexico, Atlantic, Pacific, Beaufort Sea and Cook Inlet(7). Over 80% the muds tested have LC₅₀'s that fall into the practically non-toxic range - greater than 10,000 ppm. This is true even though many different species of test organisms in various life stages have been tested. Some species are more sensitive than others and juveniles are normally more sensitive than adults, however, these differences are normally too small to cause the LC₅₀ results to fall outside the 10,000->100,000 ppm range. Test results are available on muds that produced LC₅₀ values falling below this range, however, most of these muds contained significant amounts of diesel oil. Diesel oil is not an approved additive for muds discharged on Georges Bank.

Sublethal tests are more sensitive than acute toxicity tests. However, they are also more difficult to interpret. In many cases it is not clear if the observed effect is truly adverse (pathologic) or not (compensatory). Sublethal effects are usually noted at concentrations one to two orders of magnitude lower than the 96 hour LC₅₀ values. That is, most investigators have not noted sublethal effects at concentrations below the 100-1,000 ppm range for muds not containing diesel oil as an additive.

Studies have shown that marine organisms can accumulate mud-associated metals; however, under realistic exposure conditions accumulation has not been shown to occur to a degree sufficient to cause a toxic effect in the accumulating organism(6,7,10). Drilling mud metals have only limited bioavailability because of the form the metals are in (e.g. insoluble salts, chemically bound to high molecular weight organic molecules, or adsorbed on clays).

Another issue of concern is whether or not accumulated metals are bioconcentrated in prey organisms and a direct threat to human health. This is unlikely since studies of other pollutants indicate that organic mercury(11) and possibly organic selenium(12) (neither of which are present in drilling mud) are the only metals shown to have bioconcentration potential. An API research project is currently addressing this possible problem(13).

Field Studies

During the past five years major field studies have been conducted in the Beaufort Sea, the Lower Cook Inlet, Offshore California, the Gulf of Mexico and in the Atlantic. These studies addressed either one or both of these questions: What is the fate of the discharged material? That is, how rapidly is it dispersed to concentrations approaching background levels? What is the nature and extent of effects on the biological community?

Water Column Effects

When drilling mud is discharged to the ocean most of the solids settle rapidly in the vicinity of the well site⁽⁵⁾. Settling is much more rapid than one would predict from the particle size distribution in the mud system. These finely divided clay particles owe their stability in the mud system to the electrical charge between the particles and the presence of lignosulfonate which serves as a deflocculant. When the mud contacts seawater these particles are destabilized by the decrease in lignosulfonate concentration and by the high concentration of electrolytes present in seawater. This leads to agglomeration of particles and rapid settling. Only a small fraction of the particles (less than 10%) escape extensive initial flocculation and remain in the water column for more than a few minutes.

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The rapid decrease in the concentration of suspended solids in the water column with distance is illustrated by the data shown in Table 6, taken from a Gulf of Mexico field test. Values shown are the maximum suspended solids concentration and minimum transmittance numbers measured at the noted distance during two high rate discharges. Suspended solids concentration dropped quickly with distance from the source due to settling and dispersion.

The greatest decrease in concentration occurred in the first 50 meters. Suspended solids concentrations approached background levels around 500 meters and 1000 meters for the 275 barrel per hour and 1000 barrel per hour test, respectively.

Transmittance was the only hydrographic variable affected by the discharge. All other hydrographic variables (temperature, salinity, dissolved oxygen) remained unchanged from ambient conditions within the monitored interval (40-1500 meters from the discharge point). Note that transmittance values did not approach background as quickly as suspended solids. Transmittance values take longer to reach background because of fine particles present in the plume continue to scatter light effectively even when present in concentrations too low to significantly contribute to the weight of suspended solids.

The transmittance and suspended solids data was used to estimate the maximum quantity of solids present in the water column during both discharges. This is the quantity present in the water column immediately

after discharge ceases. This was estimated to be 5% of the discharged solids during the 275 barrel per hour test and 7% during the 1000 barrel per hour test. The quantity of solids in the water column continues to decrease after discharge ceases since settling continues as the plume drifts.

In addition to the solid particles, drilling mud may contain low concentrations of soluble components. An estimate of the dilution ratio for any soluble materials present was made by using the ratio of the volume of the plume in the water column to the volume of liquid phase discharged. After a time of one hour this dispersion ratio for soluble components was estimated to be about two orders of magnitude less than the dispersion ratio for solids, presumably due to almost all of the solids having settled by this time.

In addition to the Gulf of Mexico study there have been several other similar tests conducted in other areas of the OCS(2,14,15,17). Even though the tests have been conducted under a variety of environmental conditions using different muds and different sampling techniques the results have been similar in every case.

The following empirical equation based on several sets of field data has been proposed to calculate drilling mud dispersion in the water column during discharge⁽²⁰⁾. The equation is expressed in terms of

transport time (distance traveled by a parcel of fluid/current velocity) to allow comparisons of discharges occurring under different current conditions.

The dispersion ratio, D, (suspended solids concentration in discharge/suspended concentration in water column) is given as a function of discharge rate, R, in barrels per hour, and transport time, T, in minutes.

$$D = \frac{(10^{4.45}) (T^{1.1})}{(R^{0.36})}$$

Note that the dispersion ratio is only a weak function of discharge rate. For example, for a set transport time a doubling of the discharge rate only decreases the dispersion ratio by 22%.

Because of rapid settling and dilution it is clear that drilling discharges do not significantly affect open ocean water quality. Water column concentrations can approach the 96 hour LC₅₀ values measured in laboratory tests but only for the short time that the discharge is actually occurring and only in the immediate vicinity of the discharge pipe.

Benthic Effects

The solid material that settles may adversely impact the benthos near the well. The degree of impact that can occur depends upon environmental factors (current regime, water depth, natural sedimentation rate) that dictate how long the settled material remains concentrated in the upper sediment layers near the well site. The type of impact that can occur is illustrated by the results obtained in a monitoring program conducted on the Mid-Atlantic Outer Continental Shelf(19).

The overall objective of the study was to determine what effect drilling discharges have on ambient water quality, bottom sediments, and benthic community during exploratory drilling in the Mid-Atlantic. The well site was located approximately 156 kilometers east of Atlantic City, New Jersey in an approximate water depth of 120 meters. Bottom currents here are weak and the sea floor can be characterized as a low energy environment. The study consisted of monitoring the environment around the well site before the rig moved on location (Pre-Drilling Phase) while the rig was on location (Drilling Phase), after rig moved off location (First Post-Drilling Phase), and one year after the rig was moved off location (Second Post-Drilling Phase).

The drilling discharges were found to have an effect on the benthic community. In the First Post-Drilling Survey a zone of visible drilling discharge accumulations, primarily formation clays, was observed in the immediate vicinity of the well site and elevated levels of clays were

detected as far as 800 meters southwest of the site. Megabenthos (demersal fish and crabs) increased substantially in the immediate vicinity of the well site and over the general study area south of the well site. The cuttings piles were still present near the well site in the Second Post-Drilling Survey. Megabenthic abundance was still elevated over pre-drilling level but reduced from those observed in the First Post-Drilling Survey.

The intermittent nature of the discharges were reflected in the patchy distribution of mud and cuttings piles on the sea floor near the well site. This resulted in a high variability in abundance levels of sessile macrobenthos in samples taken during the first post drilling survey. Burial effects were presumed to be the cause for the low abundance levels.

Area wide abundance levels of macrobenthic organisms decreased between the pre-drilling and first post-drilling surveys, but increased between the first and second post-drilling surveys. Similar changes were observed at far field stations which were likely to have been beyond the influence of drilling discharges. The gross taxonomic structure of the study area remained essentially unchanged in all three surveys despite changes in macrobenthic abundances.

Reductions in abundance of macrobenthos beyond the immediate vicinity of the well site occurred in those areas southwest of the site where elevated levels of clays were detected. The reduction was attrib-

uted in part to increased predation by fish and crabs and in part to diminished recruitment of larvae to the area due to substrate alteration. In the Second Post-Drilling Survey, macrobenthic abundance at the well site was no different from other sites in the study area with the exception of the brittle star Amphioplus macilentus which remained in low abundance within 90 meters of the well site.

Barium concentrations in the sediment were higher in both post-drilling surveys. Concentrations 10-30 times background were observed near the well site. All other metals and extractable hydrocarbons were unchanged from pre-drilling levels.

No relationships were detected between macrobenthic abundance and the barium content of sediments or the barium content in tissues of organisms. Elevated concentrations of barium were detected in polychaetes and brittle stars during the first post-drilling survey. One year later barium concentrations in these organisms had returned to background even though elevated concentrations of barium were still present in the sediments.

Because the discharged material on the sea floor was not quickly dispersed the type of impact observed in this study might be considered as a "worst case". In addition to being a low energy area, natural sedimentation rates are low and the area can be considered as both non-erosional and non-depositional.

Table 7 illustrates how environmental factors can affect the impact. Here we see results from three diverse areas where studies were conducted. The energy available for dispersion of settled material is indicated by the maximum bottom currents that were measured. In the Cook Inlet, an area subjected to strong diurnal tidal currents, bottom currents were 99 centimeters per second(15,16). It is an extremely energetic area. The Tanner Bank is located offshore California. Here the maximum bottom currents measured were 36 centimeters per second(17,18). The mid-Atlantic study was conducted in a relatively calm area where infrequent maximum bottom currents of 18 centimeters per second were observed(2,19). Water depth is also a consideration since storm waves have a greater effect on resuspension and bottom transport of mud solids and sediment in shallow water depths. Notice that in the Cook Inlet and Tanner Bank the water depths were only 62 and 55 meters respectively, while in the mid-Atlantic the water depth was 120 meters.

Table 7 also shows some of the results that were noted in all of the studies that allows us to compare effects in these different areas. First, visual evidence of discharged material (as observed by bottom TV or submarines) at the rig site immediately after drilling. There was no visual evidence of drilling immediately after the rig was moved off location in either the Cook Inlet or Tanner Bank study. In the mid-Atlantic even one year after the rig had moved off location, cuttings piles were still visible in the well site area.

The second parameter shown is increased barium levels in the sediment surrounding the well site immediately after drilling. In the Cook Inlet there was no increase in barium level in the sediment in the well site area because the barite particles were rapidly dispersed by the high currents. In the Tanner Bank study, barium concentrations in the sediment were moderately increased at the well site. In the low energy, mid-Atlantic area markedly increased barium levels were observed in the sediment around the well site even one year after drilling.

The third parameter addresses impacts on the benthic community. In the Cook Inlet there were no measurable impacts. Benthic effects were not studied at Tanner Bank so we cannot make a comparison here. We have already discussed the impacts observed in the Mid-Atlantic study. It is clear that the degree of impact and how long the impact persists depends on how dynamic the bottom environment is.

Conclusions

Based on the research results to date the following general conclusions may be drawn about the fate and effects of drilling discharges in the marine environment:

- Laboratory studies indicate that drilling mud toxicities are low. In the majority of cases 96 hour LC50's fall in the 10,000->100,000 ppm range. Susceptibility of test organisms

varies from species to species, however, the 96 hour LC₅₀'s normally vary less than one order of magnitude using the same mud. This is true for different classes of organisms and for organisms taken from different Outer Continental Shelf areas. Sublethal effects normally do not occur at concentrations below the 100-1,000 ppm range. When muds contain diesel oil as an additive both LC₅₀ concentrations and concentration when sublethal effects occur are significantly lower.

- c Upon discharge, most (greater than 90%) of the mud solids settle rapidly in the immediate vicinity of the well site. The remaining solids and soluble components form a plume in the water column. Drilling mud remaining in the water column is diluted to concentrations orders of magnitude less than the 96 hour LC₅₀ values in minutes. Because of the rapid settling and dilution, drilling discharges have a negligible impact on open ocean water quality.
- Drilling discharges may have an effect on the benthic community in the near vicinity of the well site, depending on environmental factors. In highly erosional areas the impact of drilling discharges will be almost immeasurable. In low energy areas where natural sedimentation rates are also low, drilling discharges will have their greatest impact. Even in these cases however, the impact appears to be highly localized, temporary, and minor.

Future Research Trends

Based on the research results to date and the decades of offshore operating experience it is difficult to conclude that drilling discharges are a significant threat to the offshore environment. Discharge of mud and cuttings should be allowed to continue however justification does exist for additional research in certain areas.

Most of the laboratory and field research to date have addressed short term impacts. These have been extensively studied and are fairly well understood. Today there is a definite trend toward studying long term fate and effects. The Department of Interior's Georges Bank Monitoring Program is a prime example of a field study concerned with this problem. Here the emphasis is on monitoring sediment and biota throughout a pristine area for several years during exploratory drilling activities to determine if any significant long term impacts occur. Laboratory studies are concentrating on sublethal effects associated with long exposure times to low concentrations of mud-sediment mixtures. One study of particular importance is an API project aimed at determining whether or not drilling fluid metals are bioaccumulated in lower trophic levels and if so, can these metals be passed up the food web and concentrated in higher trophic levels(13).

Another area of prime importance is the effort being directed toward developing improved predictive capability. A model which will satisfactorily predict the short-term fate of drilling discharges both in the water column and on the sea floor is being developed by the Offshore Operators Committee(21). It will be available in early 1983. Attempts are also underway to develop models to predict long term fate however, this problem is more difficult and these models are only useful in a qualitative sense at present. The capability to predict both long term fate and effects would be of extreme benefit however it is unlikely that a quantitative model of this type will be developed anytime in the near future.

The last area that is receiving considerable attention deals with toxicity control of new products. While most ingredients used in drilling muds today have low toxicity there is a justified concern that in the future, toxic additives may be developed and discharged to the environment. Most EPA Regions concerned with discharges offshore are requiring the use of standard mud types that have been bioassayed using the EPA Region II procedure(22). If new additives are used in the standard muds EPA is requiring toxicity data on these products. API is developing a standard bioassay procedure consistent with the EPA protocol that drilling mud service companies can use to test their new products prior to use(23).

TABLE 1

REPRESENTATIVE SHALE SHAKER DISCHARGE COMPOSITION

| <u>MINERAL</u> | <u>WT. % (DRY BASIS)</u> |
|------------------|--------------------------|
| BARIUM SULFATE | 3 |
| MONTMORILLONITE | 21 |
| ILLITE | 11 |
| KAOLINITE | 11 |
| CHLORITE | 6 |
| MUSCOVITE | 5 |
| QUARTZ | 23 |
| FELDSPAR | 8 |
| CALCITE | 5 |
| PYRITE | 2 |
| SIDERITE | 4 |
| | |
| % SOLIDS (WT. %) | 65 |
| DENSITY | 1.7 |

TABLE 2

REPRESENTATIVE MUD COMPOSITIONS

| <u>COMPONENT</u> | <u>CONCENTRATION (WT. %)</u> | |
|-----------------------|------------------------------|---------------------|
| | <u>LOW DENSITY</u> | <u>HIGH DENSITY</u> |
| BARITE | 15.0 | 62.0 |
| LOW GRAVITY SOLIDS | 6.5 | 5.9 |
| CHROME LIGNOSULFONATE | 1.0 | 0.9 |
| LIGNITE | 1.0 | 0.9 |
| INORGANIC SALTS | 0.7 | 0.5 |
| WATER | 75.8 | 29.8 |
| DENSITY (G/CC) | 1.19 | 2.09 |
| pH | 11.4 | 12.4 |

TABLE 3

REPRESENTATIVE METAL CONCENTRATIONS

| <u>METAL</u> | <u>CONCENTRATION, MG/KG</u> | |
|----------------|-----------------------------|------------|
| | <u>SHALE SHAKER</u> | <u>MUD</u> |
| BARIUM | 3160 | 37400 |
| CHROMIUM | 44 | 191 |
| CADMIUM | <2 | <1 |
| LEAD | 10 | 3 |
| MERCURY | <1 | <1 |
| NICKLE | 15 | 4 |
| VANADIUM | 11 | 5 |
| ZINC | 80 | 50 |
| SOLIDS IN MUD | 77.1 | 21 |
| DENSITY (G/CC) | 1.9 | 1.16 |

TABLE 4

TYPICAL BIOASSAY RESULTS* ON
DRILLING FLUIDS AND MAJOR COMPONENTS

| <u>MATERIAL</u> | <u>96 HOUR LC₅₀, PPM</u> |
|--------------------------------|-------------------------------------|
| BARITE | >100,000 |
| BENTONITE | >100,000 |
| LIGNITE | 25,000 |
| CHROME LIGNOSULFONATE | 500 - 10,000 |
| CLAY-CHROME LIGNOSULFONATE MUD | 10,000 - >100,000 |

*Sublethal effects usually noted at concentrations 1-2 order of magnitude less than LC₅₀ value.

TABLE 5

CLASSIFICATION OF TOXICITY GRADES

| <u>TOXICANT CLASSIFICATION</u> | <u>LC₅₀ VALUE</u> |
|--------------------------------|------------------------------|
| PRACTICALLY NON-TOXIC | ABOVE 10,000 MG/LITER |
| SLIGHTLY TOXIC | 1,000 - 10,000 MG/LITER |
| MODERATELY TOXIC | 100 - 1,000 MG/LITER |
| TOXIC | 1 - 100 MG/LITER |
| VERY TOXIC | LESS THAN 1 MG/LITER |

TABLE 6

SUSPENDED SOLIDS CONCENTRATION AND TRANSMITTANCE VS DISTANCE
DURING HIGH RATE DISCHARGES

275 Barrel/Hour - 250 Barrels Discharged

| <u>Distance from Source, m</u> | <u>Solids Concentration, mg/l*</u> | <u>Transmittance, %*</u> |
|--------------------------------|------------------------------------|--------------------------|
| 0 | 1,430,000 | - |
| 6 | 14,800 | - |
| 45 | 34 | 2 |
| 138 | 8.5 | 56 |
| 250 | 7.0 | 48 |
| 364 | 1.2 | 37 |
| 625 | 0.9 | 71 |
| Background | 0.3 - 1.9 | 76 - 85 |

1000 Barrel/Hour - 389 Barrels Discharged

| <u>Distance from Source, m</u> | <u>Solids Concentration, mg/l</u> | <u>Transmittance, %*</u> |
|--------------------------------|-----------------------------------|--------------------------|
| 0 | 1,430,000 | - |
| 45 | 855 | 0 |
| 51 | 727 | 0 |
| 152 | 50.5 | 2 |
| 375 | 24.1 | 4 |
| 498 | 8.6 | 23 |
| 777 | 4.1 | 21 |
| 878 | 1.2 | 71 |
| 1470 | 2.2 | 82 |
| 1550 | 1.1 | 82 |
| Background | 0.4 - 1.1 | 80 - 87 |

*Maximum concentration and minimum transmittance measured at noted distance.

TABLE 7

EFFECT OF ENVIRONMENTAL FACTORS ON STUDY RESULTS

| | <u>COOK INLET</u> | <u>TANNER BANK</u> | <u>MID-ATLANTIC</u> |
|-------------------------------------------------------------------------|-------------------|--------------------|---------------------|
| <u>ENVIRONMENTAL FACTORS</u> | | | |
| Maximum Bottom Current, cm/sec | 99 | 36 | 18 |
| Water Depth, meters | 62 | 55 | 120 |
| <u>STUDY RESULTS</u> | | | |
| Visual Evidence of Discharged Material Immediately After Drilling | NO | NO | YES |
| Increased Barium Levels in Sediment Immediately After Drilling | NO | YES | YES |
| Benthic Impacts in Study Area | NO | -- | YES |

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DRILLING MUD CIRCULATION SYSTEM

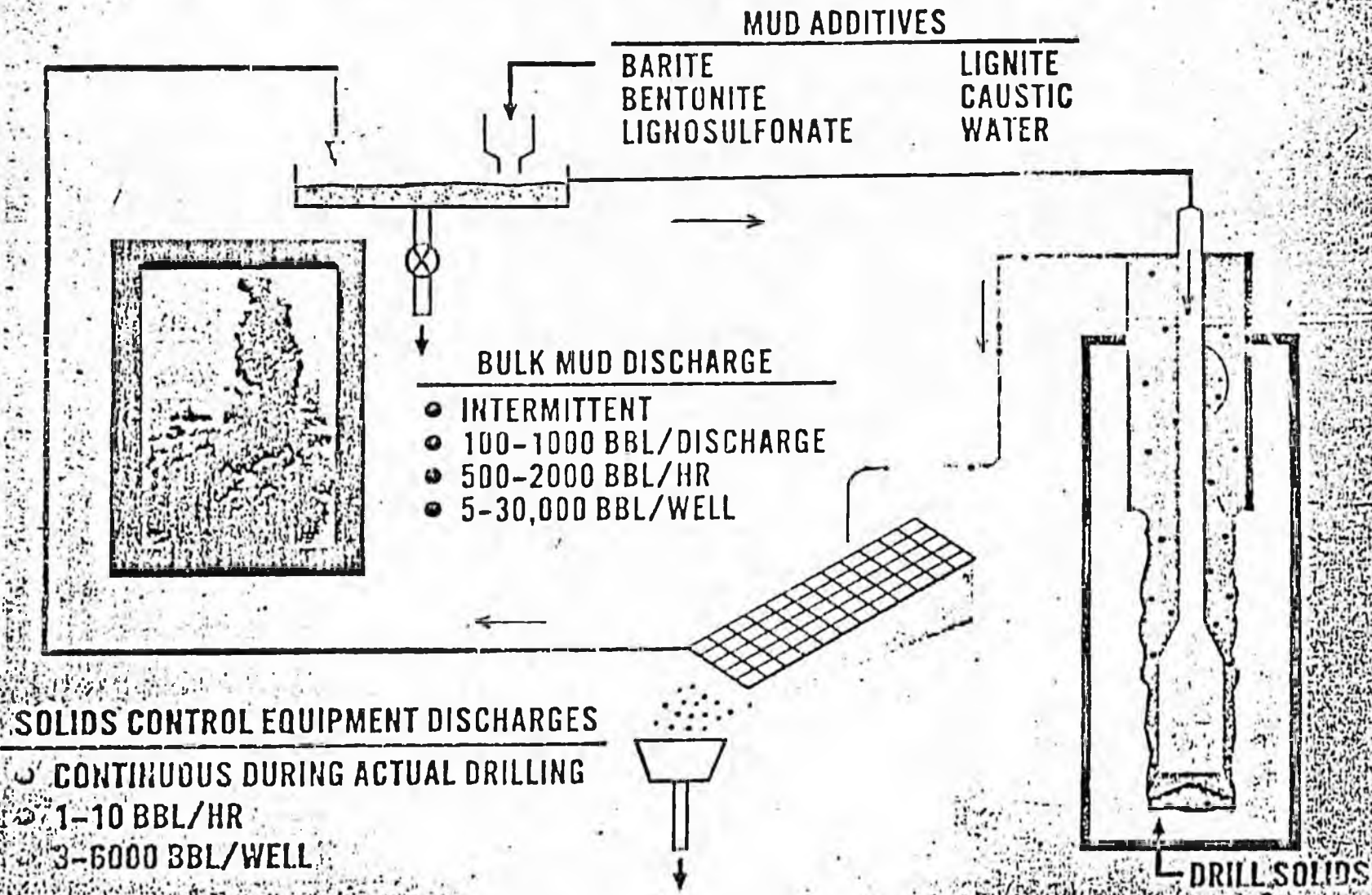


Figure 1



AMERICAN INSURANCE ASSOCIATION

85 John Street
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(212) 669-0400

January 18, 1984

Mr. David Hanline
Mail Stop 530
Region 10
U. S. Environmental Protection Agency
1200 Sixth Avenue
Seattle, Washington 98101

Re: Alaska Proposed Regulations on Financial
Responsibility for Hazardous Waste Opera-
tions - Article 6 of Title 18 Environmental
Conservation, Chapter 62 Hazardous Waste -
Corrected Draft 11/15/83

Dear Sir:

The American Insurance Association, an Association representing over 170 property and casualty insurers very much involved in the emerging pollution insurance market, understands that the State of Alaska has submitted for your review draft regulations covering hazardous waste facilities.

As insurers, the main concern which we have with these regulations is of course the financial regulations as contained in Title 18 Environmental Conservation Chapter 62 Hazardous Waste Article 6 Sections 600 to 680 of the proposed regulations.

The "Working Draft" as corrected November 15, 1983 is substantially different from the first draft we reviewed (dated May 13, 1982). Our Association, as well as our individual members have communicated since then with the Department of Environmental Conservation and with Mr. Ray Preston (the attorney who drafted the latest proposals) on frequent occasions in an effort to attain our common goal: i.e. that the final regulations will be reasonable and flexible so that qualified operators of hazardous waste facilities may assure their financial responsibility through insurance if they wish, and so that the insurance industry will be able to offer the coverage at a reasonable price.

Unfortunately, this aim is not met in the current working draft. These proposals mandate the terms and conditions of the coverage. They are not flexible at all considering the size and newness of the market for pollution coverage. They are detrimental to the encouragement of such a market. If enacted, these proposals would have the effect of precluding many applicants from obtaining a desired form of assurance of financial responsibility. This should be particularly troubling to those with the public's welfare in mind as it is our understanding that surety bonds and letters of credit are not readily available to cover liabilities from pollution incidents.

This is all the more reason why insurers who are desirous of offering this coverage, should be allowed to structure the terms and conditions of the contract in order to enhance the market's development, while at the same time assuring compensation for loss.

The American Insurance Association recognizes that your authority as Regional Administrator in reviewing these regulations is governed by the provisions of the Solid Waste Disposal Act, as amended by the Resource Conservation and Recovery Act, 42 U.S.C. 6901 et seq. That authority is limited to assuring that the state regulations are: (1) equivalent to the federal EPA regulations, (2) consistent with the federal program or state programs in other states, and (3) that they provide for adequate enforcement. 42 U.S.C. 6926(b)

The American Insurance Association urges you to consider carefully these proposals for the State of Alaska in view of the first two criteria. In our view, the proposed regulations on financial responsibility contained in Article 6 are not equivalent to nor consistent with the Federal EPA regulations contained in 40 CFR Parts 264, 265 Subparts H. Nor are they consistent with other state regulations. The overwhelming majority of states are adopting or seeking to adopt almost identical financial regulations to those of the Federal EPA.

The pollution market is accurately described as being in its infancy. Little information is in fact known by many state regulators about how this market functions. In our view, these draft regulations are not intentionally designed to discourage the market, but nevertheless do so because they impose rigid restrictions on a marketplace where conditions change daily. As the American Insurance Association has informed legislators and regulators in the many states, our industry is genuinely concerned that the market will not grow if hampered through restricting regulations or legislation.

As you are undoubtedly aware, the Federal EPA regulations were developed only after extensive discussion amongst many industries and governmental agencies. Those regulations do not dictate as to the type of policy. They allow for either a claims-made or occurrence based policy which can be written by a primary or excess/surplus

lines carrier. Minimum limits were set low so as to encourage insurers to write the coverage. Pollution insurance (particularly for pollution occurring over time) before the effective date of the federal regulations (July 1982) generally was written by the surplus/excess lines and the foreign markets. Coverages varied from carrier to carrier; risks were defined in the individual contracts. Understanding that the domestic market was only beginning to offer pollution coverage of the sort anticipated to cover pollution from both sudden accidents and accumulated releases of hazardous substances, the EPA regulators let the industry determine most of the terms, conditions and types of policy to offer. As a result, today there are numerous types of policies from which to choose. Since July 1982, some insurers have changed their forms to meet certain conditions.

The following points of differences between the federal regulations and the State of Alaska's constitute our reasons for believing that Alaska's proposals are not consistent with the aim of the Federal program. To reiterate, that aim is to assure compensation for losses and to encourage insurers in their role of providing compensation.

First, and most troubling of all, is the provision inserted in the latest draft 18 AAC 62.640(d)(3) stating that an insurance contract cannot be cancelled except for the reason that the insured has not paid the premium. Requiring an insurer to provide coverage regardless of the conduct of the insured is against the traditional nature of the insuring agreement and may be contrary to public policy (i.e. financing liability for unlawful and criminal acts). Many of the terms or conditions of the policy are designed to encourage responsible and safety-oriented behaviour by the insured. Government regulations should not have the effect of treating bad actors and good actors alike. Yet prohibiting an insurer from relying on the policy's terms will have this effect. For example, many policies contain an exclusion which voids coverage if the insured knowingly fails to comply with applicable laws or regulations. Alaska's regulations would disallow cancellation by an insurer in this instance to the unjust benefit of the violator.

Second, the draft regulations appear to require both sudden and non-sudden coverage in the same policy, 18 AAC 62.640(d)(1). This is a severe limitation on the recently emerging market, as most companies have offered sudden coverage under the traditional form (Comprehensive General Liability policy) and now are offering non-sudden under one of the newly developed policies (such as the Environmental Impairment Liability policy). It is true that the Insurance Services Office form combines both types but there is no reason why this form should be the required policy.

Third, these draft regulations have been changed from the earlier ones to allow a claims-made policy. As noted in the Federal Treasury report:

"the 'claims made' approach to pollution insurance coverage has the advantages of (1) letting insurers gradually accumulate reserves which might be matched against potential claims resulting from gradual pollution incidents, and (2) giving the insurer the flexibility needed to keep current premiums reflective of current loss and expense experience." Department of Treasury, Report on Hazardous Substance Liability Insurance pp 71-72.

These two concerns, accumulation of reserves for potential claims and the need for some correlation between premiums and loss and expense, are the motivation behind some (but not all) companies' use of a retroactive date through which they can restrict their coverage.

The use of a retroactive date allows the insurer greater predictability and accuracy, two essentials of the insurance industry. Unfortunately, however, Alaska's draft regulations would not allow this. Instead, coverage would be mandated on a claims-made basis (which disallows CGL policies now providing sudden pollution coverage on an occurrence basis), and required to be provided for all claims made during the policy term "no matter when" the occurrences occurred, 18 AAC 62.640(d)(3). While it is not yet clear in the marketplace whether the presence or absence of a retroactive date is best for either or both insurers or insureds, the State of Alaska would disallow this limiting factor - limiting as to both exposure of the insurer and premium of the insured.

Fourth, our members are justly concerned by the provision which requires the insurer to agree that "any final judgment against the insured for liability...may be enforced or executed directly against the insurer." 18 AAC 640(d)(2) The American Insurance Association questions the need for this unusual provision. The purpose of insurance is not to be substituted as the defendant, but rather to provide coverage to the defendant as defined in the insurance contract. We are not aware of any problems in Alaska with enforcement of judgments or with coverage payments to an insured. In any case, insurers' contract is with an insured; there may be situations where the contract does not provide coverage even though the insured is liable to a third party. An example is the typical provision whereby the insurer is not obligated to pay if an insured refuses to cooperate in the defense of an action.

Finally, we support the federal regulations as they exist. The American Insurance Association submits that it has not yet been shown that the minimum limits of the federal regulations are insufficient, as Alaska would seem to believe. We support the federal certificate and endorsement both as to form and content. The Federal EPA regulations do not require both a policy endorsement and a certificate of insurance as Alaska would. The EPA understood the administrative

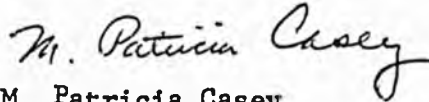
problems such a requirement would cause and allowed insurers instead to provide either a certificate of insurance or an endorsement while keeping the right of the EPA to view the entire policy at any time upon request. Also, the language of the federal certificate or federal endorsement was achieved only after a lengthy comment period and an educational process on all sides.

The American Insurance Association and the insurance industry are desirous of seeing a good regulatory program in Alaska. To the extent possible, we prefer to see states enact substantially similar to the federal requirements, in part because our industry worked so hard to assist the federal environmental agency in understanding our capabilities and needs.

The American Insurance Association is very concerned that the current Alaska draft regulations will make current insurance unavailable; make the current policy forms unusable in that state; and will prove discouraging to both domestic and foreign insurance markets.

We appreciate your review of this matter and hope that you can help the Department of Environmental Conservation in Alaska to understand that their latest draft will in effect discourage financial responsibility, which effect is obviously inconsistent with the objectives of the Federal Resource Conservation and Recovery Act.

Very truly yours,



M. Patricia Casey
Associate Counsel

MPC/dt

cc: Ray C. Preston, Esq.
Ms. D. Elizabeth Cuadra, Robertson, Monagle, Eastaugh & Bradley
Mr. Richard A. Neve, Commissioner of Dept. of Environmental Conservation

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February 8, 1984

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Mr. Jim Palmer
Office of Senator Fahrenkamp
Alaska Legislature
Pouch V
Juneau, Alaska 99811

Re: Alaska Proposed Regulations on Hazardous Waste

Dear Mr. Palmer:

On February 6 I attended a luncheon meeting where Senator Fahrenkamp was the speaker. During a wide-ranging talk on the many issues currently demanding her attention, Senator Fahrenkamp mentioned briefly her concern about the draft regulations on hazardous waste.

Afterward, we chatted briefly, and I mentioned that the American Insurance Association, a client of this law firm, has some remaining concerns about the financial responsibility section of the proposed regulations. Senator Fahrenkamp encouraged me to send you some information that might explain those concerns.

Therefore, I am enclosing a copy of the January 18, 1984 letter of Ms. M. Patricia Casey (Associate Counsel for the AIA) to the Regional Office of EPA. The explicit statement of substantive concerns begins at the first full paragraph on page 3 of that letter.

The AIA has, of course, previously submitted comment letters and background information to the Alaska Department of Environmental Conservation during the public comment period on the proposed regulations. We believe our concerns about the present draft, however, are best reflected in Ms. Casey's January 18, 1984 letter.

Sincerely,


D. Elizabeth Cuadra

DEC:sd
Enclosure
cc: M. Patricia Casey (AIA)

THANK YOU FOR THE OPPORTUNITY TO TESTIFY ON THE DEPARTMENT OF ENVIRONMENTAL CONSERVATION'S PROPOSED REGULATIONS CONTROLLING HAZARDOUS WASTE. FOR THE RECORD, MY NAME IS JIM PALMER, AND I AM REPRESENTING SENATOR BETTYE FAHRENKAMP, WHO WAS CHAIRMAN OF THE SENATE RESOURCES COMMITTEE WHICH FIRST CONSIDERED AND PASSED SB 29 IN 1981. THIS BILL AUTHORIZED THE DEPARTMENT OF ENVIRONMENTAL CONSERVATION TO TAKE RESPONSIBILITY FOR CONTROLLING HAZARDOUS WASTES IN THE STATE OF ALASKA. SENATOR FAHRENKAMP WAS ALSO THE CHAIRMAN OF THE CONFERENCE COMMITTEE WHICH WORKED ON AND PRODUCED THE FINAL VERSION OF SB 29.

ALL OF US HERE AND THROUGHOUT ALASKA HAVE NO DESIRE TO SUBJECT OUR LAND AND HEALTH TO THE PERILS OF HAZARDOUS WASTES--THE EFFECTS OF WHICH WE CAN ALL TOO CLEARLY SEE IN OTHER PARTS OF THE COUNTRY. SENATOR FAHRENKAMP SHARES THE CONCERN. HOWEVER, THE SENATOR HAS SEVERE RESERVATIONS ABOUT THE DEPARTMENT'S REGULATIONS AS THEY ARE CURRENTLY DRAFTED.

THE SENATOR'S TWO MAIN CONCERNS ARE THE FAILURE OF THE REGULATIONS TO FOLLOW LEGISLATIVE INTENT AND, SECOND AND PERHAPS MOST IMPORTANT, THEIR POSSIBLE DIRE EFFECTS UPON SMALL BUSINESSES IN THE STATE.

IN 1976, THE RESOURCE CONSERVATION AND RECOVERY ACT WAS PASSED BY THE UNITED STATES CONGRESS, PLACING RESPONSIBILITY FOR CONTROLLING HAZARDOUS WASTES ON THE ENVIRONMENTAL PROTECTION AGENCY. INDIVIDUAL STATES COULD TAKE OVER THIS RESPONSIBILITY IF THEY ESTABLISHED AN APPROVED HAZARDOUS WASTE PROGRAM.

THE MAIN PURPOSE OF THE 1981 LEGISLATION PASSED BY THE ALASKA LEGISLATURE WAS TO ALLOW THE STATE OF ALASKA TO QUALIFY FOR INTERIM AUTHORIZATION TO REGULATE HAZARDOUS WASTES. THE LEGISLATURE AT THAT TIME APPROVED LANGUAGE STATING THAT THE STATE'S PROGRAM SHALL BE CONSISTENT WITH AND SUBSTANTIALLY EQUIVALENT TO THE FEDERAL REQUIREMENTS. THIS LANGUAGE WAS A SPECIFIC AMENDMENT ADOPTED TO INDICATE THE LEGISLATURE'S INTENT TO LIMIT THE STATE'S PROGRAM.

THIS LANGUAGE WAS ADOPTED IN ORDER TO ENSURE THAT THE STATE'S PROGRAM WOULD QUALIFY FOR INTERIM AUTHORIZATION FROM EPA AND TO MAKE SURE THAT THE DEPARTMENT OF ENVIRONMENTAL CONSERVATION DID NOT GO BEYOND THE INTENT OF THE FEDERAL LAW.

THE DEC PROPOSED REGULATIONS ARE NOT SUBSTANTIALLY EQUIVALENT TO THE FEDERAL REGULATIONS. HERE ARE SOME EXAMPLES OF HOW THE DIFFERENT REGULATIONS WOULD IMPACT A SMALL BUSINESS:

FEDERAL REGULATIONS HAVE A SMALL GENERATOR EXEMPTION OF 2200 POUNDS A MONTH WITHOUT QUALIFICATION. THE DEC PROPOSAL WOULD LOWER THAT TO 400 POUNDS A MONTH AND FURTHER QUALIFY THE 400 POUNDS A MONTH BY SPECIFYING THE PERCENTAGE OF EQUIVALENT CONCENTRATION. SHOULD WASTE CONTAIN 10% OF A LISTED SUBSTANCE, THE SMALL GENERATOR EXEMPTION WOULD FALL TO APPROXIMATELY 4 POUNDS A MONTH. IN FACT, TO QUALIFY FOR THE 400 POUNDS PER MONTH SMALL GENERATOR EXEMPTION, THE WASTE MATERIAL COULD CONTAIN NO MORE THAN .1% OF A LISTED SUBSTANCE.

DEC'S PROPOSED REGULATIONS RECLASSIFY 70% OF THE FEDERAL RCRA LISTINGS--OVER 300 SUBSTANCES--FROM A HAZARDOUS WASTE DESIGNATION TO AN ACUTELY HAZARDOUS WASTE DESIGNATION.

RCRA CLASSIFIES WASTE BY FOUR GENERAL CHARACTERISTICS: IGNITABILITY, CORROSIVENESS, REACTIVITY AND TOXICITY. DEC WOULD ADD CARCINOGENICITY AND PERSISTENCE TO THESE DESIGNATIONS.

THESE ARE JUST SOME OF THE MAJOR DIFFERENCES THAT EXIST BETWEEN THE FEDERAL RESOURCE CONSERVATION AND RECOVERY ACT OF 1976 AND THE PROPOSALS BEING PUT FORTH BY THE ALASKA DEPARTMENT OF ENVIRONMENTAL CONSERVATION.

SENATOR FAHRENKAMP BELIEVES THAT IF THE DEPARTMENT WISHES TO REGULATE HAZARDOUS WASTES IN A MANNER THAT IS NOT "CONSISTENT AND SUBSTANTIALLY EQUIVALENT" TO RECA, IT SHOULD PROPOSE APPROPRIATE LEGISLATION TO OBTAIN THE NECESSARY STATUTORY AUTHORITY.

IT IS NOT JUSTIFICATION FOR GOING BEYOND THE ORIGINAL LEGISLATIVE INTENT BECAUSE THE DEPARTMENT BELIEVES THAT RECA HAS SERIOUS DEFICITS, BELIEVES THAT RECA AS CURRENTLY ADMINISTERED IS NOT ADEQUATELY PROTECTING THE CITIZENS OF ALASKA, OR BELIEVES THAT THERE WILL BE FUTURE CHANGES TO RECA BY THE CONGRESS.

THE SECOND CONCERN OF SENATOR FAHRENKAMP IS OVER THE CONSEQUENCES OF THESE REGULATIONS ON THE SMALL BUSINESSES IN THE STATE.

AS PROPOSED, THESE REGULATIONS WOULD REGULATE INDUSTRIES AND COMPANIES NOT PRESENTLY COVERED BY RECA. SEVERAL EXAMPLES OF THIS ADDITIONAL JURISDICTION WOULD BE, FOR INSTANCE, INDUSTRIAL DRY CLEANERS AND AUTOMOBILE SERVICE STATIONS.

PERHAPS THE BEST EXAMPLE IS AN AUTOMOBILE SERVICE STATION WHICH GENERATES OVER 55 GALLONS OF WASTE LUBE OIL A MONTH. THIS AMOUNTS TO ABOUT 60 AUTOMOBILE OIL CHANGES. I WOULD IMAGINE THAT THERE ARE MANY GAS STATIONS, AUTOMOBILE SERVICE STATIONS, AND AUTOMOBILE DEALERS IN THE STATE WHO GENERATE THIS MUCH WASTE LUBE OIL MONTHLY. THEY WOULD BE COVERED BY THESE REGULATIONS. THEY ARE NOT CURRENTLY COVERED BY RECA.

WHAT WOULD BE THE CONSEQUENCES TO THE SERVICE STATIONS OR OTHER SMALL BUSINESSES COVERED BY THESE REGULATIONS? FIRST, THE WASTES MUST BE PROPERLY LABELED AND CONTAINERIZED ACCORDING TO THE FEDERAL DEPARTMENT OF TRANSPORTATION GUIDELINES. SECOND, AN IDENTIFICATION NUMBER MUST BE OBTAINED BEFORE TRANSPORTING THESE WASTES TO A DISPOSAL SITE. THIRD, A CRADLE TO GRAVE MANIFEST MUST BE KEPT. FOURTH, THE GENERATOR OF THE WASTES MUST MAINTAIN PROPER RECORDS ON THESE WASTES ON A LONG TERM BASIS. FIFTH, THE SMALL BUSINESS MAN MUST PREPARE ANNUAL REPORTS ON THESE WASTES FOR THE DEPARTMENT OF ENVIRONMENTAL CONSERVATION. SIXTH, THE WASTES MUST BE TRANSPORTED TO AN APPROVED DISPOSAL SITE. THE CLOSEST DISPOSAL SITE TO ALASKA IS IN ARLINGTON, OREGON. AN ESTIMATE OF SHIPPING AND HANDLING COSTS FOR ONE 55 GALLON DRUM (ASSUMING NO CONSOLIDATION) IS ABOUT \$3,000 PER DRUM.

SIXTH, IF A GENERATOR STORES THE WASTE MATERIAL FOR OVER 90 DAYS, THE GENERATOR BECOMES A STORER OF HAZARDOUS WASTE AND BECOMES SUBJECT TO EVEN MORE ONEROUS REQUIREMENTS.

THE SMALL BUSINESSMAN WILL BE SEVERELY IMPACTED BY THE REGULATIONS.

BEFORE THE DEPARTMENT ISSUES SUCH DETAILED REGULATIONS, IT IS SENATOR FAHRENKAMP'S BELIEF THAT ADEQUATE HAZARDOUS WASTE DISPOSAL SITES BE ESTABLISHED IN THE STATE, THAT A PUBLIC AWARENESS AND EDUCATION EFFORT BE DONE SO THAT THE PEOPLE ARE AWARE OF THE PROPERTIES AND IDENTIFICATION OF A HAZARDOUS WASTE, AND FINALLY THAT THE DEPARTMENT ESTABLISH SOME MECHANISM TO AID THE SMALL GENERATOR SO THAT HAZARDOUS WASTES CAN BE HANDLED AND DISPOSED OF PROPERLY.

IN CONCLUSION, SENATOR FAHRENKAMP URGES YOU TO TAKE BOTH LEGISLATIVE INTENT AND THE IMPACT OF THESE REGULATIONS ON SMALL BUSINESSES INTO ACCOUNT WHEN YOU FORMULATE THE FINAL REGULATIONS.

AS CHAIRMAN OF THE SENATE RESOURCES COMMITTEE, SHE HAS ASKED THE DEPARTMENT TO PRESENT THESE REGULATIONS TO THE FULL COMMITTEE AFTER FINAL REGULATIONS ARE DRAFTED. SHE LOOKS FORWARD TO WORKING WITH YOU TO ACHIEVE OUR COMMON OBJECTIVE--THE PROPER CONTROL OF HAZARDOUS WASTES IN THE STATE.

NOTE REGARDING THE FOLLOWING FRAME(S) ON MICROFILM:
COMPLETE DOCUMENT IS AVAILABLE IN ORIGINAL FILES.
TITLE PAGE ONLY HAS BEEN FILMED.

Thursday
August 6, 1981

Final Report

Part III

**Environmental
Protection Agency**

**Hazardous Waste Management System;
Identification and Listing of Hazardous
Waste**

FROM THE DESK OF
Senator Jalmar Kerttula

Attached are charts showing
the locations, amounts and
classification of both low
level and high level radioactive
waste disposal areas.....figures
from the Department of Energy

3-19

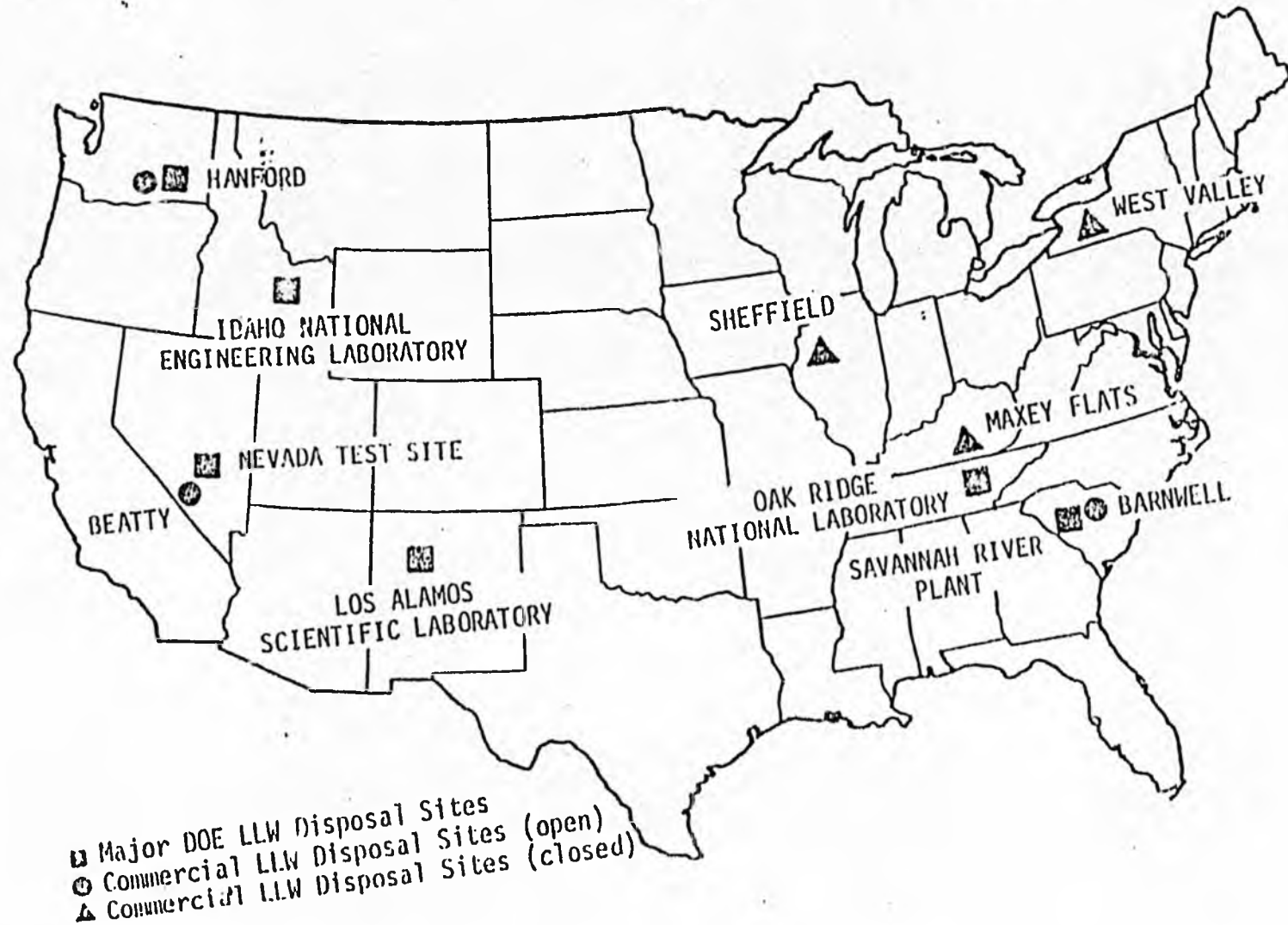


FIGURE 3-8
LOCATIONS OF MAJOR DOE AND COMMERCIAL LLW BURIAL SITES

1/6/81

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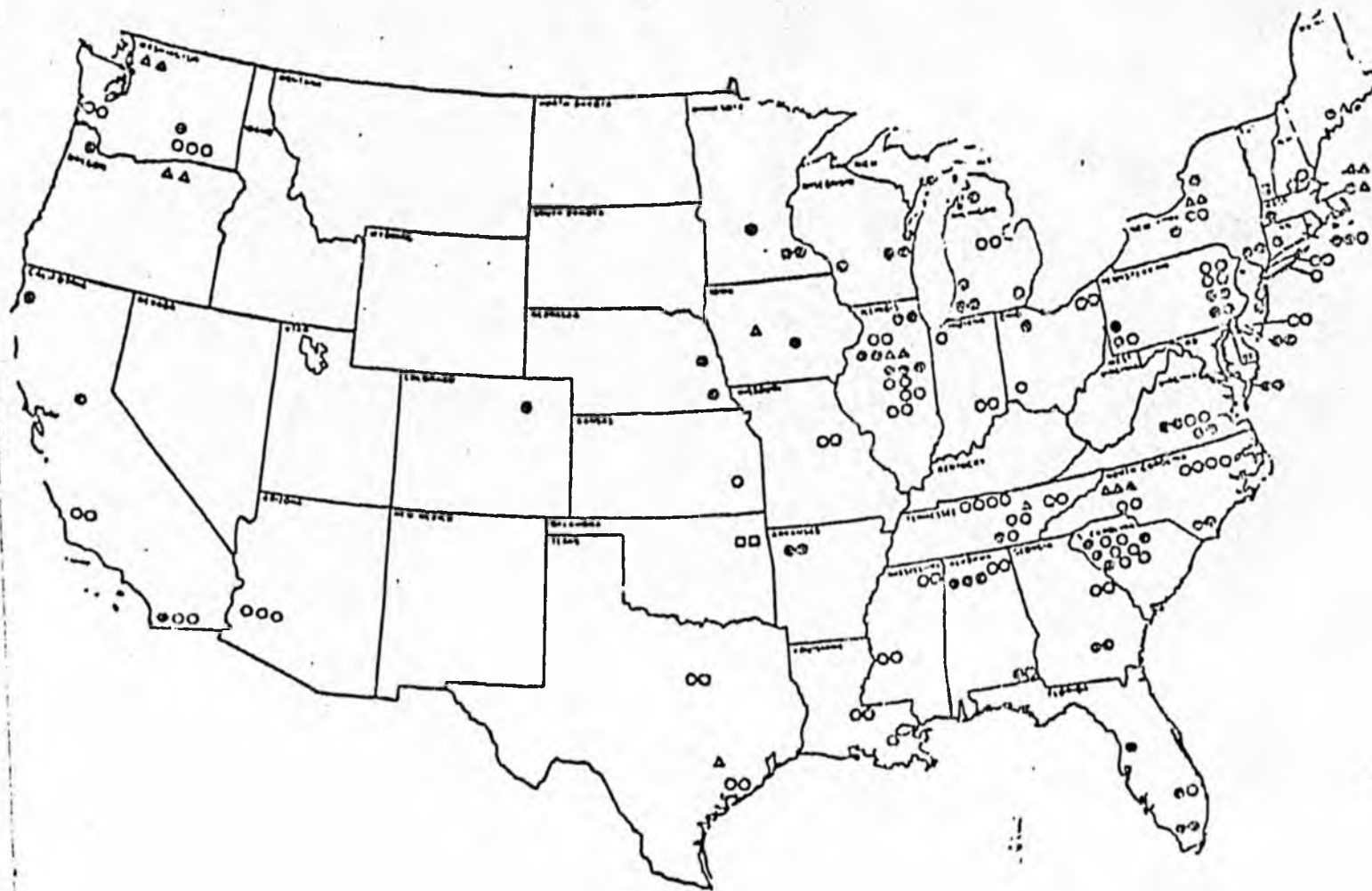
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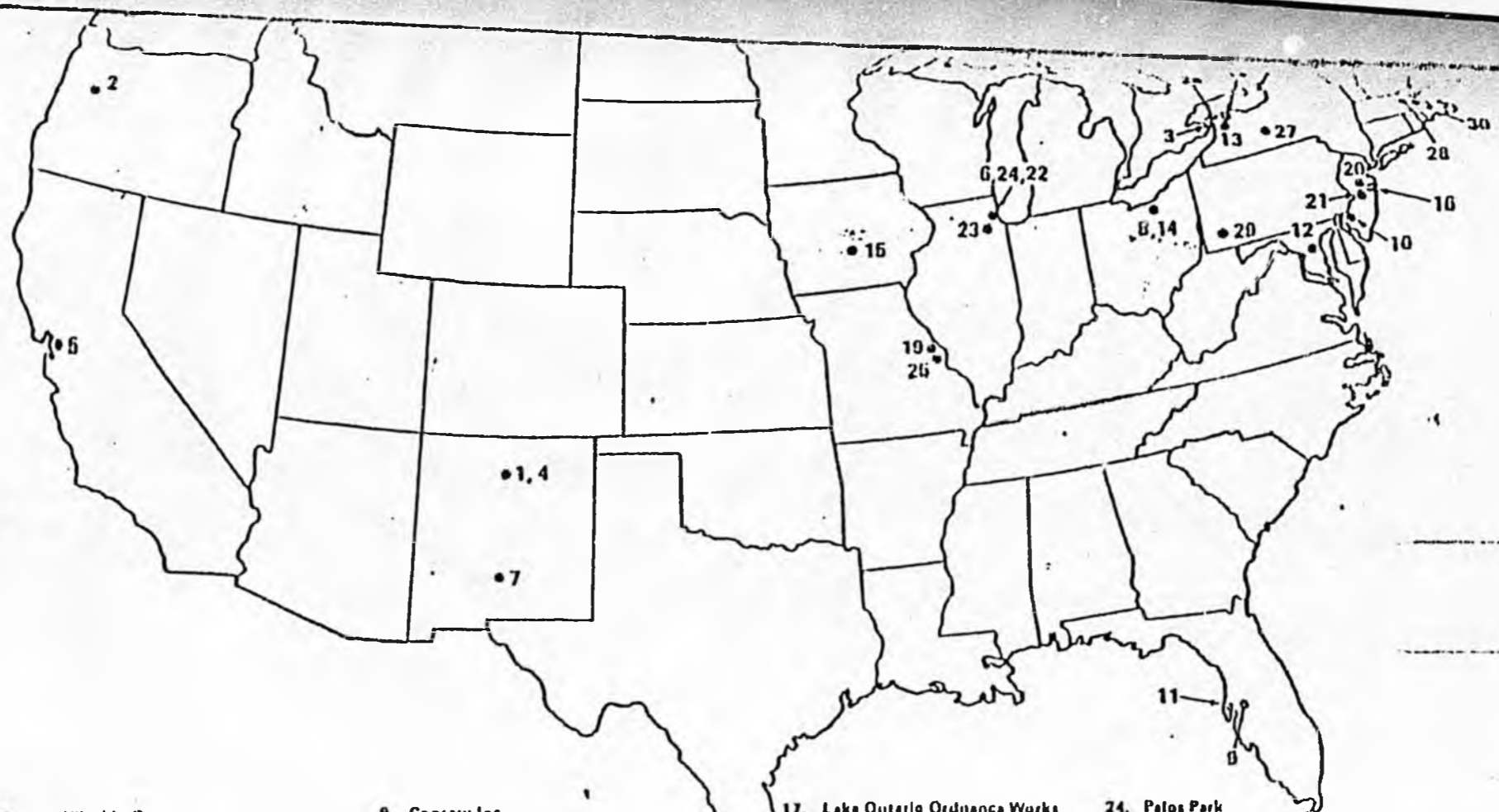
- Key**
- Operable
 - Under Construction
 - With Limited Work Authorizations
 - ▲ On Order

| | |
|--------------------------------------------------------------------|--------------------|
| 74 Reactors with operating licenses | 24,905 MWe |
| 87 Reactors with construction permits | 95,830 MWe |
| 2 Reactors with limited work authorizations | 2,300 MWe |
| 19 Reactors on order (including 2 units not sited on map) | 22,282 MWe |
| 182 Total | 178,400 MWe |

March 20 1980

Source: Atomic Industrial Forum, 1980.

9-3



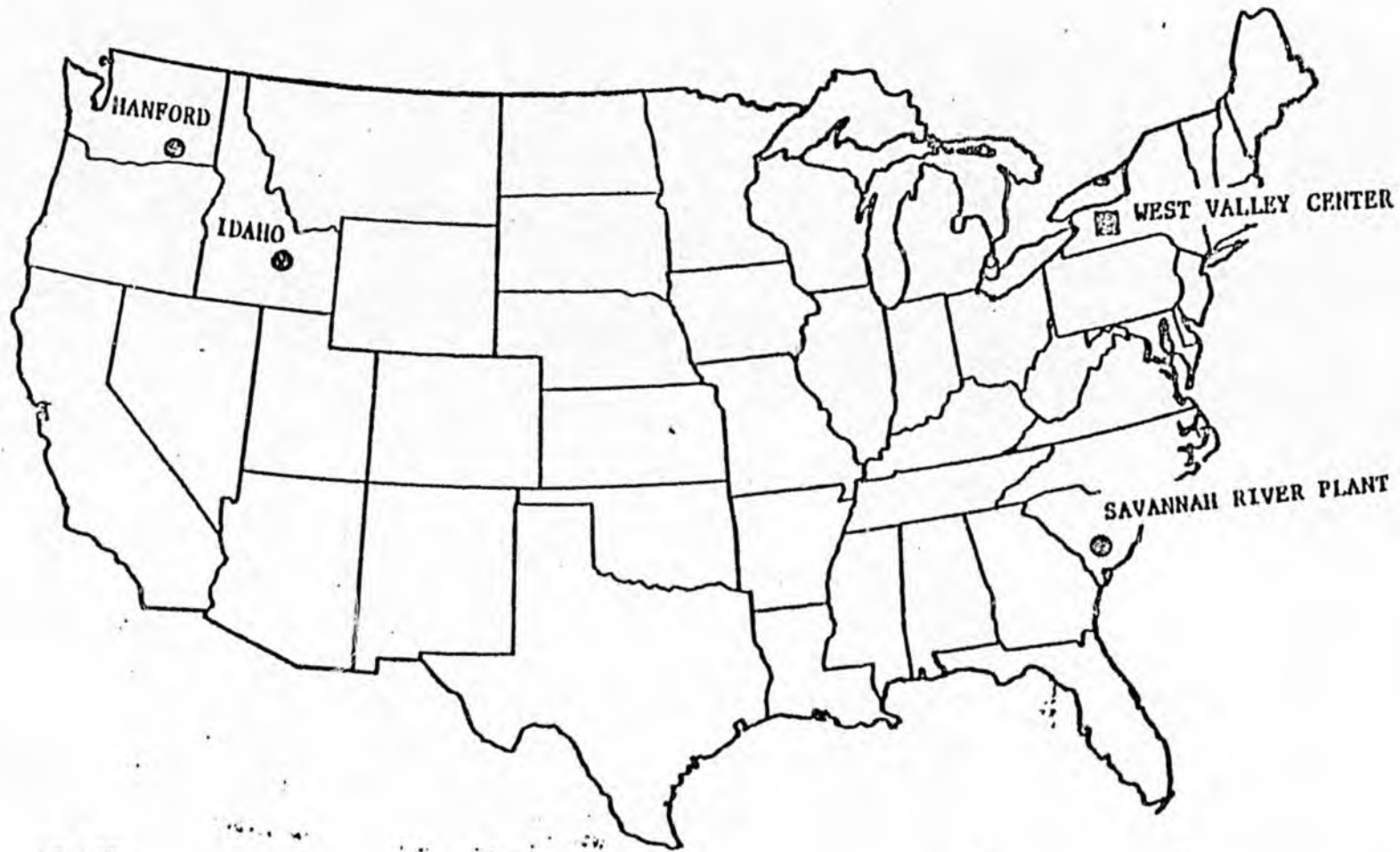
- | | | | |
|-----------------------------------------|---------------------------------------|----------------------------------------------------------|-----------------------------|
| 1. Acid/Pueblo Canyon | 9. Consav Inc. | 17. Lake Ontario Ordnance Works Associated Properties | 24. Palos Park |
| 2. Albany Metallurgical Research Center | 10. E.I. du Pont de Nemours & Company | 18. Linda Air Products | 26. St. Louis Airport |
| 3. Athland Company | 11. Gardiner, Inc. | 19. Mallinckrodt, Inc. | 28. Seaway Industrial Park |
| 4. Bayo Canyon | 12. W. N. Grace & Company | 20. Middlesex Landfill | 27. Seneca Army Depot |
| 5. University of California | 13. Guterl Steel Corp. | 21. Middlesex Sampling Plant | 29. Shipak Landfill |
| 6. University of Chicago | 14. Harshaw Chemical Company | 22. National Guard Armory | 30. Universal Cyclops, Inc. |
| 7. Cimarron Mesa | 15. Iowa State University | 23. Olin Chemical Company | 31. Ventrion Corporation |
| 8. Hylon Metals, Inc. | 16. Kellco | | |

FIGURE 9-1

LOCATION OF SITES THAT REQUIRE OR MAY REQUIRE REMEDIAL ACTION

source: U.S. Department of Energy, 1980.
A Report to the Congress to Accompany the
Proposed Residual Radioactive Material
Control Act (ORNL/Sub 80 13329/1).

3-2



○ DOE

■ COMMERCIAL

FIGURE 3-1

LOCATIONS OF HIGH-LEVEL WASTE STORAGE SITES

F-13

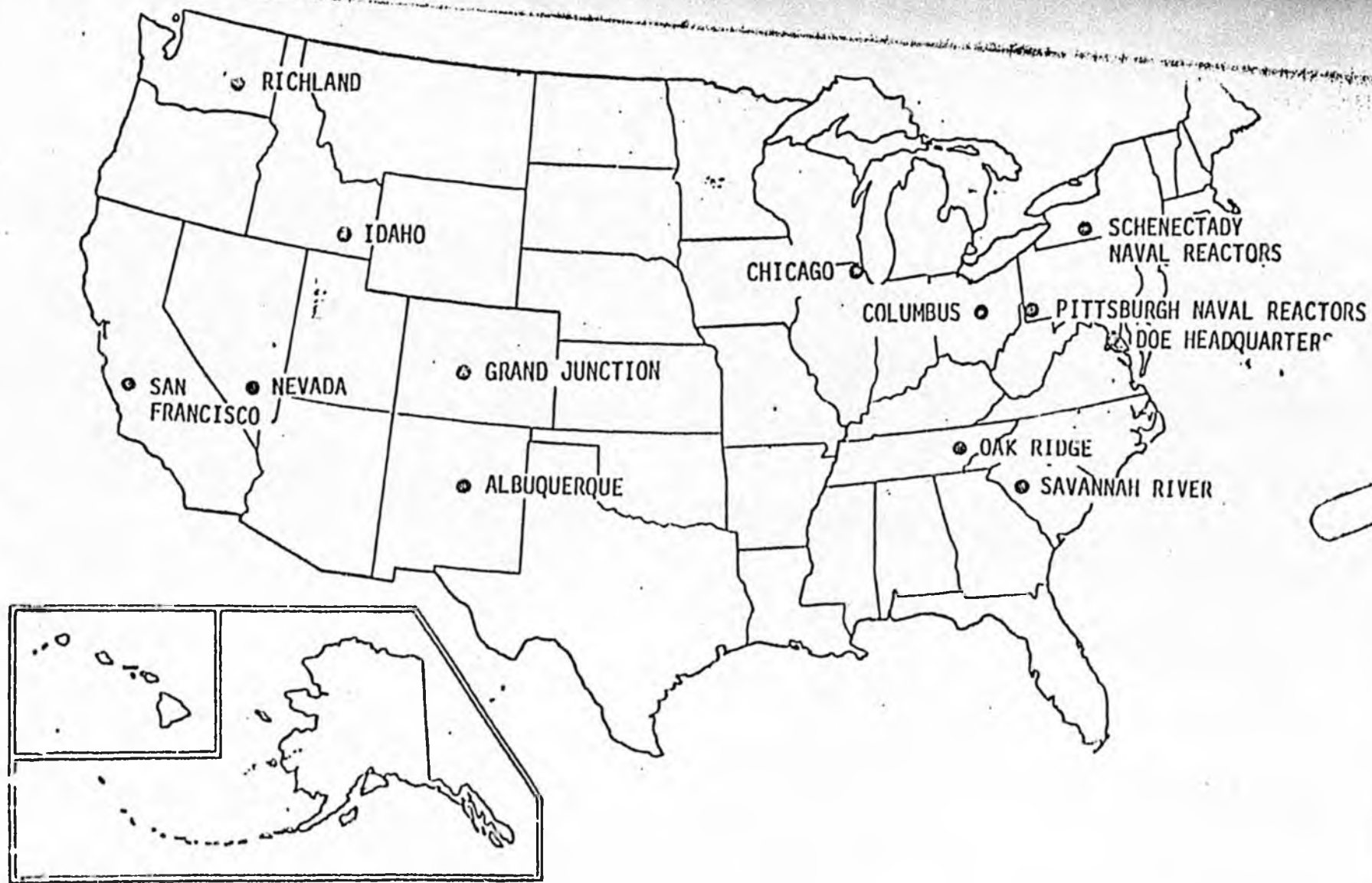
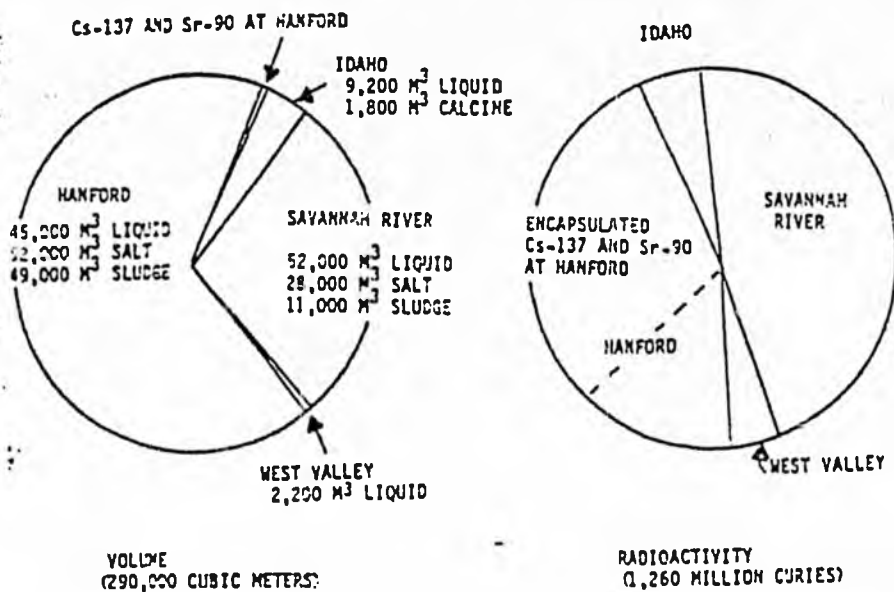


FIGURE F-3
DOE FIELD OFFICE LOCATIONS

The major classes of radioactive materials considered in this document are as follows:

- o High-Level Wastes--These wastes are generated in reprocessing and contain virtually all of the fission products and most of the actinides not separated out during reprocessing. These wastes are being considered for disposal in geologic repositories or by other technical options designed to provide long-term isolation of the wastes from the biosphere.
- o Transuranic Wastes--These wastes are produced primarily from the reprocessing of defense spent reactor fuels, the fabrication of plutonium to produce nuclear weapons and, if it should occur, plutonium fuel fabrication for use in nuclear power reactors. Transuranic wastes contain low levels of radioactivity but varying amounts of long-lived elements above uranium in the Periodic Table of Elements, mainly plutonium. This waste is currently defined as material containing more than 10 nanocuries of transuranic activity per gram of material.
- o Spent Nuclear Fuel--These are the irradiated fuel assemblies that are removed from a nuclear reactor after having served their useful life. This material (if declared waste) is considered for disposal in geologic repositories.
- o Uranium Mine and Mill Tailings--These wastes are the residues from uranium mining and milling operations. They are hazardous because they contain low concentrations of radioactive materials which, although naturally occurring, contain long-lived radionuclides. The tailings, with a consistency similar to sand, are generated in large volumes--about 10 to 15 million tons annually--and are presently stored in waste piles at the site of mining and milling operations.
- o Decontamination and Decommissioning Wastes--As defense and civilian reactors and other nuclear facilities reach the end of their productive lifetimes, parts of them will have to be handled as either transuranic or low-level wastes, and disposed of accordingly. Decontamination and decommissioning activities will generate significant quantities of wastes in the future.
- o Low-Level Wastes--These wastes exclude HLW, spent fuel, transuranics, and uranium mill tailings as defined above. Low-level wastes are generated in almost all activities involving radioactive materials and are presently being disposed of by shallow land burial.

(a) IN YEAR 1980



(b) IN YEAR 2000

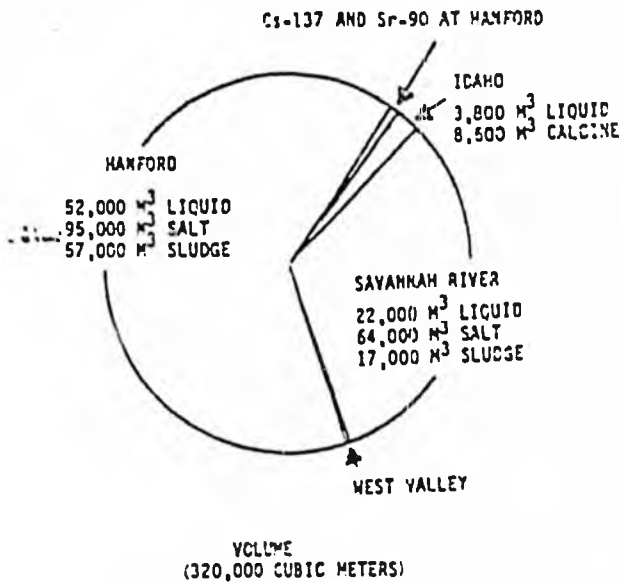


FIGURE 3-3
PRESENT AND PROJECTED QUANTITIES OF HIGH-LEVEL WASTE

Western Energy Update

Western Interstate Energy Board/WINB
2500 Stapleton Plaza • 3333 Quebec Street • Denver, CO 80207
303/837-5851 • FTS 327-5851

Staff Analysis 82-10
September 10, 1982

High-Level Radioactive Waste Bills: Comparisons and Contrasts

The 97th Congress has been wrestling with high-level radioactive waste legislation since early 1981, but despite strong impetus from industry and the Department of Energy, House floor action -- not to mention passage by Congress -- is far from assured. All three House committees with primary jurisdiction over the waste legislation have reported nuclear waste bills, and the bills now await House Rules Committee action. The Rules Committee not only must draft the rule for House floor action on the legislation, it also has jurisdiction over congressional veto provisions in each of the bills.

Several key members of the Rules Committee are vehemently opposed to federal away-from-reactor storage of spent fuel. Consequently, they are bent on blocking floor action on the legislation until they are assured that the legislation reaching the floor does not contain provision for federal AFR storage of spent fuel. One way to block the legislation is to hold hearings on the congressional veto provisions contained in the bill. Since the U.S. Supreme Court has agreed to review the constitutionality of one type of congressional veto provision, holding hearings on the provisions could be a convenient, legitimate way to stall floor action on the waste bill.

Even if the House does manage to pass waste legislation this year, prospects for full congressional passage are slim. It is unlikely that a conference committee could reach a compromise before the end of the session.

Failure to pass waste legislation this year would not be surprising in light of the controversial nature of the legislation and the history of past attempts to pass waste legislation. Congress has been entertaining high-level radioactive waste legislation for a number of years. During the 96th Congress, waste legislation was nearly passed, but disagreement among key congressional players over state veto of the location of a military waste repository within the state's borders thwarted passage of the legislation.

Interest in the waste legislation was quickly revived in the 97th Congress. Bills were introduced in both houses, and by November of 1981, the Senate Energy and Environment Committees both reported out waste bills, clearing the way for negotiation of a compromise bill for floor action. By December, the House

Science and Technology Committee reported out its version of the nuclear waste legislation (HR 5016).

In March 1982, the House Interior Committee passed its waste bill (HR 3809), and one month later, the Senate passed its bill (S 1662). House action slowed during the middle of 1982 as the House Energy and Commerce Committee, the last committee with jurisdiction over the full legislation, grappled with the nuclear waste issue and the Clean Air Act rewrite. While action in the Energy Committee was stalled, the Armed Services Committee which had jurisdiction over military wastes, approved the Interior bill with one modification. Finally, on August 4, the Energy Committee passed a waste bill (HR 6598). This cleared the way for House Rules Committee action.

The balance of this report analyzes the House nuclear waste bills, comparing them to the Senate bill, and provides a historical background on the federal government's efforts in high-level waste.

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Historical Background

High-level radioactive waste results from nuclear defense activities and reprocessing of spent fuel from nuclear reactors. In addition, spent fuel from nuclear reactors must be disposed of in the same way as high-level radioactive wastes if it is not reprocessed. High-level wastes from both defense and commercial activities are stored at several facilities around the country. Spent fuel from commercial nuclear power generating stations is currently being stored in pools at the reactor sites. At a number of the commercial reactors, available storage capacity is quickly being depleted, so there is significant pressure for the development of disposal capacity, and more immediately, interim storage capacity.

The federal government has been trying to develop permanent disposal capacity for high-level radioactive wastes and spent fuel since the 1950s. In 1957, pursuant to the recommendation of the National Academy of Sciences, the federal government began to concentrate on deep underground salt deposits as possible repository sites. In the early 1960s, Project Salt Vault began in Lyons, Kansas. Project Salt Vault took place in an abandoned salt mine. Experiments were conducted to evaluate salt's potential as a repository medium, to demonstrate waste emplacement equipment and techniques, to study the effect of heat and radiation on the rock and assess the overall feasibility and safety of handling radioactive wastes in an underground environment.

The results of Project Salt Vault were successful enough to prompt plans to use the mine as a pilot demonstration repository. Subsequently, geologists began questioning the suitability of the site because there were a large number of oil and gas exploratory boreholes in the vicinity of the mine. In 1972, information surfaced regarding the mysterious disappearance of nearly 200,000 gallons of water in a nearby salt mine. This event raised sufficient questions regarding the geologic integrity of the salt formation to warrant cancellation of the plans to construct a pilot repository.

In 1968, the federal government expanded its search for host rocks suitable for repository development by beginning to evaluate the Hanford basalt formation in Washington State. Concurrently, studies of salt formations in Kansas continued, and the investigations were expanded to New Mexico. In 1972, the United States Geological Survey began reconnaissance of Gulf Coast salt domes and bedded salt in the Paradox Basin of Utah and Colorado. In 1974, the Waste Isolation Pilot Project was proposed for New Mexico. This project is to be an underground salt repository for defense-related intermediate level radioactive wastes.

1976 heralded a significant development in the U.S. high-level nuclear waste disposal effort. In that year, the National Waste Terminal Storage program (NWTs) was announced. While the NWTs essentially was a continuation of the previous radioactive waste program, it was the first attempt to integrate the diverse projects that had been undertaken over the previous 20 years. Also in 1976, evaluation of tuff and granite formations at the Nevada Test Site began.

In 1979 and 1980, pursuant to a presidential directive, evaluation of nonsalt rock types was accelerated, and in 1981, development of a national geologic screening process began. The national screening process is not a part of the mainline program for identifying potential repository sites. The methodology for this screening process is currently being developed through its application to the Basin and Range Geological Province in the western U.S.

The key element to note about the development of the U.S. high-level radioactive waste disposal program is the fact that the program is the result of numerous incremental decisions rather than a comprehensive and coordinated program plan. As a result, the program has been met with suspicion and skepticism by the public and the states. Congress realized this problem with the program, when it determined that there was a need for a comprehensive nuclear waste policy act.

-4-

COMPARISON OF BILLS

Findings and Purposes

The Senate bill (S 1662) and the three House bills all contain similar Findings and Purposes sections. The bills all announce the finding that nuclear waste is a national problem, and with the exception of the House Science bill (HR 5016), all the bills specifically recognize that past waste disposal efforts have been inadequate. Finally, all of the bills find that state, public and tribal participation is essential to the waste disposal program. S 1662 and HR 5016 both include findings that nuclear power is important to the maintenance of a diversified energy base and that the lack of a clear program for the disposal of radioactive wastes unreasonably burdens the choice of nuclear power as an energy source. Those two bills also contain findings that technology exists to provide reasonable assurance that safe disposal of high level radioactive waste can be achieved. All of the bills, with the exception of HR 5016, contain statements recognizing the federal responsibility for developing disposal capacity for high-level wastes and the responsibility of waste generators for funding the development of waste disposal facilities.

All of the nuclear waste bills contain purposes sections that identify assumption of the federal responsibility and the establishment of a clear federal policy for the disposal of high-level radioactive wastes as basic purposes of the legislation. The bills also identify the purpose of establishing meaningful state and public participation. S 1662 and HR 5016 state that the purpose of the legislation is to authorize the Secretary of Energy to construct a waste repository, to establish a system of financing the waste program, and to provide for an integrated program.

The Interior and Energy bills, HR 3809 and HR 6598 respectively, include similar purposes and, in addition, include the purpose of establishing a schedule for the siting, construction and operation of a facility. In essence, all four of the bills do in fact establish such a schedule.

Definitions

Two definitions are of particular importance in S 1662. The definition of affected states is limited to states in which a waste disposal or storage facility is to be located. At least one state has expressed concern that this definition is too narrow. Two potential problems with this definition are immediately apparent. The first arises if a facility is close to, but not inside, the boundaries of a particular state. The bordering state could suffer socioeconomic and radiological problems that could be as severe as or more severe than those suffered by the host state. Second, the location of a site in one state could have significant transportation impacts on surrounding states. These transportation impacts could necessitate significant expenditures to upgrade roadways and upgrade emergency response plans, equipment and personnel. Consequently, it may be desirable to include other states, in addition to the host states, in the consultation and cooperation and impact assistance provisions.

A similar problem exists with respect to the definition of affected Indian tribes. While none of the House bills contain definitions of affected states and Indian tribes, the substantive provisions of all of the House bills limit consultation and cooperation provisions and impact assistance provisions to host states and Indian tribes.

Defense-Related Wastes

The House Science and Energy bills exempt facilities for defense wastes only from the requirements of the nuclear waste legislation, except for a provision requiring state consultation and concurrence and state veto with a one house override in the siting of defense facilities. The report accompanying the Science bill makes it clear that the provision exempting defense waste facilities is not intended to preclude the disposal of defense wastes in a repository with civilian wastes.

The Interior Committee bill does not exempt defense waste only facilities from the provisions of the nuclear waste bill. The Armed Services Committee, however, in its sequential referral action on the Interior bill, voted to exempt defense waste facilities from the bills provisions, while retaining a two house override for defense facilities.

The Senate bill includes language similar to that contained in the House Science and Energy bills, but with one major addition. The Senate bill requires the President to evaluate the disposal of defense wastes in the repositories developed for civilian wastes. The evaluation must take into consideration cost, efficiency, health and safety, regulatory, transportation, public acceptability and national security factors. Unless the President determines that separate defense and civilian facilities are needed, defense wastes will be disposed of in the repository constructed for civilian wastes.

Mission Plan

The requirement of a mission plan is unique to the House Science bill. HR 501b requires that DOE develop a mission plan. The mission plan is intended to be a blueprint for all programs authorized under the nuclear waste legislation. The mission plan must identify all information that should be available before responsible decisions can be made regarding the siting and construction of a test and evaluation facility or a repository; all such information that is not currently available; all financial, legal political and institutional problems that might impede implementation of the waste legislation; guidelines for evaluating the suitability of sites; and the known sites at which siting research (site characterization) activities should be undertaken. States and Indian tribes would be provided with an opportunity to comment on the draft mission plan.

Programmatic Environmental Impact Statement

Only the House Science Committee bill requires the preparation of a programmatic EIS.

Identification and Recommendation of Sites for Site Characterization

Each of the bills requires DOE to set forth guidelines for the recommendation of sites for repositories. The guidelines must set forth criteria that would qualify or disqualify sites; including geologic factors, proximity to natural resources, population, hydrology, and seismicity. The Energy Committee bill also includes proximity to national parks as a criterion. (Note: None of the bills include transportation as a criterion.) All of the bills require that the guidelines mandate the consideration of various geological media and require that, to the extent practicable, DOE recommend sites in different geologic media. The

Interior and Energy bills also contain specific population guidelines. The Interior bill precludes the location of a repository in any city, county, or township if it has a population greater than 2500 and a population density of 1000 people or more per square mile. The Energy Committee bill precludes the location of a repository in a county, city or township that has a population of more than 2500 or in an area in which there are more than 1000 people within one square mile of the site. There is some concern that the Energy Committee language will eliminate all sites now under consideration.

The Science bill requires DOE to identify at least three sites for siting research activities (site characterization) within one year of enactment of the legislation. The identified sites must include at least two geologic media.

The Energy bill requires that three sites in two different geologic media be recommended to the President within 14 months of the enactment of the waste legislation. Prior to recommendation of the sites to the President, the recommendations must be reviewed by the Repository Advisory Review Commission, a commission made up of seven presidential appointees. DOE must recommend at least three additional sites by 1985.

The Interior bill requires DOE to recommend to the President three sites in three different geological media within one year of enactment of the legislation. By 1985, DOE must recommend at least two additional sites, one of which must be in granite.

Finally, the Senate bill requires DOE to recommend to the President three site for site characterization before 1984. Two of the sites must be in different geologic media. DOE is required to recommend three additional sites for site characterization by 1987. The three additional sites will be chosen after a national site screening. The Senate bill requires at least two repositories, and the three sites recommended in 1987 will be used for selection of the second repository only.

All of the bills require that public hearings be held in the vicinity of the site prior to the recommendation of the site. In addition, all of the bills require notification to the governor of the state in which the site is located of the recommendation of the site for site characterization. The Secretary must include a detailed statement of the basis of the recommendation when it is submitted to the President and forwarded to the governor. The Energy and Interior bills require notification to the state legislature as well as the governor.

The House bills authorize additional recommendation of sites if the Secretary deems it necessary.

Presidential Review of Sites Recommended for Characterization

The Science bill does not require presidential approval for sites identified for siting research activities. The remaining bills provide for a 60 day review by the President, with an extension of up to six months. If the President does not approve or disapprove the recommendation within the 60 day or six month period, whichever is applicable, the site is automatically deemed approved. Governors or Indian tribes must be notified of approval or disapproval of a site by the President. (The Energy and Interior bills also requires notification of the state legislature.) Because only three sites will be characterized prior to selection

of the first repository pursuant to the Senate bill, that bill requires DOE to recommend an additional site within 60 days of disapproval of a site by the President.

All of the bills provide that none of the decisions made regarding the recommendation of sites for site characterization require NEPA compliance.

Site Characterization Activities

All of the waste bills require the preparation of an environmental assessment and the conducting of public hearings in the vicinity of the site prior to the sinking of a shaft for site characterization purposes. In addition, all of the bills except the Science bill require the preparation of a general plan for the site characterization activities. The general plan and the environmental assessment must both be submitted to the Nuclear Regulatory Commission and the governor (and legislature) or Indian tribe for comment, and DOE must take steps to minimize impacts identified by the environmental assessment or the comments.

The Energy Committee and Senate bills require consideration in the general plan of the suitability of the site for a repository. The Senate bill also states that DOE may not conduct activities not considered in the general plan, unless any requirement for an environmental impact statement under NEPA has been met.

The Energy Committee bill contains a provision authorizing site characterization activities for sites at which the location of the principal borehole was identified prior to August 1, 1981. This authorization is valid whether or not an environmental assessment or general plan has been prepared. The general plan and environmental assessment provisions must then be satisfied within two years of the enactment of the legislation. The provision is designed to prevent delay of site characterization activities already underway at sites such as the Hanford Reservation in Washington State.

All of the bills severely restrict the use of radioactive materials during site characterization activities.

With the exception of the limited provision in the Senate bill, site characterization activities are not subject to NEPA compliance.

Site Approval and Construction Authorization

The House Interior and Science bills contain virtually identical provisions governing the approval of a site for the final repository and the issuance of construction authorization for the repository. Under these two bills, DOE must hold hearings in the vicinity of all sites under consideration for the repository. Hearings must be held following site characterization at at least three sites before DOE can make a site recommendation to the President. Once DOE makes a decision, the agency must notify the governor and the legislature of the state in which the site is located, or if the site is located on an Indian reservation, DOE must notify the tribe. DOE must wait 30 days from the date of this notification before recommending the site to the President. The recommendation to the President must include a comprehensive statement of the basis for the recommendation. This statement shall consist of, among other things, an environmental impact statement that evaluates at least three sites and the comments of the governor and the legislature or the Indian tribe.

The President must recommend a site to Congress by March 30, 1987, and if the state or Indian tribe does not object to the recommendation, it becomes effective 60 days after submission of the President's recommendation to Congress. DOE must submit an application for construction authorization to the Nuclear Regulatory Commission (NRC) within 90 days after the recommendation becomes effective. The NRC must make a final decision on the construction authorization application by 1989 or three years after submission of the application, whichever is later.

The Science Committee bill contains an expedited presidential review and construction authorization provision when compared to that of the Energy and Interior bills. (It is also important to note that the Science bill only requires that three sites be recommended for site characterization; the Interior bill requires that five sites be recommended, and the Energy bill requires that six sites be recommended. The fact also contributes to the expedited nature of the Science bill's repository development schedule.)

Under the Science bill, DOE must hold public hearings only in the vicinity of the site DOE plans to recommend. After DOE decides to recommend the site for a final repository, it must notify the governor or the Indian tribe. DOE then submits the recommendation to the President, together with a repository development report. The repository development report must include an environmental impact statement, the views of the governor or tribe of the state or reservation in which the site is located, and the views of any other state that is directly affected by the repository siting decision.

The President has 30 days to approve the site, with automatic approval if the President does not make a decision. Unless the state or tribe objects to the siting decision, approval is effective 30 days after it is submitted to Congress. Within 30 days of the time that the approval becomes effective, DOE must file an application for construction authorization. The NRC must make a final decision on the construction authorization within two years of submittal of the application. The two year deadline can be extended for an additional year under certain circumstances.

Finally, the Science bill requires that construction of the repository be completed within six years of construction authorization. None of the other bills contain a similar construction deadline, but they do require DOE to develop a project decision schedule.

The Senate bill schedule also differs from the schedule contained in the Interior and Energy bills. This is primarily because the Senate bill provides for at least two repositories. Under the Senate bill, DOE, by 1986, must recommend a site to the President from the three sites that were initially characterized. By 1989, a second site must be recommended. Both recommendations to the President must be accompanied by an environmental impact statement. The EIS for the first recommendation need only consider the three sites that were initially characterized. The EIS for the second recommendation must consider all sites that have been characterized with the exception of the first site chosen. The second repository site recommendation must take into account the need for regional sites and the need to minimize transportation distances.

The President has 60 days to approve or disapprove a site. If the President disapproves a site, DOE has 60 days to recommend another site. Assuming that the state or Indian tribe does not object, DOE must submit an application for construction authorization within 120 days of presidential approval. A final decision

on construction authorization for the first repository must be made by 1989, and the final decision on construction authorization for the second repository must be made by 1992.

In order to ensure that at least two repositories will be built, the Senate bill limits the capacity of the first repository to 70,000 metric tons of spent fuel or its equivalent in high-level waste. Only the Senate bill requires more than one repository.

State Veto Over Repository Siting Decisions

The Senate bill and the House Energy Committee and Science Committee bills all contain similar provisions for state veto of the approval of a repository within that state's borders and a congressional override of that veto. Under the bills, a state may object to the approval of a repository site within its borders and a tribe may similarly object to the location of a repository within the tribe's reservation, so long as the objection is submitted before the site approval becomes effective. If an objection is submitted to Congress, at least one house of Congress must pass a resolution upholding the state objection or the site is deemed approved. Under the Science bill, Congress has 40 days of continuous session to pass such a resolution; under the Senate bill, Congress has 60 days; and under the Energy bill, Congress has 90 days.

The Interior bill also provides for state or tribal veto of a repository siting decision, but under this bill, both Houses of Congress must disapprove of the state veto by resolution or the state veto is valid. This type of congressional override, which gives the states far more power, is supported by the National Governor's Association.

State Consultation

At certain milestones in the repository siting process, DOE must notify the states of key decisions and submit reports to the states. These notification requirements are discussed in other portions of this analysis.

In addition to the notification requirements, DOE must engage in a process of consultation and concurrence, or alternatively consultation and cooperation, with states and Indian tribes that have potential repository sites within their borders. This includes all sites subject to site characterization activities. The House Science bill and the Senate bill require consultation and concurrence, while the Energy and Interior bills require consultation and cooperation. The distinction between concurrence and cooperation could be important in determining the extent to which DOE must seek to reach a resolution with the states over state concerns. The Energy and Interior bills and the Senate bill all require that the process of consultation be embodied in written agreement between DOE and the state or tribe, but only the Energy bill specifically requires that the written agreement be binding. The Science bill provides that DOE may enter into written agreements.

Financial Assistance to the States

All of the bills provide for financial assistance to the states. The Senate bill provides for payments to state and local governments to cover the cost of state involvement in consultation and concurrence and to mitigate socioeconomic and environmental impacts of a repository. No federal/state-cost sharing is required by the Senate bill.

The Energy bill provides for financial assistance to the states in which site characterization activities have been undertaken. Funds will be provided for review, testing and monitoring, and information gathering and dissemination with respect to siting and construction activities. Such funds will be available on a 90 percent/10 percent cost-sharing basis. Funds will also be available for mitigation of socioeconomic and environmental effects of a repository. No cost sharing is required for this form of financial assistance.

The Interior Committee bill contains provisions similar to the Energy bill, except that cost-sharing for the review and monitoring type of financial assistance is on a 75 percent/25 percent basis.

The Science bill also provides for 75 percent/25 percent cost-sharing for review and monitoring assistance, and in addition, the bill limits this type of assistance to \$3 million per year until a repository is approved for the site. The Science bill is also unique in that it provides for a flat rate of impact assistance for states once the site is approved for a repository. Under this provision, states will receive \$10 million per year until the repository is filled to capacity.

Test and Evaluation Facilities

The Senate bill and the House Science Committee bill both provide for the development of a test and evaluation facility. The Senate bill requires that DOE draw up a plan for the development of at least one test and evaluation facility. The express purpose of the facility is to demonstrate packaging, handling and emplacement technology and to further the demonstration of disposal of high-level waste and spent fuel. Congress must approve the plan before the facility can be constructed. The test and evaluation facility cannot be physically integrated with the first repository. State consultation and cooperation provisions apply to the test and evaluation facility, but there is no provision for state or tribal veto.

The Science bill requires that DOE begin development of a test and evaluation facility five years and four months after enactment of the bill at a site that has been characterized. The purposes of the facility are to focus repository siting research activities at the most promising site; to provide for integration of technological components in a functioning repository-like system; to provide for resolution of potential repository licensing issues; and to supplement siting data. Contrary to the Senate version, the Science Committee test and evaluation facility clearly can be expanded into a final repository.

A number of commentators believe the development of a test and evaluation facility is either unnecessary or a subterfuge for the development of the final repository without initially needing construction authorization. Those objecting to such a facility argue that many of the facility's purposes have already been fulfilled by other DOE programs.

Monitored Retrievable Storage

The House Interior and Energy bills and the Senate bill, all contain virtually identical provisions requiring DOE to submit to Congress a plan for the development of one or more monitored retrievable storage facilities. Submission of the proposal is to be accompanied by an environmental assessment. A limited environmental impact statement is required only if construction of the facility is authorized. DOE is authorized to make impact assistance payments to state and local governments to mitigate the social and economic impact of the construction of the facility. A monitored retrievable storage facility must be licensed by the NRC.

There is considerable disagreement over the need for monitored retrievable storage. Proponents of such a facility argue that significant technological breakthroughs are likely in the next several decades, so it would be foolish to commit the waste program exclusively to mined geological repositories. In addition, they note that monitored retrievable storage provides safeguards that are not associated with permanent repositories and allows for retrievability of spent fuel if reprocessing becomes attractive.

Opponents of monitored retrievable storage argue that development of such a facility would be an abdication of our responsibility to future generations because we would be passing on to them the wastes from our electrical generation. They also note that monitored retrievable storage would relieve the pressure on the Department of Energy to find a permanent solution to the nuclear waste problem.

Interim Storage of Spent Nuclear Reactor Fuel

All of the waste bills contain provisions relating to the interim storage of spent fuel. These provisions have sparked heated debate in Congress. Industry has been supporting federal away-from-reactor storage of spent fuel because many commercial reactors are reaching their onsite storage capacity. Industry argues that this problem was caused by the federal government's ban on fuel reprocessing and also the federal government's inability to develop permanent disposal facilities in a timely fashion. Opponents of federal away-from-reactor storage counter that interim storage of spent fuel is the utilities' problem and that dry cask storage is technically feasible and economically preferable to federal away-from-reactor storage.

The Energy, Interior and Senate bills all provide for research and expedited generic licensing for dry cask storage. They also provide for expedited approval of transshipments of spent fuel between reactors and reracking of fuel rods in storage ponds as ways to increase capacity. Finally, all three of the bills provide for limited, last resort federal away-from-reactor storage.

The Science bill provides for a DOE program to demonstrate dry cask storage of spent fuel at commercial reactors. The program will be undertaken in cooperation with industry, and the costs of the program will be shared, with DOE picking up 25 percent of the costs.

Financial Arrangements

All of the bills provide for a nuclear waste fund to finance the waste management program. This fund will be financed by nuclear utilities.

Effect of Legislation on Other Statutory or Legal Requirements

The Senate bill contains a provision that states that passage of the bill shall be construed to satisfy any legal or statutory requirement for the existence of or federal approval of a demonstrated technology for the disposal of spent fuel and high-level radioactive waste. This provision would have the effects of eliminating the need for the Nuclear Regulatory Commission's waste confidence rulemaking and legislatively overruling a California state statute that bans the construction of additional nuclear facilities in the state until a demonstrated

waste disposal technology exists. This provision of the Senate bill has been opposed by many states. None of the House bills contain a similar provision.

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TO: Legislators and Staff interested in Hazardous
Waste Site Clean-up

FROM: Donna Wise, NCSL Staff Director for *DW*
Natural Resources and Environment Committee

SUBJECT: Hazardous Waste Management: Requirements for
State Participation in Site Clean-up under
"Superfund"

DATE: August 27, 1981

The following information is intended to provide you with an update on the most recent actions taken by U.S. EPA to implement Superfund. This particular package is limited to U.S. EPA procedures and requirements to clean up the top 400 inactive hazardous waste sites in the country. While EPA may make minor revisions to this document, it will serve as the basis for all site clean ups to be executed during the coming year.

While that portion of the Superfund which is aimed at hazardous waste site clean-up is voluntary, states choosing to avail themselves of federal funds will be required to provide a financial matching share. Thus beginning with fall special sessions, state legislatures may be asked to appropriate the state contribution to site clean-up.

For instance, if a site, which was privately owned at the time of waste disposal, appears on the National Priority list of 400 sites, the federal fund will pay 90% of cleanup costs and future maintenance and operation - the State must assure 10% of the clean-up costs and long term maintenance and operation. If a site appears on the National Priority list and was publically owned at the time of disposal, the State will be required to pay at least 50% of the response costs and long term maintenance and operation.

Should a state choose to participate in this federal site clean up program, a cooperative agreement must be executed with U.S. EPA. The following draft document describes the Cooperation Agreement process.

Should you have any questions on the following information, please don't hesitate to contact me at (202) 624-5431.

NCSL Staff has selected the following sections of the EPA document on State Cooperative Agreements which may be of particular interest to state legislators.

- I. Purpose of the EPA/State Cooperative Agreement
for states wishing to undertake management
responsibility for site clean up.

- III. State Cooperative Agreement
procedures for executing a cooperative agreement
including those state financial assurances (state
match) which must be provided.

- IV. State Costs eligible for payment by the federal fund

- V. State Agreements
for those states which choose to rely solely on EPA
for the management of site clean up.

- VII. Glossary of terms

NCSL Contact: Donna Wise (202) 624-5431

SELECTED PORTIONS OF
INTERIM GUIDANCE

COOPERATIVE AGREEMENTS WITH STATES
UNDER THE
COMPREHENSIVE ENVIRONMENTAL RESPONSE, COMPENSATION,
AND LIABILITY ACT OF 1980 (P.L. 96-510)

U.S. ENVIRONMENTAL PROTECTION AGENCY
OFFICE OF EMERGENCY AND REMEDIAL RESPONSE

AUGUST 3, 1981

U.S. EPA Contact: Mr. Sam Morekas (202) 382-2456

I. PURPOSE

Section 104 of the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) of 1980 (P.L. 96-510) authorizes the President to enter into a Cooperative Agreement or a Contract with a State to allow appropriate response -- removal or remedial action -- to a release within that State consistent with the National Contingency Plan (NCP). By Executive Order, the President has delegated this authority to the Environmental Protection Agency (EPA).

This document instructs the Regional Offices in how to use Cooperative Agreements with the States for planning and implementing planned removals and remedial actions under CERCLA (commonly called "Superfund"). It does not address emergency actions (i.e., immediate removals). Guidance on this type of response will be provided at a later date. This document also provides guidance on agreements with States when EPA has the lead responsibility for the response action.

A Cooperative Agreement may be site-specific or may cover response at more than one site; however, careful fiscal reporting will be necessary to distinguish costs by site. This guidance covers procedures for site-specific Cooperative Agreements only, but procedures for multiple-site Cooperative Agreements will be basically the same.

The Cooperative Agreement assigns to the State and EPA precise and clear responsibilities for each phase of the response action. It must describe the State's plan for the response action and EPA's involvement in the action.

Under a Cooperative Agreement, funds are generally transferred to a State through a letter of credit. (See Section II-C.) For Superfund Cooperative Agreements, the letter of credit will be used for projects budgeted at \$1 million or less. To ensure accurate fiscal management of the Trust Fund, EPA is seeking an exception from the Office of Management and Budget to switch from letter of credit to the advanced method of payment or cost reimbursement method of payment for projects greater than \$1 million.

III. SUPERFUND COOPERATIVE AGREEMENTS

A. General

Superfund Cooperative Agreements may be negotiated with States that are willing and able to assume a management role for response actions.

B. Preapplication Procedures

1. Initial Clearinghouse Review

When the Interim List of Priority Sites is published, potential applicants should notify each clearinghouse of their intent to seek Superfund assistance. Since EPA and the States will develop plans for responses at these sites, States should notify clearinghouses of the response actions. Clearinghouse review is required at the time an application is formally submitted to EPA. Review is usually not required when changes are made to an existing Cooperative Agreement if such changes do not substantially alter the scope and purpose of the proposed action.

2. Preapplication Assistance

The Regional Offices and the States must work together to reach a mutually acceptable Superfund Cooperative Agreement delineating Federal, State, and joint responsibilities. The more issues that can be settled in the preapplication stage, the smoother the later stages will be. Preliminary work to develop detailed Statements of Work, refine costs estimates, and assign responsibilities should commence as soon as possible.

The following paragraphs discuss briefly the requirements that should be addressed during preapplication assistance with the State. The States and EPA must agree mutually upon the activities to be funded. Responsibilities that cannot be scoped out in the work plan (see attached sample work plans) should be addressed by Special Conditions.

3. National Contingency Plan

The activities covered by Superfund Cooperative Agreements must be consistent with the existing NCP, dated March 19, 1980, and the changes required by the provisions of Section 105 of CERCLA as interpreted by interim guidance.

4. Cost Recovery

EPA will use State documentation in its cost recovery actions. Therefore, the State must have procedures in place to assure the legal chain of custody of samples and materials taken from the site. In addition, the State must have a system that will document, with great detail, those costs incurred at the site. Additional guidance on cost recovery is being developed by the Policy and Planning Unit, Office of Waste Programs Enforcement.