EFFECTS OF MERCURY ON MAN AND THE ENVIRONMENT

HEARINGS

BEFORE THE

SUBCOMMITTEE ON ENERGY, NATURAL RESOURCES, AND THE ENVIRONMENT

OF THE

COMMITTEE ON COMMERCE
UNITED STATES SENATE

NINETY-FIRST CONGRESS

SECOND SESSION

ON

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THE EFFECTS OF MERCURY ON MAN AND THE ENVIRONMENT

WEDNESDAY, JULY 29, 1970

UNITED STATES SENATE,
COMMITTEE ON COMMERCE,
SUBCOMMITTEE ON ENERGY, NATURAL
RESOURCES AND THE ENVIRONMENT,
Washington, D.C.

The subcommittee met, pursuant to notice, at 10 a.m. in room 5110, New Senate Office Building, Hon. Philip A. Hart (chairman of the subcommittee) presiding.

Present: Senators Hart, Scott, and Prouty.

Senator HART. The committee will be in order.

Our first witness this morning was to have been the able Senator from Vermont, Mr. Prouty. Senator Prouty, who is a member of the Committee on Commerce, has called to say that he has continued to be detained at the office by some Vermont visitors. He suggests that we proceed with our next scheduled witness, following which we can give him notice and he can come over. His time is brief so it should not last more than perhaps 5 minutes.

I am told that, anticipating that Senator Prouty will be on for a while, the Corps witnesses will not be here for a while.

Let me do something I don't normally do. That is read my opening statement. I am a slow reader so perhaps when I finish our witnesses will be here.

OPENING STATEMENT BY THE CHAIRMAN

Today our subcommittee resumes hearings on the effects of mercury on man and the environment. We had hearings early in May in Michigan. Since then the situation regarding this pollutant has changed drastically.

In May it appeared that we were dealing with a water pollution problem confined to the Great Lakes. Now the nationwide reach of the damage is acknowledged. Additional information has also become available regarding pollution of resources other than water.

Putting it all together, the sum of the pieces of this unpleasant news is that we may now be experiencing one of the greatest environmental crises in our history. It has been reported that at least 17 States now are afflicted with unsafe mercury levels in water. Yet this alarming evidence may not reveal the true dimension of the problem.

At those hearings of ours in May, testimony of the Food and Drug Administration indicated that there is nothing sacred about the current safe guideline of 0.5 part per million of mercury in fish. The Food and Drug Administration representatives admitted that that guideline was based in part on the limits of our technological capability to detect and confirm the presence of lesser amounts of this chemical.

It was disclosed further that whereas a safety factor of 100 is generally used for the setting of residue tolerances in food—that is, once the highest safe level for man is determined, only one one-hundredth of that amount is generally allowed in food.

The safety factor of 100 is generally used for the setting of residue tolerances in food. Studies using a safety factor of only 10 provide the basis for the current guideline. And, finally, the Food and Drug Administration refused to go on record as saying that fish with 0.5 part per million of mercury was in fact safe. It seems to follow that as more sensitive tests for mercury detection become available, guidelines may well be lowered. The result may be a rather dramatic expansion of the delineation of the crisis.

Now this is said not to alarm but rather to alert those who have been reluctant to accept the full extent of the tragedy which has befallen us. It will be a major purpose of these hearings to attempt to add to our knowledge of the actual reach of that tragedy.

We will also be interested in pinpointing the weaknesses in our system which permitted the crisis to develop and, in attempting to determine what remedial action is necessary, to prevent future "mercuries."

In addition, it is hoped that we will be able to make some progress toward handling the problem, coping with the problem of compensation of those innocent victims whose means of livelihood now may be lost to them for some time to come.

Thus ends the prepared statement.

Normally it is the chairman who arrives late. And, relying on that general rule, the first of the scheduled witnesses has not yet appeared. This will give me some comfort the next time I am late.

I realize now that the distinguished citizen who was scheduled to be our fourth and concluding witness is present and I am delighted to welcome him.

I should explain that several weeks ago I spent a pleasant and, for me, very educational morning aboard a cruiser which Hope College of Holland, Mich., operates in a very unique body of water, which through a very narrow gap flows into and out of Lake Michigan.

There, several students who were spending the summer, and during the school year many students have used the boat as a very practical resource in their attempt to profile the lake in question, check the pollution levels, and in some cases assist in the instruction of high school teachers who are seeking to insure that our next generation understands more clearly in mind the enormity of this problem.

So I welcome the professor of chemistry of Hope College, Dr. David Klein.

STATEMENT OF DR. DAVID H. KLEIN, PROFESSOR OF CHEMISTRY, HOPE COLLEGE, HOLLAND, MICH.

Dr. KLEIN. Thank you, Senator Hart.

I have been studying this problem of mercury in the environment for almost 2 years now and I very much welcome this opportunity to present my views to you.

According to the count that I saw when I prepared this statement, 14 States have detected mercury contamination of their waters or their wildlife. That was a week ago. The numbers change quite rapidly but I don't think that will affect the argument. It must now be 17 or 20, something of that sort.

In any case the fact that mercury has been detected in only 14 States does not mean at all that the remaining 36 States are free from mercury contamination——

Senator HART. Doctor, I wonder, if, since you are just beginning, you would be willing to step aside for a few minutes while we first welcome and then invite our first witness, Senator Prouty, to make his statement.

STATEMENT OF HON. WINSTON PROUTY, U.S. SENATOR FROM VERMONT

Senator PROUTY. Thank you, Mr. Chairman.

I am sorry to be late. I had a group of young people from Vermont in my office and I wanted to visit with them.

Mr. Chairman, I have a rather lengthy statement which I will not read but ask that it be included in the record.

Senator HART. It will be placed in the record.

Senator PROUTY. Today I urged President Nixon to designate mercury a hazardous substance and recommend methods and means for the removal of mercury from lakes, rivers, and streams.

We are confronted with a problem which is the product of either our ignorance or inattention or both. I believe that mercury pollution now affects 20 States.

Senator HART. You arrived just as we were debating it. The professor said he had a count of 14 last week. In my opening statement I said 17. Now you raised it.

Senator PROUTY. I hope the professor was right. I note that Michigan and Vermont are States in which all commercial fishing has been banned. Investigations in Vermont reveal that mercury is present not only in lakes where there is industry, but in small remote ponds as well.

When small ponds produce fish contaminated beyond the safety level set by the Food and Drug Administration it is certain that the issue is far more complex than we had supposed.

My State is not heavily industrialized. It has none of the chemical industries usually identified as the prime sources of pollution. Almost no agricultural mercury seed grain is used. The orchards discontinued the use of mercury many years ago. So did most milk testing plants and paper processors.

Where does the mercury come from? That is the problem we are confronted with at the present time. Undoubtedly it has existed for over

a period of many years and unfortunately we are just now discovering the seriousness of the problem.

I wish to take this opportunity to congratulate the Senator from Michigan, the chairman of the subcommittee, for conducting these hearings and I hope and know that as a result of his efforts and those of others we are going to learn more and more about this problem and the possibilities for its solution.

Mr. Chairman, I am very grateful for the opportunity to be here.

Senator HART. Many, many thanks, Senator. Your suggestion that you have made to the President indeed is something that we will look at thoroughly today and tomorrow in these hearings in juxtaposition with other proposals that we undoubtedly will hear. I think the suggestion is all to the good.

I sense the enormity of our ignorance and the tragedy and cost that that lack of knowledge is posing. It is not surprising that one who over the years demonstrated such concern with respect to environmental damage as you would this morning make this further contribution. I know how busy you are.

As a member of the committee I hope you can stay, but we will certainly understand if you have to slip off.

Senator PROUTY. Thank you very much. Before I came to Congress I was chairman of the Vermont Water Conservation Board. We were concerned with pollution problems, and I think the State of Vermont has done an outstanding job. However, we have been stunned by our ignorance with respect to this particular aspect of pollution.

Thank you very much.

Senator HART. Thank you.

(Senator Prouty's statement follows:)

STATEMENT OF HON. WINSTON PROUTY, U.S. SENATOR FROM VERMONT

I would like to thank the Senator from Michigan for his continued concern about the grave problem of mercury poisoning, one which has mushroomed since first becoming a matter of concern for the Great Lakes states some months ago. As we all know, at least 20 states are now experiencing major problems with mercury contamination. We are rudely confronted with the product of either our ignorance or inattention, or both.

Although it took us in the United States somewhat by surprise, we should have been prepared because mercury poisoning is not a totally new phenomenon. In the last decade Japan has suffered two crises of mercury poisoning, resulting in nearly 100 deaths and many cases of birth defects. Mercury poisoning in the past six years has left 35 dead in Iraq, 4 in Pakistan, and 20 in Guatemala. In December of last year, three children in New Mexico suffered permanent brain damage after eating pieces of a hog bred on mercury-treated seed grain.

In 1965, the Swedish Royal Commission on Natural Resources established the relationship between mercury pesticides and a large decrease in the bird population. In 1968, it was the Swedish delegation to the Codex Committee on Food Additives which presented concrete evidence of how mercury effluent from industrial production contaminates fish.

The toxicological, or poisoning, process of contamination is similar to that of DDT. Inorganic mercury (of which the U.S. annually dumps over 6 million pounds into its waters) is highly insoluble in water, and, therefore, of little danger to fish. However, it is taken into the food chain by micro-organisms which are in turn eaten by predators and so on up the food chain, until the mercury, now in a methylated organic form, is taken into the systems of the perch, walleye, carp, et cetera, and finally on to man, last link in the food chain. At each stage, the mercury is more concentrated.

When the highly compounded methyl mercury finally does reach man, it can cause neurological and brain damage, as well as injury to the liver and kidneys.

Studies have shown the ease with which mercury in its methylated form can penetrate both the placental barrier and brain barrier, causing severe birth defects. In all cases, 10% of all the mercury we ingest goes to the brain; it is lethal to brain cells.

The mercury effluent remains in the environment from 10 to 100 years after dumping. This fact must not be lost on those who would urge delay in implementing mercury control.

Mr. Chairman, you and the other members of your Committee are aware of the problem. At hearings in Mt. Clemens, Michigan, you wondered aloud why, if mercury dumping was practiced in many states, contamination had only been discovered in the Great Lakes area. Today, we know that 20 states have mercury-contaminated waters.

Some states have now been forced to ban all commercial fishing in their waters due to actual or suspected mercury poisoning in fish. Michigan is one, Vermont is another. It is not necessary for me to describe the unavoidable hardships imposed by this ban. But several aspects of the Vermont case will, I think, interest you.

Following the ban on fishing, the State Agency of Environmental Conservation instituted a task force to undertake a complete study of the mercury problem.

After becoming aware of the troubles experienced along the Great Lakes, we were not surprised that our own Lake Champlain should have substantial amounts of mercury contamination. The figures show poisoning in fish as high as 1.4 parts per million in the Outer Mallets Bay zone, and 2.0 parts per million in the Missisquoi River (The Food and Drug Administration says that .5 parts per million or mercury is dangerous to human life and must be dealt with). These are areas which we checked first, as they have a certain amount of industrial concentration, and so were considered most probably to contain mercury.

But the, as a matter of course, the task force checked Lake Memphremagog. I am sure that you can appreciate our amazement at finding levels of mercury in excess of .5 parts per million, since we are unaware of any industry now or in the past that has used any appreciable quantities of mercury in that region of Vermont or Canada.

Then it became apparent that we had a new ballgame. Consider an area like Silver Lake. It is located in the Green Mountain National Forest, atop a mountain and accessible only by four-wheel drive vehicles or by pack trip. It has no industry whatever—but it does have mercury contamination.

When Joe's Pond in Danville, Vermont produces fish contaminated eight times beyond the level set by the FDA, *we are warned that the issue is far more complex than we had supposed.* Presently, fish from all bodies of water 20 acres or larger are being analyzed. In almost every case, the findings show substantial amounts of mercury poisoning.

Vermont is not a heavily industrial state, and has none of the chemical industries usually identified as the prime polluters. Almost no agricultural mercury seed grain is used. The orchards discontinued use of mercury years ago. So did most milk testing plants and paper processors. So where does the mercury come from?

Mr. Chairman, we realize now more than ever that this is no simple matter and that mercury pollution must be attacked from a number of fronts.

There are numerous other areas in which further research is urgently needed. One of the possible sources of pollution cited by our task force in Vermont is fallout—but, this is just a hypothesis. We know, too, that there is mercury naturally present in the environment, but are not sure how this affects our ecological balance. We in Vermont are doing all that we can, assisted by the facilities of our universities. Additionally, at my request, a program of sampling is now being undertaken by the U.S. Public Health Service. Yet the resources of a single state cannot solve all aspects of this nationwide problem.

Finally, we have come to realize that we can no longer afford to let these problems sneak up on us. With each day's dumping leading to some mercury contamination for 10 more years, we must anticipate the next ecological crisis. In Vermont, once we finish our investigation into mercury, we shall study lead, and continue with other minerals, until we are satisfied that we are not sacrificing permanent health to present convenience. After fish, we shall move to study muskrats, ducks, and other aquatic animals. Again, there is too much to do.

At the moment, we are stunned by our lack of knowledge. We cannot even identify all the sources of mercury contamination. Vermont is only a small state, but we are doing, I feel, a truly outstanding job of research to combat mercury pollution. I hope that other states which do not feel themselves threatened by

the problem will take a hard second look. I hope states which mistakenly feel that by stemming the flow of mercury effluent they will end their troubles will learn from our experience in Vermont. And most of all, I hope that our state efforts will now be complemented by increasing concern from the Federal Government. Vermont's predicament is now the nation's problem.

Nationwide it is apparent that action is essential in three areas—assurance that (1) no contaminated fish are sold in the marketplace, (2) prevention of industrial effluent of mercury, and (3) development of a long-range problem of information, analysis and transfer which will be adequate to prevent unintentional pollution.

First, we must be sure that all contaminated fish are removed from the market. It is the responsibility of the Federal Government to ensure that dangerous food fish are not introduced into interstate commerce, by co-operating with state authorities to sample and test for contamination.

While removal of the adulterated fish solves the short-term health hazard, secondly industrial effluence of mercury must also be halted. The Department of Interior is moving hard against mercury pollution. Two weeks ago, Secretary Hickel threatened court action against mercury polluters, and ordered the Federal Water Quality Administration and the U.S. Geological Survey to seek out polluters. He also wired the governors of 17 states where mercury pollution has become a major problem to urge them to take action at the state level. Last week he asked the Department of Justice to move against companies which have refused voluntary self-restraint.

Justice now says that they will bring suits against eight of these corporations, under the Refuse Act of 1899. The Administration has thus taken a large step forward. Establishment of minimum levels at which the government will act frees the states from the competition for business which sometimes causes ecological havoc. However, President Nixon also has the power, granted in the Water Quality Improvement Act, to designate mercury a "hazardous substance" and to recommend methods and means for the dealing with them when they become a problem? Before the crisis becomes more alarming, this should be done.

But the Administration must also realize that an end to an effluent is not an end to contamination. In view of Vermont's problems, and with the realization that Vermont is not an industrialized state, I feel that the present Federal concentration on large industries may in the end be misleading. Unless the larger industrialized states are aware of the findings we are getting in Vermont, they may very well end up in a complacent mood feeling that if they only zero in on large industrial users and figure once they correct that situation, all is well. (How many industries are there in Detroit compared to Vermont?)

Finally, we need to assure the acquisition and exchange of information on all matters of environmental pollution. To begin with, the present level of contamination labeled "dangerous" set by the FDA at .5 parts per million is only an "interim guideline" based on a safety factor of only 10 instead of the more usual 100. More study is needed to determine how much mercury we can allow the human body to consume. The formation of the Environmental Protection Agency will be an important step forward in researching and administering pollution control.

Should we fail to remove the contaminated items, fail to plug the sources of pollution, and fail to establish the means for interrelated study and legislative review of the problem, the consequences are staggering. As mentioned previously, once dumped, mercury will remain present in the environment from 10 to 100 years. Further, it concerns me that we have developed no practical way to remove mercury from our river beds. At present, scientists are at work on various types of absorbent clays which might be introduced into our waters to tie up mercury and eliminate it from the food chain without altering the ecological balance. But as yet they have found nothing workable. In the meantime, what options are open to us in those states so heavily burdened with mercury pollution?

First, the mud from the river-bottom containing the mercury can simply be removed. This would of course be terribly expensive, and result in unknown dangers to the whole environment.

Second, particularly offensive areas could be diked off. But aside from the resulting imbalances, this is only a partial measure. No matter where the mercury itself is dumped, it soon becomes generalized throughout the area as it is passed through the food chain. In bodies of water which have no known source of industrial effluent mercury, this method is useless.

In short, awaiting further scientific progress, we have no recourse against mercury already present in our waters. The mercury dumped while I am speaking will plague us for decades, and will probably end up in our own system.

What we have learned about mercury recently indicates that what we see and know about pollution is not as frightening perhaps as the unknown and unseen.

Perhaps it is wise to interject an optimistic note. I believe there is some reason for optimism. We have seen a change in the basic approach of government from the day it was only a referee among interests competing for resources to the day when government must be considered the trustee of the environment for all the people.

It must administer this trust not with stop-gap measures to halt specific abuses but with a clear top priority national goal of a quality environment for all. We must channel our wealth into protecting our future. If we fail to do this, we must be confronted by an environmental catastrophe that would render our wealth meaningless and which no amount of money ever could cure.

Ending on this note, Mr. Chairman, I would like to thank you for giving me the opportunity to testify on this most important and crucial matter, and I eagerly await the recommendation of your Committee upon which we can act.

Senator HART. Doctor, you had just begun.

DR. DAVID H. KLEIN—resumed

Dr. KLEIN. I am sure the figure 20 States is more likely correct than my 14 and as time goes on it will hit 48 to 50 States. In any case the fact that mercury contamination has not been found in a State doesn't mean it does not exist, but simply means the contamination has not yet been located.

Any State on whose waters there is a mercury cell chloralkali plant has a mercury pollution problem. Any State which permits the use of mercury-containing chemicals in agriculture has a problem. Any State which has papermills or chemical plants using mercury catalysts or almost any mercury-using industry has a problem.

The existence of this problem in the United States came to light just over 4 months ago when the Canadian Government banned the sale of fish caught in Lake Saint Clair because of their elevated mercury content. Officials of Federal and State agencies charged with protection of the environment, and officials of mercury-using industries, were all surprised by the discovery of mercury pollution here.

That surprise was itself surprising since Sweden 5 years ago experienced exactly what the United States is experiencing now and described its problems in the open literature. In January 1966 Sweden sponsored an international conference entitled "The Mercury Problem," and anyone attending that meeting or reading its published reports would know immediately that the mercury pollution which was occurring in Sweden was also occurring in the United States.

That conference, incidentally, included in its list of participants five U.S. Government scientists affiliated with the Office of Science and Technology, the Department of the Interior, the Department of Agriculture, and the Public Health Service.

Clearly, the reports of these men never reached anyone with both the authority and the will to take appropriate steps to protect our environment. Another international conference on mercury pollution, in May 1967, was sponsored by the International Atomic Energy Agency. The results of this conference also escaped the attention of responsible officials in industry and in State and Federal Government.

The publications which first described (in English) the Minamata Bay poisonings, and which correctly attributed these poisonings to an industrial discharge of mercury compounds into public waters, appeared in 1960 and 1967. The information presented in these publications, predictably, did not appear to generate any particular excitement within the various environmental protective agencies in this country. Thus, until 4 months ago, officials of Government and of industry were able to ignore what had been learned in Sweden and in Japan and were able to convince themselves, without ever making a measurement, that the United States was somehow immune to mercury pollution.

Like all elements, mercury moves through the environment by natural processes, primarily the erosion of rocks, followed by river transport to the oceans. Natural processes probably move about 5,000 tons of mercury trough the environment each year, worldwide.

Over thousands of years, nature has evolved so that these quantities can be tolerated, and organisms which are particularly sensitive to mercury poisoning do not live in areas where natural levels of mercury are high. At present, the activities of man move approximately an additional 5,000 tons of mercury through the environment, but the added mercury is concentrated in a relatively few locations, and nature has not had time to evolve, to handle the extra burden.

About a quarter of this 5,000 tons is released in the United States—about 5 grams per person per year. The chloralkali industry alone has been contributing 2 grams per capita per year. Certainly these are small amounts, but the toxic amounts are also small. For example, a 14-year-old boy was left permanently mentally retarded after eating Minamata Bay fish for 10 days. This boy probably ate no more than five-hundredths of a gram of mercury. We are being supplied with much more than that quantity now.

Senator HART. Doctor, this shows that I am a Greek and history fellow and really have trouble understanding this. You say that that 10-day period he had about .5.

Dr. KLEIN. .05 gram. The case is cited of this lad who ate 50 milligrams. If you estimate that the kid eats about a pound of fish a day and you estimate that that fish is 10 parts per million mercury, he was in that region at Minamata Bay for only 10 days and could have eaten that fish for only 10 days. A little multiplication is that he ate something like .05 gram of mercury. The concentration in the fish was higher.

Senator HART. My question is I would assume that there had been people, adults as well as youth, who lived in that region who over a longer period of time have consumed more fish than that boy did in 10 days. Was it the intensity—was it the fact that it all went in in 10 days rather than more over 10 years——

Dr. KLEIN. That is very hard to say. About 1 percent of the people living in the area were poisoned. You can assume that they ate about 2 milligrams per day of methylmercury. That would be an average number for fish eaters. I suppose there are a few Japanese who don't like fish either but I suppose the average would be 2 milligrams a day.

I took this case because it was possible to isolate what his total dose had been since he had that exposure for a defined period of time.

Senator HART. Thank you.

Mr. KLEIN. Most of the annual 5 grams of mercury per capita is discharged into public waters, and when an industry discharges mercury or its compounds into a waterway, the biota of that waterway will accumulate it. All heavy metals tend to concentrate from water into fish and shellfish, and for mercury the concentration factor is about a thousand. That is based on data taken in 1934 so it is not very new.

That is, if the concentration of mercury in unpolluted natural waters is about 0.1 part per billion, fish living in these waters will have a natural mercury content of 0.1 part per million. Thus nature, instead of acting to minimize the mercury problem, acts to amplify it.

Nature acts in another even more drastic way to amplify the mercury problem, by converting inorganic mercury to methylmercury in natural waters. This conversion can be brought about by microorganisms living in sediments, and via several other routes. Methylmercury concentrates in fish much more readily than does inorganic mercury; the concentration factor may be as high as 1 million.

Further, methylmercury is much more toxic to man than is inorganic mercury. The toxicity and concentration effects are illustrated by some data on the Minamata poisonings. The waters of Minamata Bay apparently contained about 0.3 parts per billion total mercury, and less than 5 percent of the total, say 3 percent, entered the bay as methylmercury. Bay waters containing 0.01 parts per billion methylmercury led to fish and shellfish containing 10 parts per million methylmercury, and eating these fish caused 116 officially recognized poisoning cases, and 43 deaths, in a population of about 10,000.

I might add that the definition of a poisoning case was quite rigorous. It took more than one or two or three symptoms of methylmercury poisoning to be officially categorized as poison. There are many more cases with only a few symptoms who escape these statistics all together. Because of the high toxicity and concentration factor, it is essential to avoid any entry of methylmercury into natural waters. A daily input of only 10 pounds of methylmercury into the St. Clair River would be sufficient to drive the mercury content of the fish to 10 parts per million, the Minamata concentration, even though the flow of the river is very large.

Let me illustrate the toxicity and concentration more. One can visualize 10 pounds fairly easily but the flow through the St. Clair River is more difficult. The flow through there is about the same as the flow over Niagara Falls. Niagara Falls has a little more water than the St. Clair River but it is about the same.

If we picture all the water which flows over Niagara Falls in a day, dissolve in that water 10 pounds of mercury as methylmercury, that will be sufficient eventually to drive the mercury concentration of the fish to those Minamata Bay concentrations.

Senator HART. How long is eventually?

Dr. KLEIN. That depends on how many fish are there. How much they store in their bodies. It doesn't take very long. A couple of days. If you did this for a few days—there is some rate factor there that I don't understand but "eventually" is not 50 years.

Seantor HART. We are talking about a matter of weeks at the most.

Dr. KLEIN. I believe we are talking about a rather short time.

In a waterway with a smaller flow, correspondingly less mercury would be enough. These small amounts of methylmercury could enter

the water in several ways: directly, as methylmercury from agricultural runoff or carelessness in industries using mercury catalysts, or indirectly, by conversion of phenylmercury used as an industrial fungicide and disinfectant in paint, the paper industry and others, and by conversion of inorganic mercury from chloralkali plants, mercury battery plants, etc. In fact, since any mercury which enters natural waters may be converted into methylmercury, there appears to be no basis for permitting the discharge of any mercury into any stream.

To date, cases of mercury poisoning in the United States have been either attempted suicides or accidental poisonings resulting from failure to follow the precautions printed on the label of agricultural mercurials. There have been no known outbreaks of mass poisonings analogous to the Minamata poisonings.

The most polluted Great Lakes fish contain nearly as much mercury as the least polluted Minamata Bay fish, but since, as a rule, we don't eat much fish, there probably will be no poisoning outbreak of the Minamata Bay magnitude.

However, among those groups for which fish is a major part of the diet, for example, some Indian tribes living along mercury polluted rivers, there may indeed be clinical cases, especially among the children. At Minamata Bay, some 5 percent of the children born during the epidemic had congenital mercury poisoning; although, most of their mothers showed no symptoms.

Such children born in the United States would probably be diagnosed as cerebral palsy or mentally-retarded. Among adults, the early symptoms may include personality change, numbness of the extremities, narrowing of the visual fields, tremor and similar vague symptoms which make life less pleasant for the afflicted individual and for those with whom he comes in contact.

These symptoms are due to destruction of brain tissue. Certain chromosome defects have also been observed in persons who ate three meals a week of fish with elevated mercury content. The long-term effect on humans of ingesting small amounts of methylmercury is unknown, but it would seem advisable to try to stop all human ingestion of methylmercury until adequate animal experimentation is done, to establish a realistic safe limit in the United States.

Mercury enters the human food chain by foods other than fish. There is evidence that the grain grown from mercury treated seeds contains higher concentrations of mercury than grain grown from untreated seeds. There is good evidence that the mercury compounds sprayed on apples and potatoes to control fungi are translocated to the edible portions. Current FDA regulations apparently allow no residue of mercury in foods, and since the use of agricultural mercurials does leave a mercury residue, I do not understand why these compounds are still in widespread use.

Banning the discharge of mercury to our waters, and discontinuing the use of mercurial chemicals in industry and agriculture may cause some economic hardships. On the other hand, the free discharge of these toxic materials to the environment has already taken away the livelihood of many commercial fishermen, has destroyed a large part of our recreational hunting and fishing, and has presented a severe health hazard to the general public. The mercury problem is real, it is widespread, and it will not go away for a very long time.

Now there are a couple of comments that I thought of after I prepared this. If I understand the situation correctly, the prosecutions are now under the Rivers and Harbors Act.

Senator HART. The Refuse Act, yes.

Dr. KLEIN. In any case, If I understand that act, that excludes from its bounds municipal wastes, isn't that right? Municipal sewage?

Senator HART. Sewage.

Dr. KLEIN. Now it seems to me that there is an appreciable concentration of mercury which enters municipal waste lines. I calculated once from the tabulated usages of mercury that a million people will put into municipal sewage lines about 1,000 pounds of mercury per year so that coming out of the sewers of Detroit, Windsor, and whatnot, there may be 2,000 or 3,000 pounds per year of mercury into that first waterway and that is specifically excluded from prosecution under the present act.

Further, that stuff is collected exactly under the circumstances in which the conversion from inorganic mercury to methylmercury is most likely. I don't know what that is worth but I threw it out.

Senator HART. Clearly it is worth this: If that is correct, we better hurry up and amend that Refuse Act.

Dr. KLEIN. It seems that way, yes.

Senator HART. What do we do about municipal waste?

Dr. KLEIN. I believe it is possible to discontinue most of the uses of mercury that go into municipal waste. There is a very large use of hospital disinfectants. In Detroit, this is something like 900 pounds a year. That is a healthy piece of the total mercury from that single use, hospital disinfectants.

Senator HART. Are there alternative elements that can substitute for mercury in the municipal waste treatment with the same degree of effectiveness?

Dr. KLEIN. I don't think I understand.

Senator HART. Let's assume we say no mercury in the municipal treatment. Is there some substitute that can be used?

Dr. KLEIN. Oh, I misled you, I am afraid. The treatment plants don't use mercury. This comes down sinks and toilets and drains from all over Detroit. This is hospital disinfectants, rinsing out paint brushes after you have painted a wall with Latex paints. A large number of small uses like that which add up.

Senator HART. Well, again, as we turn the pages in this story we find more and more things to concern us.

Dr. KLEIN. Right. That is one more.

Now I will go a little more if I may. I looked through an old German paper—almost everything it turns out is in the old German literature somewhere. Back in 1934 the quantity of mercury eaten by the average German was measured. Germans used to like to do that sort of thing.

Well, it turns out that the normal diet in 1934 was about 35 micrograms per week. I don't think the units will be too important. I will try to keep them consistent. That is 26 years ago. About 34 micrograms per week eaten; 35 rather.

Now I tried to analyze what might be ingested by somebody living in the United States and I found a standard low-cost diet for an active U.S. male in a handbook somewhere and tried to estimate as best I

could the concentrations of mercury at harvest time in the food such a person was likely to eat.

If he eats no meat at all he will ingest 300 micrograms per week. If he eats a little regular meat he will be up to 350 which is 10 times the quantity he would have eaten had he lived in Germany in 1934. If all the meat in his diet—it was only 2 pounds a week in this particular diet—had been fish at a half part per million his total intake would have been 750 micrograms per week.

Now the best study that I know of which describes how such mercury is safe to eat per week is a Swedish one. They suggest 400 micrograms per week as a safe maximum. So that if someone eats a normal diet and eats as little as 2 pounds of fish a week, he is well over that safe limit, that safe maximum.

Senator HART. Almost twice it.

Dr. KLEIN. Very nearly. If he eats no meat at all he is almost there.

Well, one more thing. I think most of those involved in the mercury problem that you are examining today have been making their position clear for the past several years. Most of them have been indicating that they believe that it is all right for the American public to ingest mercury at levels far above natural background.

It seems to me that the chloralkali industry has indicated that they believe it is all right for me and my family to ingest elevated concentrations of mercury. I think the paper industry believes it is all right. The plastics industry believes it is all right. The Department of Agriculture, by its actions, has indicated that it believes it is all right. The FDA, by its actions, indicates that they believe that it is all right for me and my family to ingest a lot of mercury. The Public Health Service seems to believe that it is all right.

Now I don't think that any of those groups has represented me at all well. I think that the information which they needed was available to them at least 5 years ago. In some cases 10 years ago. Nothing was done with it. That, I guess, is one reason why I am here. I want to clarify that even though all those people think it is all right for me and my family to ingest a lot of mercury, I don't think it is all right. That is about what I want to say.

I will be happy to answer any other questions.

Senator HART. Not to quarrel with you at all, but if all of us had thought it was all right, given these figures you describe, why haven't most of us broken down?

Dr. KLEIN. That is a very interesting—let me read to you something. The symptom of mercury, the psychological symptoms of mercury poisoning—it is a syndrome called erethism, whatever that means.

This disturbance is characterized by anxiety, excessive self-consciousness, difficulty in concentrating, irritability, resentment of criticisms, complaints of headaches and fatigue——

[Laughter.]

[Continuing.] Blushing and excessive perspiration.

[Laughter.]

Now, that is the first observed syndrome from mercury poisoning. A little later than that your hands may begin to shake and your vision may narrow but that is the first observed symptom. I would not go to my physician with that collection of symptoms.

Senator HART. I was on the commissions on the causes and prevention of violence. We should have had you as a witness.

Dr. KLEIN. There is a lot of—lead does much the same thing and there is a lot of lead as well.

Senator HART. I know you spoke seriously, although our reaction was one of laughter almost disbelief. It wasn't disbelief. It was a realization that the symptoms, the early symptoms that you describe, are increasingly experienced by many of us.

Well, you clearly think that the guideline of 0.5 parts per million that Food and Drug said is not adequate to protect the public, is that correct?

Dr. KLEIN. Yes, I think I would agree to that.

Senator HART. To lower it will increase substantially the number of States that will be producing fish that are seized. Do you anticipate that there will be any fish left safe to consume—I don't say catch, but to consume?

Dr. KLEIN. Well, ocean fish are probably pretty nice as long as you don't catch them too near Japan. I think that one can define areas in the Great Lakes which will be relatively free from mercury pollution. It seems to me, however, that to set a number to say this concentration of mercury in fish is OK and a higher number is not OK isn't really a very good way to go about it.

What we really need to be concerned with is the total intake of mercury. You could eat fish that are one part per million mercury if you don't eat fish very often.

Senator HART. I grow uncomfortable—I am a fisherman—but what other food has mercury?

Dr. KLEIN. Almost everything. Certainly if you get down to so-called natural levels, you find some of everything in everything. One study on translocation of mercury in potatoes, for example, concluded that the concentration of mercury in potatoes which had never come near any agricultural chemical which had been something like 5 parts per billion, I think.

If you compare that to potatoes which have been at some time treated with agricultural mercurials the factor goes up by a factor of 10. Up to 50 parts per billion. All foods have some.

Senator HART. What foods in addition to fish are likely to have a sufficient level that would cause you to avoid its use in your home?

Dr. KLEIN. Well, liver and brains—I avoid the use of those anyway. I think many animal organs tend to concentrate mercury. Pork liver. Things of that kind. But it is so widespread—you know, there is no way to eat if we tried to avoid all foods enriched in mercury.

Senator HART. That is why I asked more precisely those foods which might have a level sufficiently high to cause you to avoid these.

Dr. KLEIN. Even wheat has been reported to have high concentrations.

In the United States wheat ranges from two-tenths part per million to 68 parts per million. That is a long way, it is a long range.

Senator HART. Whatever we can do to insure that mercury shall not be introduced into streams, you say that the introduction of mercury should be stopped. What do we do about the mercury that is already there? Is there any way that you know of to render harmless the mercury that is collected in the waters?

Dr. KLEIN. Well, as you know, it is a lot easier to get it in than to get it out. I don't really know of any way that seems satisfactory. One can

speak of dredging and that just stirs up a big mess and you may be worse off dredging than not.

The only thing that seems at all hopeful to me would be introduction of large quantities of, say, some mineral which would have the ability to bind that mercury very tightly to its surface and at least immobilize it at the bottom. That is the best guess I know.

In the St. Clair River that will eventually get into Lake Erie and then it is an Ohio problem and Michigan is off the hook, but you can't do that forever.

Senator HART. I asked you about what other foods would contain mercury and then what foods might contain it at a level high enough so that you would avoid them. I am told that mercury is used in dental fillings, and nasal sprays. Why isn't there a toxic does of mercury from sources like that?

Dr. KLEIN. I really don't know. I have pondered about that dental business for quite some time. Apparently when you get a filling you do get an appreciable amount of mercury from the tooth on into the blood and you excrete it out. Why none of those uses show toxicity is not clear to me.

Senator HART. Is it inorganic?

Dr. KLEIN. That is inorganic mercury. That is right. The distinction between the methylmercury, which is the really bad one, and inorganic mercury physiologically I think relates largely to the ease of transport across the various body barriers. A placenta of a pregnant mother normally isolates the fetus very well indeed but methylmercury concentrates in the fetus.

There is a greater concentration in the blood of the fetus than in the blood of the mother.

Senator HART. Well, you used the figure of about 5,000 tons of mercury a year that man adds to the environment.

Dr. KLEIN. That is a guess.

Senator HART. All right. Now a succeeding witness, whose prepared statement, as yours was, was made available to us, Mr. Nader, will tell us that if half of the mercury used in this country since 1900 was distributed evenly, our entire fish and water supply would be contaminated beyond human consumption. With figures like that to draw on, isn't it likely that segments of our population already are affected by mercury intoxication in insidious ways?

You described the early symptoms. Do you have any opinion as to how many children are mentally retarded or labeled slow learners who have mercury to thank for their condition?

Dr. KLEIN. I couldn't guess at all. As I say, the case that comes to mind for some reason—I can just envision a tribe of Indians living along a river downstream from a paper mill and eating a lot of fish, but I wouldn't be able to guess at all as to the total number of children involved.

Senator HART. Well, my last question: Let's assume the decision would be that there is no basis for permitting the discharge of mercury into any stream. Let's assume that. That would require a dramatic reduction in the uses of mercury. What alternatives to mercury are there for the several uses to which mercury now is put? How effective are they? What is the price?

Dr. KLEIN. I believe much of that was covered by a study by the National Research Council a year or two ago, which said what would hap-

pen if you didn't fill anybody's teeth with mercury? How much would this free? And so forth.

It may be that it would cost a little more. There are plenty of other materials available. I have infinite faith in the ability of the chemical industry to produce chemicals for almost any purpose. I think they can do better than mercury. I think they really haven't looked very hard for alternatives to mercury. Largely I think because mercury is shiny and pretty and it is fun to play with and man has always been fascinated by it. I am sure there can be easily developed alternative things to use.

Senator HART. I would ask staff to obtain and review the study to which you have referenced, assuming your memory is good.

Mr. BICKWIT. Are you saying that because you believe that there are alernatives to current mercury uses, that you would encourage the banning of all mercury products and that nothing over background levels of mercury is tolerable?

Dr. KLEIN. I don't think that we need to spray orchards with mercury chemicals. I think that use has decreased already and I would think it could be phased out all together. I think that the chemical industry can develop alternatives there. I think that the chemical industry needs not put mercury into the waterways.

I think it can in fact recover that mercury and use it again. I think that it would be recovering the mercury if it cost $10 a pound instead of $7 a pound. I believe they could recover it and reuse it. Most uses of mercury can be stopped. Probably not all.

You must reach a point where the use is so small that stopping it doesn't really help. But I don't believe that we should use mercury on food products and I don't believe in any use of mercury which puts it into the water.

Mr. BICKWIT. And you are saying that we can't rely on any numerical guideline to protect us. The only way to protect us adequately is to get rid of the products at the source, get rid of the products by allowing them not to be produced rather than control the amounts of residue resulting from those products. Is my understanding correct?

Dr. KLEIN. If I am understanding you correctly then you are understanding me correctly. [Laughter.]

Senator HART. Mr. Bickwit fell into a phrase there that would be a delight for a Government bureaucrat who wants to regulate something but wants to do it gently. He said that we would avoid something by allowing them not to be produced. By allowing them not to be produced. [Laughter.]

Mr. BICKWIT. I am reminded of: is this a question? Yes, if this is an answer.

Dr. KLEIN. Let me just clarify what I feel about additional uses of mercury. It is like picking a scab. There is a great body of mercury now lying from the bottom of rivers all over. A great reservoir of it in the soil. A great reservoir of it in the wildlife.

I don't know how that will go away. Eventually I suppose it will but if we keep putting more in there I know it will never go away.

Mr. BICKWIT. Even if we do ban future uses of it, what do we do now as far as protecting ourselves? Numerical guidelines won't work at this point. What does the public do while mercury compounds are being phased out?

Dr. KLEIN. Well, I suppose we could increase the surveillance of the mercury content in food. I think FDA could do that. That would be a nice contribution to the general health and welfare.

The technology to do that is readily available. It has been available for some years. They can get—they can do it much more sensitively than a half part per million. They can easily get down to parts per billion. I do it. And I do it for a hobby. They do it for a living.

Mr. BICKWIT. Even though numerical guidelines are inadequate we ought to acknowledge we have nothing else at this point and we ought to lower our——

Dr. KLEIN. I believe that is correct, yes. I think, if something shows up which indeed has a lot of mercury, that should be immediately pulled off the market.

Mr. BICKWIT. I have one more question.

In your statement you say that the incidence in Japan and Sweden should have given us notice that our mercury discharges were dangerous. Others have said that this would not necessarily tip us off to the dangers of discharging inorganic mercury as the Swedes didn't prove that bacteria could convert inorganic mercury to the highly toxic organic methylmercury until early 1968.

Do you not agree with that explanation.

Dr. KLEIN. You are correct. I don't. I really don't understand——

Mr. BICKWIT. What aspect of the explanation don't you agree with? Was the determination that inorganic mercury could be converted to methylmercury made before that time? Or did we not have to know that in order to know that mercury was dangerous?

Dr. KLEIN. You don't have to know that. A child knows that mercury is poisonous. Man has known that since, well before the time of Christ. It was described by the Egyptians in 500 B.C. That mercury is poisonous is no big news to anyone. That mercury concentrates in fish shouldn't be a surprise either since that happens with all heavy metals.

The measurements on which you could figure out the concentration factor were published in 1934. And it is not a hard paper to find, the one in which those measurements were published, because that is the only paper there is on mercury prior to the Swedish papers.

Mr. BICKWIT. What is the concentration of organic or methylmercury?

Dr. KLEIN. The concentration factors described in the 1934 paper refers to inorganic mercury. The concentration factor of a thousand from water into fish. Now the Swedes could use that kind of data.

Senator HART. Thank you very much.

Professor, in your work there in Lake Macatawa have you tested for mercury? I couldn't recall whether we talked about that or not.

Dr. KLEIN. I have not. I have tested some of the input streams and they are very low. There is one factory which uses mercury and I looked at its output and it is not elevated notably above background levels. That is just one set of analyses that I have done.

Senator HART. And there is—doesn't Holland discharge municipal waste into Macatawa?

Dr. KLEIN. I have been trying to figure out for some time just what it is that Holland does with its municipal waste. [Laughter.]

I believe that a lot of it comes into Macatawa. It is a little bit difficult to study that particular watershed because it sloshes in and out

into Lake Michigan in a hurry. Unless you happen to be there between sloshes you can't measure anything. [Laughter.]

We have incidentally found I think the real key to stopping industrial pollution. We have a student go out in a little boat with a 3-horsepower motor and a bunch of plastic bottles. That act alone has been very helpful. I think the quality of the waters in that lake have improved immeasurably since the kid went out in that little boat with the plastic bottles. [Laughter.]

Senator HART. When I was there with you I was told by your students that you were most interesting in class. I can understand why.

Dr. KLEIN. Thank you very much.

Senator HART. Having been all over the lot on our batting order of witnesses, I would like next, because of the time problem that he has, to receive the testimony of Ralph Nader.

I can think of few Americans who need less introduction, especially in Detroit. When I am hard put to cite examples of the fact that one can influence the system, that one can change activities which influence intimately your day to day life, I always think of Ralph Nader, and I am sure others do.

STATEMENTS OF RALPH NADER AND DR. ALBERT FRITSCH, TECHNICAL CONSULTANTS

Mr. NADER. Thank you very much.

I would like to introduce Dr. Albert J. Fritsch, an organic chemist who has spent some time researching this problem and he has a statement on the technical aspects of this problem. There is some new information which I would like to have him deliver and I have a brief statement afterwards.

Senator HART. Dr. Fritsch, we welcome you. If you will just pull that mike over.

Dr. FRITSCH. Thank you, Mr. Chairman. We are all quite aware of the deep concern in this Nation over mercury pollution. The United States is the largest consumer of mercury and shows every sign of continuing to be for years to come. Yet our concern about this very toxic metal does not go hand-in-hand with our consumption.

Last month a Swedish manufacturer of methyl mercury seed dressing stopped production of the dressing for export partly because it was "immoral" to export a pesticide banned at home; last week, the U.S. Court of Appeals for the Seventh Circuit refused to allow the USDA to interfere with the sale, distribution, or manufacture of certain agricultural seed treatment products containing mercury compounds and generally referred to as Panogen products.

The Swedish and Japanese concern about this metal has been far more serious and productive than ours in America. In fact we must owe much credit to a young Scandinavian zoologist, Norvald Fimreite.

He came to the University of Western Ontario in the fall of 1967, with a proposal to work on the effects of mercury on Canadian wildlife. During 1968–69 mercury contents on wildlife and fish were analyzed. March 19, 1970, Dr. W. N. Holsworth notified the Canadian Wildlife Service of dangerous levels of mercury in fish. March 24, 1970, export of fish from Lake St. Clair was prohibited. July 24, 1970, the Canadian Department of Agriculture said it would not permit regis-

tration of seed-treatment products containing mercury or allow use of other products containing mercury if suitable alternatives were available. Dr. J. A. George, who directed Mr. Fimreite's research, says that he has never known the results of research being applied so rapidly. Yet we have seen our country allow a return of Panogen to full sale and production.

Japanese farmers used phenyl mercury compounds as fungicides against rice blast and other diseases. This was decreased in 1967 and completely replaced by nonmercury compounds in 1968. It was mainly the use of Panogen in Sweden which resulted in research on methylmercury effects and eventual withdrawal of these alkyl seed disinfectants in February 1966.

The Alamogordo, N. Mex., tragedy where three children were poisoned after eating pork from hogs fed mercury-treated seed is still fresh in our minds. Two of these children are still in coma having suffered irreparable damage to their nervous systems. Yet, Panogen can now be again freely produced. The rollcall of mishaps concerning organomercurials is not limited to our unconcerned land but must include the world:

Minamata Bay, Japan (1953–60): 111 dead or seriously disabled.
Iraq (1961): 35 deaths and 321 injuries.
West Pakistan (1963): Four deaths and 34 injuries.
Guatemala (1966): 20 deaths and 45 injuries.
Nigata, Japan (1968): Five deaths and 25 injuries.

However, even the vivid and horrible descriptions of victims poisoned by mercury compounds is indeed small compared to the continuing poisoning of our environment which could result in a few years with vast injury to whole populations.

The horror is compounded by the burden of proving beyond reasonable doubt that organomercurials are harmful and that no major industry will suffer by a ban on these compounds—with the emphasis on the latter. Extreme mercury poisoning results in severe kidney damage, loosening of teeth, severe damage to the nervous system, and eventual death.

But we must remember that mild chronic mercury poisoning may result in nervous anxiety, insomnia or loss of appetite or the effects of senility; many of these cases may never even be diagnosed as mercurialism. Thus we should not let the relatively small number of cases of acute mercury poisoning—much less than aspirin—distract us from the gravity of this major environmental problem facing us. Nor is this merely a question of proper labeling of mercury products. Nor will we stand for placing the blame for belated banning of contaminated fish on regulatory agencies alone; for the damages economically to the sporting industries must be laid at the feet of the contaminating industries.

THE PROBLEM

The gravity of the mercury pollution problem springs from the unusual nature of mercury and its organic and inorganic compounds: (*a*) Mercury is quite volatile and can contaminate the air; (*b*) mercury is a liquid and can spread over surfaces in small droplets which are quite difficult to collect; (*c*) mercurials undergo translocation in plants and animals; that is, a mercurial sprayed on a plant leaf or placed on seed will find its way to roots, the stalk and even the grain.

A Swedish study has shown that seed treated with mercury compounds bear grain containing considerably more mercury than untreated seed. (*d*) Mercury can be converted by bacteria in river and lake sludge to highly toxic methylmercury compounds which find their way through the food chain to fish and man.

Recently it has even been suggested that this mercury complexification in river beds proceed at an even faster rate than originally anticipated. (*e*) Mercury being quite mobile and evasive cannot be detoxified in the same sense as many of the toxic but nonpersistent pesticides which decompose in air and sunlight. Mercury and its compounds when placed in river beds become more toxic with time.

Small amounts of organomercury compounds have been known to be toxic to man for almost a century. The Mrak report includes some of these compounds in the chapters dealing with mutagenicity and teratogenicity. A recent study by Muntzing says that the concentrations needed to cause a type of mutagenic effect—c-mitotis—were extremely small; in fact lower than of any other c-mitotic substance known. Thus when speaking of neurological damage, chromosomal aberrations and teratogenic effects in human beings, we are speaking of mercury contaminated substances of the order of parts per million—and parts per billion in air and water.

Thanks to recent highly sensitive analytical instrumentation we are able to get rapid and precise data on water, air, and solid contaminated samples. These measurements indicate the scope of the problem. Yet with all this sophisticated instrumentation (*a*) there is no systematic monitoring system for mercury content in the air, (*b*) no known figures on losses of mercury through evaporation, product contamination and water emissions, (*c*) only random sampling of fish and water from various parts of the country.

Mercury, more than any other environmental contaminant presently known, exhausts the capability of governmental regulating agencies to respond to the problem.

The tangle of jurisdictions means that control will be indefinitely delayed unless prompt extraordinary action at the presidential level is forthcoming. The *Panogen* case and the almost daily accounts of sizeable mercury emissions in 20 States screams to the Nixon administration to put teeth into existing statutes: The Refuse Act of 1899, the Antipollution Act of 1967, et cetera. We can hardly expect State and local governments to act alone. Mercury pollution is part of the bigger problem of heavy metal pollution and the need for immediate action by a unified agency is paramount.

The regulatory and enforcement web is but part of the problem; we simply lack comprehensive scientific data. Where is all the mercury consumed each year going when next year we will need another 6 million pounds? Only about one-sixth of our annual consumption is recycled.

The dramatic lawsuits against 10 companies—which, by the way, are all chlor-alkali producers—are based on sizable mercury emission data gathered by the FWQA. But these 10 plus 3 earlier mentioned chlor-alkali producers in Louisiana account for only 4.47 percent of that industry's annual consumption of mercury. (See app. 1.) Where is the rest going? Just how much is emitted by large ventilation systems in these plants? Besides knowing where, we would like to know what is mercury doing to us. How toxic are the various mercury compounds?

The urgency of our concern does not rest only on existing medical and scientific data but more so on the scarcity of it.

USES OF MERCURY

Since the beginning of this century, 163 million pounds of mercury have been consumed in the United States. We doubt if more than a quarter of this can be presently accounted for. If only half of this expended mercury is distributed uniformly and allowed to become soluble, our entire fish and water supply would be contaminated beyond human consumption. Much mercury eventually escapes into the atmosphere or is bound in insoluble inorganic compounds.

Mr. Chairman, we wish to submit a list of the principal categories of mercury uses:

Table I: (*a*) Chlor-alkali industry: The largest and fastest growing industrial user of mercury is the chlor-alkali industry. Here mercury cells are used in the electrolytic process wherein common salt is converted into chlorine gas and caustic soda, both products being in strong demand today.

Two-thirds of the U.S. chlorine is still produced by the diaphragm—non-mercury—method but the trend, due to a number of economic factors, is toward the mercury cell methods.

I had this data when I composed this report but the latest pamphlet from the Chlorine Institute shows the diaphragm method is showing a slight increase for this year. It is admitted by more responsible companies within the chlor-alkali industry that some plants are dirty operations and there is some resentment that these have got off free without water cleaning techniques. Every lawsuit mentioned this past week was against some of these dirty operations. I strongly recommend that the FWQA check immediately every one of the remaining plants if this has not been done. I submit the names of companies, plant locations, capacities and method used to this committee for consideration. (App. 2 and 3.)

The statistics in table I show 1,572,000 pounds of mercury consumed by the chlor-alkali industry but that is not the total picture.

The final category of "other"—1,082,000 pounds—includes mainly mercury used for initial stocking and plant expansions of mercury-cell chlorine producers. The rapid growth of this industry is better reflected by adding that part of the "other use" category dealing with these new chlor-alkali plants. Thus in 1969, 34 percent of the total consumption of mercury in this country went into this one industry compared with 2 percent in 1947 and 12 percent in 1960. Preliminary statistics for the first quarter of 1970 show 36 percent and this industry may very well reach the 50-percent mark by the end of the decade.

This is on table II which you have not seen as disclosed before. Theoretically, no mercury is consumed in the actual production of chlorine or caustic soda, but losses through product contamination, water effluents and air ventilation account for the need of constantly replenishing the mercury in the cells. In fact, between four-tenths and five-tenths of 1 pound of mercury is consumed for each ton of chlorine produced.

FWQA has only exposed 4.47 percent of that loss. It is grossly incorrect to hear this industry's officials say, if they really lost all mercury attributed to them, they would go into the mercury retrieval business. This is false, for the cost of cleaning up their water supplies is

greater than the mercury gained. But the fact that relatively clean plants exist and compete means the cost must not be prohibitive. We hope the Government will not be coerced in paying this bill and thus subsidize irresponsibility.

(*b*) Fungicide uses: Mercury is used to kill fungi in three major areas: the paint, pulp and paper, and agricultural industries. In the paint industry 739,000 pounds of mercury were used last year mainly as mildewcides for exterior house paints and as latex preservatives. National Paint, Varnish & Lacquer Association officials admit that the latex preservatives could be omitted without serious economic loss, but that there are no comparably effective mildewcides. The known polychlorinated phenolic and barium salt substitutes must be applied in far greater concentrations and both classes have environmental objections. However, the "absolute essential" nature of mercury mildewcides is based on a custom of light colored exterior surfaces in the warm humid regions of our country. This might be one of the first customs that we must sacrifice in order to reduce the spread of irretrievable mercury.

Slimicides such as phenylmercury acetate (PMA) have been used extensively to reduce fungi growth in pulp storage ponds. Some officials of the American Paper Institute are skeptical of the 42,000 pounds (table I) of mercury attributed to their pulp industry and some admit that mercury slimicide use should be banned. However, former practices must now haunt this industry. Likewise, H. Bouveng has indicated that the increase of mercury content in fish seems more pronounced from pulp industries than from the chlor-alkali. He adds that the combined pollution of PMA and organic waste materials promotes the formation of methylmercury.

The greatest concern about mercury fungicide usage is in agriculture as seed dressing. Here the actual mercury consumed—204,000 pounds—is more serious than mere statistics indicate; for mercury comprises only a fraction of the final formulation; this formulation is applied over a great volume of seed; the seed is sowed over millions of acres; and the mercury is partly translocated into foods. Rosen and others have shown that mercury-treated seeds eventually result in eggs containing three times as much mercury as those from hens eating grain grown from untreated seed.

Sweden, upon becoming concerned by drastic reduction in bird populations due to treated seed, first reduced seed dressing formulae by 50 percent in Febraury 1964, and recommended that only infected seed should be treated. These recommendations became compulsory in 1965.

By the first of February 1966, all alkylmercury-containing seed were no longer registered. In all cases spring seed disinfection is allowed only after investigation of the seed samples and determination that disinfection is necessary.

The Swedish Embassy sent a cable to Ministry of Agriculture and received a reply yesterday morning that this has never been applied and that there has been no reported decline in grain production.

Recently reports mentioned agricultural income losses of between 20 to 30 percent should mercurials be totally banned. However, these figures represent total loss to any crop to which one or other mercurial has been registered. Officials of USDA mention only three areas

of seed treatment for which suitable substitutes are not available: certain wheat smuts, barley stripe, and turf diseases. These areas account for 6 percent of our farm income. Yet a sizeable section of the grain belt does not even use mercury seed dressings; the northern plain States use these on about half the seed and the lower plain States such as Kansas on about 90 percent. Thus, calculating the rule-of-thumb 10 percent per year loss due to nontreatment to half the wheat and barley crop, losses would not exceed 0.3 percent of farm income.

Nor do we have to even concede this loss in the interim while research for smut-resistant strains or biological or nontoxic chemical alternatives are in process. A Northwestern plant pathologist suggests, that with a total ban on mercurials, seed could be exported from his smut-free region to the Midwest. The small subsidy required for transportation fees should not equal the 0.3 percent income loss to agriculture. Environmental costs should be included in economic considerations.

I have mentioned the four most critical areas of mercury usage as such. No user must be overlooked or allowed to follow voluntary self-regulation alone. Certain industries in other areas have likewise proven to be irresponsible in reference to mercury industrial wastes. It was the use of mercury chloride as a catalyst in the production of vinyl chloride, which resulted in the Minamata Bay disaster.

Recommendations:

1. The immediate enforcement of all present laws with regard to industrial waste emission and that all mercury users be charged with criminal and civil neglect for failure to comply with existing law. It cannot be emphasized too strongly that this is equivalent to a national disaster and requires the utmost use of the States' legitimate power.

2. Maximum protection cannot be achieved by existing laws alone. Thus I suggest a graded series of regulatory actions somewhat analogous to those presented in the Mrak report by the Pesticide Advisory Committee, based on the extent of contamination or risk involved. There could be four grades of mercury use:

(a) those demanding immediate banning (the fungicides);
(b) those requiring stricter controls within the plant;
(c) those demanding active surveillance;
(d) those where only periodic surveillance is necessary.

3. Immediate banning should be imposed on all mercury compounds used as fungicides whether in the paint, paper and pulp, or agricultural industries. There is little problem with a ban on the pulp industry. The paint industry most likely will object, but the factors of local custom versus environmental damage must be considered. The paint industry uses 340,377 pounds of phenyl mercuric acetates and 325,286 pounds of phenyl mercuric oleate per year and predicts annual growth rates of 5 percent for the first and 2.5 percent for the second. These compounds are irretrievable and will eventually enter the air, waterways or soil.

Vigorous research must be encouraged for substitutes in agriculture. DuPont has a product which appears effective in the control of turf diseases; Uniroyal has another which seems to control loose smut in wheat and barley. The ingenuity which discovered and modified the mercurials will not be too overtaxed to find substitutes.

The mercury fungicides, slimicides and mildewcides are placed in this immediate action category because they are high dispersal mer-

curials. Their effect rests in direct spreading over large surface areas whether pulp lakes, house-sidings, or fields of grain. Here the entropy of contamination is greatest, that is, the intentional dispersal makes decontamination almost impossible. We are simply unable to recollect and recycle mercury used by these industries.

4. The last three categories require new law. I propose a licensing of all mercury uses and the demand for annual accounting of all mercury used and sold as secondary product. The strictest controls must be in those industries where mercury is part of a chemical process, whether as electrode, catalyst, or amalgam. Thus the three areas which come under this grade of strict controls should be the chloralkali, the catalyst, and amalgamation industries which would include the users of mercuric chloride and mercuric sulfate in the hydration of acetylene to make acetaldehyde and in other esterification, oxidation and miscellaneous reactions. Water treatment procedures must be installed and other effluents controlled for mercury loss in these plants.

5. Active surveillance must be maintained in areas where mercury can be discharged through negligence and accident. This applies where mercury is used in minor quantities as a source of a variety of chemical compounds and formulations. Here could be included the pharmaceuticals, dental preparations, and general laboratory uses of mercury. The amount of mercury consumed in general laboratory practices has been increasing over the years. Most scientists have a healthy respect for the metal and its derivatives but there is some irresponsibility in the disposal of waste materials.

6. A periodic surveillance of the electrical apparatus and instrumentation industries employing mercury should generally prove sufficient, especially where no chemical processing occurs and the handling involves no serious environmental risk. However, due to arbitrary classification some industrial plants actually should be regulated within a previous category, for example, the production of mercury batteries may overlap in the category of general laboratory use. The environmental regulating agency should have power to set stricter controls when this seems advisable.

7. Stiff penalties should be imposed on direct emission of mercury into the environment and for failure to report or for false reporting of mercury consumption. When other heavy metals are found to be quite harmful, similar regulations should be placed on their use.

Conclusion: Tighter government enforcement of existing laws and the requirement of licensing mercury usage will not completely curb the flow of mercury. Several industries do not use mercury as such and yet can contaminate the environment with it. It is thought that the combustion of fossil fuels, even with low mercury content, releases a considerable amount into the atmosphere. The FWQA recently accused the Kaiser Aluminum refining plant at Baton Rouge of releasing 12.5 pounds of mercury per day. But no mercury is used by the plant and one can only surmise that the release comes from mercury in bauxite ore. Functioning and abandoned mercury mining sites must be constantly checked for mercury leaching into waterways.

In conclusion, I would like to voice my concern for the little people of this land who make their living off of the sporting and fishing industry; this includes the baitsellers, the cafe owners, and boating people. They have no lobby and their losses are never figured when we

mention the mercury pollution problem, and yet the irresponsibility of big business has cost them their livelihood.

I hope they do not take their frustrations out on the FWQA and other agencies which are attempting to do their duty. Immediate and decisive action should lower mercury contents in fish in a short while, but only strict licensing regulations will prevent future occurrences.

We must move on to the far more difficult job of cleaning up and making biologically inactive the tons of mercury wastes which have resulted through industrial irresponsibility. In fact, no company which has caused this desecration should be allowed to report profits until the waterways are again free of their junk. When private industry abdicates public responsibility, it becomes its own worst enemy and hastens the day of its own demise.

(The attachments to the prepared statement follow:)

TABLE I.—MERCURY CONSUMPTION AND CHANGE IN USAGE IN THE UNITED STATES

[In pounds]

	1969	Gain or loss from 1968 to 1969
Electrolytic chlorine	1,572,000	+246,000
Electrical apparatus	1,382,000	[1] −110,000
Paint	739,000	[1] −64,000
Instrumentation	391,000	−190,000
Catalysts	221,000	+76,000
Dental preparations	209,000	+51,000
Agriculture	204,000	−56,000
General laboratory use	126,000	[1] −25,000
Pharmaceuticals	52,000	+20,000
Pulp and paper making	42,000	[1] +11,000
Amalgamation	15,000	−5,000
Others	1,082,000	
Total	6,035,000	

[1] The overall trend over a 10-year period is the inverse of that indicated above.

Source: National Bureau of Mines reprinted in the Chemical and Engineering News, June 22, 1970 (the 1969 statistics); Mineral Yearbook, 1968, National Bureau of Mines (for the 1968 statistics used for gain or loss shown in right-hand column).

TABLE II.—THE PERCENT OF U.S. MERCURY CONSUMPTION USED BY CHLOR-ALKALI INDUSTRY

[In percent]

Year	(a) Electrolytic chlorine	(b) A plus part of "other uses" used for initial stocking (actual total use of mercury by chlor-alkali industry)
1947	2.0	
1948	1.8	
1949	2.0	
1950	2.6	
1951	2.7	
1952	6.0	
1953	5.1	
1954	4.9	
1955	5.4	
1956	6.3	
1957	7.6	
1958	8.7	
1959	10.6	
1960	12.1	12
1961	10.8	17
1962	11.2	25
1963	10.3	33
1964	11.6	15
1965	11.5	28
1966	16.0	30
1967		32
1968	23.1	29
1969	26.0	34
1970		[1] 36

[1] Preliminary.

APPENDIX I

LIST OF LAWSUITS ON MERCURY EMISSION

	Pounds per day
1. Allied Chemical Co., Solvay, N.Y. (into Lake Onondaga)	4.4
2. Diamond Shamrock Corp., Delaware City (Delaware River)	11.5
3. Diamond Shamrock Corp., Muscle Shoals, Ala. (Tennessee River)	6.5–8.6
Average	7.55
4. Georgia Pacific Corp., Bellingham, Wash. (Puget Sound)	41.5
5. International Mining & Chemical Co.'s Chlor-alkali Division, Orrington, Maine (Penobscot River)	2.6
6. Olin Mathieson, Augusta, Ga. (Savannah River)	8.7–12.9
Average	10.8
7. Olin Mathieson, Niagara Falls, N.Y. (Niagara River)	26.6
8. Oxford Paper Co., Rumford, Maine (Androscoggin River)	26.2
9. Pennwalt Chemical Co., Calvert City, Ky. (Tennessee River)	1.54
10. Weyerhauser Co., Longview, Wash. (Columbia River)	15.1
Subtotal	147.19
Louisiana producers:	
1. Kaiser Aluminum & Chemical Co., Gramercy	32.2
2. Wyandotte Co., Geismar	11.7
3. Dow Chemical, Plaquemine	3.22
Subtotal	47.2
Total pounds per day	194.91
Total pounds per year	70,168

Note: 70,168 pounds is 4.47 percent of consumption by chlor-alkali industry.

APPENDIX 2

TABLE 1.—CHLORINE PLANTS IN THE UNITED STATES

State and city	Producer	Year built[1]	Cells	Containers filled	Notes
Alabama:					
Huntsville	Stauffer Chemical Co. (leased from U.S. Government).	1943	Hooker S (diaph.)	— — — —	8
Le Moyne	Stauffer Chemical Co	1965	De Nora 22×5 (merc.)	— — S B	1
McIntosh	Olin Corp	1952	Olin E8(merc.)	— — S B	1
Mobile	Diamond Shamrock Chemical Co.	1964	De Nora (merc.)	— — S —	1
Muscle Shoals	do	1952	De Nora 24×2M (merc.)	— — S B	3
Arkansas: Pine Bluff	(U.S. Government)	1943	Hooker S (diaph.)	— —	8
California:					
Dominguez	Stauffer Chemical Co	1963	BASF (merc.)	— — — —	3, 8
Pittsburg	The Dow Chemical Co	1917	Dow (diaph.), Dow (merc.)	— T S —	3
Delaware: Delaware City.	Diamond Shamrock Chemical Co.	1965	De Nora 18×4 (merc.)	— — S —	3
Georgia:					
Augusta	Olin Corp	1965	Olin E11F (merc.)	— — S —	1
Brunswick	Allied Chemical Corp	1957	Solvay V-100 (merc.)	— — S —	1
Do	Brunswick Chemical Co	1967	Hooker S4 (diaph.)	— — — —	1, 7
Illinois: East St. Louis.	Monsanto Co	1922	De Nora 18×6 (merc.) (1962)	— — S —	3
Kansas: Wichita	Vulcan Materials Co	1952	Hooker S, S3A, S3B (diaph.)	C T S —	1
Kentucky:					
Calvert City	B.F. Goodrich Chemical Corp	1966	De Nora 24H5 (merc.)	— — — —	1
Do	Pennwalt Corp	1953	Olin E11F (1967) (merc.)	— — S B	3
Louisiana:					
Baton Rouge	Ethyl Corp	1938	Downs (fused salt), Hooker S3D (diaph.).	— — S —	1, 4
Do	Allied Chemical Corp	1937	Allen-Moore (modified) (diaph.), Hooker S4 (diaph.) (1968).	— — S —	1
Geismar	Wyandotte Chemicals Corp	1959	Diamond D3 (diaph.), Uhde 30 sq. m. (merc.) (1964), Hooker S4 (diaph.) (1969).	— — S B	1
Gramercy	Kaiser Aluminum & Chemical Corp.	1958	Hooker S3B (diaph.)	— — S B	1
Charles	PPG Industries Inc	1947	Columbia N 1, Hooker S3A (diaph.), De Nora 48H5 (merc.) (1969).	— T S B	1
Plaquemine	The Dow Chemical Co	1958	Dow (diaph.), Solvay V-200 (merc.) (1963).	— — S —	1
Taft	Hooker Chemical Corp	1966	Hooker S4 (diaph.)	— — S —	1
Maine:					
Orrington	IMC Chlor-Alkali Inc	1967	De Nora 24H5 (merc.)	— — S —	1
Rumford	Ethyl Corp. (Oxford Paper Division).	1916	Sorensen (merc.)	— — — —	1, 7

See footnotes at end of table, p. 118.

TABLE 1.—CHLORINE PLANTS IN THE UNITED STATES—Continued

State and city	Producer	Year built[1]	Cells	Containers filled	Notes
Michigan:					
Midland	The Dow Chemical Co	1897	Dow (diaph.)	— — S —	1
Montague	Hooker Chemical Corp	1954	Hooker S3A (diaph.)	— — S —	1
Wyandotte	Pennwalt Corp	1898	Diamond D3 (diaph.) (1960)	C T S —	1
Do	Wyandotte Chemicals Corp	1938	Hooker S3B (diaph.), Wyandotte (merc.).	— — S —	1
Mississippi: Vicksburg.	Southwest Potash Corp	1962	None	— — S —	6
Nevada: Henderson	Stauffer Chemical Co. of Nevada Inc.	1942	Hooker S (diaph.)	— — S —	1
New Jersey:					
Elizabeth	Maquite Corp	1964	Maquite (merc.)	— — — —	1
Linden	GAF Corp	1956	Krebs (merc.) (63): Mod. BASF-Krebs (69).	— T S —	1
Newark	Vulcan Materials Co	1961	Hooker S. (diaph.), Hooker S4 (1968).	— — S —	1
New York:					
Niagara Falls	E. I. du Pont de Nemours & Co., Inc.	1898	Downs (fused salt)	— — — —	4
Do	Hooker Chemical Corp	1898	Hooker S, S3A, Gibbs (modified) (diaph.), Uhde 20 sq. m. (merc.) (1961).	— T S —	3
Do	International Minerals & Chemical Corp.	1916	Hooker S (diaph.)	— — S —	2
Do	Oil Corp	1897	Olin E11F (merc.) (1960)	— — S —	1
Do	Stauffer Chemical Co	1898	Hooker S, S3M (diaph.)	— — S —	1
Syracuse	Allied Chemical Corp	1927	Allen-Moore (modified) (diaph.), Solvay Process SD12 (merc.) (1946), Solvay S60 (merc.) (1953), Hooker S4 (diaph.) (1968).	— — S —	3
North Carolina:					
Acme	Allied Chemical Corp	1963	Solvay V-200 (merc.)	— — S —	1
Canton	U.S. Plywood-Champion Papers, Inc.	1916	Hooker S (diaph.)	— — — —	1,7
Pisgah Fo est	Olin, Ecusta Operations	1947	Sorensen (merc.)	— — — —	1,7
Ohio:					
Ashtabula	Detrex Chemical Industries, Inc.	1963	Olin E11F (merc.)	— — — —	1
Do	Reactive Metals, Inc	1949	Downs (fused salt)	— — S —	4
Barberton	PPG Industries, Inc	1936	Columbia (diaph.)	— T S —	1
Painesville	Diamond Shamrock Chemical Co.	1928	Diamond D3 (diaph.) (1959)	C T S —	1
Oregon: Portland	Pennwalt Corp	1947	Gibbs, Gibbs (modified) (diaph.) Diamond (Diaph.) 1967.	C T S B	1
Tennessee:					
Charleston	Olin Corp	1962	Olin E11F, E812 (merc.)	— — S B	1
Memphis	E. I. du Pont de Nemours & Co., Inc.	1958	Downs (fused salt)	— — S —	4
Do	Velsicol Chemical Corp	1943	Hooker S4 (diaph.) (1969)	— — S —	1
Texas:					
Corpus Christi	PPG Industries Inc	1938	Columbia N 1, N 3 (diaph.)	— T S —	3
Denver City	Vulcan Materials Co	1947	Hooker S (dipah.)	— — — —	1
Freeport	The Dow Chemical Co	1940	Dow (diaph.)	— — S —	1
Houston	U.S. Plywood-Champion Papers, Inc.	1936	Hooker S (diaph.)	— — — —	1,7
Deer Park (Houston).	Diamond Shamrock Chemical Co.	1938	Diamond (diaph.), De Nora 18 SGL (merc.)	C T S B	3
Houston	Ethyl Corp	1952	Downs (fused salt)	— — S —	4
Do	Shell Chemical Co	1966	Hooker S4 (diaph.)	— — — —	1
Point Comfort	Aluminum Co. of America	1966	De Nora 24 x 5 (merc.)	— — S B	1
Port Neches	Jefferson Chemical Co., Inc	1959	Hooker S3B (diaph.)	— — — —	1
Snyder	American Magnesium Co	1969		— — S —	9
Virginia:					
Hopewell	Hercules, Inc	1939	Hooker S3 (dipah.)	— — S —	1
Saltville	Olin Corp	1951	Olin E8 (merc.)	— — S —	1
Washington:					
Bellingham	Georgia-Pacific Corp	1965	De Nora 18 x 4 (merc.)	— — S B	1,7
Longview	Weyerhaeuser Co	1957	De Nora 14 TGL & 24 H5 (merc.) (1967)	— — S —	1,7
Tacoma	Hooker Chemical Corp	1929	Hooker S3 (diaph.)	— T S B	1
Do	Pennwalt Corp	1929	Gibbs (modified) diaph.)	C T S —	1
West Virginia:					
Moundsville	Allied Chemical Corp	1953	Solvay S60 (merc.)	— — S B	1
New Martinsville	PPG Industries, Inc	1943	Columbia N 1, N 3, N 6 (diaph.), Uhde 20 sq. m. (merc.)(1958).	— — S B	3
South Charleston	FMC Corp	1916	Hooker S3B (dipah.) (1957), Hooker S4 (dipah.) (1967).	— T S —	1
Wisconsin:					
Green Bay	Fort Howard Paper Co	1968	Hooker S4 (diaph.)	— — — —	1,7
Port Edwards	Wyandotte Chemicals Corp	1967	De Nora 24 H5 (merc.)	— — S —	1

[1] Refers to year chlorine production started at location.

TABLE 2.—CURRENT AND PLANNED CHLORINE EXPANSIONS

Location	Producer	Capacity increase	Cells	Status	Projected completion	Notes
UNITED STATES						
Louisiana: Plaquemine.	Dow Chemical Co.	Part of $2,200,000 project: ethylene and chloralkali.	Dow (diaph.)	Building	2Q 1970	
Michigan: Midland	do		do	Modernization planned.	1971–72	
Texas: Freeport	do		do	Minor expansion planned.		
CANADA						
Beaubarnois	Standard Chemicals Ltd.	220 T/d	Uhde	Building	1970	1

TABLE 3.—CURRENT AND PLANNED NEW PLANT CONSTRUCTION [1]

Location	Producer	Capacity	Cells	Status	Projected completion	Notes
UNITED STATES						
Louisiana: St. Gabriel	Stauffer Chemical Co	500 tons per day	Uhde 30 sq. m	Building	1st quarter 1970	1
Oregon: Albany	Oregon Metallurgical Co	10,000 tons per year	Alcan	do	do	9
Utah: Grantsville	National Lead Co	45,000 tons per year [2]	BASF	do	Late 1971	9
Washington: Dallesport	Dow Chemical Co	24,000 tons per year	Dow	do	do	9
		24,000 tons per year [3]	do		Late 1972 or 1973	
Puerto Rico: Guayanilla	PPG Industries, Inc	500 tons per day	DeNora (mercury)	Building	Late 1970	1
CANADA						
Nova Scotia: Abercrombie Point	Canso Chemicals, Ltd	$8,000,000		do	Early 1970	1

[1] Cumulative supplements available upon request, usually each quarter.
[2] Magnesium.
[3] Magnesium (100,000 tons per year Cl_2).

APPENDIX 3

Chlorinated paraffins (chloroparaffins)		Annual capacity f (millions o[1] pounds)
Diamond Shamrock Corp., Electro Chems. Div	Painesville, Ohio	12
Dover Chem. Corp	Dover, Ohio	14
Hercules Inc	Parlin, N.J	5
Hooker Chem. Corp., Industrial Chems. Div	Niagara Falls, N.Y	10
I.C.I. (Organics), Inc	Bayonne, N.J	10
Keil Chem. Co	Hammond, Ind	10
Koppers, Co., Inc., Organic Materials Div	Bridgeville, Pa	4
Neville Chem. Co	Santa Fe Springs, Calif	3
Pearsall Chem. Corp	Phillipsburg, N.J	5

[1] Capacities are extremely flexible. Capacity excludes that for monochlorination of linear paraffins for detergent alkylate.

Source: Oil, Paint and Drug Reporter, Sept. 2, 1968, Correspondence.

Chlorine		Annual capacity (thousands of tons)	Remarks: All produced from chlorine-caustic cells except where noted
Allied Chem. Corp., Industrial Chems. Div	Acme, N.C	60.0	
	Baton Rouge, La	200.0	
	Brunswick, Ga	108.0	
	Moundsville, W. Va	80.0	
	Syracuse, N.Y	130.0	
Aluminum Co. of America	Point Comfort, Tex	150.0	
American Metal Climax, Inc., Southwest Potash Corp., Div.	Vicksburg, Miss	25.0	Oxidation of HCL via NO_2
Arkla Chem. Corp	Pine Bluff, Ark	27.0	
Brunswick Chem. Co	Brunswick, Ga	30.0	
Detrex Chem. Industries, Inc	Ashtabula, Ohio	22.0	
Diamond Shamrock Corp., Electro Chems. Div	Deer Park, Tex	315.0	
	Delaware City, Del	146.0	
	Edgewood, Md	30.6	
	Mobile, Ala	27.0	
	Muscle Shoals, Ala	93.6	
	Painesville, Ohio	88.5	
The Dow Chem. Co	Freeport, Tex	1,700.0	Also magnesium cells.
	Midland, Mich	282.6	
	Pittsburg, Calif	350.0	
	Plaquemine, La	380.0	
E. I. du Pont de Nemours & Co., Electrochemicals Dept.	Memphis, Tenn	154.0	Byproduct of metallic sodium mfg.
	Niagara Falls, N.Y	65.2	Do.
Ethyl Corp	Baton Rouge, La	172.0	Do.
	Houston, Tex	37.8	Do.
Oxford Paper Div	Rumford, Maine	4.7	
FMC Corp., Inorganic Chems. Div	South Charleston, W. Va	345.2	
Fields Point Mfg. Corp	Providence, R.I	3.6	
GAF Corp	Linden, N.J	82.8	Adding 88.2 early 19
Georgia-Pacific Corp., Puget Sound Div	Bellingham, Wash	36.0	
B. F. Goodrich Chem. Co	Calvert City, Ky	186.0	
Hercules Inc	Hopewell, Va	18.0	
Hooker Chem. Corp., Industrial Chems. Div	Montague, Mich	64.8	
	Niagara Falls, N.Y	165.8	
	Tacoma, Wash	120.6	
	Taft, La	214.4	
IMC Chlor-Alkali, Inc	Orrington, Maine	65.0	
International Minerals & Chem. Corp., Agricultural Chems. Div.	Niagara Falls, N.Y	8.3	
Jefferson Chem. Co., Inc	Port Neches, Tex	54.0	
Kaiser Aluminum & Chem. Corp., Kaiser Chems. Div.	Gramercy, La	36.0	Expanding to 150 by January 1969.
Kimberly-Clark Corp	Kimberly, Wis	3.6	
Monsanto Co., Organic Chem. Div	Anniston, Ala	9.0	
	Sauget, Ill	94.0	
Olin Mathieson Chem. Corp., Chems. Div	Augusta, Ga	143.0	
	Charlston, Tenn	165.6	
	McIntosh, Ala	135.0	
	Niagara Falls, N.Y	76.0	
	Saltville, Va	81.0	
Pkg. Div. (Ecusta Paper Co.)	Pisgah, N.C	2.2	
PPG Industries, Inc., Industrial Chem. Div	Barberton, Ohio	81.0	
	Corpus Christi, Tex	81.0	
	Guayanila, P.R	(170.0)	Planning.
	Lake Charles, La	460.0	
	New Martinsville, W. Va	256.0	

See footnotes at end of table, p. 122.

Chlorine		Annual capacity (thousands of tons)	Remarks: All produced from chlorine-calstic cells except where noted
Pennsalt Chems. Corp	Calvert City, Ky	98.2	
	Portland, Oreg	66.6	
	Tacoma, Wash	46.8	
	Wyandotte, Mich	68.4	
Scott Paper Co., S. D. Warren Co., Div	Westbrook, Maine	1.8	
Shell Oil Co., Shell Chem. Co., Div	Houston, Tex	80.0	
Standard Pkg. Corp., Eastern Fine Paper and Pulp Div.	South Brewer, Maine	2.2	
Stauffer Chem. Co., Industrial Chem. Div	Dominguez (Los Angeles), Calif.	30.0	
	Henderson, Nev	110.0	
	Huntsville, Ala	36.0	Leased from U.S. Government Planning.
	Iberville Parish, La	(2)	
	Lemoyne, Ala	55.0	
	Niagara Falls, N.Y	46.8	
United States Plywood-Champion Papers Inc., Champion Papers Div.	Canton, N.C	18.0	
	Pasadena, Tex	14.4	
Velsicol Chem. Corp	Memphis, Tenn	24.8	
Vulcan Materials Co., Chems. Div	Denver City, Tex	10.8	
	Newark, N.J	36.0	
	Wichita, Kans	100.0	
West Virginia Pulp and Paper Co	Covington, Va	3.6	
Weyerhaeuser Co	Longview, Wash	100.0	
	Plymouth, N.C	4.3	
Wyandotte Chems. Corp	Geismar, La	290.0	
	Port Edwards, Wis	55.0	
	Wyandotte, Mich	198.0	

[1] Captive.
[2] Not available.

Note: Several pulp and paper companies not listed are believed to have some captive production. Much of the above capacity is produced for captive use only.

Senator HART. Thank you, Doctor. Very early in your testimony we were joined by the distinguished minority leader and member of the committee and subcommittee, Senator Scott from Pennsylvania.

I know your schedule is one that will not permit you to stay very long.

Senator SCOTT. Mr. Chairman, I appreciate this. I think the hearings are decidely useful. The need for action is obvious. I hope we can have it.

I note the reference to urging the Nixon Administration to put teeth into existing statutes. I understand that about 2 weeks ago the Secretary of the Interior issued a public warning to certain offending companies, wired the Governors of 17 States urging strong action against companies who have been found guilty of discharging mercury into interstate waters, urged also corrective actions at local levels, and designated an investigating team from FWQA and the U.S. Geological Survey to pinpoint areas of pollution and provide data necessary for corrective action.

The Secretary asked the Department of Justice to take action under section 13 of the Rivers and Harbors Act of 1899 against several offending companies. After some examination by the Department of Justice they decided to comply with the request of Interior. Civil suits are expected to be filed against eight firms involving 10 plants. Obviously, existing statutes are finally being utilized to remedy a condition which has been neglected for years. This hardly warrants a pinpointing of an administration in power for 18 months.

I think that was a little gratuitous on your part, but we all inject a little political remark for personal benefit or political benefit. You were just caught at it that time. That is all right. I do it too.

Mr. NADER. I think the standard was the incumbency of the administration. The Johnson administration certainly was even more neglectful in that it never even discovered the existence of the 1899 act.

Senator SCOTT. That is what I was leading up to.

The Johnson administration not only failed to little note or long remember, they never noted and never discovered that such an act existed; isn't that right? So that while much needs to be done, and you are right to bring it to the public's attention—this is the first administration that has actually done anything about the mercury problem under the 1899 act. We have no controversy. More needs to be done. You make very good points. I commend both of you for them. I just couldn't resist the opportunity to set the record straight. I would like to make one thing perfectly clear.

Thank you, Mr. Chairman.

Senator HART. Senator Scott is a master at setting the record straight in such a fashion that——

Senator SCOTT. It is never the same again.

Senator HART. It is very difficult thereafter to understand.

I wanted to go further in defending the Nixon administration. I made an arrow at that point in the testimony. I heard it too. The Panogen case and the almost daily accounts of sizable mercury admissions screams to the Nixon administration to put teeth into existing statutes. To the extent that you are criticizing existing statues, I am one of those fellows that doesn't want the White House to write the laws. You can scream at Congress for the absence of teeth in the statutes.

I suspect what you are really zeroing in on is the inadequacy—indeed until the recent past the absence—of aggressive effective enforcement of existing statutes. Now we all fogged up the record on that.

Senator SCOTT. Well, there is a package of environmental bills pending. Some come from the administration, which in fact I introduced. Some come from various Senators. I think it is tragic that none come from the Congress to become law. I think it is high time we ought to have committees in Congress sufficiently able to function to get some of the bills of this type out.

Senator HART. I am ready to call the roll on a couple here, if you are ready to vote on them.

Senator SCOTT. I am ready to vote on them. You and I are imbued with such wisdom, but we have not yet been able to diffuse it sufficiently among our colleagues.

Senator HART. Having agreed that we are innocent, we will now go on to Mr. Nader.

Mr. NADER. Thank you, Mr. Chairman.

Before I proceed to my testimony I would like to introduce into the record a pamphlet produced by the Chlorine Institute entitled "Challenge and Change, Chlorine in 1970."

Senator HART. It will be received and placed in the committee files.

Mr. NADER. Mr. Chairman and distinguished members of the subcommittee, I appreciate the invitation to comment on some aspects of mercury contamination which is your concern today.

This morning, you have heard detailed testimony on the prevalence, use, and harm incident to commercial handling and mishandling of mercury. Many lakes, rivers, and streams, with their stocks of edible fish, have been accorded emergency designation by public authorities due to industrial dumping of poisonous mercury. This heavy metal, we are belatedly informed, has penetrated land, air, water, and food. Its deadly effect on the human body is unquestioned even by the most insensitive industrialists. Its persistence in the environment means that, even assuming the prevention of new mercury contamination, the environment is stuck with this lethal form of silent violence to millions of unsuspecting citizens for many years.

The "discovery" of this mercury epidemic may be for environmentalists what thalidomide was to advocates of control over drug company abuses in the early sixties. That is, mercury may generate genuine concern and artificial remedies for the larger problem of environmental violence of which it is a part.

It is incumbent upon us to ask why it took so long for industry and pollution authorities to realize the danger. The hazardous properties of mercury compounds have been known in the medical literature for decades. The uses and access paths to the environment of mercury are no secret. Companies in the paper, chemical, and plastics industries and their top officials have known about the dumping of mercury into waterways or its release into the air. Sweden took steps a few years ago to control the use and disposal of mercury. In May 1969, the cover article in Environment magazine was devoted to a detailed discussion of mercury pollution.

I remember when this came out. It was totally ignored. A very detailed page after page treatment in one of the leading environmental journals of the country.

Senator HART. What date is that?

Mr. NADER. May 1969.

Senator HART. The author of that article, incidentally, will be our witness tomorrow.

Mr. NADER. Fine.

Still the forces of industrial irresponsibility and official paralysis continued unabated. It remained for a graduate student in zoology at the University of Western Ontario to startle the authorities earlier this year into some action by his empirical tests showing samples of Lake Erie fish to contain dangerous levels of mercury.

It is just that simple. You pick a fish out of Lake Erie and test it.

In addition to the recommendations made earlier before this subcommittee, the following suggestions can be made:

1. There needs to be an international alert system to avoid the incredible delay in responding to environmental crises which are already recognized in nearby countries.

2. The Federal Government should initiate the practice of producing "cycle profiles" of various industrial products and place on the public record for regulatory and citizen scrutiny the origin, use, and disposal patterns of potential or actual environmental hazards.

In terms of mercury there would be a cycle profile analyzing what mercury is, where it is produced in terms of the mines, how it is used in successive stages, either to market or in industrial operations and where it is dumped into the environment.

3. The mercury contamination reveals how very weak is our system of food testing and monitoring. Fish contamination from water pollutants should be a prime concern of fish inspection legislation presently shelved due to industry opposition.

Mr. Chairman, you have been the major sponsor of this legislation through the last few years. You have seen the problems attendant upon passing a simple sanitation bill. Now there is additional evidence requiring that that bill include the adequate lab testing of fishery products for the kind of contamination that we now see is involved with mercury compounds.

Had that bill been passed 2 years ago and the labs set up, the problem would have been discerned in much more detail than it is now as well as problems of contamination by other heavy metals such as cadium, arsenic, and zinc.

Senator HART. Interrupting you very briefly, you are right about that and maybe at least in the narrower frame of that fish bill your suggestion that the mercury thing can advance the cause of environmental protection the way thalidomide did when Senator Kefauver was laboring under such difficulty to move us on the amendments to the Food and Drug. It might well be that that fish bill now can be moved out here as a result of this. It should be amended as you suggest.

Senator SCOTT. The reference to the empirical test, whereby you take a mackerel out of Lake Erie and examine it, recalls to me the ancient custom of examining entrails to predict the future. Here the examination is very similar to the Roman auguries—what does this indicate to the future of the Nation? According to what you have discovered, an irreversible situation insofar as the inhalation or intake of mercury is concerned, seems to be facing the human individual. There isn't much you can do about it after it reaches a certain level.

Mr. NADER. That is right.

Senator SCOTT. Thank you.

Mr. NADER. It is the pyramiding effect, Senator Scott. As it goes through the biological cycle from the bottom of the mud base in the lakes and goes through the cycle and is consumed by the fish, the pyramiding effect and concentration effect is spectacular.

Can the Federal Government afford any longer to spend annually less than one-tenth the cost of a nuclear submarine to test its food products for hazards?

I think this has to be emphasized again and again. I think it might well be worthwhile to try to obtain the justification as to why this Congress is so easily transformed into massive support for one nuclear submarine after another when it refuses to allocate any more than $15 million for the Food and Drug Administration to analyze the food products that are becoming contaminated and otherwise harming 200 million American consumers. It is just that kind of counterpoise of the budget that has to be analyzed again and again and again.

Senator HART. I have a hunch if we could find really that it was the Communists putting the mercury in, then we would get the money for it.

Senator SCOTT. Or if you could find a way to be sure that only the eels were the ones who consumed the mercury we lake Senators would be right on the job.

Mr. NADER. Your comment brings to mind the statement right before Earth Day, April 22, 1970, when some people—I believe the Daughters of the American Revolution—thought this was really Communist inspired because it came on Lenin's birthday. I suppose if Earth Day was Communist inspired the country would really do something about the environment as you said.

Senator SCOTT. Your reference to one-tenth the cost of the nuclear submarine reminds me of way back in the late forties, we began the mobile TB tests for tuberculosis. That program only cost $10 million to get started in this country, and it proved to be one of the most useful vehicles we have had in combating the dreadful disease.

I used the same analogy on the floor at the time. It cost one-tenth of the cost of a destroyer.

Senator HART. We are willing to ante up great sums of money against possible enemies and nickel and dime ourselves to death in fighting actual enemies.

Mr. NADER. That is right. Billions for risks, real or fancied from abroad, and very little for actual realities occurring in this country.

4. There are serious deficiencies in the system of sanctions which can be applied to violators under existing law. Institutions like corporations can be bent toward less violent behavior toward man and environment through the use of legal sanctions against culpable officials of these business firms. Suspension of corporate officials from their duties, nonreimbursable fines, legally forced resignations, and personal liability to injured citizens are illustrations of how the law can generate deterrence by a system that more accurately equates decisional authority with accountability for the consequences of such corporate-based decisions.

I might add that the toughest sanctions against business behavior in the Federal Government come from the Securities and Exchange Commission which can suspend officials, ban advertising, virtually dissolve firms. And if this is done for investor protection why shouldn't it be done for something we think of far greater value.

In addition, a persistently violative corporate practice should at some point be the basis for revocation of product use registration rights or even the revocation of the corporate charter. In other words, if a particular product is safe under certain conditions of use and is registered for commercial use throughout the country, there is a second stage activity that can be engaged in by the enforcement authority where it determines that a company is abusing the use of a registered product and it can selectively withhold the right of use of that product by the company and as such, place that company at a severe competitive disadvantage.

The subcommittee should give serious consideration to the need for a more effective sanction system that will give concrete meaning to the research, testing, standards, and other instrumental policies designed to clean up the environment. For example, if a corporation can be thrown into bankruptcy for not paying its creditors, why shouldn't there be comparable standards for environmental bankruptcy should a firm display persistently violent environmental behavior? Are the stakes any lower than nonpayment of company bills?

I think in this context the invitation for top executives of such companies as Dow Chemical and Wyandotte Chemical and the other

paper and pulp mills and other producers or users of mercury, that these executives should come to testify before a hearing in the Senate or in the House, if only to allow us to understand better what the motivational structure of a corporate system is like.

For example, we should want to know what kind of reporting system up the corporate hierarchies these executives have established in order to keep themselves aware of what has happened. The fact of the matter is wherever there is an environmental crisis like this or consumer abuse, two kinds of people come and testify before Congress. Critics of the process or Government officials. It is almost unheard of for top executives to be requested or to be willing to come and contribute their views and questions.

I think part of the most mild sanction would include the invitation for these executives to come. Just the mere spending of time discussing these problems, away from the worries of their office, would tend to have an informative and educative and sobering effect on the gentlemen.

Senator HART. Mr. Nader, I don't know how informative or sobering it was and I confess to you that had you been there to ask questions it would have been a lot more pointed, but we did hear from executives of both Dow and Wyandotte Chemical in the subcommittee hearing some 2 months ago on the shores of Lake St. Clair, where one of them had been dumping. I will have to reread that testimony.

Mr. NADER. Was it the chairman of the board or the president of the company?

Senator HART. It was the executive vice president.

Mr. NADER. That is my point. That is all the difference in the world. The auto safety movement was launched in Congress a few years ago precisely because Senator Ribicoff refused to accept executive vice presidential testimony and asked for the chairman or the president of the company.

Senator HART. You know, I have always had the feeling, and I run into this in the antitrust business, the danger you run into when you have the chairman of the board or the president discussing a specific corporate action is that he—and probably very truthfully—says, well, you know, for the details you will have to talk to the division manager.

Mr. NADER. He can be accompanied by his technical consultants. The point is he should be held to a certain standard of awareness about what his company is doing. Otherwise, we have the process where the top people say they don't know what is going on at the bottom and the bottom says they are just taking orders.

Senator HART. It sounds like the price fixing.

Senator SCOTT. If I may just interject a disclaimer of conflict of interest here. A Seattle newspaper recently published—evidently newspaper costs are such that they can't afford research divisions any more—a statement that I was the owner of the Scott Paper Co.

I am not the owner of the Scott Paper Co., though I was once a shareholder. Senator Fulbright, knowing at that time that I was a shareholder, said to me at one meeting that he assumed that every time he used a Scott paper product he was benefiting me as a shareholder. I said, "Yes, every time you turn around."

So I would like the record to show that I am not the owner of the Scott Paper Co.

Senator HART. I am glad that can be corrected also.

Mr. NADER. Five. The lag of the law behind the harm done to people and property through the abuse of technology is producing the mass phenomenon of victims without crimes. The corporate technologies produce the victims; yet the law is kept from articulating the crimes. This is planned anarchy and will serve to build up enormous tensions and costs in our society, both human and material. The necessary corporate reform that will have to come in the seventies must take into account the enormous options for harm and destruction now available to negligent or callous companies and industries in possession of complex chemicals and technologies.

For example, I am sure the next problem after mercury will be arsenic levels in water. There was an article in Science magazine recently indicating an area in the lower Midwest of rather alarming levels of arsenic in the water tested. Where does the arsenic come from? Some say it comes from some kinds of detergents or other chemicals that are dumped into the water.

The point is: Here we go again. The problem has been going on for some years with no alert function to bring it to the public and the Government's attention.

In the mercury compound contamination, who is to compensate those people who have been injured or whose property or livelihood, for example, fisherman, has been destroyed or impaired. Let not the recognition that governments have failed to develop systems to identify and quantify the personal damage obscure the fact that even if such information existed, there are few available and practical procedures and remedies to obtain compensation in our courts. Compensation for unjust injuries and damage can be a significant deterrent to economically motivated companies. However, this of course in turn does not subordinate the need for information.

I would like to provide two illustrations here of where the public has a right to know. Beginning from a proposal in 1963 by a subcommittee of the Committee on Government Operations in the House of Representatives, there was a request to HEW to establish a national industrial water inventory survey. At that time HEW, or where water pollution activities were, refrained from developing a questionnaire because of industry opposition. Finally, in 1965 a proposed questionnaire which would obtain key information on a company-by-company basis on water pollutants was sent to the Bureau of the Budget—in 1965 that is—and it still resides there.

The Bureau of the Budget under the Federal Reports Act has to clear questionnaires from Government agencies which are directed to industry or commerce and through something like 5 years it has been blocked. Primarily because the Bureau of the Budget permits an industry advisory committee to almost have veto power over its operations.

The Bureau of the Budget has consistently refused opening the doors of collaboration in these committees and allowing consumer or other more diverse representation. Had this questionnaire been sent out in 1965, it is possible that problems such as mercury poisoning would have been uncovered much earlier than has been the case.

One wonders what other potential problems of pollutants still remain to be uncovered, because this questionnaire is still languishing in the Bureau of the Budget.

A second item of information should be directed to the Army Corps of Engineers. I have not yet seen a complete list of all polluters who have been issued permits by the U.S. Army Corps of Engineers for industrial pollution of a continuing nature so that their discharges would not be in violation of section 13 of the Rivers and Harbors Act of 1899. And I think that the corps might well, on a State-by-State basis, disclose over a period of time, what permits were given, what the rationale was for giving the permit.

Senator HART. On that second point, Mr. Nader, I understand that today we will see for the record a list of permits issued under the 1899 act.[1] What additional detail may be furnished, I don't know. On the first point, I think it not inappropriate that the subcommittee address a letter to the Bureau of Budget citing your comment asking for action with respect to the clearance and distribution of the questionnaire or an explanation as to why it has not been cleared. I am sure Senator Scott would join me in that letter and will contribute enormously to persuading them.

Mr. NADER. I would agree with that, Mr. Chairman.

In the attention given mercury's environmental impact, almost unnoticed is the most intimate and devastating impact of mercury on workers handling or exposed to the materials. That is, mercury as an occupational hazard.

While the chlor-alkali, paint, and pulp industries, through their careless control of mercury effluents, are responsible for many of the mercury hazards now confronting the general public, they are also directly responsible for the damage to the health of their workers—a group more severely and chronically exposed to mercury contamination than any in the Nation. While the average citizen absorbs mercury through his food and occasionally through drinking water and the air he breathes, these workers inhale mercury vapor continuously as part of their jobs. This mercury goes directly to the lungs, not the digestive tract. Inhaled mercury, or mercury compounds may be more detrimental to man than mercury which is drunk or eaten. Absorption through the respiratory tract leads to a higher rate of accumulation of mercury in the brain than via other routes of absorption. There is a citation for that in a study by P. R. Stahl. The study is entitled "Air Pollution Aspects of Mercury and Its Compounds," available through the National Air Pollution Control Administration. It is dated September 1969. Fear of excessive exposure to mercury has become a major source of grievances in the chemical industry.

In most of the discussion on mercury poisoning no attention has been given to the occupational hazard part of that problem. A Connecticut plant of Hamilton Standard, a division of United Aircraft Corp., illustrates the severity of this problem. In the company's description of the job "Maintenance Mechanic, Mechanical," the following statement appears under the title "Working Conditions": Frequent exposure to grease, oil, gases, mercury vapors, dirt, dust, inclement weather make job somewhat disagreeable."

To mix mercury vapors in a casual way with dirt or inclement weather is a startling understatement and glosses over working conditions in which chronic exposure to mercury is so severe that the workers, after futile protest and consistent refusals by the management to allow them to see their own health records, have threatened

[1] List begins on p. 137.

to close the plant down unless mercury emissions inside the plant are strictly controlled. The workers report they have had mercury levels checked through urine samples. When the mercury level in a worker reaches a certain point, he is temporarily transferred to another job where exposure to mercury vapor is reduced. Later he is switched back. This exercise is largely pointless because mercury is cumulative and short-term respites from exposure are likely to do little to avoid long-term hazards.

At the same time the workers are reluctant to confront management directly on this point because of the obvious job loss implications. However, the frustration that is building up certainly is heading in that direction.

This plant, by the way, dumps effluent into a local stream which has not yet been tested for mercury residues by the Department of Interior.

I might add United Aircraft and all subdivisions would come under the Walsh-Healy Act which is a Federal law designed to establish minimum safety standards for any plant that engages in handling Government contracts over $10,000 worth and United Aircraft certainly qualifies for that. Yet where is the Department of Labor here? Once again something in its more moribund state, oblivious to these long-range and varied hazards that are affecting working people and, in effect, generate far more violence on the job in terms of death and injury and diseases than all the violence combined in the streets.

Excerpts from interviews with workers conducted by Anthony Mazzocchi of the Oil, Chemical & Atomic Workers Union, demonstrate that the problems at United Aircraft's plant are indicative of a major neglect of the chemical industry of the occupational health implications of industrial mercury. Here are some excerpts from interviews with chemical workers.

MEMBER OF LOCAL 8–447, WOODBRIDGE CHEMICAL CO., HAWTHORNE, N.J.

Most of our products are mercury. And we made a product called ROM . . . After we make this product, we turn it into a powder and we have to pack it. When we pack it, the dust from this here powder gets into our lungs, even though we have a mask on. And they're supposed to have a blower. But every time the doctor comes in to test me for the mercury that I inhale from this powder, they always tell me that they should take me down to the still (mercury distilling unit) instead of sending scrap mercury, because I have more mercury in my system than we collect in the scrap container.

We have so much mercury, I'm telling you, the mercury; they put 25 flasks on the table and they say, "Dump them." They see you dump 25; they bring 50 more. And how much of this mercury am I inhaling? I told my foreman, "You know, I'm going to be in the cemetery." He said, "Well, I tell you; I'll send you a wreath." He said it as a joke but he was serious.

MEMBER OF LOCAL 9672, DOW CHEMICAL CO. PLANT, SARNIA, CANADA

We all know there is a terrific health hazard with mercury . . . It's become a common thing to see it laying around on the floor and on the ground. The window cleaners come in to clean windows in our unit, and a half an hour after they start to do their job, their squeegees become so covered with silver that they can't use them any longer, and the buckets become tainted because of the mercury they scrape off the windows.

For the chemical industry, as these statements show, control of mercury as a pollutant must begin at home. Mercury is a particularly difficult problem in industrial use because it is a liquid which easily vaporizes. Tests on the long-term effects of chronic inhalation of

mercury vapor are very incomplete. It is well known, however, that mercury poisoning is something like lead poisoning in that it develops slowly and insidiously. Its symptoms, headaches, dizziness, lethargy, inability to concentrate, are often attributed to other causes, but its long-term effects are directly on the nervous system. Mercury poisoning as an occupational disease must be thoroughly investigated and studied and national standards for safe mercury thresholds be established and enforced in the industrial environment as well as the environment at large.

It is time for the word "emergency" to ring out again and again in dealing with environmental violence.

I might add here, Mr. Chairman, that we still, no matter what our commentaries and our expressions of concern, have not recognized environmental violence for what it is in terms of its magnitude and seriousness now and later and for future generations.

I think when I see the attendance of this committee today before what is really a national disaster I recall the dog and cat bill that this committee, that the main committee considered in 1966, which brought out one of the most vigorous attendance of the members of the committee in recent years.

I think that is an expression of the simple fact that both citizens and official representatives are not expressing the gut as well as the intellectual worry and concern for the real destruction of the natural habitat which we rely on for our health and safety.

This mercury situation, if it could ever be dramatized, in an explicit, graphic way, would make a Kavka novel pale by comparison. We don't have to read Kavka novels any more the way we are going. We are experiencing them. Somehow we have to get the communication process moving to recognize the fact that violence in this country comes in many forms and the most deadly and serious forms are those coming out of our plants and our mines and our chemical and other technologies spreading throughout the land poisoning the soil and water and air and getting into our food and in our bodies and jeopardizing not only the health of present Americans but the health of future generations. This kind of violence comes with a silence, an insidiousness, a lack of voice or noise. It doesn't provoke sensory receptions of pain and anguish on the part of its victims. It proceeds from consequences remote in time and place to the originating decisions of cuff-linked executives.

It involves itself in the intricacies of bureaucracies and apathy and as such doesn't get the recognition by the Justice Department as seven or eight 20-year-olds get with beards and sandals demonstrating on streets.

I think we must begin to recognize we have to develop priorities within our existing law-enforcement personnel and our existing budgets and that these priorities have to be directed toward the greatest risk and the greatest realities of violence that exist today. Environmental contamination comes right up to the top of that list.

Thank you.

Senator HART. Well, I hope the last few minutes goes on tape into every living room tonight. It would help. I wish all of us had the magic with words coupled with the social conscience that is yours.

There may be some questions. I had some prepared. I am afraid that they might even spoil the flavor of what you have given us but I will ask the staff to determine if there are any questions that should be developed.

Mr. BICKWIT. Perhaps we can develop the flavor, and attempt to enhance it.

You mentioned the Refuse Act and the fact that you hadn't yet seen a list of the number of permits that had been granted. We will now place that list in the record.[1]

Mr. BICKWIT. It does disclose in 23 States of the Union there are no permits whatsoever granted. I take it this is of concern to you because the Refuse Act can be used as a means to determine inventories, to determine exactly what is going into our waters.

But in this case, even if we knew what was going into our waters, this wouldn't have really done much for us if we didn't know the dangers of the particular contaminant.

Now there has been some dispute as to whether we should have, as to whether we did. What do you see as the best way to enhance our knowledge so that the lag that you describe in your recommendation No. 5, does not continue to haunt us?

Mr. NADER. Incidentally, before I reply to that question, is the Corps of Engineers going to supply a historical record of these permits? I think it would be useful to supply it right back to 1899 if it is possible.

Mr. BICKWIT. They have supplied this to Congressman Reuss' subcommittee, House Subcommittee on Conservation and Natural Resources, and we have obtained a copy from that subcommittee. It goes back to 1899.

Mr. NADER. Fine.

In reference to your question, I think there are many ways to reply but I think the key response is simply to shift the burden of proof statutorily and in the regulations so that any firm which dumps any foreign ingredients or chemical or pollutant into the natural environment has to show evidence that this pollutant or this intrusion into the environment is either neutral or nonharmful.

Now that still allows for the tolerance of negligible risks. What it requires, however, is that every factory or every mine or every municipal pollutant who tries to use the air and water and soil as their private sewers or dumping grounds must uphold a burden of proof that these intrusions into other peoples' environment are not harmful or are neutral.

Once the burden of proof is shifted, the incentive to do the research will be increased on the part of industry, as well as the incentive for Government to do the research because the prosecutions will have to come thick and heavy, and as a result the Government will have an incentive to develop this kind of information for its own use in law enforcement.

I might add the following: One of the cardinal precepts of the capitalist system in this country is the recognition of property rights. And yet one dimension of that system is destroying millions of peoples' property rights without an iota or a cent of compensation.

[1] See list on p. 137.

Example: Gary, Ind. United States Steel. Enveloping the city in a cocoon of pollution, depreciating property values of small home owners, small businesses, and in effect destroying property or requiring property to be maintained and painted far more regularly than should be the case. Now that is really taking other peoples' property. It is taking it knowingly and systematically over time without any compensation.

I think that illustrates how neglectful, how vacuous the existing legal system is when a prime precept of the economic system does not get recognition in the law for people who are not powerful in a property matter.

All through the country when the statement is made that air pollution is costing us $14 billion in property damage, that means in large part private property damage. There is no compensation. So in order to generate the kind of data and information that you asked about, the second incentive structure would be to loosen the procedural and substantive obstacles to claimants who are damaged and who want to proceed through the courts for compensation.

Or if you have legislatively established a compensation trust fund whereby the steel industry, for example, will simply put in this trust fund so much per ton of steel to compensate the property and health rights that have been damaged through its operations.

This is a very economically motivated society. If you want to motivate the production of knowledge and the use of knowledge you have to motivate the economic incentives in terms of sanctions and penalties.

Mr. BICKWIT. Well we haven't got that compensation system now. What do you suggest we do about the compensation of those who have been injured by this particular process?

Mr. NADER. Mercury you mean? I think what has to be done is the following, and it is a rather innovative proposal only because there is no other way to do it.

When you have a contamination that is difficult to trace between the perpetrator and the victim in a sequence, like the old tort where A struck B, the connection is clear. Where you have that kind of contamination, you have to in effect make a broad-view responsibility structure whereby all of the contaminants of mercury in the society such as the paper and pulp mills and the chemical plants are studied for their respective allocations and that their contribution would be in a rough sense that proportion and that a compensation fund be set up for the compensation of injuries and disease to the victims and the compensation of the fishery industry and fishermen have been deprived of their livelihood.

Now there have been similar compensation systems set up with similar complexities. When damage suits proceeded against the Tetracycline conspirators a system of compensation was set up arising out of a settlement whereby lawyers representing the State attorneys-general and consumers or patients who purchased these overpriced products arrived at a settlement of about $85 million and then proceeded to try, under court order and supervision, to try to distribute these sums to the State attorneys-general in portions held in trust for the State and to patients who filed their claims. That is a difficult process but any achieving of justice in a new field is a difficult process.

I think once the bugs are worked out of a system like this, once the anticipation of such systems being developed is driven home to pollut-

ing industries, then I think you will find the deterrents there in increasing amount.

Mr. BICKWIT. Under your system compensation comes from industry entirely without subsidy from Government?

Mr. NADER. That is right. I think there has been altogether too much welfare for corporations in recent years. [Laughter.]

Mr. BICKWIT. You talk about a burden of proof that industry should have to sustain before it would be allowed to dump any particular potential pollutant, introduce any chemical into the environment. What standard of proof would you want to impose on industry in light of the fact that admittedly our technological knowledge is so limited that a standard which required proof beyond doubt would be unable to be met?

Mr. NADER. You develop the kinds of standards where the coming forward with evidence is on the shoulders of the potential polluter. That makes all the difference in the world because he has to do the research to prove X standard of risk this is acceptable. He has to do the research. What this will force is the kind of cycle profile by industries and companies of these new ingredients that they are using. That is, they will have to study precisely what the ecological effect is in order to meet these standards.

Now some will argue well, that will slow up progress. What kind of progress? Progress for who? For example, we often hear that the counter action to pesticide controls with more severe standards will wreck our agriculture. It will chop production by 40, 50, 60 percent. Where is the proof for that?

Nobody has ever asked the industry or the agriculture business to precisely document that charge, or the Department of Agriculture. For example, in the mercury area automatically the spokesmen for agribusiness said there would be a 20- to 30-percent decline in production if mercury fungicides are taken off the market; 20 to 30 percent decline in production.

Dr. Fritsch's figures are remarkably less than that. The Swedish experience communicated today through the Swedish Embassy is that there has been no decline in production. What does this mean? It could mean that there is a process of systematic prevarication operating here precisely because the burden of proof has always been on victims and on Government and not on the perpetrator of the new chemical intrusion into the environment.

Mr. BICKWIT. What do you do with the argument that you refer everything to be proofed beyond doubt to be safe, as of this point we don't have much left?

Mr. NADER. There obviously has to be a substantial program to go back to all the chemicals and other ingredients now being used with abandon in the environment but that is precisely what we need.

If anybody suggests we need anything less than a Manhattan-type project for ecological sanity, then I don't think he appreciates what the risks are for the next generation.

Mr. BICKWIT. Dr. Fritsch mentioned the dangers inherent in the use of mercury fungicides. With all these dangers, are either of you aware as to why it was when the Department of Agriculture attempted to move against one such fungicide that they were overruled by the courts?

My understanding is that the Department did attempt to suspend Panogen and that an injunction was granted to the manufacturer of the pesticide to enjoin the suspension.

Have you any idea as to why the court arrived at that conclusion in light of the overwhelming evidence that you present of the dangers of Panogen and other mercurials?

Dr. FRITSCH. We haven't seen the actual testimony presented by the Agriculture Department but we did see the decision and we can guess some of the testimony. We wonder if they have done their homework—the Agriculture Department. Why didn't translocation ever appear?

Mr. BICKWIT. You are suggesting that the Department has not presented the strongest case possible.

Dr. FRITSCH. There may have been other reasons but certainly it wasn't a strong case.

Mr. NADER. It is also part of the vague definition of imminent peril. The very defects that your amendment, Senator, strives to remedy.

Mr. BICKWIT. Thank you very much.

Senator HART. I must make a confession. Beginning at about noon I picked up material bearing on a meeting I have at 2 in order to do my homework and your—this is a terrible admission to make on the record—discussion has made it impossible to do my work so I will blame you for my ineptness at 2.

Thank you very, very much.

Doctor, would you provide for the record a summary of your background?

Dr. FRITSCH. Yes, sir.

Senator HART. Thank you very much.

(The information requested follows:)

BIOGRAPHY OF ALBERT J. FRITSCH, TECHNICAL CONSULTANT, CENTER FOR THE STUDY OF RESPONSIVE LAW, WASHINGTON, D.C.

Dr. Fritsch received his B.S. and M.S. degrees from Xavier University of Ohio and his Ph.D. from Fordham (1964) in chemistry. He received an S.T.L. from Loyola of Chicago in 1968. He was a research associate with Dr. M. Dewar at the University of Texas until June 1970. While in Chicago he cooperated with the Great Lakes Naval Medical and Dental Research Units in the syntheses and testing of three anti-bacterial and anti-viral agents. He has published in this area and in the fields of heterocyclic and boron-nitrogen chemistry.

He is a member of the American Chemical Society, Sigma Xi, Phi Lambda Upsilon, and the American Association for the Advancement of Science. He is likewise a Jesuit priest.

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APPENDIX 4

U.S. DEPARTMENT OF THE INTERIOR,
FISH AND WILDLIFE SERVICE,
BUREAU OF COMMERCIAL FISHERIES,
Washington, D.C., July 28, 1970.

Mr. ALBERT FRITZCH,
Center for Responsible Law,
Washington, D.C.

DEAR MR. FRITZCH: In response to your request of July 27, we estimate the annual value of commercial fish affected by State closures of fisheries due to mercury pollution to be about $3.2 million. This figure is derived by taking the value of the annual catch of those fisheries which currently have been closed. The areas where commercial fishing has been affected to date by closure due to the mercury problem include all of the Great Lakes, except Lake Michigan, all of the Tennessee Valley River system, and the lower Mississippi River above New Orleans.

It should be pointed out that these are rather gross estimates and they do not include the value of fish caught by sport fishermen in affected areas.

Sincerely yours,

PHILIP M. ROEDEL, *Director.*

(The list referred to on p. 132 follows, hearing testimony resumes on p. 423.)

TABLE A

DATA concerning existing permits issued since March 3, 1899 by the Corps of Engineers to any person for the purpose of discharging INDUSTRIAL WASTES into navigable waters within or bordering any state

ALABAMA

Name & Address of Permittee* (1)	Product Manufactured (2)	Type of Wastes discharged (3)	Date Permit Issued-Renewal (4)	Section of 1899 Act under which Permit Issued (5)	Term of Permit (6)	Date of last Inspection to insure compliance with permit. Indicate whether or not in compliance (7)	Name & location of water receiving waste discharge (8)
Industrial Development Board of the town of Camden, Alabama	Paper and related products	Treated liquid effluent	5 July 1967	13 (See 407)	Indefinite	-	Alabama River (Approx. Mile 12(
Industrial Development Board of the City of Selma, Alabama P. O. Box 939 Selma, Alabama	Paper and related products	Liquid treated effluent	After-the-fact 21 October 1968	10	Indefinite	1967	Alabama River (Approx. Mile 22(

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ALABAMA

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Union Bag-Camp Paper Corp., 233 Broadway New York, N. Y.	Paper and related products	Treated liquid effluent	25 May 1965	10	Indefinite	1967	Alabama River (approx. Mile 28
Courtaulds (Ala) Inc. P. O. Box 1076 Mobile, Alabama	Nylon and Filament Yarn	Treated liquid effluent	16 May 1952	10	Indefinite	1967	Mobile River (at 27-Mile Bluff near Salco, Ala.
Shell Chemical Co. Dv. of Shell Chemical Company P. O. Box 536 Axis, Alabama 36505	Insecticides	Treated liquid effluent	7 June 1968	10	Indefinite	-	Mobile River (approx. 27 mile north of Mobile near Mt. Vernon, Alabama
Gulf States Paper Corp. Demopolis, Alabama	E-Z Opener Bags, Pulp, Paper	Treated liquid effluent	19 Mar 1957	10	Indefinite	1967	Tombigbee River approx. 15 miles west of Demopoli Alabama

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Geigy Chemical Corp. McIntosh, Alabama 36553	Optical Brighteners Sequestrene Compounds Insecticides, Herbicides Soil Nutrients	Treated liquid effluent	1 Nov 1967	10	Indefinite	1967	Tombigbee River (approx Mile 61) McIntosh, Alabam
Alabama Kraft Company, Phenix City, Alabama 36867 Located near Cotton, Ala.	Liner Board	Treated liquid effluent	20 June 66	10	Indefinite	1967	Chattahoochee Rv (approx. Mile 11 W. F. George Reservoir
Beaunit Fibers Coosa Pines Plant Childersburg, Alabama	Fiber and related products	Treated liquid effluent	3 Jan 1966	10	Indefinite	-	Coosa River (approx Mile 80)
Alabama Power Company Birmingham, Alabama	Electrical power	Heated Water	13 Oct 1939	10	Indefinite	-	Hog Bayou (Tributary of Chickasaw Creek at Mobile, Ala.
Alabama Power Company Birmingham, Alabama	Electrical power	Heated water	28 Dec 1962	10	Indefinite	-	Black Warrior Rv (aprox. Mile 228 near Demopolis,A

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TABLE A

Data concerning existing permits issued since March 3, 1899 by the Corps of Engineers to any person for the purpose of discharging INDUSTRIAL WASTES into navigable waters within or bordering any state

ALASKA

Name & Address of Permittee	Product Manufactured	Type of Wastes discharged	Date Permit Issued-Renewal	Section of Refuse Act under which Permit Issued	Term of Permit	Date of last inspection to insure compliance with permit. Indicate whether or not in compliance	Name and location of water receiving waste discharge
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Standard Oil Co. of California Box 7-839 Anchorage 99501	Petroleum processing plant	Waste water (treated)	12 April 1963	Section 10	3 years to construct. Indefinite	Not inspected	Cook Inlet at Nikiski, Alaska
Shell Oil Co. 1008 W. 6th St. Los Angelles 90054	Crude oil separator treatment	Saltwater (treated)	29 November 1965	Section 10	3 years to construct. Indefinite	Not inspected	Cook Inlet, north of East Foreland
Phillips Petroleum Co 842 Phillips Bldg. Bartlesville, Okla. 74003	Gas liquification plant	Treated water	14 March 1969	Section 10	3 years to construct. Indefinite	Not inspected	Cook Inlet at Nikiski, Alaska
Fairbanks, City of Fairbanks 99701	Power plant	Heated water (treated)	18 November 1969	Section 10	3 years to construct. Indefinite.	Not inspected	Chena River at Fairbanks, Alaska
International Seafoods, Inc. 427 Bellevue Ave. E. Seattle 98102	Canned salmon	Fish waste	3 April 1969	Section 10	3 years	Not inspected	Cook Inlet near mouth of Kasilof River

TABLE A

Data concerning existing permits issued since March 3, 1899 by the Corps of Engineers to any person for the purpose of discharging INDUSTRIAL WASTES into navigable waters within or bordering any state

ARIZONA

Name & Address of Permittee* (1)	Product Manufactured (2)	Type of wastes discharged (3)	Date Permit Issued-Renewal (4)	Section of Refuse Act under which Permit Issued (5)	Term of Permit (6)	Date of last inspection to insure compliance with permit. Indicate whether or not in compliance (7)	Name and location of water receiving waste discharge (8)

NONE

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ARKANSAS

Name and Address of Permittee* (1)	Product Manufactured (2)	Type of Wastes discharged (3)	Date Permit issued-renewal (4)	Section of Refuse Act Under which Permit issued (5)	Term of Permit (6)	Date of last inspection to insure compliance with permit. Indicate whether or not in compliance (7)	Name and Location of water receiving waste discharge (8)
Ark. Power & Light Co. Pine Bluff, Arkansas	Electrical Power	Thermal Pollution	22 Dec 60	Section 10	2-1/2 years	22 Dec 60 compliance	Miss. R., Mile 655.5 AHP Arkansas
City of West Memphis, Arkansas	Unknown	Sewage	Jul 45	Section 10	3 years	Unknown	Miss. R., Mile 730.0 AHP West Memphis, Arkansas
City of West Memphis,	Sewage (Treated Mun.)	Treated Sewage Effluent	9 Jun 69	Section 10	3 years	Not completed at this time	Miss. R., Mile 728.5 AHP Arkansas
International Paper Company, P.O. Box 2328, Mobile, Alabama	Paper cartons	Paper Mill Waste Water (primary treatment)**	27 Jan 69	10	4 yrs	6 Jan 70 (in compliance)	Arkansas River at Nav. Mile 61.4

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**Secondary treatment facilities are currently under construction to comply with requirements of Arkansas Pollution Control Commission.

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CALIFORNIA

Los Angeles District
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State of California

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City Manager City of San Diego City Administration Building San Diego, CA	Sewage Treatment	Treated Effluent	7 March 1961	Sec. 10	3 yrs. (completed)	July 1964	Pacific Ocean Off Point Loma
Vista Sanitation District 5555 Overland Ave. San Diego, CA (City of Carlsbad)	Sewage Treatment	Treated Effluent	16 Dec. 1963	Sec. 10	3 yrs. (completed)	Jan. 1967	Pacific Ocean about 4 miles south of Carlsbad
Southern California Edison Company P. O. Box 351 Los Angeles, CA	Electric Power Plant	Cooling Water	14 Dec. 1964	Sec. 10	3 yrs. (completed)	July 1966	Pacific Ocean about 2 miles south of San Clamente
Department of Special District Services County of San Diego 5555 Overland Ave. San Diego, CA (Cardiff Sanitation District)	Sewage Treatment	Treated Effluent	15 Jan. 1965	Sec. 10	3 yrs. (completed)	April 1966	Pacific Ocean at San Elijo Lagoon

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Kelco Company 2145 East Belt St. San Diego, CA	Kelp Byproducts	Waste Water	27 July 1965	Sec. 10	3 yrs. (completed)	June 1968	San Diego Bay near U. S. Pierhead Station 477
South Laguna Sanitary District P. O. Box 36 South Laguna, CA	Sewage Treatment	Treated Effluent	5 Feb. 1954	Sec. 10	3 yrs. (completed)	Feb. 1955	Pacific Ocean, 200 feet north of Aliso Creek. South Laguna
Southern California Edison Company P. O. Box 350 Los Angeles, CA	Electric Power Plant	Cooling Water	24 Sept. 1956	Sec. 10	3 yrs. (completed)	Nov. 1957	Pacific Ocean at Huntington Beach
Dana Point Sanitary District P. O. Box 571 Dana Point, CA (City of San Juan Capistrano)	Sewage Treatment	Treated Effluent	14 Jan. 1965	Sec. 10	3 yrs. (completed)	May 1966	Pacific Ocean at Doheny Beach State Park, Orange County

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Emerald Bay Service District 600 Emerald Bay Laguna Beach, CA	Sewage Treatment	Treated Effluent	4 Jan. 1962	Sec. 10	3 yrs. (completed)	May 1964	Pacific Ocean at Emerald Bay west of Laguna Beach
County Sanitation Districts of Orange County P. O. Box 5175 Fountain Valley, CA	Sewage Treatment	Treated Effluent	31 Aug. 1964	Sec. 10	3 yrs. (completed)	Sept. 1965	Pacific Ocean at Santa Ana River, Orange County
Signal Oil & Gas Co. 1010 Wilshire Blvd. Los Angeles, CA	Oil Processing Plant	Waste Water	16 Dec. 1964	Sec. 10	3 yrs. (completed)	May 1965	Pacific Ocean, 1,.00 feet west of 23rd St. Huntington Bch
Standard Oil Co. of Calif. P. O. 606 LaHabra, CA	Oil Processing Plant	Waste Water	27 April 1966	Sec. 10	3 yrs. (completed)	Oct. 1966	Pacific Ocean, 5,.00 feet west of 23rd St. Huntington Bch

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Continental Oil Co. 180 North Ashwood Ventura, CA	Petroleum Processing	Waste Water	17 Oct. 1968	Sec. 10	3 yrs. (completed)	Oct. 1968	Pacific Ocean, 4 miles west of Ventura
Union Oil Co. of California 9645 Santa Fe Springs Road Santa Fe Springs, CA	Petroleum Processing	Waste Water	7 Feb. 1969	Sec. 10	3 yrs. (completed)	May 1969	Pacific Ocean at Seacliff, Ventura County
Summerland Sanitary District P. O. Box 121 Summerland, CA	Sewage Treatment	Treated Effluent	14 Nov. 1958	Sec. 10	3 yrs. (completed)	May 1960	Pacific Ocean, 6 miles east of Santa Barbara
Standard Oil Co. of California P. O. Box 606 LaHabra, CA	Petroleum Processing	Waste Water	28 Sept. 1959	Sec. 10	3 yrs. (completed)	May 1960	Pacific Ocean at Carpinteria
Montecito Sanitary District P. O. Box 5097 Santa Barbara, CA	Sewage Treatment	Treated Effluent	4 Nov. 1960	Sec. 10	3 yrs. (completed)	May 1961	Pacific Ocean, 2.5 miles east of Santa Barbara Hbr.

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Port Hueneme Sanitary District P. O. Box 298 Port Hueneme, CA	Sewage Treatment	Treated Effluent	4 Dec. 1963	Sec. 10	3 yrs. (completed)	June 1965	Pacific Ocean at Port Hueneme, Ventura County
City of Oxnard City Hall Oxnard, CA	Sewage Treatment	Treated Effluent	20 Feb. 1964	Sec. 10	3 yrs. (completed)	May 1966	Pacific Ocean, about 2 miles south of Port Hueneme
City of San Buenaventura P. O. Box 99 Ventura, CA	Sewage Treatment	Treated Effluent	10 Sept. 1965	Sec. 10	3 yrs. (completed)	May 1967	Pacific Ocean at County Fairgrounds at Ventura
Phillips Petroleum Company 1306 Santa Barbara Street Santa Barbara, CA	Petroleum Processing Plant	Waste Water	18 Jan. 1968	Sec. 10	3 yrs. (completed)	July 1968	Pacific Ocean, 1 mile south of Rincon Pt., Ventura County

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Carpinteria Sanitary District City Hall Carpinteria, CA	Sewage Treatment	Treated Effluent	15 Nov. 1960	Sec. 10	3 yrs. (completed)	May 1961	Pacific Ocean at Oak Ave., Carpinteria
City of Santa Barbara Public Works Dept. 636 Garden St. Santa Barbara, CA	Sewage Treatment	Treated Effluent	6 Feb. 1964	Sec. 10	3 yrs. (completed)	Aug. 1964	Pacific Ocean near Stearns Wharf
Goleta Sanitary District P. O. Box 452 Goleta, CA	Sewage Treatment	Treated Effluent	21 Sept. 1964	Sec. 10	3 yrs. (completed)	May 1966	Pacific Ocean near Goleta Beach pier
Shell Beach Sanitary District P. O. Box 259 Shell Beach, CA	Sewage Treatment	Treated Effluent	14 July 1953	Sec. 10	3 yrs. (completed)	May 1954	Pacific Ocean at Shell Beach
Morro Bay Sanitary District City Hall Morro Bay, CA	Sewage Treatment	Treated Effluent	14 Oct. 1953	Sec. 10	3 yrs. (completed)	Aug. 1954	Pacific Ocean at Morro Creek

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Union Oil Co. of California Union Oil Center Los Angeles, CA	Coke Processing	Wash Water	6 Oct. 1954	Sec. 10	3 yrs. (completed)	May 1956	Pacific Ocean at Oso Flaco Lake
San Simeon Acres Community Services District San Simeon, CA	Sewage Treatment	Treated Effluent	9 Jan. 1964	Sec. 10	3 yrs, (completed)	May 1966	Pacific Ocean midway between Cambria & San Simeon
South San Luis Obispo County Sanitation District 214 E. Branch St. Arroyo Grande, CA	Sewage Treatment	Treated Effluent	13 April 1965	Sec. 10	3 yrs. (completed)	May 1967	Pacific Ocean at Oceano
Southern California Edison Company P. O. Box 351 Los Angeles, CA	Electric Power Plant	Cooling Water	30 Dec. 1946	Sec. 10	3 yrs. (completed)	June 1948	Pacific Ocean at Redondo Beach

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City of Los Angeles Board of Public Works City Hall Los Angeles, CA	Sewage Treatment	Treated Effluent	21 March 1948	Sec. 10	3 yrs. (completed)	May 1950	Santa Monica Bay at Hyperion
Southern California Edison Company P. O. Box 351 Los Angeles, CA	Electric Power Plant	Cooling Water	17 April 1953	Sec. 10	3 yrs. (completed)	May 1954	Pacific Ocean at Redondo Beach
County Sanitation Districts of Los Angeles County 2020 Beverly Blvd. Los Angeles, CA	Sewage Treatment	Treated Effluent	3 August 1953	Sec. 10	3 yrs. (completed)	July 1955	Pacific Ocean at Whites Point, San Pedro
Southern California Edison Company P. O. Box 351 Los Angeles, CA	Electric Power Plant	Cooling Water	15 October 1953	Sec. 10	3 yrs. (completed)	March 1955	Santa Monica Bay at El Segundo

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County Sanitation Districts of Los Angeles County 2020 Beverly Blvd. Los Angeles, CA	Sewage Treatment	Treated Effluent	2 Sept. 1954	Sec. 10	3 yrs. (completed)	June 1956	Pacific Ocean at Whites Point, San Pedro
City of Los Angeles Board of Public Works City Hall Los Angeles, CA	Sewage Treatment	Sewage Sludge	21 Dec. 1955	Sec. 10	3 yrs. (completed)	May 1958	Santa Monica Bay at Hyperion
City of Los Angeles Dept. of Water & Power P. O. Box 3669 Los Angeles, CA	Electric Power Plant	Cooling Water	14 May 1956	Sec. 10	3 yrs. (completed)	May 1958	Pacific Ocean near El Segundo
Standard Oil Company of California P. O. Box 606 LaHabra, CA	Petroleum Processing	Waste Water	11 April 1957	Sec. 10	3 yrs. (completed)	May 1958	Pacific Ocean at El Segundo

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CALIFORNIA

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City of Los Angeles Dept. of Public Works City Hall Los Angeles, CA	Sewage Treatment	Treated Effluent	23 March 1959	Sec. 10	3 yrs. (completed)	August 1962	Los Angeles Hbr. at Ferry St., Terminal Island
Southern California Edison Company P. O. Box 351 Los Angeles, CA	Electric Power Plant	Cooling Water	30 October 1962	Sec. 10	3 yrs. (completed)	April 1964	Santa Monica Bay at El Segundo
County Sanitation Districts of Los Angeles County 2020 Beverly Blvd. Los Angeles, CA	Sewage Treatment	Treated Effluent	30 Sept. 1963	Sec. 10	3 yrs. (completed)	August 1966	Pacific Ocean at Whites Point, San Pedro
Southern California Edison Company P. O. Box 351 Los Angeles, CA	Electric Power Plant	Cooling Water	30 March 1965	Sec. 10	3 yrs. (completed)	October 1966	Pacific Ocean at Redondo Beach
City of Los Angeles Board of Public Works City Hall Los Angeles, CA	Sewage Treatment	Treated Effluent	16 May 1967	Sec. 10	3 yrs. (completed)	March 1969	Santa Monica Bay at Hyperion

* If permittee is an agent disposing of waste for a manufacturer or municipality, then also include name & address of manufacturer or municipality

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TABLE A

Data concerning existing permits issued since March 3, 1899 by the Corps of Engineers to any person for the purpose of discharging INDUSTRIAL WASTES into navigable waters within or bordering any state

CALIFORNIA

Name & Address of Permittee* (1)	Product Manufactured (2)	Type of wastes discharged (3)	Date Permit Issued-Renewal (4)	Section of Refuse Act under which Permit Issued (5)	Term of Permit (6)	Date of last inspection to insure compliance with permit. Indicate whether or not in compliance (7)	Name and location water receiving waste discharge (8)
Pacific Gas & Electric Co. 245 Market Street San Francisco, Calif.	Electric Power	Cooling Water	7 Mar 49	Section 10	Indefinite	6/5/50 - Yes	Elkhorn Slough at Moss Landing, California
Pacific Gas & Electric Co. 245 Market Street San Francisco, Calif.	Electric Power	Cooling Water	4 Feb 64	Section 10	Indefinite	9/1/66 - Yes	Monterey Bay at Moss Landing, California
Georgia-Pacific, Corp. P.O. Box 580 Toledo, Oregon	Pulp	Mill effluent	17 Sep 64	Section 10	Indefinite	7/1/65 - Yes	Pacific Ocean at Somoa, Humboldt County, Calif.
Del Monte Properties Company Pebble Beach, Calif.	Mine Sand	Silt and clayey materials	28 Aug 62	Section 10	Indefinite	7/15/63 - Yes	Pacific Ocean at Spanish Bay, Monterey, Co., Calif.
Crown Simpson Pulp Company 6363 Airport Way South Seattle, Washington 98108	Pulp	Mill effluent	25 Mar 68	Section 10	Indefinite	5/2/68 - Yes	Pacific Ocean at Fairhaven, Humboldt Co., Calif.

* If permittee is an agent disposing of waste for a manufacturer or municipality, then also include name & address of manufacturer or municipality

Note: Quality of wastes are regulated by State of California Regional Water Quality Boards.

Data concerning [illegible]
by the Corps of Engineers to any person for the purpose of discharging INDUSTRIAL WASTES into navigable waters within or bordering any state

CALIFORNIA

Sacramento District
South Pacific Division
State of California

Name & Address of Permittee	Product Manufactured	Type of wastes Discharged	Date Permit Issued-Renewal	Section of Refuse Act under which Permit Issued	Term of Permit	Date of Last inspection to insure compliance with permit. Indicate whether or not in compliance	Name and location of water receiving waste discharge
E. I. DuPont P.O. Box JJ Antioch, Calif.	Chemicals	Chemicals	No. 2827 8 June 56	Section 10, River & Harbor Act of 3 March 1899	3 Years constr. period	Oct 56 - Yes	At Antioch, Sacramento River
Fiberboard 1789 Montgomery San Francisco, Calif.	Paper	Pulp	No. 4157 (18Jan68) No. 3221 (27Jan60) No. 2878 (20Sep56)	"	"	Apr 68 - Yes Jul 60 - Yes Sep 56 - Yes	At West Island, San Joaquin River
Diamond National P.O. Box 1500 Red Bluff, Calif.	Paper	Pulp and Chemicals	No. 3132 25 May 59	"	"	Mar 64 - Yes	Sacramento River, Mile 243.5
Libby Owens Ford 1701 E. Broadway Toledo, Ohio	Glass	Chemicals	No. 3478 20 November 61	"	"	Dec 61 - Yes	At Mossdale, San Joaquin River
M.P. Kirk & Sons P.O. Box 8067 Emeryville, Calif.	Reclaim Batteries	Acid	No. 3917 (9Sep65) No. 2925 (17May57)	"	1 Year constr. period	Nov 65 - Yes Nov 68 - Yes	Sacramento River, Mile 57.6
Dow Chemical Co. P.O. Box 351 Pittsburg, Calif.	Chemicals	Acidic waste mixed with cooling water	No. 3065 (14Oct58) No. 3045 (26Aug58)	"	3 Years const. period	Oct 58 - Yes Jan 58 - Yes	At Pittsburg, New York Slough
Humble Oil & Refining Co. Benicia, Calif.	Petroleum	Chemical	No. 4172 12 January 68	"	"	Nov 69 - Yes	Near Benicia-Martinez Bridge, Suisun Bay
Allied Chemical Corp., Nichols Rd. Pittsburg, Calif.	Chemical	Acidic process wastes mixed with cooling water	No. 4574 12 January 70	"	"	Under construction	At Pittsburgh, Suisun Bay

TABLE A

Data concerning existing permits issued since March 3, 1899 by the Corps of Engineers to any person for the purpose of discharging INDUSTRIAL WASTES into navigable waters within or bordering any state

CALIFORNIA

Name & Address of Permittee* (1)	Product Manufactured (2)	Type of wastes discharged (3)	Date Permit Issued-Renewal (4)	Section of Refuse Act under which Permit Issued (5)	Term of Permit (6)	Date of last inspection to insure compliance with permit. Indicate whether or not in compliance (7)	Name and location of water receiving waste discharge (8)
City of Sacramento City Hall Sacramento, Calif.		Industrial and Domestic Sewage	No. 2006 (13 Jan 39) No. 1884 (3 Dec 35	10	3 years constr. period	Jun 41 - Yes Jul 38 - Yes	At Sacramento, Sacramento. River
City of Stockton		Industrial and Domestic Sewage	No. 3709 (26 Feb 64) No. 1558 (14 Dec 22)	10	Approval of Plans No constr. period	Nov 63 - Yes Dec 25 - Yes	.4 Mile Slough Stockton Channel
City of Tracy P.O. Box 1029 Tracy, Calif.		Industrial and Domestic Sewage	No. 2939(20 Jun 57)	10	3 Years constr.	Dec 60 - Yes	Head of Sugar Channel

If permittee is an agent disposing of waste for a manufacturer or municipality, then also include name & address of manufacturer or municipality

TABLE A

Data concerning existing permits issued since March 3, 1899 by the Corps of Engineers to any person for the purpose of discharging INDUSTRIAL WASTES into navigable waters within or bordering any state

FLORIDA

Name & Address of Permittee* (1)	Product Manufactured (2)	Type of wastes discharged (3)	Date Permit Issued-Renewal (4)	Section of R & H Act of 1899 under which Permit Issued (5)	Term of Permit (6)	Date of last inspection to insure compliance with permit. Indicate whether or not in compliance (7)	Name and location of water receiving waste discharge (8)
Fernandina Pulp & Paper Co. (Now ITT Rayonier, Inc.) P. O. Box 2002 Fernandina Beach, Fla. P(4386)	Paper	Mill effluent	26 Jan 1938	10	Indefinite	January 1969 **	Atlantic Ocean at Fernandina, Fla.
Citrus Concentrates, Inc. Dunedin, Fla. P(5863)	-	-	31 Mar 1943	10	Indefinite		St. Josephs Sound at Dunedin, Fla.
St. Regis Paper Co. P. O. Box 18020 Jacksonville, Fla. P(8854)	Paper	Mill effluent	24 Sep 1951 Modified, revived & extended 25 Oct 55	10	Indefinite	January 1969 **	St. Johns River & Broward River, Fla
U. S. Gypsun Co. P. O. Box 3197 Jacksonville, Fla. P(60-450)	Paper	Mill effluent	25 Oct 1960	10	Indefinite		St. Johns River, Fla.

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**No violation of permit detected, but cautionary letters were written expressing concern over small amounts of solids being discharged and permittees were urged to take steps to abate all pollution.

TABLE A

Data concerning existing permits issued since March 3, 1899 by the Corps of Engineers to any person for the purpose of discharging INDUSTRIAL WASTES into navigable waters within or bordering any state

FLORIDA

Name & Address of Permittee*	Product Manufactured	Type of wastes discharged	Date Permit Issued-Renewal	Section of 1899 Act under which Permit Issued	Term of Permit	Date of last inspection to insure compliance with permit. Indicate whether or not in compliance	Name and location of water receiving waste discharge
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
American Cyanamid Co. Santa Rosa Plant P. O. Drawer 1826 Pensacola, Florida American Cyanamid Co. Rockefeller Plaza New York, N. Y.	Acrylic Fiber	Treated liquid effluent	11 Feb 1958	10	Indefinite	1967	Escambia Bay (7 miles SW of Milton, Florida)
Gulf Power Company P. O. Box 1151 Pensacola, Florida	Electrical Power	Heated Water	26 May 1961	10	Indefinite	-	Warren Bayou (Arm of West Bay) near Panama City, Florida
Coastal Timber Land & Pulp Corp. P. O. Box 267 Blountstown, Florida	Hardboard	Treated Liquid effluent	7 Oct 1965	10	Indefinite	-	Apalachicola River at Blountstown, Florida

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TABLE A

Data concerning existing permits issued since March 3, 1899 by the Corps of Engineers to any person for the purpose of discharging INDUSTRIAL WASTES into navigable waters within or bordering any state

GEORGIA

Name & Address of Permittee* (1)	Product Manufactured (2)	Type of wastes discharged (3)	Date Permit Issued-Renewal (4)	Section of 1899 Act under which Permit Issued (5)	Term of Permit (6)	Date of last inspection to insure compliance with permit. Indicate whether or not in compliance (7)	Name and location of water receiving waste discharge (8)
American Cyanamid Co., P.O. Box 368 Savannah, Ga. 31402	Titanium dioxide and sulfuric acid	Sulfuric Acid, ferrous sulphate	Renewal - 14 Jan 69	10	Indefinite	-	Savannah River (Savannah Harbor)
Brunswick Pulp & Paper Co., Brunswick, Georgia	Paper and Pulp	Bleach Craft	Issued - 13 Apr 64	10	Indefinite	-	Turtle River (Brunswick Harbor)
Great Southern Land & Paper Company Changed to: Great Southern Division of Great Northern Paper Co. P. O. Box 44, Cedar Springs, Georgia 31732	Liner Board	Treated Liquid Effluent	13 Nov 1963	10	Indefinite	1967	Chattahoochee Riv Approx. Mile 39
Georgia Power Company Electric Building Atlanta, Georgia	Electrical Power	Heated water	10 Aug 1948	10	Indefinite	-	Chattahoochee Riv near Whitesburg, Georgia

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TABLE A

Dataconcerning existing permits issued since March 3, 1899 by the Corps of Engineers to any person for the purpose of discharging INDUSTRIAL WASTES into navigable waters within or bordering any state

COLORADO

›me & Address ›f Permittee* (1)	Product Manufactured (2)	Type of wastes discharged (3)	Date Permit Issued-Renewal (4)	Section of Refuse Act under which Permit Issued (5)	Term of Permit (6)	Date of last inspection to insure compliance with permit. Indicate whether or not in compliance (7)	Nam wat r receiving was e discharge and location of (8)

N O N E

If permittee is an agent disposing of waste for a manufacturer or municipality, then also include name & address of manufacturer or municipality

TABLE A

Data concerning existing permits issued since March 3, 1899 by the Corps of Engineers to any person for the purpose of discharging INDUSTRIAL WASTES into navigable waters within or bordering any state

CONNECTICUT

ıme & Address of Permittee* (1)	Product Manufactured (2)	Type of wastes discharged (3)	Date Permit Issued-Renewal (4)	Section of Refuse Act under which Permit Issued (5)	Term of Permit (6)	Date of last inspection to insure compliance with permit. Indicate whether or not in compliance (7)	Nam wat r was	and location of receiving e discharge (8)
N O N E								

tee is an agent disposing of waste for a manufacturer or municipality, then also include name & address of ırer or municipality

TABLE A

Data concerning existing permits issued since March 3, 1899 by the Corps of Engineers to any person for the purpose of discharging INDUSTRIAL WASTES into navigable waters within or bordering any state

DELAWARE

ame & Address of Permittee* (1)	Product Manufactured (2)	Type of wastes discharged (3)	Date Permit Issued-Renewal (4)	Section of Refuse Act under which Permit Issued (5)	Term of Permit (6)	Date of last inspection to insure compliance with permit. Indicate whether or not in compliance (7)	Name and location of water receiving waste discharge (8)
E.I. duPond de Nemours Co. Wilmington, Del.	Chemicals	Chemical Waste	12-30-54	10	-	7-27-26 in compliance	Christina R., Newport, New Castle Co., Del
Barcroft Co. Lewes, Del.	Magnesium	Sea Water	3-27-69	10	12/31-72	9-16-69 in compliance	Delaware Bay, Harbor of Refuge, Lewes, Del.

If permittee is an agent disposing of waste for a manufacturer or municipality, then also include name & address of manufacturer or municipality

TABLE A

Data concerning existing permits issued since March 3, 1899 by the Corps of Engineers to any person for the purpose of discharging INDUSTRIAL WASTES into navigable waters within or bordering any state

HAWAII

ame & Address of Permittee* (1)	Product Manufactured (2)	Type of wastes discharged (3)	Date Permit Issued (4)	Section of Refuse Act under which Permit Issued (5)	Term of Permit (6)	Date of last inspection to insure compliance with permit. Indicate whether or not in compliance (7)	Name and location of water receiving waste discharge (8)
Hono Sewer & Water Com, City & County of Hono	Water - Sales Sewage Disposal	Sewage - 48" outfall	15 Jul 26	Sec 10 of Act of Cong appr 3 Mar 1899	On or before 31 Dec 27	Unknown	Across Kewalo Reef west of Kewalo Basin 3000' east of Hono Hav Channel
County of Maui, Terr of Hawaii, Wailuku, T.H.	" "	Sewage - 18" outfall	14 Jul 28	" " "	On or before 31 Dec 31	Unknown	Sewer line terminating in the Pacific Ocean at Kahului, Maui
County of Maui, Terr of Hawaii, Wailuku, T.H.	" "	Sewage - 24" cast iron outfall	27 Nov 33	" " "	On or before 31 Dec 36	Unknown	In Kahului Bay at a point about 3 miles northerly fr the inn end of the west breakwater of Kahului Harbor
County of Hawaii Hilo, Hawaii T.H.	" "	Sewage - 24" outfall	5 May 34	" " "	On or before 31 Dec 37	Unknown	Length of outfall - 1698 ft into HiloBay
G.B. Wait, Kauai Terminal Ltd, Port Allen, Kauai, T.H.	" "	Sewage - 10" outfall	21 Sep 39	Sec 14 "	Upon termination of this authority	Unknown	Discharge directly into PacOcean across Port Allen breakwater, Port Allen, Kauai

If permittee is an agent disposing of waste for a manufacturer or municipality, then also include name & address of manufacturer or municipality

TABLE A

Data concerning existing permits issued since March 3, 1899 by the Corps of Engineers to any person for the purpose of discharging INDUSTRIAL WASTES into navigable waters within or bordering any state

HAWAII

Name & Address of Permittee* (1)	Product Manufactured (2)	Type of wastes discharged (3)	Date Permit Issued (4)	Section of Refuse Act under which Permit Issued (5)	Term of Permit (6)	Date of last inspection to insure compliance with permit. Indicate whether or not in compliance (7)	Name and location of water receiving waste discharge (8)
Dept of Public Works, Terr of Hawaii	Water - Sales Sewage Disposal	Sewage - 8" outfall	22 Jul 39	Sec 10 of Act of Cong Appr 3 Mar 1899	On or before 31 Dec 41	Unknown	440' into PacOcean fr shoreline in front of Waialae School for boys
CO, Const Services, Central Pac Base Comd, APO 950, San Francisco	" "	Sewage - 36" pressure & gravity outfall	8 Oct 45	" " "	On or before 31 Dec 48	Nov 1947 In compliance	Fr Sand Island extending southward approx 1000' into Pac Ocean & laying on bottom thereof
Maui Electric Co, P.O.Box 355, Wailuku, Maui	" "	Warm Water - 2 36" concrete pipes & outlet structure	28 Nov 45	" " "	On or before 31 Dec 48	Unknown	100' beyond MW Line 1000' E of Kahului Har, Maui
City & County of Hono City Hall, Hono, T.H.	" "	Sewage - 78" outfall	7 Jan 46	" " "	On or before 31 Dec 48	June 1950 In compliance	Fr Sand Island extending southward approx 3,200' into Pac Ocean
Dept of Public Works, City & County of Hono, Hono 13, T.H.	" "	Sewage - 24" outfall	Approval of plans 11 Apr 50	" " "	" "	Feb 1951 In compliance	Discharge approx 1/2 mile east of entrance channel, Hono Harbor
A. Horner, Manager, Hawn Canneries Co, Ltd, Kapaa, Kauai, T.H.	Pineapple	Fluid waste - 12" transit pipe	8 Mar 51	" " "	On or before 31 Dec 52	Unknown	150' seaward fr end of existing shore groin at the northside of the mouth of Waikaea Stream

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TABLE A

Data concerning existing permits issued since March 3, 1899 by the Corps of Engineers to any person for the purpose of discharging INDUSTRIAL WASTES into navigable waters within or bordering any state

HAWAII

me & Address f Permittee*	Product Manufactured	Type of wastes discharged	Date Permit Issued-Renewal	Section of Refuse Act under which Permit Issued	Term of Permit	Date of last inspection to insure compliance with permit. Indicate whether or not in compliance	Name and location of water receiving waste discharge
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Dept of Public Works, Ofc of County Engr, County of Maui, Wailuku, Maui, T.H.	----	Sewage - 16" outfall	26 Aug 52	Sec 10 of Act of Cong Appr Mar 3, 1899	On or before 31 Dec 55	Unknown	Approx 1700' seaward & discharge into Pacific Ocean, Paia, Maui
County of Maui, Dept of Public Works, Wailuku, Maui, T.H.	----	Sewage - Relocate Kahului sewer force main -18" C.I.	12 May 53	" " "	On or before 31 Dec 56	Unknown	Fr shoreline into Pac Ocean at Kahului, Maui on northerly side Pier 1
Samuel Mahelona Memorial Hospital, Kealia, Kapaa, Island of Kauai, T.H.	----	Sewage - 8" C.I. outfall	30 Jul 53	" " "	On or before 31 Dec 56	Unknown	125' fr shore - fr hospital to sea at Kapaa Puna, Kauai, T.H.
City & County of Hono, Hono 13, Hawaii	----	Sewage - 42" R.C.P. outfall	25 Oct 60	" " "	On or before 31 Dec 63	Unknown	Ext 3,782' offshore toward Mokolea Rock into waters of Kailua Bay
Crossroads Development Co, 931 University Ave, Hono, HI	----	Sewage (treated) -8" outfall	28 Nov 61	" " "	On or before 31 Dec 64	Unknown	Extending 500' into Kaneohe Bay
Estate of James Campbell 828 Mort St, Hono, HI	----	12" outfall -treated sewage	26 Mar 62	" " "	On or before 31 Dec 65	Unknown	Extending 624' into ocean at Oneula Beach, Honouliuli, Ewa, Island of Oahu

If permittee is an agent disposing of waste for a manufacturer or municipality, then also include name & address of manufacturer or municipality

TABLE A

Data concerning existing permits issued since March 3, 1899 by the Corps of Engineers to any person for the purpose of discharging INDUSTRIAL WASTES into navigable waters within or bordering any state

HAWAII

ame & Address of Permittee* (1)	Product Manufactured (2)	Type of wastes discharged (3)	Date Permit Issued (4)	Section of Refuse Act under which Permit Issued (5)	Term of Permit (6)	Date of last inspection to insure compliance with permit. Indicate whether or not in compliance (7)	Name and location of water receiving waste discharge (8)
Dept of Public Works, County of Hawaii, Hilo, Hawaii	----	Sewage - 48" outfall, 42" by-pass	22 Aug 63	Sec 10 of Act of Cong Appr 3 Mar 1899	On or before 31 Dec 66	Unknown	Outlet of sewage into Puhi Bay, Pacific Ocean
Ralph A. Schrader, Farrell & Schrader, Inc, 1169 Lusitana St, Hono, HI	----	Sewage (treated) -8" outfall	9 Apr 64	" " "	On or before 31 Dec 66	Unknown	Extending 1200' offshore into waters of Kaneche Bay
Sunn, Low, Tom & Hara, Consulting Engr, 195 S. King St, Hono, HI	----	Sewage - 36" outfall	6 Jul 64	" " "	On or before 31 Dec 67	Unknown	Extending 1380' seaward into waters of Pacific Ocean at Sandy Beach area, Maunalua
Jim P. Ferry, Dept of Land & Natural Resources, State of HI, P.O.Box 621, Hono, HI	----	Sewage (treated) - 15" R.C.P. outfall	10 Dec 64	" " "	On or before 31 Dec 67	Unknown	Waialua Ocean outfall at Waialua, Kauai, HI
Yoshio Kunimoto, Chief Engr, Dept of Public Works, City & County of Hono, Hono, HI	----	Sewage (treated) - 36" R.C.P. outfall, 24" R.C.P. overflow line	9 Nov 65	" " "	On or before 31 Dec 68	Unknown	Waianae Ocean, Waianae, Oahu
Fred L. Schumacher, County Engr, County of Kauai, P.O. Box 111, Lihue, Kauai	____	Sewage - 8" & 6" outfall	10 Oct 66	" " "	On or before 31 Dec 69	Unknown	Extending 400' into Pacific Ocean fronting Moikeia Canal

If permittee is an agent disposing of waste for a manufacturer or municipality, then also include name & address of manufacturer or municipality

TABLE A

Data concerning existing permits issued since March 3, 1899 by the Corps of Engineers to any person for the purpose of discharging INDUSTRIAL WASTES into navigable waters within or bordering any state

IDAHO

Name & Address of Permittee* (1)	Product Manufactured (2)	Type of wastes discharged (3)	Date Permit Issued-Renewal (4)	Section of Refuse Act under which Permit Issued (5)	Term of Permit (6)	Date of last inspection to insure compliance with permit. Indicate whether or not in compliance (7)	Name and location water receiving waste discharge (8)
Potlatch Forests Inc. Gen. Offices, Lewiston, Idaho	Kraft paper	Pulp process waste	29 Oct 53	Section 10	**Indefinite	Dec. 68 (Complies)	Snake River, Lewiston, Idaho

**Permit to perform work limited to 31 Dec three years subsequent to year of issue,

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Data concerning existing permits issued since March 3, 1899 by the Corps of Engineers to any person for the purpose of discharging INDUSTRIAL WASTES into navigable waters within or bordering any state

ILLINOIS

Name & Address of Permittee* (1)	Product Manufactured (2)	Type of wastes Discharged (3)	Date Permit Issued-Renewal (4)	Section of Refuse Act under which Permit Issued (5)	Term of Permit (6)	Date of last inspection to insure compliance with permit. Indicate whether or not in compliance. (7)	Name and Location of water receiving waste discharge. (8)
City of Chicago Chicago, Illinois		Sludge	2-3-42	Section 10	12-31-45		Lake Michigan
Republic Steel Corp Chicago, Illinois	Iron & Steel	Storm water & Industrial Waste	9-16-42	Section 10	12-31-45		Calumet River
Republic Steel Corp Chicago, Illinois	Iron & Steel	Storm water & Industrial Waste	10-12-42	Section 10	12-31-45		Calumet River
Acme Steel Company Riverdale, Illinois	Steel Products	Storm water & Industrial Waste	5-29-45	Section 10	12-31-48		Little Calumet River

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TABLE A

Data concerning existing permits issued since March 3, 1899 by the Corps of Engineers to any person for the purpose of discharging INDUSTRIAL WASTES into navigable waters within or bordering any state

ILLINOIS

Name & Address of Permittee* (1)	Product Manufactured (2)	Type of wastes Discharged (3)	Date Permit Issued-Renewal (4)	Section Refuse Act under which Permit Issued (5)	Term of Permit (6)	Date of last inspection to insure compliance with permit. Indicate whether or not in compliance (7)	Name and Location of water receiving waste discharge (8)
Republic Steel Corp. Chicago, Ill.	Iron & Steel	Industrial Waste	Issued 8-1-63 Renewed 12-29-66	Section 10 & 13	12-31-72	Annually In Compliance	Calumet River
Interlake Steel Corp., Chicago, Ill.	Iron & Steel	Industrial Waste	Issued 8-1-63 Renewed 12-21-66	Section 10 & 13	12-31-72	Annually In Compliance	Calumet River
International-Harvester Co. Chicago, Ill.	Iron & Steel	Industrial Waste	Issued 8-1-63 Renewed 12-29-66	Section 10 & 13	12-31-72	Annually In Compliance	Calumet River

*These permits were issued under Settlement Agreement entered 2 July 1963 resulting from litigation in Federal Court.

Data concerning existing permits issued since March 3, 1899 by the Corps of Engineers to any person for the purpose of discharging INDUSTRIAL WASTES into navigable waters within or bordering any state

INDIANA

Name & Address Permittee* (1)	Product Manufactured (2)	Type of wastes Discharged (3)	Date Permit Issued-Renewal (4)	Section of Refuse Act under which Permit Issued (5)	Term of Permit (6)	Date of last inspection to insure compliance with permit. Indicate whether or not in compliance. (7)	Name and Location of water receiving waste discharge. (8)
Standard Oil Co. Whiting, Indiana	Petroleum Products	Storm water	6-13-42	Section 10	12-31-45		Lake Michigan
Youngstown Sheet & Tube Co. East Chicago, Ind.	Iron & Steel	Storm water & Industrial Waste	4-5-51	Section 10	12-31-54		Indiana Harbor Canal
Youngstown Sheet & Tube Co. East Chicago, Ind.	Iron & Steel	Storm water & Industrial Waste	9-17-53	Section 10	12-31-56		Indiana Harbor Canal
Youngstown Sheet & Tube Co. East Chicago, Ind.	Iron & Steel	Storm water & Industrial Waste	8-12-55	Section 10	12-31-58		Indiana Harbor Canal
Youngstown Sheet & Tube Co. East Chicago, Ind.	Iron & Steel	Storm water & Industrial Waste	8-29-61	Section 10	12-31-64		Indiana Harbor Canal
Inland Steel Co. East Chicago, Ind.	Iron & Steel	Storm water & Industrial Waste	1-19-65	Section 10	12-31-68		Indiana Harbor Canal
Inland Steel Co. East Chicago, Ind.	Iron & Steel	Storm water & Industrial Waste	2-29-68	Section 10	12-31-71		Lake Michigan

TABLE A

Data concerning existing permits issued since March 3, 1899 by the Corps of Engineers to any person for the purpose of discharging INDUSTRIAL WASTES into navigable waters within or bordering any state

IOWA

Name & Address of Permittee* (1)	Product Manufactured (2)	Type of wastes discharged (3)	Date Permit Issued-Renewal (4)	Section of Refuse Act under which Permit Issued (5)	Term of Permit (6)	Date of last inspection to insure compliance with permit. Indicate whether or not in compliance (7)	Name and location of water receiving waste discharge (8)
NONE							

* If permittee is an agent disposing of waste for a manufacturer or municipality, then also include name & address of manufacturer or municipality

TABLE A

Data concerning existing permits issued since March 3, 1899 by the Corps of Engineers to any person for the purpose of discharging INDUSTRIAL WASTES into navigable waters within or bordering any state

KANSAS

ame & Address of Permittee* (1)	Product Manufactured (2)	Type of wastes discharged (3)	Date Permit Issued-Renewal (4)	Section of Refuse Act under which Permit Issued (5)	Term of Permit (6)	Date of last inspection to insure compliance with permit. Indicate whether or not in compliance (7)	Name and location of water receiving waste discharge (8)

NONE

If permittee is an agent disposing of waste for a manufacturer or municipality, then also include name & address of manufacturer or municipality

TABLE A

Data concerning existing permits issued since 3 March 1899 by the Corps of Engineers to any person for the purpose of discharging INDUSTRIAL WASTES into navigable waters within or bordering any state

KENTUCKY

Name and Address of Permittee* (1)	Product Manufactured (2)	Type of Wastes discharged (3)	Date Permit issued-renewal (4)	Section of Refuse Act Under which Permit issued (5)	Term of Permit (6)	Date of last inspection to insure compliance with permit. Indicate whether or not in compliance (7)	Name and Location of water receiving waste discharge (8)
West Virginia Pulp & Paper Co., Box 278 Wickliffe, Kentucky	Paper & Pulp	Paper Mill Effluent	27 Aug 68	Section 10	3 years	Not completed at this time.	Miss. R., Mile 950 AHP Wickliffe, Kentucky

If permittee is an agent disposing of waste for a manufacturer or municipality, then also include name and address of manufacturer or municipality.

TABLE A

Data concerning existing permits issued since March 3, 1899 by the Corps of Engineers to any person for the purpose of discharging INDUSTRIAL WASTES into navigable waters within or bordering any state

LOUISIANA

me & Address f Permittee* (1)	Product Manufactured (2)	Type of wastes discharged (3)	Date Permit Issued-Renewal (4)	Section of Refuse Act under which Permit Issued (5)	Term of Permit (6)	Date of last inspection to insure compliance with permit. Indicate whether or not in compliance (7)	Name and location water receiving waste discharge (8)
Town of Berwick Berwick, La.	N/A	Sewer (6")	16 Aug 1956	**	**	7 Nov 1956 In compliance	Atchafalaya River 16.2 miles above mouth
Town of Simmesport Simmesport, La.	N/A	Sewer (8").	6 May 1970	**	**	8 Mar 1965 In compliance	Atchafalaya River 132.7 miles above mouth
Sewerage Dist. #2 St. Mary Parish, La. c/o DeFraites Associates P.O. Box 936 Houma, La.	N/A	Sewer (12")	9 Jan 1961	**	**	21 Apr 1961 In compliance	Atchafalaya River 15.3 miles above mouth
City of Morgan City Morgan City, La.	N/A	Sludge (30")	12 Feb 1968	**	**	9 Dec 1969 In compliance	Atchafalaya River 18.6 miles above mouth
Town of Franklin P.O. Box 567 Franklin, La.	N/A	Waste water (30")	16 Aug 1968	**	**	5 Nov 1969 In compliance	Bayou Teche, Mile 16.8

** Note: All Permits are issued under Section 10 of the River & Harbor Act, 3 March 1899. Term of Permits are until structure is removed or permit revoked.

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ouisiana Power & Light Co. terlington, La.	Electric Power	Heated Water	6/26/56	Section 10 of River & Harbor Act of 3 March 1899	** Indefinite Period	December 1969	Ouachita River Sterlington, La.
ommercial Solvents Corp. terlington, La.	Methanol, ammonia, nitroparatrins, ammonia nitrate	Traces of oil 10 pts. to 1,000,000 gal.	10/29/47	Section 10 of River & Harbor Act of 3 March 1899	Indefinite Period	December 1969	Ouachita River Sterlington, La.
lin Mathieson Corp. est Monroe, La.	Paper Products	Saline Minerals Tannic acid	8/12/63 Revised 3/2/64	Section 10 of River & Harbor Act of 3 March 1899	Indefinite Period	December 1969	Ouachita River Sterlington, La.

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Humble Oil & Refining Co. P.O. Box 61812 New Orleans, La.	N/A	Sewer (8")	29 June 1964	**	**	10 Aug 1964 In compliance	Bayou Rigaud, vicinity Grand Isle, La.
Southwestern Gas & Electric Co. Shreveport, La.	(Electric Power)	Water (8")	29 Apr 1946	**	**		Caddo Lake, Shreveport, La.
City of Shreveport Shreveport, La.	N/A	Sewer (12")	2 June 1937	**	**		Cross Bayou, Shreveport, La.
Mr. Eddie R. Hammonds c/o T. F. Kramer, Inc. P.O. Box 228 Franklin, La.	N/A	Sewer (8")	4 Dec 1961	**	**	19 Apr 1962 In compliance	Franklin Canal, 5.2 miles above mouth
City of Houma Houma, La.	N/A	Waste water (12")	15 Nov 1933	**	**	15 Dec 1934 In compliance	* GIWW, vicinity Mile 60.1 WHL
City of Houma Houma, La.	N/A	Storm sewer (24")	15 July 1940	**	**	16 Dec 1940 In compliance	* GIWW, vicinity Mile 58 WHL
City of Houma Houma, La.	N/A	Sewer (24")	3 Aug 1942	**	Easement 50 yrs.	11 Jan 1952 In compliance	* GIWW, vicinity Mile 58 WHL

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*Gulf Intracoastal Waterway

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City of Houma Houma, La.	N/A	Sewer (14")	8 Jan 1944	**	Easement 50 yrs.	13 Mar 1944 In compliance	* GIWW, vicinity Mile 58 WHL
City of Morgan City Morgan City, La.	N/A	Sewer (16")	3 Jan 1950	**	**	21 Sep 1951 In compliance	* GIWW, Milo 95.1 WHL.
New Orleans Public Service 317 Baronne St. New Orleans, La.	N/A	Hot water (2 - 102")	24 Jan 1955	**	**	23 Aug 1968 In compliance	* GIWW, Mile 19.1 EHL.
St. Mary Parish Sanitary Sewer Dist. #1 Franklin, La.	N/A	Sewer (12")	11 Apr 1958	**	**	6 Nov 1962 In compliance	* GIWW, Mile 95.1 WHL.
City of Houma Houma, La.	N/A	Sewer (16")	14 July 1958	**	**	23 Sep 1958 In compliance	* GIWW, Milo 58.2 WHL
Town of Plaquemine Plaquemine, La.	N/A	Storm sewer (72")	21 Mar 1960	**	**	26 Apr 1961 In compliance	* GIWW, Plaquemine to Morgan City, 1.5 Miles below Plaquemine Lock

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Sewerage & Water Board of New Orleans City Hall - Civic Center New Orleans, La.	N/A	Drainage water Pumping Station	20 Jan 1961	**	**	15 April 1970 In compliance	* GIWW, Algiers Canal, 2.8 miles west of Algiers Lock
Plaquemines Parish Commission Council Pointe-a-la-Hache, La.	N/A	Sewer (8")	27 Feb 1963	**	**	7 Jan 1964 In compliance	* GIWW, 3.8 miles west of Algiers Lock
Sewerage & Water Board of New Orleans City Hall - Civic Center New Orleans, La.	N/A	Drainage water Pumping Station	14 Oct 1963	**	**	24 Apr 1967 In compliance	* GIWW, 17.1 EHL
Board of Supervisors Sewerage Dist #10 Terrebonne Parish, La. P.O. Box 936 Houma, La.	N/A	Sewer (6")	28 Apr 1958	**	**	24 Mar 1959 In compliance	Houma Canal, 0.3 miles south-west from GIWW

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Gulf States Utilities Co. Lock Drawer 2951 Beaumont, Texas	(Electric Power)	Waste water (30")	22 Nov 1968	**	**	3 June 1969 In compliance	Houston River, 1.8 miles above mouth, near Westlake, La.
Seworage & Water Board of New Orleans City Hall - Civic Center New Orleans, La.	N/A	Drainge water (12' x 16')	21 Sep 1965	**	**	17 Apr 1970 In compliance	Lake Pontchartrain, Danube Road, New Orleans, La.
Jefferson Parish Jefferson Parish, La.	N/A	Storm drain Pump Station #2	11 Aug 1969 Waiver of Objection - No structure in waterway involved	**	**		Lake Pontchartrain
Sewerage &, Water Board of New Orleans City Hall - Civic Center New Orleans, La.	N/A	Storm drain Pump Station	7 Nov 1969 Waiver of Objection - No structure in waterway involved				Lake Pontchartrain
U. S. Industrial Chemicals, Inc. P.O. Drawer 9 New Orleans, La.	(Alcohol)	Waste (12")	3 Feb 1916	**	**	15 July 1945 In compliance	Mississippi River, Mile 102 AHP
The Celotex Co. Marrero, La.	(Paper products)	Waste water (24")	21 Sep 1923	**	**		Mississippi River, Marrero, La.

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Orange Grove Refining Co., Inc. Orange Grove, La.	(Petroleum Products)	Waste water (12" line)	16 Aug 1924	**	**	29 June 1925 In compliance	Mississippi River, Mile 80.5 AHP
Town of Plaquemine Plaquemine, La.	N/A	Sewer (12")	13 Mar 1934	**	**	May 1937 In compliance	Mississippi River, Plaquemine, La.
Freeport Sulphur Co. 1804 American Bank Bldg. New Orleans, La.	(Sulphur Mining)	Sewer (6")	14 Aug 1934	**	**	13 Nov 1934 In compliance	Mississippi River, Port Sulphur, La.
City of Gretna Gretna, La.	N/A	Waste water (12")	20 Nov 1934	**	**	22 Jan 1935 In compliance	Mississippi River, Mile 96.5 AHP
The Solvay Process Co. Syracuse, N. Y.	(Chemical)	Chemical waste. (2 - 9")	1 Feb 1935	**	**	19 Apr 1935 In compliance	Mississippi River, Baton Rouge, La.
Board of Commissioners East Jefferson Water Works Dist, #1 Jefferson Parish, La.	N/A	Wash water (12")	10 Nov 1937	**	**		Mississippi River, Mile 104.1 AHP

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Town of New Roads New Roads, La.	N/A	Sewer (10")	27 Sep 1938 Waiver of Objection - No structure in waterway involved				Mississippi River, New Roads, La.
Gulf Refining Co. P.O. Drawer 2100 Houston, Texas	(Petroleum (Products	Waste (6")	26 Sep 1940	**	**	2 May 1941 In compliance	Mississippi River, Fort Jackson, La., Mile 19.4 AHP
Sewerage & Water Board of New Orleans 526 Carondelet St. New Orleans, La.	N/A	Sewer discharge (2 - 20")	Repairs 9 Dec 1943	**	**	13 July 1945 In compliance	Mississippi River, Mile 92.4 AHP
St. Bernard Parish Police Jury Chalmette, La.	N/A	Sewer (12")	14 Mar 1946	**	**	5 July 1950 In compliance	Mississippi River, Mile 90.2 AHP
Freeport Sulphur Co. Port Sulphur, La.	(Sulphur Mining)	Sewer (6")	20 Mar 1946	**	**	7 May 1947 In compliance	Mississippi River, Mile 38.5 AHP
Solvay Process Co. Syracuse 1, N.Y.	(Chemical)	Brine (2 - 9")	21 Aug 1947	**	**	23 Dec 1948 In compliance	Mississippi River, Mile 232.2 AHP

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Louisiana Power & Light Co. 142 Delaronde St. New Orleans, La.	(Electric Power)	Hot water (2 - 66") (1 - 72") (2 - 114")	24 Aug 1949	**	**	22 Jan 1951 In compliance	Mississippi River Mile 104.5 AHP
Board of School Directors Plaquemines Parish Pointe-a-la-Hache, La.	N/A	Sewer (?)	25 Jan 1950	**	**	11 Feb 1954 In compliance	Mississippi River Mile 69.4 AHP
St. Charles Parish Waterworks Dist #2 Hahnville, La.	N/A	Water (4")	27 July 1950	**	**	19 Oct 1951 In compliance	Mississippi River Mile 120.6 AHP
Town of Plaquemine Plaquemine, La.	N/A	Sewer (10")	5 Dec 1951	**	**	23 Dec 1952 In compliance	Mississippi River Mile 207.6 AHP
Kaiser Aluminum & Chemical Corp. P.O. Box 1031 Baton Rouge, La.	(Aluminum Products)	Chemical wastes (12") "Red mud"	12 May 1952	**	**	23 Oct 1952 In compliance	Mississippi River Mile 233.7 AHP
American Cyanamid Co. 30 Rockfeller Plaza New York, N.Y.	(Chemicals)	Chemical wastes (42")	11 July 1952	**	**	9 Apr 1954 In compliance	Mississippi River Mile 114.5 AHP

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Commandant 8th Naval District Federal Bldg. New Orleans, La.	N/A	Sewer (2 - 10", 1 - 8")	28 Aug 1952	**	**	27 Feb 1953 In compliance	Mississippi River, Mile 89.9 AHP
Board of School Directors Parish of Plaquemines Pointe-a-la-Hache, La.	N/A	Sewer (8")	20 Nov 1952	**	**	29 Oct 1953 In compliance	Mississippi River, Mile 24.7 AHP
Monsanto Chemical Co. Luling, La.	(Chemicals)	Chemical wastes (6")	14 Nov 1952	**	**	21 Aug 1953 In compliance	Mississippi River, Mile 120.0 AHP
Ingram Products Co. P.O. Box R R Chalmette, La.	(Petroleum Products)	Waste water (24")	13 Aug 1953	**	**	12 Apr 1962 In compliance	Mississippi River Mile 87.0 AHP
Kaiser Aluminum & Chemical Corp. P.O. Box 1031 Baton Rouge, La.	(Aluminum)	Chemical wastes (2 - 14")	19 Oct 1953	**	**	27 Apr 1964 In compliance	Mississippi River, Mile 232.8 AHP
Louisiana Power & Light Co. 142 Delaronde St. New Orleans, La.	(Electric Power)	Hot water (2 - 84")	20 Oct 1953	**	**	10 Apr 1954 In compliance	Mississippi River, Mile 104.5 AHP

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St. James Parish Waterworks Dist #2 Vacherie, La.	N/A	Sludge (6")	2 July 1954	**	**	18 May 1956 In compliance	Mississippi River Mile 151.0 AHP
St. James Parish Waterworks Dist. #1 Convent, La.	N/A	Sludge (6")	1 July 1954	**	**	18 May 1956 In compliance	Mississippi River Mile 154.0 AHP
St. John the Baptist Waterworks Dist. #2 Edgard, La.	N/A	Sludge (3")	2 July 1954	**	**	18 May 1956 In compliance	Mississippi River Mile 139.0 AHP
St. John the Baptist Waterworks Dist. #3 Lions, La.	N/A	Sludge (8")	2 July 1954	**	**	18 May 1956 In compliance	Mississippi River Mile 137.0 AHP
Sewerage & Water Board of New Orleans 526 Carondelet St. New Orleans, La.	N/A	Sewer (16")	13 July 1954 Waiver of Objection - No structure in waterway involved	**	**	5 July 1955 In compliance	Mississippi River Mile 91.4 AHP
Cora-Texas Manufacturing Co. White Castle, La.	(Sugar)	Waste water (16")	16 July 1954 Waiver of Objection - No structure in waterway involved	**	**	17 May 1956 In compliance	Mississippi River White Castle, La

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Louisiana State University University Station Baton Rouge, La.	N/A	Sewer (12")	27 Sep 1954	**	**	10 May 1967 In compliance	Mississippi River, Mile 226.6 AHP
Freeport Sulphur Co. American Bank Bldg. New Orleans, La.	(Chemicals)	Waste water (3")	4 Jan 1955	**	**		Mississippi River, Mile 76.8 AHP
Kaiser Aluminum & Chemical Corp. P.O. Box 1600 Chalmette, La.	(Aluminum)	Storm drain (24")	5 Aug 1955	**	**	20 May 1955 In compliance	Mississippi River, Mile 89.9 AHP
Norris Development Co., Inc. 704 St. Claude Ave. New Orleans, La.	N/A	Sewer	5 Jan 1956 Waiver of Objection - No structure in waterway involved	**	**	21 Jan 1963 In compliance	Mississippi River St. Barnard Parish
St. Bernard Sewerage Dist. #2 Chalmette, La.	N/A	Sewer (1-10", 1-24")	26 July 1957	**	**	10 July 1962 In compliance	Mississippi River Mile 86.4 and Mile 84.3 AHP
Dow Chemical Co. Plaquemine, La.	(Chemicals)	Waste water (2 - 108")	28 May 1957	**	**	22 May 1958 In compliance	Mississippi River Mile 209.1 AHP

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(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Wyandotte Chemical Corp. Geismar, La.	(Chemicals)	Waste water (14")	10 July 1957	**	**	5 May 1958 In compliance	Mississippi River, Mile 183.6 AHP
Sewerage & Water Board of New Orleans City Hall - Civic Center New Orleans, La.	N/A	Sewer (20")	13 Dec 1957 Waiver of Objection - No structure in waterway involved	**	**		Mississippi River, Mile 91.4 AHP
Gulf States Utilities Co. Baton Rouge, La.	(Electric Power)	Hot water (1 - 84") (1 - 72") (2 - 108")	11 Mar 1958	**	**		Mississippi River Mile 201.2 AHP
Dalcour Water Works Plaquemines Parish Pointe-a-la-Hache, La.	N/A	Sludge (4")	22 July 1958	**	**	10 July 1962 In compliance	Mississippi River Mile 81.0 AHP
Buras Water Works Dist. Plaquemines Parish, La. Empire, La.	N/A	Sludge (4")	17 July 1958	**	**	26 Nov 1958 In compliance	Mississippi River Mile 18.6 AHP
Town of New Roads New Roads, La.	N/A	Sewer (1-16", 1-10")	9 Sep 1958 Waiver of Objection - No structure in waterway involved	**	**		Mississippi River New Roads, La.

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Alton Ochsner Medical Foundation 3503 Prytania St. New Orleans, La.	N/A	Water (18")	23 Dec 1958	**	**	20 June 1966 In compliance	Mississippi River, Mile 105.5 AHP
Town of Plaquemine Plaquemine, La.	N/A	Sewer (8")	20 May 1960	**	**	19 Apr 1961 In compliance	Mississippi River, Mile 208.6 AHP
Freeport Sulphur Co. New Orleans, La.	N/A	Waste water (8")	28 Nov 1960	**	**	3 Dec 1962 In compliance	Mississippi River, Mile 38.8 AHP
Board of School Directors Parish of Plaquemines Pointe-a-la-Hache, La.	N/A	Sewer (8")	29 Nov 1960	**	**	10 July 1962 In compliance	Mississippi River, Mile 15.8 AHP
Town of Lutcher Lutcher, La.	N/A	Sludge (6")	7 Dec 1961	**	**	15 Feb 1963 In compliance	Mississippi River, Mile 147.4 AHP
Buras Development Co., Inc. P.O. Box 454 Buras, La.	N/A	Sewer (6")	22 Jan 1962	**	**	15 Apr 1963 In compliance	Mississippi River, Mile 23.3 AHP

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(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Plaquemines Parish Commission Council Pointe-a-la-Hache, La.	N/A	Sewer (20")	14 Jan 1965	**	**	11 Oct 1966 In compliance	Mississippi Rive Mile 23.7 AHP
Union Carbide Corp. 1200 St. Charles Ave. New Orleans, La.	(Chemicals)	Effluent (3 - 60")	12 May 1965	**	**	15 Sep 1967 In compliance	Mississippi Rive Mile 127.5 AHP
Crown Fellerbach Corp. P.O. Box 218 St. Francisville, La.	(Paper Products)	Paper mill effluent (1 - 42", 1 - 54")	19 Aug 1965	**	**	9 May 1967 In compliance	Mississippi Rive Mile 258.8 AHP
Shell Chemical Co. P.O. Box 2707 Baton Rouge, La.	(Chemicals)	Water (2 - 36")	15 July 1966	**	**	30 Aug 1968 In compliance	Mississippi Riv Mile 183.2 AHP
E. I. duFont deNemours & Co., Inc. Wilmington, Delaware	(Chemicals)	Industrial waste (30")	11 Jan 1967	**	**	26 Jan 1968 In compliance	Mississippi Rive Mile 169.2 AHP
Bovay Engineers, Inc. Baton Rouge, La.	N/A		14 Aug 1967 Waiver of Objection - No structure in waterway involved	**	**		Mississippi Riv
Freeport Chemical Co. Carondelet Bldg. New Orleans, La.	(Chemicals)	Effluent (72")	11 Oct 1967	**	**	27 Aug 1968 In compliance	Mississippi Riv Mile 160.3 AHP

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U.S. Oil of Louisiana, Inc. 615 Howard Ave. New Orleans, La.	(Pertoleum Products)	Salt water (4")	7 Oct 1963	**	**	18 Feb 1964 In compliance	Mississippi River, Mile 48.3 AHP
Plaquemines Parish Commission Council Pointe-a-la-Hache, La.	N/A	Sewer (20")	2 Oct 1963	**	**	26 Apr 1965 In compliance	Mississippi River, Mile 71.9 AHP
Sewerage & Water Board of New Orleans City Hall - Civic Center New Orleans, La.	N/A	Sewer (66")	19 Mar 1964	**	**	23 July 1965 In compliance	Mississippi River Mile 91.6 AHP
Solvay Process Division Allied Chemical Corp. P.O. Box 271 Baton Rouge, La. 70821	(Chemicals)	Effluent (2 - 16")	11 Aug 1964	**	**	29 Dec 1964 In compliance	Mississippi River Mile 232.2 AHP
General Chemical Division Allied Chemical Corp. P.O. Box 2830 Baton Rouge, La.	(Chemicals)	Effluent (1 - 2")	12 Aug 1964	**	**	23 Sept 1965 In compliance	Mississippi River Mile 230.8 AHP

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LOUISIANA

Name & Address of Permittee* (1)	Product Manufactured (2)	Type of wastes discharged (3)	Date Permit Issued-Renewal (4)	Section of Refuse Act under which Permit Issued (5)	Term of Permit (6)	Date of last inspection to insure compliance with permit. Indicate whether or not in compliance (7)	Name and locat water receivin waste discharg (8)
Wyandotte Chemical Corp. Geismar, La.	(Chemicals)	Industrial wastes (20")	13 Oct 1967 Waiver of Objection - No structure in waterway involved	**	**		Mississippi River, Mile 183.7 AHP
Wyandotte Chemical Corp. Geismar, La.	(Chemicals)	Waste water (20")	28 Nov 1967 Waiver of Objection - No structure in waterway involved	**	**		Mississippi River, Mile 183.7 AHP
St. Bernard Parish Sewer Dist. #2 Chalmette, La.	N/A	Sewer (10")	29 Dec 1967 Waiver of Objection - No structure in waterway involved	**	**		Mississippi River, vicinity Mile 85.0 AHP
Vulcan Material Co. c/o Sovay Engineers, Inc. 5217 Government St. Baton Rouge, La.	(Chemicals)	Waste (1-6", 1-8")	17 Jan 1968	**	**	20 Aug 1968 In compliance	Mississippi River, Mile 182.7 AHP
Wyandotte Chemical Co. Geismar, La.	(Chemicals)	Chloride waste (20")	13 Mar 1968	**	**	9 Aug 1968 In compliance	Mississippi River, Mile 183.7 AHP
Shell Chemical Co. Norco, La.	(Chemicals)	Waste water (20")	3 Apr 1968 Waiver of Objection - No structure in waterway involved	**	**		Mississippi River, Mile 126.5 AHP
Kaiser Aluminum & Chemical Corp. P.O. Box 337 Gramercy, La.	(Aluminum)	Effluent (40")	3 July 1968	**	**	14 Mar 1969 In compliance	Mississippi River, Mile 145.2 AHP

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TABLE A

Data concerning existing permits issued since March 3, 1899 by the Corps of Engineers to any person for the purpose of discharging INDUSTRIAL WASTES into navigable waters within or bordering any state

LOUISIANA

Name & Address of Permittee* (1)	Product Manufactured (2)	Type of wastes discharged (3)	Date Permit Issued-Renewal (4)	Section of Refuse Act under which Permit Issued (5)	Term of Permit (6)	Date of last inspection to insure compliance with permit. Indicate whether or not in compliance (7)	Name and loca water receivi waste dischar (8)
Geigy Chemical Corp. c/o Sanders, Miller, Downing & Kean P.O. Box 1588 Baton Rouge, La.	(Chemicals)	Waste (1 - 24") (1 - 14")	8 Aug 1968	**	**	13 Jan 1970 In compliance	Mississippi River, Mile 200.0 AHP
Witco Chemical Co. Gretna, La.	(Chemicals)	Storm drain (2 - 24")	19 Dec 1968 Waiver of Objection - No structure in waterway involved	**	**		Mississippi River Mile 97.7 AHP
Chevron Chemical Co. Oakpoint, La.	(Chemicals)	Storm drain (36")	23 Dec 1968 Waiver of Objection - No structure in waterway involved	**	**		Mississippi River Mile 72.2 AHP
Chevron Chemical Co. Oakpoint, La.	(Chemicals)	Storm drain (36")	24 Dec 1968 Waiver of Objection - No structure in waterway involved	**	**		Mississippi River Mile 72.2 AHP
Louisiana Electric Cooperative, Inc. New Roads, La.	(Electrict Power)	Industrial wastes (8")	9 Jan 1970 Waiver of Objection - No structure in waterway involved	**	**		Mississippi River Mile 258.0 AHP
Wyandotte Chemical Corp. Geismar, La.	(Chemicals)	Storm drain (20")	23 Apr 1970 Waiver of Objection - No structure in waterway involved	**	**		Mississippi River Mile 183.6 AHP

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Data concerning existing permits issued since March 3, 1899 by the Corps of Engineers to any person for the purpose of discharging INDUSTRIAL WASTES into navigable waters within or bordering any state

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Sewerage & Water Board of New Orleans City Hall - Civic Center New Orleans, La.	N/A	Storm drain	15 Jan 1968 Waiver of Objection - No structure in waterway involved	**	**		Mississippi River-Gulf Outlet
Shell Oil Co. P.O. Box 60193 New Orleans, La.	(Petroleum Produces)	Waste water (24")	3 Jan 1968	**	**		Mississippi River, Southwest Pass, Mile 8 BHP
Constructing Quartermaster U.S. Quartermaster Corps Barksdale Field Shreveport, La.	N/A	Sewer (14")	6 Apr 1931	**	**		Red River, vicinity Shreveport, La.
Commanding Officer Headquarters, 3rd Air Force Tampa, Florida	N/A	Sewer (10")	20 Oct 1942	**	**	17 Aug 1945 In compliance	Red River, Alexandria, La.
Town of Pineville Pineville, La.	N/A	Sewer (15")	17 Dec 1943	**	**	1 June 1944 In compliance	Red River, Pineville, La.
Town of Boyce Boyce, La.	N/A	Sewer (6")	24 Oct 1946 Waiver of Objection - No structure in waterway involved	**	**		Red River, Boyce, La.

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Data concerning existing permits issued since March 3, 1899 by the Corps of Engineers to any person for the purpose of discharging INDUSTRIAL WASTES into navigable waters within or bordering any state

LOUISIANA

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Plantation Park, Inc. Bossier City, La.	N/A	Sewer (6")	15 Dec 1950 Waiver of Objection - No structure in waterway involved	**	**		Red River, Bossier City, La.
Town of Marksville Marksville, La.	N/A	Sewer (12")	30 Mar 1951 Waiver of Objection - No structure in waterway involved	**	**		Red River, Marksville, La.
Town of Bossier City Bossier City, La.	N/A	Sewer (2 - 10")	7 Sep 1951 Waiver of Objection - No structure in waterway involved	**	**		Red River, Bossier City, La.
Mayor, City of Natchitoches Natchitoches, La.	N/A	Sewer (16")	7 Nov 1955 Waiver of Objection - No structure in waterway involved	**	**	6 Nov 1958 In compliance	Red River, Natchitoches, La.
Water & Sewerage Dept. Shreveport, La.	N/A	Sewer (36")	23 Dec 1955 Waiver of Objection - No structure in waterway involved	**	**	2 Nov 1958 In compliance	Red River, Shreveport, La.
Water & Sewerage Dept. Shreveport, La.	N/A	Sewer (30")	19 July 1956 Waiver of Objection - No structure in waterway involved	**	**	5 Jan 1958 In compliance	Red River, Shreveport, La.
City of Alexandria Alexandria, La.	N/A	Sewer (2 - 30") (1 - 10")	26 Feb 1957 Waiver of Objection - No structure in waterway involved	**	**		Red River, Alexandria, La.
City of Bossier City Bossier City, La.	N/A	Sewer (66")	11 Apr 1957	**	**	6 Dec 1962 In compliance	Red River, Bossier City, La.

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Data concerning existing permits issued since March 3, 1899 by the Corps of Engineers to any person for the purpose of discharging INDUSTRIAL WASTES into navigable waters within or bordering any state

LOUISIANA

ame & Address of Permittee* (1)	Product Manufactured (2)	Type of wastes discharged (3)	Date Permit Issued-Renewal (4)	Section of Refuse Act under which Permit Issued (5)	Term of Permit (6)	Date of last inspection to insure compliance with permit. Indicate whether or not in compliance (7)	Name and locatio water receiving waste discharge (8)
Bayou Construction Co. P.O. Box 5946 Bossier City, La.	N/A	Sewer (8")	16 Apr 1957 Waiver of Objection - No structure in waterway involved	**	**		Red River, Shreveport, La.
Town of Colfax Colfax, La.	N/A	Sewer (8")	29 Sep 1959	**	**	12 Apr 1960 In compliance	Red River, Colfax, La.
Pan American Engineers 1022 Tenth St. Alexandria, La.	N/A	Sewer (8")	2 May 1960 Waiver of Objection - No structure in waterway involved	**	**		Red River, Boyce, La.
City of Shreveport Shreveport, La.	N/A	Storm drain (1 - 42") (1 - 54") (1 - 48")	31 Aug 1960	**	**	6 Dec 1962 In compliance	Red River, Shreveport, La.
City of Bossier Bossier, La.	N/A	Sewer (24")	2 July 1962	**	**	13 May 1964 In compliance	Red River, Bossier City, La.
City of Alexandria Alexandria, La.	N/A	Sewer (24")	18 Dec 1963	**	**	21 June 1967 In compliance	Red River, Alexandria, La.
City of Pineville Pineville, La.	N/A	Storm sewer	13 Aug 1968 Waiver of Objection - No structure in waterway involved	**	**		Red River, Pineville, La.

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Data concerning existing permits issued since March 3, 1899 by the Corps of Engineers to any person for the purpose of discharging INDUSTRIAL WASTES into navigable waters within or bordering any state

LOUISIANA

ame & Address of Permittee* (1)	Product Manufactured (2)	Type of wastes discharged (3)	Date Permit Issued-Renewal (4)	Section of Refuse Act under which Permit Issued (5)	Term of Permit (6)	Date of last inspection to insure compliance with permit. Indicate whether or not in compliance (7)	Name and locati water receiving waste discharge (8)
Town of Boyce Boyce, La.	N/A	Storm sewer (8")	2 June 1969 Waiver of Objection - No structure in waterway involved	**	**		Red River, Boyce, La.
City of Lafayette Lafayette, La.	N/A	Sewer (42")	3 May 1968	**	**	18 Feb 1970 In compliance	Vermilion River, Mile 48.2 above mouth

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TABLE A

Data concerning existing permits issued since March 3, 1899 by the Corps of Engineers to any person for the purpose of discharging INDUSTRIAL WASTES into navigable waters within or bordering any state

MAINE

Name & Address of Permittee* (1)	Product Manufactured (2)	Type of wastes discharged (3)	Date Permit Issued-Renewal (4)	Section of Refuse Act under which Permit Issued (5)	Term of Permit (6)	Date of last inspection to insure compliance with permit. Indicate whether or not in compliance (7)	Name and location of water receiving waste discharge (8)
NONE							

If permittee is an agent disposing of waste for a manufacturer or municipality, then also include name & address of manufacturer or municipality

TABLE A

Dataconcerning existing permits issued since March 3, 1899 by the Corps of Engineers to any person for the purpose of discharging INDUSTRIAL WASTES into navigable waters within or bordering any state

MARYLAND

Name & Address of Permittee*	Product Manufactured	Type of wastes discharged	Date Permit Issued-Renewal	Section of Refuse Act under which Permit Issued	Term of Permit	Date of last inspection to insure compliance with permit. Indicate whether or not in compliance	Name and location of water receiving waste discharge
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
NONE							

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TABLE A

Data concerning existing permits issued since March 3, 1899 by the Corps of Engineers to any person for the purpose of discharging INDUSTRIAL WASTES into navigable waters within or bordering any state

MASSACHUSETTS

ame & Address of Permittee* (1)	Product Manufactured (2)	Type of wastes discharged (3)	Date Permit Issued-Renewal (4)	Section of Refuse Act under which Permit Issued (5)	Term of Permit (6)	Date of last inspection to insure compliance with permit. Indicate whether or not in compliance (7)	Name and location of water receiving waste discharge (8)
Safety Projects & Engineering, Inc. 3 Malden Street West Quincy, Mass.	none (1)	toxic wastes	30 Dec 69	Section 10	1 yr. (2)	12 Feb 70 in compliance	Mass. Bay about 9.3 miles offshore from entrance to Boston Harbor, Mass.

(1) Permittee does not manufacture any product but did dispose of toxic waste materials for various industrial firms in the Boston area.

(2) The permit was first issued in 1962 and renewed subsequently year by year. The operations were suspended as of February 13, 1970, at the request of the Corps of Engineers because of complaints by State officials.

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TABLE A

Data concerning existing permits issued since March 3, 1899 by the Corps of Engineers to any person for the purpose of discharging INDUSTRIAL WASTES into navigable waters within or bordering any state

MICHIGAN

Name & Address of Permittee* (1)	Product Manufactured (2)	Type of wastes discharged (3)	Date Permit Issued-Renewal (4)	Section of Refuse Act under which Permit Issued (5)	Term of Permit (6)	Date of last inspection to insure compliance with permit. Indicate whether or not in compliance (7)	Name and location of water receiving waste discharge (8)

NONE

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Data concerning existing permits issued since March 3, 1899
by the Corps of Engineers to any person for the purpose of
discharging INDUSTRIAL WASTES into navigable waters within
or bordering any state

MINNESOTA

ame & Address Permittee* (1)	Product Manufactured (2)	Type of wastes discharged (3)	Date Permit Issued-Renewal (4)	Section of Refuse Act under which Permit Issued (5)	Term of Permit (6)	Date of last inspection to insure compliance with permit. Indicate whether or not in compliance (7)	Name and locati water receiving waste discharge (8)
Boise Cascade Corp. Formerly (Minnesota & Ontario Paper Co.) International Falls, Minnesota.	Paper	Wood Fibre	12 Aug 1969	Sec. 10 River & Harbor Act 1899	General w/cond. K&L	Inspected by State Agencies	Rainy River
Reserve Mining Co. Silver Bay, Minnesota	Taconite	Tailings	June 1952 Extended to 31 Dec 1970	Sec. 10 River & Harbor Act 1899	General	Sept. 1968 - Conferences now under way on probable pollution	Lake Superior

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Data concerning existing permits issued since March 3, 1899 by the Corps of Engineers to any person for the purpose of discharging INDUSTRIAL WASTES into navigable waters within or bordering any state

MISSISSIPPI

Name & Address of Permittee* (1)	Product Manufactured (2)	Type of wastes discharged (3)	Date Permit Issued-Renewal (4)	Section of 1899 Act under which Permit Issued (5)	Term of Permit (6)	Date of last inspection to insure compliance with permit. Indicate whether or not in compliance (7)	Name & location waste receiving waste discharge (8)
Mississippi Power Co. Gulfport, Mississippi	Electrical power	Heated water	25 June 1956	10	Indefinite	-	Biloxi River north of Biloxi, Miss.
Mississippi Power Co. Gulfport, Mississippi	Electrical power	Heated water	13 Sep 1961	10	Indefinite	-	Back Bay of Biloxi in the Big Lake Area near Biloxi, Mississippi
International Paper Co. Natchez, Miss.	Paper Products	Traces of Tannic Acid	9 Nov 1949 Renewal 31 Dec 55	10	Indefinite	-	Mississippi River, Natchez, Miss.
Johns-Manville Corp. Manville, N. J.	Insulation Board ceiling tile, etc	Primarily dissolved solids	13 Sep 1946	10	Indefinite	December 1969	Mississippi River, Natchez, Miss.
Miss. Power & Light Co. Jackson, Miss.	Electric Power	Heated Water	16 Jun 65 16 Jul 69	10	Indefinite	December 1969	Mississippi River, Vicksburg, Miss.
City of Vicksburg, Miss.	City Water Plant	Lime slurry	2 Oct 69	10	Indefinite	December 1969	Yazoo Diversion Cana Vicksburg, Miss.

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Data concerning existing permits issued since March 3, 1899 by the Corps of Engineers to any person for the purpose of discharging INDUSTRIAL WASTES into navigable waters within or bordering any state

MISSOURI

Name & Address of Permittee* (1)	Product Manufactured (2)	Type of wastes discharged (3)	Date Permit Issued-Renewal (4)	Section of Refuse Act under which Permit Issued (5)	Term of Permit (6)	Date of last inspection to insure compliance with permit. Indicate whether or not in compliance (7)	Name and location of water receiving waste discharge (8)
American Oil Co. Sterling & Standard Sugar Creek, Mo 64054	Gasoline & Petroleum Products	Waste Water from Treatment Lagoons	9 August 1960 Rev. 14 November 1961	Section 10	Indefinite	Inspected at Completion of Construction and were in compliance with Permit Instrument	Mo. River Mile 356.3 R.B.
Union Electric Co. 1901 Gratiot St. St. Louis, Mo 63166	Electricity	Ash Pond Discharge Channel	28 February 1970	Section 10	Indefinite	Inspected at Completion of Construction and were in compliance with Permit Instrument	Mo. River Mile 58.1 R.B.
Phillips Petroleum Co. 2029 Fairfax Trafficway Kansas City, Ks 66115	Gasoline & Petroleum Products	Waste Water	5 October 1939	Section 10	Indefinite	Inspected at Completion of Construction and were in Compliance with Permit Instrument	Mo. River Mile 368.1 R.B.
Mississippi Lime Company Ste. Genevieve, Mo. 63670	Lime	Lime slurry	20 Sep 67 7 Aug 69	Section 13	2 years 2 years	July 1969 In compliance	Mississippi River Mile 122.4, Ste. Genevieve, Mo.
City of New Madrid, Missouri	Electrical Power	Thermal Pollution	17 Jul 69	Section 10	3 years	Not completed at this time.	Miss. R., Mile 884.5 At Missouri

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MONTANA

STATE OF MONTANA

ne & Address f Permittee* (1)	Product Manufactured (2)	Type of wastes discharged (3)	Date Permit Issued-Renewal (4)	Section of Refuse Act under which Permit Issued (5)	Term of Permit (6)	Date of last inspection to insure compliance with permit. Indicate whether or not in compliance (7)	Name and location water receiving waste discharge (8)

NONE

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Data concerning existing permits issued since March 3, 1899 by the Corps of Engineers to any person for the purpose of discharging INDUSTRIAL WASTES into navigable waters within or bordering any state

NEBRASKA

Name & Address of Permittee*	Product Manufactured	Type of wastes discharged	Date Permit Issued-Renewal	Section of Refuse Act under which Permit Issued	Term of Permit	Date of last inspection to insure compliance with permit. Indicate whether or not in compliance	Name and location of water receiving waste discharge
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)

NONE

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NEVADA

Name & Address of Permittee*	Product Manufactured	Type of wastes discharged	Date Permit Issued-Renewal	Section of Refuse Act under which Permit Issued	Term of Permit	Date of last inspection to insure compliance with permit. Indicate whether or not in compliance	Name and location of water receiving waste discharge
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
NONE							

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NEW HAMPSHIRE

Name & Address of Permittee*	Product Manufactured	Type of wastes discharged	Date Permit Issued-Renewal	Section of Refuse Act under which Permit Issued	Term of Permit	Date of last inspection to insure compliance with permit. Indicate whether or not in compliance	Name and location of water receiving waste discharge
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)

NONE

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NEW JERSEY

Name & Address of Permittee* (1)	Product Manufactured (2)	Type of wastes discharged (3)	Date Permit Issued-Renewal (4)	Section of Refuse Act under which Permit Issued (5)	Term of Permit (6)	Date of last inspection to insure compliance with permit. Indicate whether or not in compliance (7)	Name and location water receiving waste discharge (8)
Borough of Spring Lake Spring Lake, N.J.		Sanitary Sewage	25 Feb 1932	10	3 years	31 Mar 1932	Atlantic Ocean Spring Lake, N.J.
Boro of Bradley Beach Bradley Beach, N. J.		Sanitary Sewage	17 Dec 1931	10		Approval of Plans	Atlantic Ocean Bradley Beach, N.J.
Borough of Deal Deal, N. J.		Sanitary Sewage	12 May 1941	10	3 years	9 Jan 1942	Atlantic Ocean Deal, N. J.
Borough of Belmar Belmar, N.J.		Sanitary Sewage	22 Apr 1941	10	3 years	7 Jan 1942	Atlantic Ocean Belmar, N.J.
Zone Construct Quartermaster Zone II, Fort Hancock		Sanitary Sewage	28 Nov 1941	10		Approval of Plans	Atlantic Ocean Fort Hancock, N.J.

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by the Corps of Engineers to any person for the purpose of

discharging INDUSTRIAL WASTES into navigable waters within

or bordering any state

NEW JERSEY

ame & Address of Permittee* (1)	Product Manufactured (2)	Type of wastes discharged (3)	Date Permit Issued-Renewal (4)	Section of Refuse Act under which Permit Issued (5)	Term of Permit (6)	Date of last inspection to insure compliance with permit. Indicate whether or not in compliance (7)	Name and location of water receiving waste discharge (8)
Town of Neptune Neptune, N.J.		Sanitary Sewage	23 Sep 1964	10	3 years	9 Feb 1965	Atlantic Ocean Bradley Beach, N.J
City of Asbury Park Asbury Park, N.J.		Sanitary Sewage	18 Jan 1950	10	3 years	4 April 1955	Atlantic Ocean Asbury Park, N.J.
Town ship of Ocean Sewage Authority Oakhurst, N. J.		Sanitary Sewage	11 Apr 1968	10	3 years		Atlantic Ocean Deal, N.J.
Borough of Manasquan Manasquan, N.J.		Sanitary Sewage	4 Aug 1961	10	3 years	9 Feb 1965	Atlantic Ocean Manasquan, N. J.
Borough of Deal Deal, N. J.		Sanitary Sewage	13 Sep 1930	10	3 years	16 Dec 1931	Atlantic Ocean Deal, N.J.

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City of Asbury Park Asbury Park, N.J.		Sanitary Sewage	29 Aug 1934	10	3 years	22 Jan 1935	Atlantic Ocean Asbury Park, N.J.
S. Belmar Boro Belmar, N. J.		Sanitary Sewage	5 Oct 1936	10	3 years	31 Dec 1939	Atlantic Ocean Avon, N.J.
Boro of Neptune City, Avon, N.J.		Sanitary Sewage	17 Jan 1938	10	3 years	16 Dec 1938	Atlantic Ocean Avon, N.J.
Boro of Sea Bright Sea Bright, N.J.		Sanitary Sewage	1 Dec 1938	10	3 years	21 Dec 1939	Atlantic Ocean Sea Bright, N.J.
Boro of Allenhurst Allenhurst, N. J.		Sanitary Sewage	29 Dec 1938	10	3 years	15 Jan 1940	Atlantic Ocean Allenhurst, N.J.
N.E. Monmouth County Regional Sewage Authority Red Bank, N.J.		Sanitary Sewage	12 May 1969	10	3 years		Atlantic Ocean Monmouth Beach

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NEW JERSEY

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(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Hackensack Improvement Commission Hackensack, N.J.		Sanitary Sewage	11 Jun 1923	10	3 years	22 Nov 1926	Hackensack River Hackensack, N.J.
Township of Teaneck Teaneck, N. J.		Sanitary Sewage	24 Jun 1925	10	3 years	12 Nov 1928	Hackensack River Teaneck, N.J.
Boro of Riverside Riverside, N.J.		Sanitary Sewage	9 July 1917	10	3 years	20 Aug 1917	Hackensack River Riverside, N.J.
Board of Commission Ridgefield Park, N.J.		Sanitary Sewage	13 Mar 1917	10	3 years	16 Oct 1917	Hackensack River Ridgefield Park, N.J
Jersey City Sewerage Authority Jersey City, N. J.		Sanitary Sewage	5 Jan 1953	10	3 years	27 Aug 1963	Hackensack River Jersey City, N.J.
City of Hoboken Hoboken, N.J.		Sanitary Sewage	29 Feb 1965	10	3 years		Hudson River, Piers 14 & 15 Hoboken, N.J.

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NEW JERSEY

Name & Address of Permittee* (1)	Product Manufactured (2)	Type of wastes discharged (3)	Date Permit Issued-Renewal (4)	Section of Refuse Act under which Permit Issued (5)	Term of Permit (6)	Date of last inspection to insure compliance with permit. Indicate whether or not in compliance (7)	Name and location of water receiving waste discharge (8)
Boro of Kenasburg Kenasburg, N.J.		Sanitary Sewage	5 May 1925	10	3 years	29 Oct 1928	Raritan Bay Keansburg, N.J.
Boro of Sayreville Sayreville, N.J.		Sanitary Sewage	20 March 1952	10	Approval of Plans	9 Nov 1961	Raritan Bay Morgan, N.J.
Middlesex County Sewerage Authority New Brunswick, N.J.		Sanitary Sewage	30 Jan 1956	10	3 years	25 Jan 1962	Raritan Bay South Amboy, N.J.
Hardrive, Inc. Knolcroft, N. J.		Sanitary Sewage	11 May 1960	10	3 years	24 Jan 1962	Raritan Bay Knolcroft, N.J.

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Data concerning existing permits issued since March 3, 1899 by the Corps of Engineers to any person for the purpose of discharging INDUSTRIAL WASTES into navigable waters within or bordering any state

NEW JERSEY

Name & Address of Permittee* (1)	Product Manufactured (2)	Type of wastes discharged (3)	Date Permit Issued-Renewal (4)	Section of Refuse Act under which Permit Issued (5)	Term of Permit (6)	Date of last inspection to insure compliance with permit. Indicate whether or not in compliance (7)	Name and location water receiving waste discharge (8)
Madison Township Sewerage Auth. Laurence Harbor, N.J.		Sanitary Sewage	5 Nov 1962	10	3 years	17 Feb 64	Raritan Bay Laurence Harbor,. N.J.
City of Perth Amboy Perth Amboy, N.J.		Sanitary Sewage	6 Feb 1924	10	3 years	17 Nov 1925	Raritan River Perth Amboy, N.J.
Boro of Sayreville Sayreville, N.J.		Sanitary Sewage	21 Jan 1949	10	3 years	19 Feb 1951	Raritan River Sayreville, N.J.

*If permittee is an agent disposing of waste for a manufacturer or municipality, then also include name & address of manufacturer or municipality

TABLE A

Data concerning existing permits issued since March 3, 1899 by the Corps of Engineers to any person for the purpose of discharging INDUSTRIAL WASTES into navigable waters within or bordering any state

NEW JERSEY

ame & Address of Permittee* (1)	Product Manufactured (2)	Type of wastes discharged (3)	Date Permit Issued-Renewal (4)	Section of Refuse Act under which Permit Issued (5)	Term of Permit (6)	Date of last inspection to insure compliance with permit. Indicate whether or not in compliance (7)	Name and location o water receiving waste discharge (8)
Boro of Highlands, N.J.		Sanitary Sewage	21 Aug 1926	10	3 years	4 April 1932	Shrewsbury River Highlands, N.J.
Bd. of Commissioners City of Long Branch Long Branch, N. J.		Sanitary Sewage	30 Oct 1923	10	3 years	9 Nov 1925	Shrewsbury River Long Branch, N.J.
Boro of Red Bank Red Bank, N. J.		Sanitary Sewage	5 Nov 1929	10	3 years	5 Nov 1931	Shrewsbury River Red Bank, N.J.
Hercules Powder Co., Inc. Wilmington, Del.	Dimethyl Terephthalate, Modified Resins	Chemical Process Wastes	1 Oct 46	10	12/31/49	1-27-47 in compliance	Delaware R., Burlington Island Burlington Co., N.J.

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TABLE A

Data concerning existing permits issued since March 3, 1899 by the Corps of Engineers to any person for the purpose of discharging INDUSTRIAL WASTES into navigable waters within or bordering any state

NEW JERSEY

Name & Address of Permittee* (1)	Product Manufactured (2)	Type of wastes discharged (3)	Date Permit Issued-Renewal (4)	Section of Refuse Act under which Permit Issued (5)	Term of Permit (6)	Date of last inspection to insure compliance with permit. Indicate whether or not in compliance (7)	Name and location water receiving waste discharge (8)
Jersey Central Power & Light Co. Morristown, N.J.	Electric Power	Thermal Water	8-17-66	10 (30 Stat. 1151)	12-31-69	10-25-66 in compliance	*Discharge Channel Barnegat Bay, Lacey & Ocean Twp. Ocean Co., N.J.
Toms River Chemical Corp. Toms River, N.J.	Chemicals	Chemical Waste	5-28-65	"	12-31-68	6-11-66 In compliance	Atlantic Ocean, Ortley Beach, Ocean Co., N.J.
United States Steel Products 30 Rockefeller Plaza New York, N. Y.	Fabrication of Steel Products	Cooling & Steel Fabrication Waste Water	12-23-53	"	12-31-57	10-22-54 in compliance	Pennsauken Ck., Pennsauken Twp. Camden Co., N.J.
The Norey Realty Co. 426 Walnut St. Phila, Pa.	Not recorded	Not recorded	10-10-19	"	12-31-19	Not recorded	Big Timber Creek, Gloucester Co., N.J.
Atlantic City Electric Co. Atlantic City, N.J.	Electric Power	Cooling Water	11-8-61	"	12-31-64	10-19-62 in compliance	Tuckahoe R. Upper Twp., Cape May Co., N.J.
Northwest Magnesite Co. 1800 Farmers Bank Bldg.	Magnesite	Chemical Waste & Cooling Water	11-12-41	"	12-31-44	7-4-43 in compliance	Delaware Bay Cape Bay Pt., Cape May Co., N.J.

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TABLE A

Data concerning existing permits issued since March 3, 1899 by the Corps of Engineers to any person for the purpose of discharging INDUSTRIAL WASTES into navigable waters within or bordering any state

NEW JERSEY

Name & Address of Permittee* (1)	Product Manufactured (2)	Type of wastes discharged (3)	Date Permit Issued-Renewal (4)	Section of Refuse Act under which Permit Issued (5)	Term of Permit (6)	Date of last inspection to insure compliance with permit. Indicate whether or not in compliance (7)	Name and location of water receiving waste discharge (8)
Dixon Chemical Industries, New Jersey (Olin & Paulsboro Chemical Cos.)	Chemicals	Chemical Process & Cooling Water	6-4-59	10 (30 Stat.1151)	12-31-62	9-4-59 in compliance	Delaware R., Paulsboro, Gloucester Co., N.J.
Shell Chemical Co. New York, N. Y.	Polypropylene	Plastic Chemical Waste, Cooling & Sanitary Water	9-27-61	"	12-31-64	10-18-61 in compliance	Delaware R., Woodbury, Gloucester Co., N. J.
E. I. duPont de Nemours & Co. Wilmington, Del.	Chemicals	Chemical Process Waste	1-30-58	"	12-31-61	10-10-58 in compliance	Delaware R. Upper Penns Neck Twp. Salem Co., N. J.
E. I. duPont de Nemours & Co. Wilmington, Del.	Chemicals	Chemical Process Waste	1-25-18	"	12-31-21	Not recorded	Delaware R. Upper Penns Neck Twp. Salem Co., N.J.
E. I. duPont de Nemours & Co. Wilmington, Del.	Chemicals	Chemical Process Waste	10-31-58	"	12-31-61	7-31-59 in compliance	Delaware R. Upper Penns Neck Twp. Salem Co., N. J.

*If permittee is an agent disposing of waste for a manufacturer or municipality, then also include name & address of manufacturer or municipality

TABLE A

Data concerning existing permits issued since March 3, 1899 by the Corps of Engineers to any person for the purpose of discharging INDUSTRIAL WASTES into navigable waters within or bordering any state

NEW JERSEY

ame & Address of Permittee* (1)	Product Manufactured (2)	Type of wastes discharged (3)	Date Permit Issued-Renewal (4)	Section of Refuse Act under which Permit Issued (5)	Term of Permit (6)	Date of last inspection to insure compliance with permit. Indicate whether or not in compliance (7)	Name and location of water receiving waste discharge (8)
E. I. duPont de Nemours & Co. Wilmington, Del.	Nitrocellulose Smokeless Powder	Chemical Process Waste	4-6-17	10 (30 Stat. 1151)	12-31-20	Not recorded	Delaware R., Carneys Pt., Salem Co., N. J.
Ludlow Manufacturing & Sales Co. Edge Moor, Del.	Jute & Textile Products	Sanitary Waste	2-19-36	"	-	4-29-37 in compliance	Delaware R., Carneys Pt., Salem Co., N. J.
E. I. duPont de Nemours & Co. Wilmington, Del.	Titanium Ores	Chemical Process Waste & Cooling Water	2-1-35	"	12-31-38	Not recorded	Delaware R., Edge Moor, New Castle Co., Del.
E. I. duPont de Nemours & Co. Wilmington, Del.	Chemicals	Chemical Process Waste	12-29-67	"	12-31-70	3-19-68 in compliance	Delaware R., Deepwater, Salem Co., N. J.
Monsanto Chemical Co. St. Louis, Mo.	Benzel Chloride, Stanlinehydride, Hydrochloric Acid, & Plasticizers	Chemical Process Waste	8-16-61	"	12-31-64	9-31-61 In compliance	Delaware R., Lee Twp., Gloucester Co., N. J.

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TABLE A

Data concerning existing permits issued since March 3, 1899 by the Corps of Engineers to any person for the purpose of discharging INDUSTRIAL WASTES into navigable waters within or bordering any state

NEW JERSEY

Name & Address of Permittee* (1)	Product Manufactured (2)	Type of wastes discharged (3)	Date Permit Issued-Renewal (4)	Section of Refuse Act under which Permit Issued (5)	Term of Permit (6)	Date of last inspection to insure compliance with permit. Indicate whether or not in compliance (7)	Name and location water receiving waste discharge (8)
Socony-Vacuum Oil Co. 1500 Walnut St. Phila., Pa. 19102 (Mobil Oil)	Petroleum Products	Cooling & Process Water	12-29-52	10 (30 Stat.1151)	12-31-55	6-17-53 in compliance	Delaware R., Greenwich Twp., Gloucester Co.
Hoffman-La Roche Inc. Nutley, N. J.	Pharmaceuticals	Polished biological oxidation treatment plant effluent	3-31-70	"	12-31-73	Construction not yet started	Delaware R., Belvidere, Warren Co., N. J. ✓

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TABLE A

Data concerning existing permits issued since March 3, 1899 by the Corps of Engineers to any person for the purpose of discharging INDUSTRIAL WASTES into navigable waters within or bordering any state

NEW MEXICO

Name & Address of Permittee* (1)	Product Manufactured (2)	Type of wastes discharged (3)	Date Permit Issued-Renewal (4)	Section of Refuse Act under which Permit Issued (5)	Term of Permit (6)	Date of last inspection to insure compliance with permit. Indicate whether or not in compliance (7)	Name and location of water receiving waste discharge (8)

NONE

* If permittee is an agent disposing of waste for a manufacturer or municipality, then also include name & address of manufacturer or municipality

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TABLE A

Data concerning existing permits issued since March 3, 1899 by the Corps of Engineers to any person for the purpose of discharging INDUSTRIAL WASTES into navigable waters within or bordering any state

NEW YORK

ame & Address of Permittee* (1)	Product Manufactured (2)	Type of wastes discharged (3)	Date Permit Issued-Renewal (4)	Section of Refuse Act under which Permit Issued (5)	Term of Permit (6)	Date of last inspection to insure compliance with permit. Indicate whether or not in compliance (7)	Name and location of water receiving waste discharge (8)
John A. Manning Paper Co. Troy, N.Y.	Paper	Waste Water from Paper Production	29 October 1926	10	3 years	10 May 1929	Hudson River Troy, N. Y.
Hudson Valley Core & Products Co. Troy, N.Y.	Gas & Coke	Phenol Wastes	27 August 1926	10	3 years	10 May 1929	Hudson River Troy, N.Y.
Central Hudson Gas & Electric Co. Poughkeepsie, N.Y.	Generating Station	Cooling Water Discharge	30 December 1964	10	3 years	26 July 1967	Hudson River Danskammer Point, N.Y.
Niagara Mohawk Power Corp. Albany, N.Y.	Generating Station	Cooling Water Discharge	16 October 1952	10	3 years	8 Feb 1964	Hudson River Glenmont, N.Y.
U.S. Military Academy West Point, N.Y.	Generating Station	Cooling Water Discharge	21 Nov 1956	10	3 years		Hudson River West Point, N.Y.
Con. Ed. of N.Y., Inc. New York, N.Y.	Generating Station	Cooling Water Discharge	3 April 1957	10	3 years	21 Apr 1964	Hudson River Indian Point, N.Y.

If permittee is an agent disposing of waste for a manufacturer or municipality, then also include name & address of manufacturer or municipality

TABLE A

Data concerning existing permits issued since March 3, 1899 by the Corps of Engineers to any person for the purpose of discharging INDUSTRIAL WASTES into navigable waters within or bordering any state

NEW YORK

Name & Address of Permittee* (1)	Product Manufactured (2)	Type of wastes discharged (3)	Date Permit Issued-Renewal (4)	Section of Refuse Act under which Permit Issued (5)	Term of Permit (6)	Date of last inspection to insure compliance with permit. Indicate whether or not in compliance (7)	Name and location of water receiving waste discharge (8)
I.B.M. Corp. Poughkeepsie, N.Y.	Business Machines	Sanitary Sewage	14 May 1948	10	3 years	23 Aug 1948	Hudson River Poughkeepsie, N.Y.
Niagara Mohawk Power Corp. Albany, N.Y.	Generating Station	Cooling Water Discharge	19 Oct 1961	10	3 years		Hudson River Overslaugh Dike #2 Glenmont, N.Y.
Presbyterian Hospital 622 W. 168th St. New York, N.Y.		Cooling Water Discharge	14 Nov 1967	10	3 years	13 Sep 1968	Hudson River Ft. Washington, N.Y.
Con. Ed. of N.Y., Inc. New York, N.Y.	Generating Station	Cooling Water Discharge	29 Sep 67	10	3 years		Hudson River Indian Point, N.Y.
International Paper Co. Glens Falls, N.Y.	Paper	Waste Water from Paper Production	9 May 1969	10	3 years		Lake Champlain North of Ticonderoga, N.Y.
Long Island Lighting Co. Mineola, N.Y.	Generating Station	Cooling Water Discharge	4 Aug 1966	10	3 years		Long Island Sound Northport, N.Y.

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TABLE A

Data concerning existing permits issued since March 3, 1899 by the Corps of Engineers to any person for the purpose of discharging INDUSTRIAL WASTES into navigable waters within or bordering any state

NORTH CAROLINA

Name & Address of Permittee* (1)	Product Manufactured (2)	Type of wastes Discharged (3)	Date Permit Issued-Renewal (4)	Section of 1899 Act under which Permit Issued (5)	Term of Permit (6)	Date of last inspection to insure compliance with permit. Indicate whether or not in compliance (7)	Name and location of water receiving waste discharge (8)
Riegel Carolina Corp., Riegelwood, N. C.	Pulp Paper	Water**	15 May 51	10	Indefinite	25 May 67	Cape Fear River, 19 miles above Wilmington, N. C.
Cape Fear Feed Products, Inc., Box 1132, Fayetteville, N. C.	-	Water**	5 Feb 60	10	Indefinite	-	Cape Fear River, 1.2 miles downstream from Fayetteville, N. C.
National Spinning Co., Inc., Box 191, Washington, N. C.	Cloth	Water**	20 Sep 68	10	Indefinite	9 May 69	Tar River at Washington, N. C.
Weyerhaeuser Co., New Bern, N. C.	Pulp Paper	Water**	16 Sep 69	10	Indefinite	-	Neuse River, 1.1 miles downstream from Streets Ferry bridge in Craven County, N. C.

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** Outfall drains that, according to a representative of the N. C. Department of Water and Air Resources, meet the Water Quality Standards adopted by the State and approved by the U. S. Department of Inrerior.

TABLE A

Data concerning existing permits issued since March 3, 1899 by the Corps of Engineers to any person for the purpose of discharging INDUSTRIAL WASTES into navigable waters within or bordering any state

NORTH DAKOTA

Name & Address of Permittee* (1)	Product Manufactured (2)	Type of wastes discharged (3)	Date Permit Issued-Renewal (4)	Section of Refuse Act under which Permit Issued (5)	Term of Permit (6)	Date of last inspection to insure compliance with permit. Indicate whether or not in compliance (7)	Name and location of water receiving waste discharge (8)
NONE							

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TABLE A

Data concerning existing permits issued since March 3, 1899 by the Corps of Engineers to any person for the purpose of discharging INDUSTRIAL WASTES into navigable waters within or bordering any state

OHIO

Name & Address of Permittee*	Product Manufactured	Type of wastes discharged	Date Permit Issued-Renewal	Section of Refuse Act under which Permit Issued	Term of Permit	Date of last inspection to insure compliance with permit. Indicate whether or not in compliance	Name and location of water receiving waste discharge
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
NONE							

If permittee is an agent disposing of waste for a manufacturer or municipality, then also include name & address of manufacturer or municipality

TABLE A

Data concerning existing permits issued since March 3, 1899 by the Corps of Engineers to any person for the purpose of discharging INDUSTRIAL WASTES into navigable waters within or bordering any state

OKLAHOMA

Name & Address of Permittee* (1)	Product Manufactured (2)	Type of wastes discharged (3)	Date Permit Issued-Renewal (4)	Section of Refuse Act under which Permit Issued (5)	Term of Permit (6)	Date of last inspection to insure compliance with permit. Indicate whether or not in compliance (7)	Name and location of water receiving waste discharge (8)
NONE							

* If permittee is an agent disposing of waste for a manufacturer or municipality, then also include name & address of manufacturer or municipality

TABLE A

Data concerning existing permits issued since March 3, 1899 by the Corps of Engineers to any person for the purpose of discharging INDUSTRIAL WASTES into navigable waters within or bordering any state

OREGON

ame & Address of Permittee*	Product Manufactured	Type of wastes discharged	Date Permit Issued-Renewal	Section of Refuse Act under which Permit Issued	Term of Permit	Date of last inspection to insure compliance with permit. Indicate whether or not in compliance	Name and locatio water receiving waste discharge
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Georgia-Pacific Corp. Toledo, Oreg.	Paper Products	Sulphite Liquor	11 July 1957 Extended 16 Mar 65	R&H Section 10	31 Mar 1968	15 April 1966 Job Completed	Pacific Ocean
International Paper Co. Newport, Oreg.	Paper Products	Sulphite Liquor	11 July 1957	"	31 Dec 1960	14 Jan 1964 Job Completed	"
Boise Cascade Corp Salem, Oreg.	Paper Products	Sulphite Liquor	1 July 1959	"	31 Dec 1962	12 Aug 1959 Job Completed	Willamette River
Publishers Paper Co. P. O. Box 551 Oregon City, Oreg.	Paper Products	Sulphite Liquor	28 June 1967	"	31 Dec 1970	12 Dec 1967	"
Evans Prod. Co. P. O. Box E Corvallis, Oreg.97330	Hardboard & Plastics	Trace Resin Trace Wax	27 May 1968	"	31 Dec 1970	16 Jan 1969 Job Completed	"
Georgia-Pacific Corp P. O. Box 580 Toledo, Oreg. 97391	Paper Products	Sulphite Liquor	23 July 1968	"	31 Dec 1971	20 Mar 1969 Job Completed	Yaquina River
American Can Co. 1900 Pollitt Drive Fair Lawn, N. J. 07410	Paper Prod.	Sulphite Liquor	27 Sep 1967	"	31 Dec 1970	17 Jan 1969 Job Completed	Willamette River

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TABLE A

Data concerning existing permits issued since March 3, 1899 by the Corps of Engineers to any person for the purpose of discharging INDUSTRIAL WASTES into navigable waters within or bordering any state

PENNSYLVANIA

me & Address of Permittee*	Product Manufactured	Type of wastes discharged	Date Permit Issued-Renewal	Section of Refuse Act under which Permit Issued	Term of Permit	Date of last inspection to insure compliance with permit. Indicate whether or not in compliance	Name and location o water receiving waste discharge
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
ublicker Commercial Alcohol Co. 429 Walnut St. hila., Pa.	Alcohol, Solvents	No effluent now.	1-14-44	10	12-31-47	9-29-44 in compliance	Delaware R., Eddington, Bucks Co., Pa.
ennsylvania Steel Manufacturing Co. 000 Widener Bldg. hila., Pa.	Info not readily avail-able	Info not readily available	12-23-42	"	12-31-45	7-5-43 in compliance	Delaware R., Cornwells Height Bucks Co., Pa.
nited States Steel Corp. 25 William Penn Place ittsburgh, Pa.	Billets, Bars, Sheet Tinplate	Steel Process Waste	6-28-51	"	12-31-54	6-16-54 in compliance	Delaware R., Falls Twp., Buck Co., Pa.
nited States Steel Corp. 25 William Penn Place ittsburgh, Pa.	Billets, Bars, Sheet Tinplate	Sanitary Waste & Cooling Water	6-28-51	"	12-31-54	11-10-52 in compliance	Delaware R., Falls Twp., Bucks Co., Pa.
milton Paper Co. iquon, Pa. eyerhauser Paper p.)	Paper Products	Chemical Process Waste & Paper Waste	5-31-60	"	-	6-14-60 in compliance	Schuylkill R., Whitemarsh Twp., Montgomery Co., Pa.
amilton Paper Co. iquon, Pa. eyerhauser Paper p.)	Paper Products	Chemical Process Waste & Paper Waste	2-15-55	"	-	1-13-56 in compliance	Schuylkill R., Whitemarsh Twp., Montgomery Co,, Pa

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TABLE A

Data concerning existing permits issued since March 3, 1899

Corps of Engineers to any person for the purpose of

discharging INDUSTRIAL WASTES into navigable waters

within or bordering any state

PUERTO RICO

Name & Address of Permittee* (1)	Product Manufactured (2)	Type of wastes discharged (3)	Date Permit Issued-Renewal (4)	Section of R & H Act of 1899 under which Permit Issued (5)	Term of Permit (6)	Date of last inspection to insure compliance with permit. Indicate whether or not in compliance (7)	Name and location of water receiving waste discharge (8)
Bacardi Corp. of America, Box 9921 Santurce, P. R. P(8367)	Rum	not given	18 Oct 1950 Revised, revived and extended 9 Oct 1959	10	Indefinite	April 1970 **	Bayamon River & Vieja Bay at Pala Seco, P. R.

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** No violation of permit detected, but cautionary letters were written expressing concern over small amounts of solids being discharged and permittees were urged to take steps to abate all pollution.

TABLE A

Data concerning existing permits issued since March 3, 1899 by the Corps of Engineers to any person for the purpose of discharging INDUSTRIAL WASTES into navigable waters within or bordering any state

RHODE ISLAND

Name & Address of Permittee* (1)	Product Manufactured (2)	Type of wastes discharged (3)	Date Permit Issued-Renewal (4)	Section of Refuse Act under which Permit Issued (5)	Term of Permit (6)	Date of last inspection to insure compliance with permit. Indicate whether or not in compliance (7)	Name and location water receiving waste discharge (8)

NONE

* If permittee is an agent disposing of waste for a manufacturer or municipality, then also include name & address of manufacturer or municipality

TABLE A

Data concerning existing permits issued since March 3, 1899 by the Corps of Engineers to any person for the purpose of discharging INDUSTRIAL WASTES into navigable waters within or bordering any state

SOUTH CAROLINA

Name & Address of Permittee* (1)	Product Manufactured (2)	Type of wastes discharged (3)	Date Permit Issued-Renewal (4)	Section of 1899 Act under which Permit Issued (5)	Term of Permit (6)	Date of last inspection to insure compliance with permit. Indicate whether or not in compliance (7)	Name and location of water receiving waste discharge (8)
Branch River Wool Combing Co., Inc. P. O. Box 950 Woonsocket, R. I.	Wool Products	Effluent from a wool scouring process	28 Feb 1955	10	Indefinite	28 Feb 1956	Santee River near Jamestown, S. C.
Virginia-Carolina Chemical Corp., Chemical Division P. O. Box 6259 Charleston, S. C.	Fertilizers	35(55 gal) drums Butyl Mercaptan (one disposal)	17 May 1960	10	Two Months	18 May 1960	Atlantic Ocean 20 miles south of Charleston, S. C.
Verona Dye Works, Springfield Road Union, New Jersey	Dyestuffs	227 drums of Sodium Chlorite (one disposal)	30 Oct 1964	10	Two Months	Operation witnessed by U. S. Coast Guard 31 Oct 1964	Atlantic Ocean at dumping area designated as latitude 32° - 16', longitude 78° - 52
Black, Crow & Eidsness, Inc., 1720 Peachtree Road, N.W., Atlanta, Georgia	Chemical Dye	Industrial waste from chemical dye manufacturing plant	3 Mar 1967	10	Indefinite	21 Nov 67	Unnamed creek near Whale Branch, Lobeco, S. C.

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TABLE A

Data concerning existing permits issued since March 3, 1899 by the Corps of Engineers to any person for the purpose of discharging INDUSTRIAL WASTES into navigable waters within or bordering any state

SOUTH CAROLINA

Name & Address of Permittee*	Product Manufactured	Type of wastes discharged	Date Permit Issued-Renewal	Section of 1899 Act under which Permit Issued	Term of Permit	Date of last inspection to insure compliance with permit. Indicate whether or not in compliance	Name and location water receiving waste discharge
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
South Carolina Electric and Gas Company, P.O. Box 764, Columbia, S. C.	Electric Power	Condenser cooling waters (5° F. temperature increase) and effluent from ash disposal lagoon	20 June 1967	10	Indefinite	31 Dec 1969	Wateree River, Wateree Station, S. C.
Burns & Roe, Inc., 700 Kinderkamack Rd., Oradell, N. J.	Electric Power	Condenser cooling waters 15:7°F. temperature increase	14 July 1967	10	Indefinite	20 Mar 1970	Tailrace Canal, Pinopolis Dam, S. C.
Westinghouse Electric Corp., Nuclear Fuel Division P.O. Box 5906 Columbia, S. C.	-	Neutralized chemical waste and biologically treated sanitary waste	25 Mar 1969	10	36 Months	-	Congaree River 1.6 miles downstream from Columbia, S. C.

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TABLE A

Data concerning existing permits issued since March 3, 1899 by the Corps of Engineers to any person for the purpose of discharging INDUSTRIAL WASTES into navigable waters within or bordering any state

SOUTH DAKOTA

Name & Address of Permittee* (1)	Product Manufactured (2)	Type of wastes discharged (3)	Date Permit Issued-Renewal (4)	Section of Refuse Act under which Permit Issued (5)	Term of Permit (6)	Date of last inspection to insure compliance with permit. Indicate whether or not in compliance (7)	Name and location water receiving waste discharge (8)
NONE							

* If permittee is an agent disposing of waste for a manufacturer or municipality, then also include name & address of manufacturer or municipality

TABLE A

Data concerning existing permits issued since 3 March 1899 by the Corps of Engineers to any person for the purpose of discharging INDUSTRIAL WASTES into navigable waters within or bordering any state

TENNESSEE

Name and Address of Permittee* (1)	Product Manufactured (2)	Type of Wastes discharged (3)	Date Permit issued-renewal (4)	Section of Refuse Act Under which Permit issued (5)	Term of Permit (6)	Date of last inspection to insure compliance with permit. Indicate whether or not in compliance (7)	Name and Location of water receiving waste discharge (8)
City of Memphis	Unknown	Sewage	8 Aug 52	Section 10	3 years	Unknown	Miss. R., Mile 730 AHP Memphis, Tennessee
City of Memphis	Unknown	Sewage	10 Jun 52	Section 10	3 years	Unknown	Miss. R., Mile 731 AHP Memphis, Tennessee
City of Memphis	Unknown	Sewage	26 Mar 43	Section 10	3 years	Unknown	Miss. R., Mile 728.2 AHP Memphis, Tennessee
Memphis Light & Gas Memphis, Tennessee	Electrical Power	Thermal Pollution	26 Jul 56	Section 10	3 years	Unknown	Miss. R., Mile 725.5 AHP Memphis, Tennessee
City of Memphis	Unknown	Sewage	31 Dec 37	Section 10	3 years	Unknown	Miss. R., Mile 731.6 AHP Memphis, Tennessee

* If permittee is an agent disposing of waste for a manufacturer or municipality, then also include name and address of manufacturer or municipality.

TABLE A

TEXAS

Data concerning existing permits issued since March 3, 1899 by the Corps of Engineers to any person for the purpose of discharging INDUSTRIAL WASTES into navigable waters within or bordering any state

TEXAS

Name & Address of Permittee* (1)	Product Manufactured (2)	Type of wastes discharged (3)	Date Permit Issued-Renewal (4)	Section of Refuse Act under which Permit Issued (5)	Term of Permit (6)	Date of last inspection to insure compliance with permit. Indicate whether or not in compliance (7)	Name and location of water receiving waste discharge (8)
Champion Papers Pasadena, Texas	Paper products	"Black Liquor"	17 June 1955	**	Indefinite	**	Gulf of Mexico
E.I. DuPont DeNemours and Company, Inc.	Petro-chemicals	Empty tetraethyl lead tanks	27 March 1967	**	Indefinite	**	Gulf of Mexico
Lubrizol Corp. Deer Park, Texas	Petro-chemicals	Waste Sulfides	20 Dec. 1967	**	Indefinite	**	Gulf of Mexico
GAF Corp. Texas City, Texas	Petro-chemicals	Drummed organic chemical wastes	8 July 1968	**	Indefinite	**	Gulf of Mexico
E.I. DuPont DeNemours and Company, Inc. LaPorte, Texas	Petro-chemicals	Drummed caprolactum waste	30 Aug. 1968	**	Indefinite	**	Gulf of Mexico
Rohm and Hass Co. Deer Park, Texas	Petro-chemicals	Ammonium sulfate and organic chemicals	1 Nov. 1968	**	Indefinite	**	Gulf of Mexico

* If permittee is an agent disposing of waste for a manufacturer or municipality, then also include name & address of manufacturer or municipality

**Letters of no objection for dumping beyond the continental shelf

TABLE A

Data concerning existing permits issued since March 3, 1899 by the Corps of Engineers to any person for the purpose of discharging INDUSTRIAL WASTES into navigable waters within or bordering any state

UTAH

Name & Address of Permittee*	Product Manufactured	Type of wastes discharged	Date Permit Issued-Renewal	Section of Refuse Act under which Permit Issued	Term of Permit	Date of last inspection to insure compliance with permit. Indicate whether or not in compliance	Name and location of water receiving waste discharge
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
NONE							

If permittee is an agent disposing of waste for a manufacturer or municipality, then also include name & address of manufacturer or municipality

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TABLE A

Vermont

Data concerning existing permits issued since March 3, 1899 by the Corps of Engineers to any person for the purpose of discharging INDUSTRIAL WASTES into navigable waters within or bordering any state

VERMONT

Name & Address of Permittee* (1)	Product Manufactured (2)	Type of wastes discharged (3)	Date Permit Issued-Renewal (4)	Section of Refuse Act under which Permit Issued (5)	Term of Permit (6)	Date of last inspection to insure compliance with permit. Indicate whether or not in compliance (7)	Name and location of water receiving waste discharge (8)
Fire Dist. #4 Shelburne, Vt.		Sanitary Sewage	5 February 1958	10	3 Years	29 November 1963	Lake Champlain Shelburne Bay, Vt.
City of Vergennes Vergennes, Vt.		Sanitary Sewage	12 November 1963	10	3 Years	18 March 1965	Lake Champlain Otter Creek, Vt.
Grand Isle Fire Dist. #4 Grand Isle, Vt.		Filter Backwash Water	2 September 1969	10	3 Years		Lake Champlain Grand Isle, Vt.
Prudential Comm. Fire Dist #1 Shelburne, Vt.		Sanitary Sewage	24 March 1969	10	3 Years		Lake Champlain Shelburne Bay, Vt.
City of Burlington Burlington, Vt.	Power Generation	Cooling Water Discharge	7 April 1953	10	3 years		Lake Champlain Burlington Harbor Burlington, Vt.

*If permittee is an agent disposing of waste for a manufacturer or municipality, then also include name & address of manufacturer or municipality

TABLE A

Data concerning existing permits issued since March 3, 1899 by the Corps of Engineers to any person for the purpose of discharging INDUSTRIAL WASTES into navigable waters within or bordering any state

VIRGINIA

Name & Address of Permittee*	Product Manufactured	Type of wastes discharged	Date Permit Issued-Renewal	Section of Refuse Act under which Permit Issued	Term of Permit	Date of last inspection to insure compliance with permit. Indicate whether or not in compliance	Name and location water receiving waste discharge
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)

NONE

* If permittee is an agent disposing of waste for a manufacturer or municipality, then also include name & address of manufacturer or municipality

TABLE A

Data concerning existing permits issued since March 3, 1899 by the Corps of Engineers to any person for the purpose of discharging INDUSTRIAL WASTES into navigable waters within or bordering any state

WASHINGTON

Name & Address of Permittee* (1)	Product Manufactured (2)	Type of wastes* discharged (3)	Date Permit Issued-Renewal (4)	Section of Refuse Act under which Permit Issued (5)	Term of Permit (6)	Date of last inspection to insure compliance with permit. Indicate whether or not in compliance (7)	Name and location of water receiving waste discharge (8)
Rayonier, Inc. Hoquiam	Pulp	Liquid waste	4/23/57	10	Indefinite	None	North Channel Grays Harbor
Soundview Pulp & Weyerhaeuser Timber Co., Jointly Everett	Pulp	Liquid Waste	9/07/50	10	"	None	Port Gardner Bay, Everett Harbor
Scott Paper Co. Everett	Pulp	Plant process effluent	10/12/64	10	"	None	Port Gardner Bay Everett Harbor
Scott Paper Co.	Pulp	Unknown	2/04/69	10	"	None	Port Gardner Bay
Weyerhaeuser Timber Hoquiam	Pulp	Effluent	2/05/57	10	"	None	South Channel Grays Harbor
Hooker Chemical Corp. Tacoma	Chemicals	Waste	7/08/69	10	"	None	Hylebos Waterway Tacoma
Weyerhaeuser Timber Co., Everett	Pulp & Lumber	Effluent	4/20/53	10	"	None	Snohomish River & Steamboat Slough

* AS DEFINED BY PERMIT

If permittee is an agent disposing of waste for a manufacturer or municipality, then also include name & address of manufacturer or municipality

TABLE A

Data concerning existing permits issued since March 3, 1899 by the Corps of Engineers to any person for the purpose of discharging INDUSTRIAL WASTES into navigable waters within or bordering any state

WASHINGTON

Name & Address of Permittee* (1)	Product Manufactured (2)	Type of wastes discharged (3)	Date Permit Issued-Renewal (4)	Section of Refuse Act under which Permit Issued (5)	Term of Permit (6)	Date of last inspection to insure compliance with permit. Indicate whether or not in compliance (7)	Name and location water receiving waste discharge (8)
Crown Zellerbach Corp. Public Service Bldg. Portland, Oreg. 97204	Paper Products	Sulphite Liquor	4 April 1950	R & H Section 10	31 Dec 52	13 Feb 1951 Job Complete	Columbia River
Longview Fibre Co. Longview, Wash 98632	Paper Products	Sulphite Liquor	21 Aug 1951	"	31 Dec 54	20 Sep 51 Job Complete	"
Weyerhaeuser Timber Co. Longview, Wash 98632	Wood Pulp	Sulphite Liquor	26 Oct 1951 Extended 27 Oct 1964 Extended 22 Aug 1967	"	31 Dec 70	10 Jun 54 3 Dec 65 22 May 1968 Job Completed	"
Crown Zellerbach Corp. Public Service Bldg. Portland, Oreg. 97204	Paper Products	Sulphite Liquor	23 Feb 1960	"	31 Dec 63	8 Dec 1961 Job Completed	"

* If permittee is an agent disposing of waste for a manufacturer or municipality, then also include name & address of manufacturer or municipality

TABLE A

Data concerning existing permits issued since March 3, 1899 by the Corps of Engineers to any person for the purpose of discharging INDUSTRIAL WASTES into navigable waters within or bordering any state

WASHINGTON

Name & Address of Permittee* (1)	Product Manufactured (2)	Type of wastes discharged (3)	Date Permit Issued-Renewal (4)	Section of Refuse Act under which Permit Issued (5)	Term of Permit (6)	Date of last inspection to insure compliance with permit. Indicate whether or not in compliance (7)	Name and location of water receiving waste discharge (8)
Boise Cascade Corp 414 West 5th St. Vancouver, Wash.	Paper Products	Sulphite Liquor	13 May 1964	R&H Section 10	31 Dec 1967	24 June 1964 Job Completed	Columbia River
Crown Zellerbach Corp 2363 Airport Way Seattle, Wash 98108	Paper Products	Sulphite Liquor	7 Aug 1967	"	31 Dec 1970	17 Jan 1968 Job Completed	"
Virginia Chem. Corp. 3340 W. Norfolk Rd. Portsmouth, Va. 23703	Unknown	2 ppm zinc	20 Oct 1969	"	31 Dec 1972	Construction Completed February 1970	"
Reynolds Metals Co. P. O. Box 999 Longview, Wash. 98632	Aluminum Ingot	See Incl. 8	14 Apr 1970	"	31 Dec 1972	Construction Completed July 1967	"
Aluminum Co. of America Vancouver, wash.	Aluminum Ingot	Fluorine Cyanide Acids	27 July 1953 Extended 11 Dec 1956	"	31 Dec 1959	Construction Completed 7 Nov 1958	"

* If permittee is an agent disposing of waste for a manufacturer or municipality, then also include name & address of manufacturer or municipality

TABLE A

Data concerning existing permits issued since March 3, 1899 by the Corps of Engineers to any person for the purpose of discharging INDUSTRIAL WASTES into navigable waters within or bordering any state

WASHINGTON

Name & Address of Permittee* (1)	Product Manufactured (2)	Type of wastes discharged (3)	Date Permit Issued-Renewal (4)	Section of Refuse Act under which Permit Issued (5)	Term of Permit (6)	Date of last inspection to insure compliance with permit. Indicate whether or not in compliance (7)	Name and location water receiving waste discharge (8)
Boise Cascade Corp. P. O. Box 1015, Walla Walla, Wash. 99362	Kraft paper	Pulp process wastes	Issued 7 Nov 57 Mod. 4 Apr 58	10	**Indefinite	8 Oct 68 (Complies)	Columbia River Attalia, Wash.
Chevron Chemical Co. P. O. Box 6148 Kennewick, Wash 99336	Ammonium nitrate; Aluminum nitrate solution; ammonium nitrate solutions; nitrate acid, nitric phosphate; ammonium phosphate	Chemical residue	5 Jun 69	10	**Indefinite	No inspection	Columbia River, RM 323.2, Kennewick Wash.
Phillips Pacific Chemical Co., 1153 Denver Club Bldg. Denver, Colorado	Anhydrous ammonia; ammonium nitrate; urea solution	PO_4; SO_3; $NaHCO_3$ MEA; Susp. Solids; Na Cl; Oil (Only in authorized amounts)	4 Oct 56 9 Mar 65	10	**Indefinite	Oct 68 (Complies)	Columbia River, Wash., Kennewick
General Chemical Div. Allied Chemical & Dye Corp., P. O. Box 433 Kennewick, Wash. 99336	Aluminum nitrate; aluminum thiosulfide; liquid aluminum sulfate; aluminum poly sulfide	Chemical residues	23 Jul 51	10	**Indefinite	Oct 68 (Complies)	Columbia River, Wash., Kennewick

**Permit to perform work limited to 31 Dec three years subsequent to year of issue.

*If permittee is an agent disposing of waste for a manufacturer or municipality, then also include name & address of manufacturer or municipality.

TABLE A

Data concerning existing permits issued since March 3, 1899 by the Corps of Engineers to any person for the purpose of discharging INDUSTRIAL WASTES into navigable waters within or bordering any state

WEST VIRGINIA

Name & Address of Permittee* (1)	Product Manufactured (2)	Type of wastes discharged (3)	Date Permit Issued-Renewal (4)	Section of Refuse Act under which Permit Issued (5)	Term of Permit (6)	Date of last inspection to insure compliance with permit. Indicate whether or not in compliance (7)	Name and location water receiving waste discharge (8)
NONE							

* If permittee is an agent disposing of waste for a manufacturer or municipality, then also include name & address of manufacturer or municipality

TABLE A

Data concerning existing permits issued since March 3, 1899 by the Corps of Engineers to any person for the purpose of discharging INDUSTRIAL WASTES into navigable waters within or bordering any state

WYOMING

Name & Address of Permittee* (1)	Product Manufactured (2)	Type of wastes discharged (3)	Date Permit Issued-Renewal (4)	Section of Refuse Act under which Permit Issued (5)	Term of Permit (6)	Date of last inspection to insure compliance with permit. Indicate whether or not in compliance (7)	Name and location water receiving waste discharge (8)

N O N E

* If permittee is an agent disposing of waste for a manufacturer or municipality, then also include name & address of manufacturer or municipality

ENGCW-ON 13 March 1970

Honorable Henry S. Reuss
Chairman, Conservation and Natural
Resources Subcommittee
House of Representatives
Washington, D. C. 20515

Dear Mr. Reuss:

This refers to your recent letter requesting data on waste and dredged materials being discharged under Corps of Engineers permit into navigable waters in or adjoining Wisconsin.

I am pleased to inclose a compilation of these data, summarizing existing permits for discharging industrial wastes and dredged material into navigable waters in or adjoining Wisconsin.

Sincerely yours,

2 Incls (dup)
1. Table A
2. Table B

F. J. CLARKE
Lieutenant General, USA
Chief of Engineers

TABLE A

Data concerning existing permits issued since March 3, 1899 by the Corps of Engineers to any person for the purpose of discharging INDUSTRIAL WASTES into navigable waters within or bordering the state of WISCONSIN

Name & Address of Permittee (1)	Product Manufactured (2)	Type of wastes Discharged (3)	Date Permit Issued-Renewal (4)	Term of Permit (5)	Date of last inspection to insure compliance with permit (6)	Name and Location of water receiving waste discharge (7)
Minnesota Dept. of Highways, St. Paul, Minnesota		Storm Sewer Outlet	15 Aug 1966	No Termination Date for Effluent		Lake Superior-Duluth-Supr Hbr, Minn & Wis
City of Prairie Du Chien, Wis.		Sewer Outlet	20 Sep 1927	"		Mississippi River 634.5 Mile
Village of Desota, Wis.		Sewer Outlet	10 Dec 1965	"		Mississippi River 667.5 Mile
Dairyland Power Coop, Genoa, Wis.	Elec Power	Sewer Outfall	14 Aug 1939	"		Mississippi River 678.5 Mile
Dairyland Power Coop, Alma, Wis.	Elec Power	Sewer Outfall	12 Jan 1959	"		Mississippi River 751.0 Mile
Village of Trempealeau, Wis.		Sewer Outfall	28 Nov 1969	"		Mississippi River 714.0 Mile
City of Hudson, Wis.		Sewer Outfall	22 Jan 1932	"		St. Croix River 16.2 Mile

TABLE A.

Data concerning existing permits issued since March 3, 1899
by the Corps of Engineers to any person for the purpose of
discharging INDUSTRIAL WASTES into navigable waters within
or bordering the state of WISCONSIN

Name & Address of Permittee (1)	Product Manufactured (2)	Type of wastes Discharged (3)	Date Permit Issued-Renewal (4)	Term of Permit (5)	Date of last inspection to insure compliance with permit (6)	Name and Location of water receiving waste discharge (7)
City of Durand, Wis.		Sewer Outfall	20 Jul 1937	No Termination Date for Effluent		St. Croix River 16.9 Mile
Marathon Div of American Can Co.	Paper	Mill Effluent	21 May 1964	"	27 Mar 1967	Menominee River
Northern Paper Mills	Paper	Mill Effluent	24 Nov 1916	"	27 Mar 1967	Green Bay
Valley Paper Mills (Now Kimberly-Clark)	Paper	Mill Effluent	26 Sept 1921	"	25 Jan 1967	Lake Butte Des Morts
Riverside Paper Co.	Paper	Backwash Water Filtration Plant	4 Dec 1905	"	25 Jan 1967	Fox River
Riverside Paper Co.	Paper	Mill Effluent	4 Dec 1905	"	25 Jan 1967	Fox River

NOTE: Permits for structures were for normal 3-year period and structures have been completed

TABLE A

Data concerning existing permits issued since March 3, 1899 by the Corps of Enginsers to any person for the purpose of discharging INDUSTRIAL WASTES into navigable waters within or bordering the state of WISCONSIN

Name & Address of Permittee (1)	Product Manufactured (2)	Type of wastes Discharged (3)	Date Permit Issued-Renewal (4)	Term of Permit (5)	Date of last inspection to insure compliance with permit (6)	Name and Location of water receiving waste discharge (7)
City of Winona, Minn.		Sewer	29 June 1934	No Termination date for Effluent		Mississippi River 723.85 Mile
Pittsburgh Plate Glass Co, Red Wing, Minn.	Paint Products (Oil Processing)	Effluent	6 Apr 1950	"		Mississippi River 790.6(Mile
Northern States Power Minneapolis, Minn.	Electric Power	Cooling Water Discharge	21 May 1969	"		Mississippi River 798.6(Mile
Northern States Power Co., Minneapolis, Minn.	Electric Power	Cooling Water	7 Dec 1965	"		St. Croix River 21.6 Mile
City of Bayport, Minn.		Sewer Outfall	29 Nov 1961	"		St. Croix River 20.0 Mile
Minnesota Dept. of Highways, St. Paul, Minnesota		Storm Sewer Outlet	15 Aug 1966	"		St. Croix River 22.3 Mile

TABLE B

Data concerning existing permits issued since January 1, 1965 by the Corps of Engineers to any person for the purpose of discharging DREDGED MATERIAL into navigable waters within or bordering the state of WISCONSIN

Name & Address of Permittee	Date Permit Issued-Renewal	Term of Permit	Name and Location of water receiving dredged material	Total quantity of material discharged under this permit
(1)	(2)	(3)	(4)	(5)
Zenith Dredging Co. Duluth, Minn.	25 Apr 68	31 Dec 71 Completed 68	Lake Superior	13,500 CY Lake Bottom Material
"	16 May 68	"	"	2,000 CY Lake Bottom Material
"	15 May 68	"	"	7,000 CY Lake Bottom Material
John H. Purves, Inc. Sturgeon Bay, Wis	21 Oct 65	3 Yrs to 31 Dec 68	Green Bay	5,000 CY
Peterson Builders, Inc. Sturgeon Bay, Wisc.	5 Feb 65	3 Yrs to 31 Dec 68	Green Bay	2,000 CY
Luedtke Engr Co. Frankfort, Mich.	16 Jun 67	1 Yr to 31 Dec 68	Lake Michigan at Two Creeks	14,000 CY

TABLE B

Data concerning existing permits issued since January 1, 1965 by the Corps of Engineers to any person for the purpose of discharging DREDGED MATERIAL into navigable waters within or bordering the state of WISCONSIN

Name & Address of Permittee	Date Permit Issued-Renewal	Term of Permit	Name and Location of water receiving dredged material	Total quantity of material discharged under this permit
(1)	(2)	(3)	(4)	(5)
Roen Salvage Co. Sturgeon Bay, Wis.	3 May 65	3 Yrs to 31 Dec 68	Lake Bay	7,000 CY
Afram Bros. Co. Milwaukee, Wis.	25 Apr 67	To 31 Dec 67	Lake Michigan	5,000 CY
Board of Harbor Comm. Milwaukee, Wis.	25 Jun 68	To 31 Dec 68	Lake Michigan	5,000 CY
Edward E. Gillen Co. Milwaukee, Wis.	25 Jun 68	To 31 Dec 68	Lake Michigan	3,000 CY
Edward E. Gillen Co. Milwaukee, Wis.	29 Dec 65	To 31 Dec 66	Lake Michigan	15,000 CY
Great Lakes Dredge & Dock Co. Chicago, Ill.	26 Aug 65	To 31 Dec 65	Lake Michigan	1,500 CY

TABLE B

Data concerning existing permits issued since January 1, 1965 by the Corps of Engineers to any person for the purpose of discharging DREDGED MATERIAL into navigable waters within or bordering the state of WISCONSIN

Name & Address of Permittee	Date Permit Issued-Renewal	Term of Permit	Name and Location of water receiving dredged material	Total quantity of material discharged under this permit
(1)	(2)	(3)	(4)	(5)
Chicago & Northwestern Railroad Chicago, Ill.	30 July 65	To 31 Dec 65	Lake Michigan	9,475 CY
Medusa Portland Cement Co. Milwaukee, Wis.	12 July 67	To 31 Dec 67	Lake Michigan	4,000 CY
Milwaukee Board of Harbor Comm. Milwaukee, Wis.	10 May 67	To 31 Dec 67	Lake Michigan	3,000 CY

Note: All of the above permits completed.

TABLE

Data concerning existing permits issued since January 1, 1965 by the Corps of Engineers to any person for the purpose of discharging DREDGED MATERIAL into navigable waters within or bordering any state

ALABAMA

Name & Address of Permittee (1)	Date Permit Issued-Renewal (2)	Term of Permit (3)	Name and Location of water receiving dredged material (4)	Section of 1899 Act under which Permit Issued (5)	Total quantity of material discharged under this permit (6)
State of Alabama Highway Department Montgomery, Alabama	16 May 1969	3 years 7 months	Polecat Bay off Mobile Bay at Mobile, Ala.	10	-
Alabama State Docks Dept. Executive Office P. O. Box 721 Mobile, Alabama 36601	21 April 1965	3 years 8 months	Perdido Pass (between Gulf of Mexico & Bayou St. John) near Alabama Point, Baldwin County, Ala.	10	-
University of Alabama Marine Sciences Institute P. O. Box 667 Bayou La Batre, Alabama 36509	15 August 1967	3 years 4 months	Portersville Bay off Mississippi Sound near Bayou LaBatre, Alabama	10	Approx. 5,000 cu. yds.

TABLE B

Data concerning existing permits issued since January 1, 1965 by the Corps of Engineers to any person for the purpose of discharging DREDGED MATERIAL into navigable waters within or bordering any state

ALASKA

ALASKA

Name & Address of Permittee	Date Permit Issued-Renewal	Term of Permit	Name and Location of water receiving dredged material		Section of Refuse Act under which Permit Issued	Total quantity of material discharged under this permit
(1)	(2)	(3)	(4)		(5)	(6)
New England Fish Co. 618 Second Ave. Seattle 98104	22 January 1965	3 years	Orca Inlet	Cordova, Alaska	Section 10	8,700 c.y.
Ketchikan Pulp Co. Ketchikan 99901	2 April 1965	3 years	Ward Cove	Ketchikan, Alaska	Section 10	20,000 c.y. - 1965 20,000 c.y. - 1966
	2 February 1970	5 months	Tongass Narrows	Ketchikan, Alaska	Section 10	120,000 c.y.
Anchorage, City of Anchorage 99501	15 July 1966	3 years	Knik Arm	Anchorage, Alaska	Section 10	60,000 c.y. (removed 700,000 c.y.
	9 August 1966	3 years	Knik Arm	Anchorage, Alaska	Section 10	25,000 c.y. (removed 42,000 c.y.)
Point Chehalis Packers Box 751 Cordova 99574	9 September 1966	3 years	Orca Inlet	Cordova, Alaska	Section 10	6,500 c.y.
Corps of Engineers Box 7002 Anchorage 99501	14 July 1967	3 years	Orca Inlet	Cordova, Alaska	Section 10	11,300 c.y. est.
Ketchikan Spruce Mills Box 1579 Ketchikan 99901	4 May 1970	8 months	Tongas Narrows	Ketchikan, Alaska	Section 10	3,000 c.y.

TABLE B

Data concerning existing permits issued since January 1, 1965 by the Corps of Engineers to any person for the purpose of discharging DREDGED MATERIAL into navigable waters within or bordering any state

ARIZONA

Name & Address of Permittee (1)	Date Permit Issued-Renewal (2)	Term of Permit (3)	Name and Location of water receiving dredged material (4)	Section of Refuse Act under which Permit Issued (5)	Total quantity of material discharged under this permit (6)
NONE					

TABLE B

ARKANSAS

Data concerning existing permits issued since January 1, 1965 by the Corps of Engineers to any person for the purpose of discharging DREDGED MATERIAL into navigable waters within or bordering any state

ARKANSAS

Name & Address of Permittee (1)	Date Permit Issued-Renewal (2)	Term of Permit (3)	Name and Location of water receiving dredged material (4)	Section of Refuse Act under which Permit Issued (5)	Total quantity of material discharged under this permit (6)
Pine Bluff Sand & Gravel Co. P. O. Box 7008 Pine Bluff, Arkansas	17 Feb 70	3 yrs	Arkansas River Nav. Miles 65.6 to 73.9	10	248,000 tons
Pine Bluff Sand & Gravel Co. P. O. Box 7008 Pine Bluff, Arkansas	17 Feb 70	3 yrs	Arkansas River Nav. Miles 77.0 to 84.3	10	248,000 tons
Jeffrey Sand Company P. O. Box 5054 North Little Rock, Ark.	17 Feb 70	3 yrs	Arkansas River Nav. Miles 109.8 to 115.3	10	212,000 tons
Criss & Shaver, Inc. P. O. Box 1577 Little Rock, Arkansas	17 Feb 70	3 yrs	Arkansas River Nav. Miles 115.3 to 126.6	10	32,000 tons
Big Rock Stone & Ltl Co. P. O. Box 28 Little Rock, Arkansas	28 Apr 65	Relinquished by permittee 20 Jun 69	Arkansas River Nav. Miles 115.0 to 126.6	10	14,000 tons
Fort Smith Const & Transp Co. P. O. Box 998 Fort Smith, Arkansas	17 Feb 70	3 yrs	Arkansas River Nav. Miles 133.4 to 146.9	10	294,000 tons

TABLE B

ARKANSAS

Data concerning existing permits issued since January 1, 1965 by the Corps of Engineers to any person for the purpose of discharging DREDGED MATERIAL into navigable waters within or bordering any state

ARKANSAS

Name & Address of Permittee (1)	Date Permit Issued-Renewal (2)	Term of Permit (3)	Name and Location of water receiving dredged material (4)	Section of Refuse Act under which Permit Issued (5)	Total quantity of material discharged under this permit (6)
Mobley Construction Co. P. O. Box 109 Morrilton, Arkansas	17 Feb 70	3 yrs	Arkansas River Nav. Miles 147.0 to 160.8	10	685,000 tons
Mr. J. O. Cravens P. O. Box 166 Morrilton, Arkansas	17 Feb 70	3 yrs	Arkansas River Nav. Miles 163.5 to 183.6	10	14,000 tons
Mr. J. O. Cravens P. O. Box 166 Morrilton, Arkansas	17 Feb 70	3 yrs	Arkansas River Nav. Miles 183.6 to 188.6	10	6,000 tons
Mobley Construction Co. P. O. Box 109 Morrilton, Arkansas	17 Feb 70	3 yrs	Arkansas River Nav. Miles 194.7 to 250.0	10	111,000 tons
Arkhole Sand & Gravel Co. 323 Merchants Natl Bank Bldg. Fort Smith, Arkansas	17 Feb 70	3 yrs	Arkansas River Nav. Miles 290.2 to 302.2	10	11,000 tons
Black Rock Sand & Gravel Co. Black Rock, Arkansas	19 Apr 68	3 yrs	Black River Miles 55.0 to 80.0 Spring River Miles 0 to 10.0	10	None

TABLE B

ARKANSAS

Data concerning existing permits issued since January 1, 1965 by the Corps of Engineers to any person for the purpose of discharging DREDGED MATERIAL into navigable waters within or bordering any state

ARKANSAS

Name & Address of Permittee (1)	Date Permit Issued-Renewal (2)	Term of Permit (3)	Name and Location of water receiving dredged material (4)	Section of Refuse Act under which Permit Issued (5)	Total quantity of material discharged under this permit (6)
Mobley Construction Co. P. O. Box 109 Morrilton, Arkansas	9 Jan 70	1 yr	White River Miles 87.5 to 95.0	10	54,000 tons
Mobley Construction Co. P. O. Box 109 Morrilton, Arkansas	15 Jan 69	3 yrs	White River Miles: 206.5 to 208.2; 234.0 to 242.6; 253.3 to 254.3; 258.7 to 267.6 Black River Miles 0 to 5.0	10	126,000 tons
River Sand & Gravel Co. Lakeside Lane Newport, Arkansas	12 Apr 68	3 yrs	White River Miles 208.2 to 234.0	10	1,000 tons
River Sand & Gravel Co. Lakeside Lane Newport, Arkansas	16 Sep 69	2 yrs	White River Miles 267.6 to 278.0	10	4,000 tons
Galloway Sand & Gravel Co. Batesville, Arkansas	9 Apr 68	3 yrs	White River Miles 278.0 to 310.0	10	None

TABLE B

Data concerning existing permits issued since January 1, 1965 by the Corps of Engineers to any person for the purpose of discharging DREDGED MATERIAL into navigable waters within or bordering any state

CALIFORNIA

Name & Address of Permittee (1)	Date Permit Issued-Renewal (2)	Term of Permit (3)	Name and Location of water receiving dredged material (4)	Section of Refuse Act under which Permit Issued (5)	Total quantity of material discharged under this permit (6)
12th Coast Guard Dist. 630 Sansome St. San Francisco, Calif. 94111	25 Feb 65	10 months	Carquinez Strait, Calif. near Benicia	10	10,000 c.y.
Shell Oil Co. P.O. Box 711 Martinez, Calif.	10 Feb 67	22 months	Carquinez Strait, Calif. Westerly end of Carquinez Strait	10	5,000 c.y.
12th Coast Guard Dist. 630 Sansome St. San Francisco, Calif. 94111	22 Mar 67	9 months	Carquinez Strait, Calif. near Benicia	10	7,500 c.y.
Benicia Industries, Inc. P.O Box 315 Benicia, Calif. 94510	28 May 69	7 months	Carquinez Strait, Calif. Westerly end of Carquinez Strait	10	40,000 c.y.
State of California Dept. of Corrections Sacramento, Calif.	18 Jul 1969	41 "	San Francisco Bay, Calif. South of Alcatraz Island	10	1,200 c.y.
Union Oil Co. of Calif. 425 First St. San Francisco, Calif. 94105	29 Jul 65	17 "	Pacific Ocean One Mile West of Entrance to Humboldt Bay, Calif.	10	1,500 c.y.
San Francisco Bay Naval Shipyard Vallejo, Calif. 94592	21 Jan 70	11 "	Carquinez Strait Westerly end of Carquinez Strait	10	60,000 c.y.

TABLE B

Data concerning existing permits issued since January 1, 1965 by the Corps of Engineers to any person for the purpose of discharging DREDGED MATERIAL into navigable waters within or bordering any state

CALIFORNIA

Name & Address of Permittee (1)	Date Permit Issued-Renewal (2)	Term of Permit (3)	Name and Location of water receiving dredged material (4)	Section of Refuse Act under which Permit Issued (5)	Total quantity of material discharged under this permit (6)
Moss Landing Harbor Dist. P.O Box 103 Moss Landing, Calif.	24 May 67	42 months	Monterey Bay, Calif. 1/3 Mile South Moss Landing Harbor Entrance	10	50,000 c.y.
Trans-Bay Constructors P. O. Box 7938 San Francisco, Calif. 94119	9 Jan 68	12 "	Carquinez Strait, Calif. Westerly End of Carquinez Strait	"	4,000 "
Healy Tibbitts Const. Co. 411 Brannan St. San Francisco, Calif. 94107	3 May 65	8 "	San Francisco Bay, Calif. Westerly of Yerba Buena Island	"	13,000 "
Western Division Bureau of Yards & Docks San Bruno, Calif. 94067	12 Apr 66	21 "	" " " " " "	"	685,500 "
Healy Tibbitts Const. Co. 411 Brannan St. San Francisco, Calif. 94107	30 Jan 68	11 "	" " " " " "	"	3,000 "
The Port of Oakland, 66 Jack London Square Oakland, Calif. 94607	14 Apr 69	44 "	San Francisco Bay, Calif. South of Alcatraz Island	"	100,000 "
The Port of Oakland 66 Jack London Square Oakland, Calif. 94607	14 Apr 69	44 "	Pacific Ocean Westerly one mile from San Francisco, Calif.	"	627,000 "

TABLE B

Data concerning existing permits issued since January 1, 1965 by the Corps of Engineers to any person for the purpose of discharging DREDGED MATERIAL into navigable waters within or bordering any state

CALIFORNIA

Name & Address of Permittee (1)	Date Permit Issued-Renewal (2)	Term of Permit (3)	Name and Location of water receiving dredged material (4)	Section of Refuse Act under which Permit Issued (5)	Total quantity of material discharged under this permit (6)
Couty of Alameda 399 Elmhurst St. Hayward, Calif. 94544	15 Oct 68	38 Months	San Francisco Bay, Falif. South of Alcatraz Island	10	1,900 c.y.
Commanding Officer Naval Supply Center Oakland, Calif. 94625	28 Jan 69	11 "	" " "	10	29,000 "
Seatrain Lines Inc. 595 River Rd. Edgewater, New Jersey 07020	14 Feb 69	46 months	Pacific Ocean Westerly One Mile from San Francisco, Calif.	10	60,000 "
Todd Shipyards Corp. Foot of Main Street Alameda, Calif. 94501	10 Dec 69	12 "	" " "	"	25,000
Seatrain Terminals of Calif., 1395 Middle Harbor Rd. Oakland, Calif.	22 Jan 70	23 "	" " "	"	75,000 "
" " "	2 Feb 70	11 "	" " "	"	35,000 "
State of Calif. Dept. of Parks & Recreation P.O. Box 2390 Sacramento, Calif. 95811	28 Apr 69	44 "	San Francisco Bay, Calif. Easterly Side of Angel Island	"	85,000 "

TABLE P

Data concerning existing permits issued since January 1, 1965 by the Corps of Engineers to any person for the purpose of discharging DREDGED MATERIAL into navigable waters within or bordering any state

CALIFORNIA

Name & Address of Permittee (1)	Date Permit Issued-Renewal (2)	Term of Permit (3)	Name and Location of water receiving dredged material (4)	Section of Refuse Act under which Permit Issued (5)	Total quantity of material discharged under this permit (6)
Mrs. R. Grunt 4444 Turner Avenue Oakland, Calif.	28 Jul 65	17 months	San Francisco Bay, Calif. South of Alcatraz Island	10	1,300 c.y.
Olympian Dredging Co. 525 Market Street San Francisco, Calif.	27 Jan 65	11 "	San Francisco Bay, Calif. east of Angel Island	"	10,000 c.y.
Olympia Dredging Co. 525 Market St. San Francisco, Calif.	2 Feb 65	11 "	San Francisco Bay, Calif. east of Angel Island	"	10,000 c.y.
Healy Tibbitts Const. Co. 411 Brannan St. San Francisco, Calif. 94107	29 Sep 65	15 "	" "	"	25,000 c.y
Parr Richmond Terminal Co. 402 Wright Avenue Richmond, Calif. 94804	1 Mar 66	10 "	" "	"	15,000 c.y.
Time Oil Co. P.O. Box 1827 Richmond, Calif. 94802	25 Apr "	8 "	" "	"	17,000 c.y.
Standard Oil Co. of Calif. Box 3495 Calif. 94120	29 Nov "	13 "	" "	"	18,000 c.y.

TABLE B

Data concerning existing permits issued since January 1, 1965 by the Corps of Engineers to any person for the purpose of discharging DREDGED MATERIAL into navigable waters within or bordering any state

CALIFORNIA

ame & Address of Permittee (1)	Date Permit Issued-Renewal (2)	Term of Permit (3)	Name and Location of water receiving dredged material (4)	Section of Refuse Act under which Permit Issued (5)	Total quantity of material discharged under this permit (6)
Olympian Dredging Co. 525 Market St. San Francisco, Calif.	19 Dec 67	6 Months	San Francisco Bay, Calif. east of Angel Island	10	15,000 c.y.
Healy Tibbitts Const. Co. 411 Brannan St. San Francisco, Calif. 94107	19 Jun 67	" "	" "	10	20,000 c.y.
Peter Kiewit Sons' Co. P.O. Box 1512 Richmond, Calif. 94802	18 Jul 68	" "	" "	"	25,000 c.y.
Western Division Naval Facilities Engineering Comman San Bruno, Calif. 94066	4 Mar 69	10 "	San Francisco Bay, Calif. San Pablo Strait West of Pt. San Pablo	"	70,000 c.y.
Healy Tibbitts Const. Co. 411 Brannan St. San Francisco, Calif. 94107	17 Apr 69	8 "	San Francisco Bay, Calif. East of Angel Island	"	7,000 c.y.
City of Richmond City Hall Richmond, Calif. 94804	23 Apr 69	8 "	" "	"	23,830 c.y.

TABLE B

Data concerning existing permits issued since January 1, 1965 by the Corps of Engineers to any person for the purpose of discharging DREDGED MATERIAL into navigable waters within or bordering any state

CALIFORNIA

Name & Address of Permittee (1)	Date Permit Issued-Renewal (2)	Term of Permit (3)	Name and Location of water receiving dredged material (4)	Section of Refuse Act under which Permit Issued (5)	Total quantity of material discharged under this permit (6)
Smith Rice Co. 835 China Basin St. San Francisco, Calif. 94107	15 Jul 69	5½ months	San Francisco Bay, Calif. East of Angel Island	10	7,500 c.y.
Western Division Bureau of Yards & Docks San Bruno, Calif. 94067	17 Mar 66	9½ "	San Francisco Bay, Calif. North of Hunters Point	"	90,000 "
Western Division Naval Facilities Engineering Command San Bruno, Calif. 94066	15 Nov 66	13 "	" " "	"	150,000 "
Western Division Naval Facilities Engineering Command San Bruno, Calif. 94066	16 May 68	19 months	San Francisco Bay, Calif. South of Alcatraz Island	10	140,000 "
" "	3 Jun 68	31 "	" " "	"	200,000 "
" "	20 Nov 68	13 "	" " "	"	170,000 "
Pan-Pacific Development Co. 1290 Fourth St. Alameda, Calif. 94501	21 Jan 69	47 "	" " "	"	35,000 "
12th Coast Guard Dist. 630 Sansome St. San Francisco, Calif. 94111	21 "	47 "	" " "	"	40,000 c.y.

TABLE B

Data concerning existing permits issued since January 1, 1965 by the Corps of Engineers to any person for the purpose of discharging DREDGED MATERIAL into navigable waters within or bordering any state

CALIFORNIA

Name & Address of Permittee (1)	Date Permit Issued-Renewal (2)	Term of Permit (3)	Name and Location of water receiving dredged material (4)	Section of Refuse Act under which Permit Issued (5)	Total quantity of material discharged under this permit (6)
Bethlehem Steel Corp. Box 7963 San Francisco, Calif. 94119	13 Mar 69	46 months	San Francisco Bay, Calif. South of Alcatraz Island	10	100,000 c.y.
" " "	13 Mar 69	46 months	Pacific Ocean Westerly One Mile from San Francisco, Calif.	"	250,000 "
Western Division Naval Facilities Engineering Command San Bruno, Calif. 94066	11 Sep 69	16 "	San Francisco Bay, Calif. South of Alcatraz Island	"	249,000 "
" "	26 Nov "	13 "	" "	10	250,000 "
City of Richmond Dept. of Public Works Richmond, Calif. 94804	24 Feb 66	10 "	San Francisco Bay, Calif. East of Angel Island	10	14,700 "
Western Division Naval Facilities Engineering Command San Bruno, Calif. 94066	8 Dec "	13 "	San Francisco Bay, Calif. San Pablo Strait West of Pt. San Pablo	10	75,000 "

TABLE B

Data concerning existing permits issued since January 1, 1965 by the Corps of Engineers to any person for the purpose of discharging DREDGED MATERIAL into navigable waters within or bordering any state

CALIFORNIA

Name & Address of Permittee (1)	Date Permit Issued-Renewal (2)	Term of Permit (3)	Name and Location of water receiving dredged material (4)	Section of Refuse Act under which Permit Issued (5)	Total quantity of material discharged under this permit (6)
Healy Tibbitts Coast Co. 411 Brannan St. San Francisco, Calif. 94107	18 Dec 67	6 Months	San Francisco Bay, Calif. East of Angel Island	10	10,000 c.y.
San Francisco Port Comm. Port of San Francisco Ferry Bldg. San Francisco, Calif. 94111	19 Nov 69	37 "	Pacific Ocean Westerly One Mile From San Francisco, Calif.	10	2,200,000 "
Basalt Rock Co., Inc. Eight and River Streets Napa, Calif.	26 Jan 65	23 "	San Pablo Bay, Calif. San Pablo Strait West of Pinole Pt.	10	10,000 "
Olympian Dredging Co. 525 Market St. San Francisco, Calif.	20 Apr "	5 "	San Pablo Bay, Calif. San Pablo Strait West of Molate Pt.	10	3,000 "
Union Oil Co. Rodeo, Calif. 94572	20 Sep "	40 "	San Pablo Bay, Calif Carquinez Strait North of Oleum	10	40,000 "
Sequoia Refining Co. P. O Box 29 Corpus Christi, Tex.	15 Aug 66	40 "	San Pablo Bay, Calif. Carquinez Strait	10	225,000 "

TABLE B

Data concerning existing permits issued since January 1, 1965 by the Corps of Engineers to any person for the purpose of discharging DREDGED MATERIAL into navigable waters within or bordering any state

CALIFORNIA

ame & Address of Permittee (1)	Date Permit Issued-Renewal (2)	Term of Permit (3)	Name and Location of water receiving dredged material (4)	Section of Refuse Act under which Permit Issued (5)	Total quantity of material discharged under this permit (6)
Union Oil Co. Rodeo, Calif. 94572	3 Sep 67	40 Months	San Pablo Bay, Calif. Carquinez Strait	10	51,000
Basalt Rock Co. Inc. Box 2540 Napa, Calif. 94548	16 Dec 68	36 "	San Pablo Bay, Calif. West of Pinole Pt. 2¼ miles	10	10,000
Smith-Rice Co. 835 China Basin St. San Francisco, Calif. 94107	24 Jul 69	5 "	San Pablo Bay, Calif. Carquinez Strait North of Davis Pt.	10	6,000 "
Harbor Carriers, Inc. Pier 41 Bulkhead San Francisco, Calif. 94133	24 Feb 66	10 "	San Francisco Bay, Calif. South of Alcatraz Island	10	5,000 "
Trans-Bay Constructors P.O. Box 7938 San Francisco, Calif. 94119	30 Sep 66	39 "	Pacific Ocean Westerly One Mile from San Francisco, Calif.	10	1,257,000 "
Port of Redwood City 775 Harbor Boulevard Redwood City, Calif.	7 Feb 68	11 "	San Francisco Bay, Calif. Easterly of Redwood City	10	15,000 "
Leslie Salt Co. P. O. Box 364 Newark, Calif. 94560	28 Feb 68	10 "	San Francisco Bay, Calif. Easterly of Redwood City	10	6,000 "

TABLE B

Data concerning existing permits issued since January 1, 1965
by the Corps of Engineers to any person for the purpose of
discharging DREDGED MATERIAL into navigable waters within
or bordering any state
CALIFORNIA

Los Angeles District
South Pacific Division
State of California

Name & Address of Permittee	Date Permit Issued-Renewal	Term of Permit	Name and Location of water receiving dredged material	Section of Refuse Act under which Permit Issued	Total quantity of material discharged under this permit
(1)	(2)	(3)	(4)	(5)	(6)
Standard Oil Company 2510 Shelter Island Dr. San Diego, CA	20 May 1966	3 yrs. (completed)	Pacific Ocean 5 miles off Silver Strand San Diego County	Sec. 10	3,000 cu. yds.
Smith-Rice Derrick Barges 1255 West G St. San Diego, CA	19 July 1966	3 yrs. (completed)	Pacific Ocean 5 miles off Silver Strand San Diego County	Sec. 10	36,000 cu. yds.
National Steel & Shipbuilding Co. Harbor Drive & 28th St. San Diego, CA	9 March 1967	3 years (completed)	Pacific Ocean 5 miles off Silver Strand San Diego County	Sec. 10	7,500 cu. yds.
Commander, Southwest Division Naval Facilities Engineering Command San Diego, CA	1 Nov. 1967	3 yrs. (completed)	San Diego Bay Off Point Loma Near Ballast Point	Sec. 10	11,000 cu. yds.
National Steel & Shipbuilding Co. Harbor Drive & 28th St. San Diego, CA	8 May 1968	3 years (completed)	Pacific Ocean 5 miles off Silver Strand San Diego County	Sec. 10	120,000 cu. yds.

CALIFORNIA

TABLE B

Data concerning existing permits issued since January 1, 1965 by the Corps of Engineers to any person for the purpose of discharging DREDGED MATERIAL into navigable waters within or bordering any state

CALIFORNIA

Sacramento District
South Pacific Division
State of California

NAME & ADDRESS OF PERMITTEE	DATE PERMIT ISSUED-RENEWAL	TERM OF PERMIT	NAME & LOCATION OF WATER RECEIVING DREDGED MATERIAL	SECTION OF REFUSE ACT UNDER WHICH PERMIT ISSUED	TOTAL QUANTITY OF MATERIAL DISCHARGED UNDER THIS PERMIT
(1)	(2)	(3)	(4)	(5)	(6)
Naval Weapons Station Concord, California	#4415 21 April 1969	3 years work period	Suisun Cutoff Between Simmons & Ryer Islands Near Port Chicago, Calif.	Section 10, River & Harbors Act of 3 March 1899	Approximately 20,000 cubic yards
Cencore Corporation P. O. Box 17550 Los Angeles, California	#4363 5 February 1969	3 years work period	Middle Slough Between Browns &Winter Islands Near Pittsburg, Calif.	"	Approximately 30,000 cubic yards
Naval Weapons Station Concord, California	#4532 19 September 1969	3 years work period	Suisun Cutoff Between Simmons & Ryer Islands Near Port Chicago, Calif.	"	Approximately 30,000 cubic yards

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TABLE B

Data concerning existing permits issued since January 1, 1969 by the Corps of Engineers to any person for the purpose of discharging DREDGED MATERIAL into navigable waters within or bordering any state

COLORADO

Name & Address of Permittee	Date Permit Issued-Renewal	Term of Permit	Name and Location of water receiving dredged material	Section of Refuse Act under which Permit Issued	Total quantity of material discharged under this permit
(1)	(2)	(3)	(4)	(5)	(6)
NONE					

TABLE B

Data concerning existing permits issued since January 1, 1965 by the Corps of Engineers to any person for the purpose of discharging DREDGED MATERIAL into navigable waters within or bordering any state

CONNECTICUT

Name & Address of Permittee (1)	Date Permit Issued-Renewal (2)	Term of Permit (3)	Name and Location of water receiving dredged material (4)	Section of Refuse Act under which Permit Issued (5)	Total quantity of material discharged under this permit (6)
Mr. Julian Soibiran c/o J. Russell Spangle 126 Wilson Avenue Rowayton, Conn.	1 Apr 65	3 yrs.	Long Island Sound	Section 10 of River & Harbor Act of March 3, 1899	1,000 cu. yds.
Charles Pfizer & Co., Inc. c/o Mr. Richard F. Corkey, Attorney 516 Dewart Bldg. 302 State Street New London, Conn.	6 Sep 66	3 yrs.	Long Island Sound	"	2,000 cu. yds.
Dow Chemical Co. c/o The Arundel Corp., Agent 334 Furman Street Brooklyn, New York	5 Jan 66	3 yrs.	Long Island Sound	"	100,000 cu. yds.
Humble Oil & Refining Co. c/o Mr. F.B. Acford P.O. Box 90 Hartford, Conn.	3 Aug 66	3 yrs.	Long Island Sound	"	12,000 cu. yds.

TABLE B

Data concerning existing permits issued since January 1, 1965 by the Corps of Engineers to any person for the purpose of discharging DREDGED MATERIAL into navigable waters within or bordering any state

CONNECTICUT

Name & Address of Permittee (1)	Date Permit Issued-Renewal (2)	Term of Permit (3)	Name and Location of water receiving dredged material (4)	Section of Refuse Act under which Permit Issued (5)	Total quantity of material discharged under this permit (6)
New Haven Terminal, Inc. 30 Waterfront Street New Haven, Conn.	26 Jan 66	3 yrs.	Long Island Sound	Section 10 of River & Harbor Act of March 3, 1899	7,500 cu. yds.
Commanding Officer U.S. Naval Submarine Base, New London, Conn. c/o Webb & Knapp Marine Corp. P.O. Box 234 Stratford, Conn.	3 Oct 66	3 yrs.	Long Island Sound	"	14,500 cu. yds.
Commanding Officer U.S. Naval Submarine Base, New London, Conn. c/o Webb & Knapp Marine Corp. P.O. Box 234 Stratford, Conn.	1 Feb 66	3 yrs.	Long Island Sound	"	13,000 cu. yds.
Commanding Officer U.S. Naval Submarine Base, New London, Conn. c/o Webb & Knapp Marine Corp. P.O. Box 234 Stratford, Conn.	11 Oct 66	3 yrs.	Long Island Sound	"	11,000 cu. yds.

TABLE B

Data concerning existing permits issued since January 1, 1965
by the Corps of Engineers to any person for the purpose of
discharging DREDGED MATERIAL into navigable waters within
or bordering any state
CONNECTICUT

Name & Address of Permittee (1)	Date Permit Issued-Renewal (2)	Term of Permit (3)	Name and Location of water receiving dredged material (4)	Section of Refuse Act under which Permit Issued (5)	Total quantity of material discharged under this permit (6)
Mr. Fred Fullin. c/o Slavitt & Connery, Atts. 618 West Avenue Norwalk, Conn.	14 Jan 65	3 yrs.	Long Island Sound	Section 10 of River & Harbor Act of March 3, 1899	4,000 cu. yds.
J. Burr Bartram c/o S.E. Minor & Co., Inc. 161 Mason Street Greenwich, Conn.	8 Sep 65	3 yrs.	Long Island Sound	"	3,000 cu. yds.
Mr. Victor Borge c/o S.E. Minor & Co., Inc. 161 Mason Street Greenwich, Conn.	9 Sep 65	3 yrs.	Long Island Sound	"	3,000 cu. yds.
The Palmer Engine Co. c/o S.E. Minor & Co., Inc. 161 Mason Street Greenwich, Conn.	1 Oct 65	3 yrs.	Long Island Sound	"	63,000 cu. yds.

TABLE B

Data concerning existing permits issued since January 1, 1965 by the Corps of Engineers to any person for the purpose of discharging DREDGED MATERIAL into navigable waters within or bordering any state

CONNECTICUT

Name & Address of Permittee (1)	Date Permit Issued-Renewal (2)	Term of Permit (3)	Name and Location of water receiving dredged material (4)	Section of Refuse Act under which Permit Issued (5)	Total quantity of material discharged under this permit (6)
Electric Boat Co. Div. of Gen. Dynamics Corp. c/o Mr. F. J. Merwin Plant Engineer Groton, Conn.	4 Oct 65	3 yrs.	Long Island Sound	Section 10 of River & Harbor Act of March 3, 1899	20,000 cu. yds.
Pootatuck Yacht Club c/o Webb & Knapp Marine Corp. 1500 Elm Street Stratford, Conn.	19 Jan 66	3 yrs.	Long Island Sound	"	4,000 cu. yds.
The Shore & Country Club c/o Webb & Knapp Marine Corp. P. O. Box 234 Stratford, Conn.	13 Jan 66	3 yrs.	Long Island Sound	"	2,000 cu. yds.
Mr. John Konclub Chairman Marina Comm. Joseph J. Clirton Post 399 VFW 465 Riverside Ave. Westport, Conn.	21 Mar 66	3 yrs.	Long Island Sound	"	6,000 cu. yds.

TABLE B

Data concerning existing permits issued since January 1, 1965 by the Corps of Engineers to any person for the purpose of discharging DREDGED MATERIAL into navigable waters within or bordering any state

CONNECTICUT

Name & Address of Permittee (1)	Date Permit Issued-Renewal (2)	Term of Permit (3)	Name and Location of water receiving dredged material (4)	Section of Refuse Act under which Permit Issued (5)	Total quantity of material discharged under this permit (6)
Mr. Herbert E. Baldwin First Selectman Westport, Conn.	25 May 66	3 yrs.	Long Island Sound	Section 10 of River & Harbor Act of March 3, 1899	6,000 cu. yds.
Whaling City Dredge & Dock Buel Street Groton, Conn.	20 Sep 66	3 yrs.	Long Island Sound	"	1,000 cu. yds.
Federal Project Saugatuck River	16 Sep 69	3 yrs.	Long Island Sound	"	16,000 cu. yds.
Ponus Yacht Club Stamford, Conn.	4 Apr 67	3 yrs.	Long Island Sound	"	2,100 cu. yds.
McMichaels Yacht Yard Cos Cob, Conn.	7 Dec 67	3 yrs.	Long Island Sound	"	1,600 cu. yds.
Donald W. Lanouette, Jr. Milford, Conn.	8 Feb 68	3 yrs.	Long Island Sound	"	1,000 cu. yds.

TABLE B

Data concerning existing permits issued since January 1, 1965 by the Corps of Engineers to any person for the purpose of discharging DREDGED MATERIAL into navigable waters within or bordering any state

CONNECTICUT

Name & Address of Permittee (1)	Date Permit Issued-Renewal (2)	Term of Permit (3)	Name and Location of water receiving dredged material (4)	Section of Refuse Act under which Permit Issued (5)	Total quantity of material discharged under this permit (6)
Belle Haven Beach Club Old Greenwich, Conn.	5 Mar 68	3 yrs.	Long Island Sound	Section 10 of River & Harbor Act of March 3, 1899	2,000 cu. yds.
Edgar L. Raymond Rowayton, Conn.	7 Mar 68	3 yrs.	Long Island Sound	"	1,000 cu. yds.
Malcolm Crawford, Renwick Case & Aileen Payne Rowayton, Conn.	3 May 68	3 yrs.	Long Island Sound	"	500 cu. yds.
Harold D. Stephanak Rowayton, Conn.	6 May 68	3 yrs.	Long Island Sound	"	400 cu. yds.
Hilary Faw Rowayton, Conn.	10 May 68	3 yrs.	Long Island Sound	"	2,000 cu. yds.
Black Rock Yacht Club Bridgeport, Conn.	27 Jun 68	3 yrs.	Long Island Sound	"	10,000 cu. yds.

TABLE B

Data concerning existing permits issued since January 1, 1965 by the Corps of Engineers to any person for the purpose of discharging DREDGED MATERIAL into navigable waters within or bordering any state

CONNECTICUT

Name & Address of Permittee (1)	Date Permit Issued-Renewal (2)	Term of Permit (3)	Name and Location of water receiving dredged material (4)	Section of Refuse Act under which Permit Issued (5)	Total quantity of material discharged under this permit (6)
Riverside Yacht Club Greenwich, Conn.	26 Jul 68	3 yrs.	Long Island Sound	Section 10 of River & Harbor Act of March 3, 1899	23,000 cu. yds.
Torsten Forsberg Greenwich, Conn.	21 Aug 68	3 yrs.	Long Island Sound	"	1,000 cu. yds.
Gulf Oil Corp New Haven, Conn.	4 Sep 68	3 yrs.	Long Island Sound	"	34,000 cu. yds.
William R. Legge Darien, Conn.	5 Feb 69	3 yrs.	Long Island Sound	"	1,000 cu. yds.
Dr. Shelley H. Trubowitz Rowayton, Conn.	14 Apr 69	3 yrs.	Long Island Sound	"	375 cu. yds.
Philip Wick Darien, Conn.	14 Apr 69	3 yrs.	Long Island Sound	"	1,200 cu. yds.

TABLE B

Data concerning existing permits issued since January 1, 1965 by the Corps of Engineers to any person for the purpose of discharging DREDGED MATERIAL into navigable waters within or bordering any state

CONNECTICUT

Name & Address of Permittee (1)	Date Permit Issued-Renewal (2)	Term of Permit (3)	Name and Location of water receiving dredged material (4)	Section of Refuse Act under which Permit Issued (5)	Total quantity of material discharged under this permit (6)
Theodore C. DeBoer Darien, Conn.	16 Apr 69	3 yrs.	Long Island Sound	Section 10 of River & Harbor Act of March 3, 1899	650 cu. yds.
Paul J. Plishner Westport, Conn.	23 Apr 69	3 yrs.	Long Island Sound	"	50 cu. yds.
Nichols Yacht Yard Marine Milford, Conn.	30 Apr 69	3 yrs.	Long Island Sound	"	1,200 cu. yds.
R.E. Leslie Johnson Rowayton, Conn.	8 May 69	3 yrs.	Long Island Sound	"	1,000 cu. yds.
U.S. Navy Groton, Conn.	30 Jul 69	3 yrs.	Long Island Sound	"	29,000 cu. yds.
Town of Branford Branford, Conn.	10 Nov 69	3 yrs.	Long Island Sound	"	35,200 cu. yds.
Mrs. Philip Tarone Westport, Conn.	26 Nov 69	3 yrs.	Long Island Sound	"	1,400 cu. yds.

TABLE B

Data concerning existing permits issued since January 1, 1965 by the Corps of Engineers to any person for the purpose of discharging DREDGED MATERIAL into navigable waters within or bordering any state

CONNECTICUT

Name & Address of Permittee (1)	Date Permit Issued-Renewal (2)	Term of Permit (3)	Name and Location of water receiving dredged material (4)	Section of Refuse Act under which Permit Issued (5)	Total quantity of material discharged under this permit (6)
The Shore & Country Club Norwalk, Conn.	24 Dec 69	3 yrs.	Long Island Sound	Section 10 of River & Harbor Act of March 3, 1899	2,000 cu. yds.
Jamestown Ferry Groton, Conn.	30 Dec 69	3 yrs.	Long Island Sound	"	5,000 cu. yds.
General Dynamics Groton, Conn.	8 Jan 70	3 yrs.	Long Island Sound	"	3,000 cu. yds.
Robert Haskell Rowayton, Conn.	2 Feb 70	3 yrs.	Long Island Sound	"	1,000 cu. yds.
Pequonnock Yacht Club Bridgeport, Conn.	11 Feb 70	3 yrs.	Long Island Sound	"	10,000 cu. yds.
Henry Higgins Rowayton, Conn.	11 Feb 70	3 yrs.	Long Island Sound	"	1,000 cu. yds.

TABLE B

Data concerning existing permits issued since January 1, 1965 by the Corps of Engineers to any person for the purpose of discharging DREDGED MATERIAL into navigable waters within or bordering any state

DELAWARE

ame & Address of Permittee (1)	Date Permit Issued-Renewal (2)	Term of Permit (3)	Name and Location of water receiving dredged material (4)	Section of Refuse Act under which Permit Issued (5)	Total quantity of material discharged under this permit (6)

NONE

SECTION B

Data concerning existing permits issued since January 1, 1965 by the Corps of Engineers to any person for the purpose of discharging DREDGED MATERIAL into navigable waters within or bordering any state

FLORIDA

Name & Address of Permittee (1)	Date Permit Issued-Renewal (2)	Term of Permit (3)	Name and Location of water receiving dredged material (4)	Section of 1899 Act under which Permit Issued (5)	Total quantity of material discharged under this permit (6)
Sailboat Key, Inc. c/o Bliss & Myitray, Inc. 4014 Chase Ave. Miami Beach, Fla. 33140	Revived & Extended 1-19-70	3 years	Biscayne Bay, N. W. Shore at Miami, Fla.	10	200,000 c.y.
Bay Dredging & Const. Co. c/o Mecard P. O. Box 1484 Tampa, Fla. 33601	12-1-66 Mod. & Extended 4-14-70	3 years	Hillsborough Bay at Alafia River, Hillsborough Co.	10	unknown
Langford Marina & Villas Jensen Beach, Fla. 33457	Mod. & Ext. 7-10-67	3 years	Indian River at Jensen Beach, Fla.	10	20,000 c.y.
NASA Civil Engr. & Facilities Mgr., John F. Kennedy Space Center	Revised 4-22-65	3 years	Banana River at Space Center, Brevard County	10	unknown
Sebastian Inlet Dist. c/o James L. Beindorf & Assoc. P. O. Box 849 Vero Beach, Fla. 32960	Revised Revived & Extended 11-24-69	3 years	Indian River at Sebastian Inlet	10	12,500 c.y.
Freeport Sulphur Co. P. O. Box 61520 New Orleans, La. 70160	Mod. & Ext. 6-21-65	3 years	Hillsborough Bay	10	9,280 "
NASA Civil Engr. & Facilities Mgr. John F. Kennedy Space Center	Revised 8-6-68	3 years	Banana River at Space Center Brevard County	10	unknown

Name & Address of Permittee (1)	Date Permit Issued-Renewal (2)	Term of Permit (3)	Name and Location of water receiving dredged material (4)	Section of 1899 Act under which Permit Issued (5)	Total quantity of material discharged under this permit (6)
Bay Dredging & Const Co. c/o E. Medard P. O. Box 1484 Tampa, Fla. 33601	12-1-66 Mod. & Ext. 4-14-70	3 years	Tampa Bay, Hillsborough Co.	10	48,000 c.y
Great Lakes Dredge & Dock Co. P. O. Box 10148 Riviera Beach, Fla.	1-20-65	3 years	Approx. 2 miles east of Port Everglades Atlantic Ocean (Straits of Fla.)	10	50,000 "
B. F. Diamond Const Co. P. O. Box 926 Jacksonville, Fla. 32201	1-20-65	3 years	St. Johns River at Grassy Point	10	22,000 "
Hillsboro Inlet Improvement & Maint Dist. c/o John A. Grant, Jr., Inc. 855 Federal Hwy. Boca Raton, Fla.	4-13-65 6-3-65	3 years	Hillsboro Inlet, Broward County	10	18,500 "
Piling Structures, Inc. P. O. Box 3578 Jacksonville, Fla.	4-29-65	3 years	(Grassy Point) St. Johns R. at Jacksonville	10	2,000 "
City of Sanford Sanford, Florida	1-13-66	3 years	Lake Monroe at Sanford, Fla.	10	320,000 "
H. L. Tomlinson, et al 420 Bayshore Drive Venice Fla. 33595	4-20-66	3 years	IWW, Caloosahatchee R. to Anclote R. Roberts Bay at Venice, Sarasota County	10	15,000 "
Houdaille-Duval-Wright P. O. Box 1583 Jacksonville, Fla.	11-30-65	3 years	IWW, Jacksonville to Miami, Indian River No. of Sta. Rd. 520 at Cocoa, Fla.	10	13,000 "

Name & Address of Permittee (1)	Date Permit Issued-Renewal (2)	Term of Permit (3)	Name and Location of water receiving dredged material (4)	Section of 1899 Act under which Permit Issued (5)	Total quantity of material discharged under this permit (6)
Indian River Mosquito Control District P. O. Box 670 Vero Beach, Fla.	12-29-65 Revised & Extended 6-1-67	3 years	IWW, Jacksonville to Miami, Indian River, easterly shore, Sec. 33, 34; Twp. 33 S; Rge 40 E; Indian River County	10	305,000 c.y.
Aerojet General Corp. P. O. Box 368 Homestead, Fla.	6-1-66	3 years	Manatee Bay an arm of Barnes Sound at Monroe & Dade Co. line	10	64,750 "
Graham Boat Yard 4451 Herschel St. Jacksonville, Fla. 32210	6-25-66	3 years	St. Johns River at Jacksonville (Grassy Point)	10	7,000 "
Ben B. Gaines P. O. Box 347 Islamorada, Fla.	3-16-66	3 years	Hawk Channel, Upper Matecumbe Key, Monroe County, Fla.	10	2,000 "
Ebsary Foundation Co. 2154 N. W. North River Dr. Miami, Fla.	5-17-66	3 years	IWW, Jacksonville to Miami, Biscayne Bay North of Rickenbacker Causeway, Dade County	10	3,000 "
George H. Hodges c/o Ben Lindsey P. O. Box 190 Perry, Florida	2-2-67	3 years	Gulf of Mexico, southwest of Salt Creek at Cedar Island, Taylor County	10	13,442 "
George H. Hodges c/o Ben Lindsey P. O. Box 190 Perry, Fla.	2-3-67	3 years	Gulf of Mexico, northwest of Salt Creek at Keaton Beach, Taylor County	10	16,800 "

Name & Address of Permittee (1)	Date Permit Issued-Renewal (2)	Term of Permit (3)	Name and Location of water receiving dredged material (4)	Section of 1899 Act under which Permit Issued (5)	Total quantity of material discharged under this permit (6)
Trammell Dredging & Const Co., Inc. 5039 Timuquana Road Jacksonville, Fla. 32210	11-21-66	3 years	St. Johns River, south of Fuller Warren bridge at Jacksonville, Florida	10	7,500 c.y.
Gulf American Land Corp. P. O. Box 638 Cape Coral, Fla. 33904	9-6-67	3 years	Fahka Union Bay Sec. 33, T. 52 S., R. 28 E., Collier County, Florida	10	42,000 "
Noah H. Swayne 1012 Post Road Darien, Conn. 06820	1-13-67	3 years	Hawk Channel, Upper Matecumbe Key, Monroe County	10	500 "
Utility Board, City of Key West P. O. Drawer 1060 Key West, Fla. 33040	9-19-67	3 years	Man-of-War Harbor, Frankfort Bank, west of Fleming Key, Monroe County	10	2,000 "
City of Fort Pierce P. O. Box 3191 Ft. Pierce, Fla. 33450	5-1-67 Modified & Ext. 12-11-69	3 years	IWW (Indian River) at Ft. Pierce, Fla.	10	30,000 "
Seaboard Coast Line Railroad Co., P. O. Box 1620, Richmond, Va. 23213	8-3-67	3 years	IWW at Gasparilla Sound, Charlotte County	10	20,000 "
Central & Southern Fla. Flood Control District, P. O. Box 1671, West Palm Beach, Fla. 33402	7-11-67	3 years	Lake Worth, Palm Beach County, Fla.	10	6,666 "

Name & Address of Permittee (1)	Date Permit Issued-Renewal (2)	Term of Permit (3)	Name and Location of water receiving dredged material (4)	Section of 1899 Act under which Permit Issued (5)	Total quantity of material discharged under this permit (6)
Manatee County Port Authority Manatee County Court House Bradenton, Fla. 33505	7-12-68	3 years	Tampa Bay, east shore at Piney Point, Manatee & Hillsborough Counties	10	5,881,500 c.y.
Jacksonville Shipyards, Inc. P. O. Box 2347 Jacksonville, Fla. 32203	8-16-67	25 mos. 14 days	St. Johns River, east shore, south of Fuller Warren bridge, Jacksonville, Fla.	10	50,000 "
Seaboard Properties, Inc. c/o Bailey, Mooney & Post Assoc., Inc. P. O. Box 347 Islamorada, Fla. 32036	4-26-68	3 years	Hawk Channel between Palo Alto Key and Angelfish Key, Monroe County	10	8,000 "
Manatee County Highway Dept. 226 6th Avenue East Bradenton, Florida 33505	6-25-68	3 years	Palma Sola Bay, Manatee Co., Fla.	10	1,000 "
Summerland Key Cove, Inc. c/o Phillips & Trice Surveying 1204 Simonton Street Key West, Fla. 33040	8-29-68	3 years	Hawk Channel at Stock Island, Monroe County, Fla.	10	103,700 "
Jockey Club, Inc. Biscayne Point 11111 Biscayne Blvd. Miami, Fla. 33161	9-4-69	3 years	IWW, J-M, Biscayne Bay south of Broad Causeway, North Miami, Fla.	10	123,000 "
Manatee County Highway Dept. 226 Sixth Ave., East Bradenton, Fla. 33505	10-10-69	3 years	McLewis Bayou and Manatee River 1½ miles west of U. S. 41 bridge at Bradenton	10	2,000 "

Name & Address of Permittee (1)	Date Permit Issued-Renewal (2)	Term of Permit (3)	Name and Location of water receiving dredged material (4)	Section of 1899 Act under which Permit Issued (5)	Total quantity of material discharged under this permit (6)
Jacksonville Port Authority P. O. Box 3005 Jacksonville, Florida	2-19-70	3 years	St. Johns River at Grassy Point just south of Fuller Warren bridge	10	500,000 per year
Lee County Electric Corp., Inc. P. O. Box 3455 North Ft. Myers, Fla. 33903	3-24-70 temporary material to be replaced	3 years	IWW at Sanibel and Pine Island, Fla., Lee County	10	141,333 cu. yds. to be replaced in original location
Mr. Charles H. Morton 2111 North Banquo's Trail Pensacola, Florida 32503	9-25-69	3 years 7 months	Bayou Texar of Pensacola Bay near Pensacola, Fla.	10	approx. 150 cu. yds.
Escambia Chemical Corp. P. O. Box 467 Pensacola, Florida 32502	10-8-69	3 years 2 months	Escambia Bay near Pensacola, Fla.	10	approx. 170,000 cu. yds.
City of Pensacola Pensacola, Florida 32501	9-14-67	3 years 3 months	Pensacola Harbor at Pensacola, Fla.	10	Approx. 575,000 cu. yds.
Commanding Officer Public Works Center Naval Air Station Pensacola, Florida 32508	12-19-66 renewed on 1-14-70	3 years 3 years	Pensacola Bay, Pensacola, Fla.	10	approx. 10,000 cu. yds.
Panama City Port Authority P. O. Box 388 Panama City, Florida 32401	2-23-68	3 years 10 months	St. Andrew Bay, Panama City, Fla.	10	approx. 35,000 cu. yds.
Panama City Port Authority P. O. Box 388 Panama City, Florida 32401	7-14-65	3 years 5 months	St. Andrew Bay, Dyers Point, Panama City, Fla.	10	approx. 285,000 cu. yds.

TABLE B

Data concerning existing permits issued since 1 January 1965 by the Corps of Engineers to any person for the purpose of discharging DREDGED MATERIAL into navigable waters within or bordering any state

GEORGIA

Name & Address of Permittee (1)	Date Permit Issued-Renewal (2)	Term of Permit (3)	Name and Location of water receiving dredged material (4)	Section of 1899 Act under which Permit Issued (5)	Total quantity of material discharged under this permit (6)
Union Camp Corp. P. O. Box 570 Savannah, Georgia 31402	Renewal 17 Dec 68	31 Dec 71	Savannah Harbor (Rhodes Cut)	10	Approximately 5,000 cy material per year.
Sayler Marine Const., Inc., P. O. Box 1364 Savannah, Ga. 31402	Issued 19 Apr 66	30 Sep 66	Back River, Savannah Harbor	10	Approximately 500 cy.
Sayler Marine Const., Inc., P. O. Box 1364 Savannah, Ga. 31402	Issued 2 Jun 65	31 Dec 68	Savannah Harbor	10	Approximately 440 cy.
Standard Oil Co. P. O. Box 1706 Atlanta Ga. 30301	Renewed 3 Oct 68	31 Dec 71	Savannah Harbor Savannah River	10	The permit authorizes maintenance of depths, adjacent to wharves, piers, and slips by dragging with 1 beam or similar device. The permittee pays at the rate of $79 per hour for the Agitation Dredging authorized. The above amount is based on studies which concluded that 416 cu. yds. of maintenance material would enter the project channel during every hour of dragging operation. The Government collects approximately $55,000 per annum from these operations as a reimbursement to the Government for the increased cost of dredging operation.

Name & Address of Permittee (1)	Date Permit Issued-Renewal (2)	Term of Permit (3)	Name and Location of water receiving dredged material (4)	Section of 1899 Act under which Permit Issued (5)	Total quantity of material discharged under this permit (6)
Pure Oil Division Union Oil Company P. O. Box 8165 Savannah, Ga.	Renewal 4 Nov 65	31 Dec 68	Savannah Harbor, Savannah River	10	do
Gulf Oil Corp. P. O. Box 1149 Savannah, Ga.	Issued 13 Jan 69	31 Dec 72	Savannah Harbor, Savannah River	10	do
Atlantic Coast Line Seaboard Coast Line 601 E. Liberty St. Savannah, Ga. 31401	Renewal 31 Dec 65	31 Dec 68	Savannah Harbor, Savannah River	10	do
Stevens Shipping Co. P. O. Box 1068 Savannah, Ga. 31402	Renewal 16 Dec 68	31 Dec 71	Savannah Harbor, Savannah River	10	do
Colonial Oil Industries P. O. Box 576 Savannah, Ga. 31402	Renewal 16 Dec 68	31 Dec 71	Savannah Harbor, Savannah River	10	do
The Flintkote Corp. P. O. Box Savannah, Ga.	Issued 27 May 68	31 Dec 71	Savannah Harbor, Savannah River	10	do
Georgia Port Authority P. O. Box 2406 Savannah, Ga. 31402 Ocean Terminal Garden City Terminal	 Renewal 31 Dec 68 Renewal 31 Dec 68	 31 Dec 71 31 Dec 71	 Savannah Harbor Savannah Harbor	 10	 do
Savannah Sugar Refining P. O. Box 339 Savannah, Ga.	Renewal 17 Dec 68	31 Dec 71	Savannah Harbor (Rhode Cut)	10	do

TABLE B

GEORGIA (Cont'd)

Name & Address of Permittee (1)	Date Permit Issued-Renewal (2)	Term of Permit (3)	Name and Location of water receiving dredged material (4)	Section of 1899 Act under which Permit Issued (5)	Total quantity of material discharged under this permit (5)
American Oil Company P. O. Box 1881 Savannah, Ga.	Renewal 16 Dec 68	31 Dec 71	Savannah Harbor, Savannah River	10	do
Georgia Port Authority P. O. Box 1758 Brunswick, Ga. 31521	Issued 28 Jul 60 Renewal 16 Dec 68	31 Dec 71	Brunswick Harbor, East River	10	do
City of Brunswick P. O. Box 550 Brunswick, Ga. 31521	Issued 10 Dec 68	31 Dec 71	Brunswick Harbor, East River	10	do
Chevron Asphalt P. O. Box 1069 Mobile, Ala. 36601	Issued 26 Nov 68	31 Dec 71	Savannah Harbor, Savannah River	10	do
National Gypsum Company P. O. Box 7016 Savannah, Ga. 31408	Renewal 31 Mar70	31 Dec 71	Savannah Harbor, Savannah River	10	do
Atlantic Creosoting P. O. Box 117 Savannah, Ga.	Renewal 17 Dec 68	31 Dec 71	Savannah Harbor, Savannah River	10	do

TABLE B

Data concerning existing permits issued since January 1, 1965

by the Corps of Engineers to any person for the purpose of

discharging DREDGED MATERIAL into navigable waters within

or bordering any state

HAWAII

Name & Address of Permittee (1)	Date Permit Issued-Renewal (2)	Term of Permit (3)	Name and Location of water receiving dredged material (4)	Section of Refuse Act under which Permit Issued (5)	Total quantity of material discharged under this permit (6)
Mr. J.A. Forbes, Hawaiian Dredging & Const Co, Ltd, P.O.Box 3468, Hono,HI	24 Sep 65	Extent of Contract by Dept of Transportation	Approx 3000 yd on bearing 45° true fr end of Hilo breakwater	Rivers & Harbor Act 3 Mar 1905	17,000 c.y. (mud & sand)
F.J. Cooper, Commodore Kaneohe Yacht Club, 44-503 Kaneohe Bay Dr, Kaneohe, HI	10 Jul 68	On or before 31 Dec 71	Kaneohe Bay, Island of Oahu, HI, Pacific Ocean	Sec 10 of Act of Congress appr 3 Mar 1899	12,000 c.y.
A.C.Brodie, Channel & Hbr Dredging Co, P.O.Box 2600, Hono, HI	22 Aug 68	On or before 31 Dec 71	At sea, Pacific Ocean	Sec 10 of Act of Congress appr 3 Mar 1899	2,200 c.y.
" "	30 Dec 68	On or before 31 Dec 71	Kaneohe Bay, Island of Oahu, Hawaii, Pacific Ocean	" "	2,000 c.y.
ohn H. Grote, P.O.Box 791, aneohe, HI	5 Feb 69	On or before 31 Dec 72	" " "	" "	1,730 c.y. (silt)
arold Mau, 45-010 Lilipund Rd, aneohe, HI	19 Feb 69	" " "	" " "	" "	1,800 cy
A.C.Brodie, Channel & Har redging Co, P.O.Box 2600, ono, HI	10 Jun 69	" " "	" " "	" "	1,200 c.y.
" "	22 Sep 69	" " "	" " "	" "	2,000 c.y.

TABLE B

Data concerning existing permits issued since January 1, 1965
by the Corps of Engineers to any person for the purpose of
discharging DREDGED MATERIAL into navigable waters within
or bordering any state

HAWAII

Name & Address of Permittee (1)	Date Permit Issued-Renewal (2)	Term of Permit (3)	Name and Location of water receiving dredged material (4)	Section of Refuse Act under which Permit Issued (5)	Total quantity of material discharged under this permit (6)
A.C.Bradle, Channel & Har Dredging Co, P.O.Box 2600, Hono, HI	4 Sep 69	On or before 31 Dec 72	Kaneohe Bay, Island of Oahu, Hawaii, Pacific Ocean	Sec 10 of Act of Congress appr 3 Mar 1899	1,100 c.y.
" " "	22 Sep 69	" " "	" " "	" "	2,000 c.y.
Hawaiian Dredging & Const Co, P.O.Box 3468, Hono, HI	16 Jan 70	On or before 31 Dec 73	At sea, Pacific Ocean	" "	25.0 c.y.

TABLE B

Data concerning existing permits issued since January 1, 1965 by the Corps of Engineers to any person for the purpose of discharging DREDGED MATERIAL into navigable waters within or bordering any state

IDAHO

State of Idaho

ame & Address of Permittee	Date Permit Issued-Renewal	Term of Permit	Name and Location of water receiving dredged material	Section of Refuse Act under which Permit Issued	Total quantity of material discharged under this permit
(1)	(2)	(3)	(4)	(5)	(6)

NONE

TABLE B

ILLINOIS

Data concerning existing permits issued since January 1, 1965 by the Corps of Engineers to any person for the purpose of discharging DREDGED MATERIAL into navigable waters within or bordering any state

ILLINOIS

Name & Address of Permittee (1)	Date Permit Issued-Renewal (2)	Term of Permit (3)	Name and Location of water receiving dredged material (4)	Section of Refuse Act under which Permit Issued (5)	Total quantity of material discharged under this Permit (6)
1. Fitz Simons & Connell Dredge and Dock Division. Merritt-Chapman & Scott Corp. Chicago, Illinois For U. S. Steel Corporation Chicago, Illinois	5/21/65	12/31/68	Lake Michigan	Section 10	10,109 cubic yards
2. Fitz Simons & Connell Dredge and Dock Division Merritt-Chapman & Scott Corp. For General Mills, Inc. Chicago, Illinois	7/29/65	12/31/69	Lake Michigan	Section 10	8,051 cubic yards
3. Fitz Simons & Connell Dredge and Dock Division Merritt-Chapman & Scott Corp. For Rail to Water Transfer Corp. Chicago, Illinois	8/30/65	12/31/68	Lake Michigan	Section 10	3,915 cubic yards
4. Great Lakes Dredge & Dock Company Chicago, Illinois For Interlake Steel Corp. Riverdale, Illinois	10/4/65	12/31/68	Lake Michigan	Section 10	5,556 cubic yards

Table B

ILLINOIS

Data concerning existing permits issued since January 1, 1965

by the Corps of Engineers to any person for the purpose of

discharging DREDGED MATERIAL into navigable waters within

or bordering any state

ILLINOIS

Name & Address of Permittee (1)	Date Permit Issued-Renewal (2)	Term of Permit (3)	Name and Location of water receiving dredged material (4)	Section of Refuse Act under which Permit Issued (5)	Total quantity of material discharged under this permit (6)
5. Fitz Simons & Connell Dredge and Dock Division Merritt-Chapman & Scott Corp. Chicago, Illinois For Cargill, Inc. Chicago, Illinois	1/19/66	12/31/69 Note: Dredging was completed 5/14/66	Lake Michigan	Section 10	18,467 cubic yards
6. Fitz Simons & Connell Dredge and Dock Division Merritt-Chapman & Scott Corp. Chicago, Illinois For Archer-Daniels Midland Company Chicago, Illinois	4/1/66	12/31/69 Note: Dredging was completed 4/14/66	Lake Michigan	Section 10	7,929 cubic yards
7. Fitz Simons & Connell Dredge and Dock Division Merritt-Chapman & Scott Corp. Chicago, Illinois For Wisconsin Steel Division of International Harvester Company Chicago, Illinois	4/21/66	12/31/69 Note: Dredging was completed 4/30/66	Lake Michigan	Section 10	13,694 cubic yards

TABLE B

ILLINOIS

Date concerning existing permits issued since January 1, 1965 by the Corps of Engineers to any person for the purpose of discharging DREDGED MATERIAL into navigable waters within or bordering any state ILLINOIS

Name & Address of Permittee (1)	Date Permit Issued-Renewal (2)	Term of Permit (3)	Name and Location of water receiving dredged material (4)	Section of Refuse Act under which Permit Issued (5)	Total quantity of material discharged under this permit (6)
8. Fitz Simons & Connell Dredge and Dock Division Merritt-Chapman & Scott Corp. For Federal Marine Terminals, Inc. Chicago, Illinois	4/28/66	12/31/69 Note: Dredging was completed 4/10/66	Lake Michigan	Section 10	5,282 cubic yards
9. Fitz Simons & Connell Dredge and Dock Division Merritt-Chapman & Scott Corp. For U. S. Steel Corp. Chicago, Illinois	5/13/66	12/31/69 Note: Dredging was completed 6/30/66	Lake Michigan	Section 10	160,00 cubic yards
10. Fitz Simons & Connell Dredge and Dock Division Merritt-Chapman & Scott Corp. For Interlake Steel Corp. Chicago, Illinois	7/20/66	12/31/69 Note: Dredging was completed 7/10/66	Lake Michigan	Section 10	7,138 cubic yards
11. Fitz Simons & Connell Dredge and Dock Division Merritt-Chapman & Scott Corp. For Cargill, Inc. Chicago, Illinois	12/1/66	12/31/69 Note: Dredging was completed 12/10/66	Lake Michigan	Section 10	5,252 cubic yards

TABLE B

ILLINOIS

Data concerning existing permits issued since January 1, 1965 by the Corps of Engineers to any persons for the purpose of discharging DREDGED MATERIAL into navigable waters within or bordering any state

ILLINOIS

Name & Address Of Permittee (1)	Date Permit Issued-Renewal (2)	Term of Permit (3)	Name and Location of water receiving dredged material (4)	Section of Refuse Act under which Permit Issued (5)	Total quantity of material discharged under this permit (6)
12. Great Lakes Dredge & Dock Company Chicago, Illinois For U. S. Steel Corporation Chicago, Illinois	7/20/67	12/31/67	Lake Michigan	Section 10	146,949 cubic yards

TABLE B

INDIANA

Data concerning existing permits issued since January 1, 1965

by the Corps of Engineers to any person for the purpose of

discharging DREDGED MATERIAL into navigable waters within

or bordering any state

INDIANA

Name & Address of Permittee (1)	Date Permit Issued-Renewal (2)	Term of Permit (3)	Name and Location of water receiving dredged material (4)	Section of Refuse Act under which Permit Issued (5)	Total quantity of material discharged under this permit (6)
Great Lakes Dredge & Dock Company Chicago, Illinois For U. S. Steel Corp. Gary, Indiana	1/27/65	12/31/65	Lake Michigan	Section 10	41,435 cubic yards
Great Lakes Dredge & Dock Company Chicago, Illinois For Inland Steel Company Indiana Harbor, Indiana	4/15/65	12/31/68	Lake Michigan	Section 10	499,538 cubic yards
U. S. Steel Corp Buffington Harbor, Indiana	3/8/66	12/31/66	Lake Michigan	Section 10	7,316 cubic yards
Great Lakes Dredge & Dock Company Chicago, Illinois For U. S. Steel Corp. Gary, Indiana	4/27/66	12/31/66	Lake Michigan	Section 10	53,476 cubic yards
Great Lakes Dredge & Dock Company Chicago, Illinois For Inland Steel Company Indiana Harbor, Indiana	6/20/66	12/31/69 Note: Dredging was completed 6/10/67	Lake Michigan	Section 10	379,978 cubic yards

TABLE B

Data concerning existing permits issued since January 1, 1965 by the Corps of Engineers to any person for the purpose of discharging DREDGED MATERIAL into navigable waters within or bordering any state

IOWA

ame & Address of Permittee (1)	Date Permit Issued-Renewal (2)	Term of Permit (3)	Name and Location of water receiving dredged material (4)	Section of Refuse Act under which Permit Issued (5)	Total quantity of material discharged under this permit (5)

NONE

TABLE B

Data concerning existing permits issued since January 1, 1965
by the Corps of Engineers to any person for the purpose of
discharging DREDGED MATERIAL into navigable waters within
or bordering any state

KANSAS

Name & Address of Permittee	Date Permit Issued-Renewal	Term of Permit	Name and Location of water receiving dredged material	Section of Refuse Act under which Permit Issued	Total quantity of material discharged under this permit
(1)	(2)	(3)	(4)	(5)	(6)
NONE					

TABLE B

Data concerning existing permits issued since January 1, 1965 by the Corps of Engineers to any person for the purpose of discharging DREDGED MATERIAL into navigable waters within or bordering any state

KENTUCKY

Name & Address of Permittee	Date Permit Issued-Renewal	Term of Permit	Name and Location of water receiving dredged material	Section of Refuse Act under which Permit Issued	Total quantity of material discharged under this permit
(1)	(2)	(3)	(4)	(5)	(6)
NONE					

TABLE B

LOUISIANA

Data concerning existing permits issued since January 1, 1965 by the Corps of Engineers to any person for the purpose of discharging DREDGED MATERIAL into navigable waters within or bordering any state

LOUISIANA

Name & Address of Permittee	Date Permit Issued-Renewal	Term of Permit	Name and Location of water receiving dredged material	Section of Refuse Act under which Permit Issued	Total quantity of material discharged under this permit
(1)	(2)	(3)	(4)	(5)	(6)
W. T. Burton Co., Inc. P. O. Box 100 Sulphur, Louisiana 70663	19 Jan 70	31 Dec 73	Sabine Lake, 7 mi E fr Port Arthur, Tex	Sec 10, R & H Act of 3 Mar 1899	1,150 cu.yds.

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Data concerning existing permits issued since January 1, 1965 by the Corps of Engineers to any person for the purpose of discharging DREDGED MATERIAL into navigable waters within or bordering any state

MAINE

Name & Address of Permittee (1)	Date Permit Issued-Renewal (2)	Term of Permit (3)	Name and Location of water receiving dredged material (4)	Section of Refuse Act under which Permit Issued (5)	Total quantity of material discharged under this permit (6)
40 Fathom Fisheries, Inc. c/o Prock Marine Corp. 471 Main Street Rockland, Maine	1 Apr 66	3 yrs.	W. Penobscot Bay	Section 10 of River & Harbor Act of March 3, 1899	4,000 cu. yds.
Maine Sea Products Co. c/o Prock Marine Corp. 471 Main Street Rockland, Maine	4 May 66	3 yrs.	W. Penobscot Bay	"	3,500 cu. yds.
Mr. George W. Brewster c/o Prock Marine Corp. 471 Main Street Rockland, Maine	30 Jun 66	3 yrs.	Muscongus Bay	"	2,000 cu. yds.
Prock Marine Corp. 471 Main Street Rockland, Maine	28 Apr 66	3 yrs.	Kennebec River	"	40,000 cu. yds.
Mr. Alexander Sellers, Jr. c/o Prock Marine Corp. 471 Main Street Rockland, Maine	19 Jul 66	3 yrs.	Muscongus Bay	"	2,000 cu. yds.

TABLE B

Data concerning existing permits issued since January 1, 1965 by the Corps of Engineers to any person for the purpose of discharging DREDGED MATERIAL into navigable waters within or bordering any state

MAINE

Name & Address of Permittee (1)	Date Permit Issued-Renewal (2)	Term of Permit (3)	Name and Location of water receiving dredged material (4)	Section of Refuse Act under which Permit Issued (5)	Total quantity of material discharged under this permit (6)
Bath Iron Works Bath, Maine	17 May 66	3 yrs.	Kennebec River	Section 10 of River & Harbor Act of March 3, 1899	30,000 cu. yds.
Mr. Percival H. Wardwell Town Manager Camden, Maine	26 May 66	3 yrs.	Penobscot Bay	"	750 cu. yds.
Watson H. Blair Rockland, Maine	10 May 68	3 yrs.	W. Penobscot Bay	"	1,000 cu. yds.
Wayfarer Marine Corp. Rockland, Maine	20 Feb 69	3 yrs.	W. Penobscot Bay	"	3,000 cu. yds.
P.G. Willey & Co., Inc. Camden, Maine	21 Apr 69	3 yrs.	W. Penobscot Bay	"	250 cu. yds.
F.J. O'Hara & Sons Rockland, Maine	16 Jan 69	3 yrs.	W. Penobscot Bay	"	1,500 cu. yds.
Marvin H. Goody Islesboro, Maine	10 May 68	3 yrs.	W. Penobscot Bay	"	2,000 cu. yds.

TAILE B

Data concerning existing permits issued since January 1, 1965 by the Corps of Engineers to any person for the purpose of discharging DREDGED MATERIAL into navigable waters within or bordering any state

MAINE

Name & Address of Permittee (1)	Date Permit Issued-Renewal (2)	Term of Permit (3)	Name and Location of water receiving dredged material (4)	Section of Refuse Act under which Permit Issued (5)	Total quantity of material discharged under this permit (6)
Town of Bremen Bremen, Maine	29 Jul 69	3 yrs.	W. Penobscot Bay	Section 10 of River & Harbor Act of March 3, 1899	1,000 cu. yds.
Texaco, Inc. Portland, Maine	12 Mar 69	3 yrs.	Casco Bay	"	100,000 cu. yds.
Kennebunk River Club Kennebunkport, Maine	20 Feb 69	3 yrs.	Atlantic Ocean	"	1,500 cu. yds.

TABLE B

Data concerning existing permits issued since January 1, 1965 by the Corps of Engineers to any person for the purpose of discharging DREDGED MATERIAL into navigable waters within or bordering any state

MARYLAND

Name & Address of Permittee (1)	Date Permit Issued-Renewal (2)	Term of Permit (3)	Name and Location of water receiving dredged material (4)	Section of Refuse Act under which Permit Issued (5)	Total quantity of material discharged under this permit (6)
American Dredging Co. 12 South Twelfth Street Philadelphia, Pa.	7 Feb 68	31 Dec 71	Chesapeake Bay at Pooles Island Deep	Section 10 of 3 March 1899	449,900 cu. yds.
Great Lakes Dredge & Dock Co. 501 St. Paul Place Baltimore, Maryland	30 Jan 68	31 Dec 71	"	"	1,018,200 cu. yds.
Maryland State Roads Commission 300 W. Preston St. Baltimore, Maryland	30 Mar 70	31 Dec 73	Chesapeake Bay at Pooles Island Deep	"	None
"	15 Jan 70	31 Dec 73	"	"	None
"	14 Aug 69	31 Dec 72	Chesapeake Bay at Kent Island, Md.	"	21,645 cu. yds.

TABLE B

Data concerning existing permits issued since January 1, 1965 by the Corps of Engineers to any person for the purpose of discharging DREDGED MATERIAL into navigable waters within or bordering any state

MARYLAND

Name & Address of Permittee (1)	Date Permit Issued-Renewal (2)	Term of Permit (3)	Name and Location of water receiving dredged material (4)	Section of Refuse Act under which Permit Issued (5)	Total quantity of material discharged under this permit (6)
Maryland State Roads Commission 300 W. Preston St. Baltimore, Maryland	31 Oct 69	31 Dec 72	Chesapeake Bay at Kent Island, Md.	Section 10 of 3 March 1899	None
Great Lakes Dredge & Dock Co. 501 St. Paul Place Baltimore, Maryland	30 Oct 68	31 Dec 71	Patapsco River at Masonville, Md.	"	8,000 cu. yds.
Baltimore Gas & Electric Company Baltimore, Maryland	22 Jan 69	31 Dec 72	Chesapeake Bay at Kent Island, Md.	"	None
Bethlehem Steel Corp. Sparrows Point, Md.	16 Sep 69	31 Dec 72	Chesapeake Bay at Pooles Island Deep	"	1,185,883 cu. yds.

TABLE B

Data concerning existing permits issued since January 1, 1965 by the Corps of Engineers to any person for the purpose of discharging DREDGED MATERIAL into navigable waters within or bordering any state

MARYLAND

Name & Address of Permittee (1)	Date Permit Issued-Renewal (2)	Term of Permit (3)	Name and Location of water receiving dredged material (4)	Section of Refuse Act under which Permit Issued (5)	Total quantity of material discharged under this permit (6)
City of Annapolis Annapolis, Maryland	26 June 67	31 Dec 70	Chesapeake Bay at Kent Island, Md.	Section 10 of 3 March 1899	None
Department of the Navy Washington, D. C.	2 May 67	31 Dec 70	"	"	None

TABLE B

Data concerning existing permits issued since January 1, 1965 by the Corps of Engineers to any person for the purpose of discharging DREDGED MATERIAL into navigable waters within or bordering any state

MASSACHUSETTS

Name & Address of Permittee (1)	Date Permit Issued-Renewal (2)	Term of Permit (3)	Name and Location of water receiving dredged material (4)	Section of Refuse Act under which Permit Issued (5)	Total quantity of material discharged under this permit (6)
American Oil Co. c/o Perini Corp. Framingham, Mass.	24 Nov 65	3 yrs.	Mass. Bay	Section 10 of River & Harbor Act of March 3, 1899	40,000 cu. yds.
Gloucester Marine Railway Corp. 9 Wharf Street Gloucester, Mass.	20 May 65	3 yrs.	Mass. Bay	"	5,000 cu. yds.
Humble Oil & Refining Company 1330 Boylston St. Chestnut Hill, Mass.	21 Oct 65	3 yrs.	Mass. Bay	"	14,000 cu. yds.
Montaup Electric Co. Box 391 Fall River, Mass.	9 Sep 65	3 yrs.	Narragansett Bay	"	20,000 cu. yds.

TABLE B

Data concerning existing permits issued since January 1, 1965 by the Corps of Engineers to any person for the purpose of discharging DREDGED MATERIAL into navigable waters within or bordering any state

MASSACHUSETTS

Name & Address of Permittee (1)	Date Permit Issued-Renewal (2)	Term of Permit (3)	Name and Location of water receiving dredged material (4)	Section of Refuse Act under which Permit Issued (5)	Total quantity of material discharged under this permit (6)
Plymouth Electric Co., NEGEA Service Corp., Agent c/o Stone & Webster Engr. Corp. 125 Franklin Street Boston, Mass.	4 Mar 66	3 yrs.	Cape Cod Bay	Section 10 of River & Harbor Act of March 3, 1899	120,000 cu. yds.
Union Oil Co. of Boston 230 Lee Burbank Hwy. Revere, Mass.	22 Mar 66	3 yrs.	Mass. Bay	"	127,650 cu. yds.
N.E. Tel & Tel Co. c/o Mr. J. D'Arrigo, Plant Supervisor File # 1.9/12(3) 125 Mile Street Boston, Mass.	27 Jan 66	3 yrs.	Mass. Bay	"	500 cu. yds.
Commonwealth of Mass. Winthrop, Mass.	26 May 67	3 yrs.	Mass. Bay	"	400,000 cu. yds.

TABLE B

Data concerning existing permits issued since January 1, 1965 by the Corps of Engineers to any person for the purpose of discharging DREDGED MATERIAL into navigable waters within or bordering any state

MASSACHUSETTS

Name & Address of Permittee (1)	Date Permit Issued-Renewal (2)	Term of Permit (3)	Name and Location of water receiving dredged material (4)	Section of Refuse Act under which Permit Issued (5)	Total quantity of material discharged under this permit (6)
Rev-Lyn Contracting Company East Boston, Mass.	24 Apr 67	3 yrs.	Mass. Bay	Section 10 of River & Harbor Act of March 3, 1899	500 cu. yds.
Boston Redevelopment Authority Boston, Mass.	20 Sep 67	3 yrs.	Mass. Bay	"	18,000 cu. yds.
Commonwealth of Mass. Quincy, Mass.	11 Oct 67	3 yrs.	Mass. Bay	"	28,900 cu. yds.
Perini Corp. East Boston, Mass.	31 Oct 67	3 yrs.	Mass. Bay	"	15,000 cu. yds.
U.S. Gypsum Co. Charlestown, Mass.	2 Nov 67	3 yrs.	Mass. Bay	"	4,700 cu. yds.
Eastern Mineral, Inc. Chelsea, Mass.	11 Dec 67	3 yrs.	Mass. Bay	"	35,000 cu. yds.

TABLE B

Data concerning existing permits issued since January 1, 1965 by the Corps of Engineers to any person for the purpose of discharging DREDGED MATERIAL into navigable waters within or bordering any state

MASSACHUSETTS

Name & Address of Permittee (1)	Date Permit Issued-Renewal (2)	Term of Permit (3)	Name and Location of water receiving dredged material (4)	Section of Refuse Act under which Permit Issued (5)	Total quantity of material discharged under this permit (6)
Mass. Bay Transportation Authority Boston Mass.	22 Nov 68	3 yrs.	Mass. Bay	Section 10 of River & Harbor Act of March 3, 1899	75,000 cu. yds.
Metropolitan Dist. Comm. Boston, Mass.	3 Feb 69	3 yrs.	Mass. Bay	"	10,000 cu. yds.
Schiavone & Sons Charlestown, Mass.	24 Sep 69	3 yrs.	Mass. Bay	"	16,000 cu. yds.
Mass. Port Authority Boston, Mass.	12 Dec 69	3 yrs.	Mass. Bay	"	70,000 cu. yds.
Mass. Port Authority Boston, Mass.	13 Feb 70	3 yrs.	Mass. Bay	"	30,000 cu. yds.
Commonwealth of Mass. Manchester, Mass.	7 May 68	3 yrs.	Mass. Bay	"	6,200 cu. yds.
U.S. Coast Guard Scituate, Mass.	4 Apr 68	3 yrs.	Mass. Bay	"	6,500 cu. yds.

TABLE B

Data concerning existing permits issued since January 1, 1965 by the Corps of Engineers to any person for the purpose of discharging DREDGED MATERIAL into navigable waters within or bordering any state

MASSACHUSETTS

Name & Address of Permittee (1)	Date Permit Issued-Renewal (2)	Term of Permit (3)	Name and Location of water receiving dredged material (4)	Section of Refuse Act under which Permit Issued (5)	Total quantity of material discharged under this permit (6)
Bay Rock Realty Trust Plymouth, Mass.	21 Jul 67	3 yrs.	Atlantic Ocean	Section 10 of River & Harbor Act of March 3, 1899	55,000 cu. yds.
Sherburne Assoc. Nantucket, Mass.	16 Jul 68	3 yrs.	Nantucket Sound	"	4,000 cu. yds.
City of New Bedford New Bedford, Mass.	6 Nov 68	3 yrs.	Buzzards Bay	"	520,000 cu. yds.
Commonwealth of Mass. Fall River, Mass.	13 Jul 67	3 yrs.	Gulf of Rhode Island	"	56,200 cu. yds.
Progressive Fish Wharf, Inc. Gloucester, Mass.	9 Dec 69	3 yrs.	Mass. Bay	"	1,500 cu. yds.
Commonwealth of Mass. Danvers, Mass.	18 Nov 69	3 yrs.	Mass. Bay	"	118,000 cu. yds.

TABLE B

MICHIGAN

* Verified by inspection reports
** Amount authorized - no record of Quantity Dredged

Data concerning existing permits issued since January 1, 1965 by the Corps of Engineers to any person for the purpose of discharging DREDGED MATERIAL into navigable waters within or bordering any state

MICHIGAN

Name & Address of Permittee (1)	Date Permit Issued-Renewal (2)	Term of Permit (3)	Name and Location of water receiving dredged material (4)	Section of Refuse Act under which Permit Issued (5)	Total quantity of material discharged under this permit (6)
Dunbar & Sullivan, 2312 Buhl Bldg., Detroit, Mich.	8 Sep 66	2 yrs.	Auth. Dump Ground West End of Lake Erie North of Toledo Light	10	* 57,250 cy
Pt. Mouillee Booster, East Rockwood, Mich.	16 Dec 65	2 "	Lake Huron	"	** 17,000 "
Ninth Coast Guard, Cleveland, Ohio	25 Mar 65	2 "	Aut. Dump Ground West End of Lake Erie	"	** 28,000 "
Buckeye Pipeline, Dixie Hwy, Buckeye Rd, Lima, Ohio	27 Feb 67	3 "	Auth. Dump Ground West End of Lake Erie	"	* 16,250 "
North Cape Yacht Club LaSalle, Michigan	18 May 65	2 "	Lake Erie - to provide 4'	"	** 1,000 "
Pointe Mouillee Booster East Rockwood, Michigan	16 Dec 65	2 "	Lake Erie near Huron River	"	** 17,000 "
Joseph Miazgowicz, 13468 LaPlaisance Rd, Bolles Harbor, Michigan	20 Jun 66	2 "	Lake Erie (Waterway)	"	** 1,000 "
Stony Pointe Beach Assoc, 206 Reisig Bldg, Monroe, Michigan	28 Mar 67	2 "	Lake Erie near Monroe	"	** 1,000 "

TABLE B

MICHIGAN

* Verified by inspection reports
** Amount authorized - no record of Quantity Dredged

Data concerning existing permits issued since January 1, 1965 by the Corps of Engineers to any person for the purpose of discharging DREDGED MATERIAL into navigable waters within or bordering any state

MICHIGAN

Name & Address of Permittee (1)	Date Permit Issued-Renewal (2)	Term of Permit (3)	Name and Location of water receiving dredged material (4)	Section of Refuse Act under which Permit Issued (5)	Total quantity of material discharged under this permit (6)
Dunbar & Sullivan, 2312 Buhl Bldg., Detroit, Mich.	30 Sep 66	2 yrs.	Auth. Dump Ground West End Lake Erie	10	* 10,050 cy
Dunbar & Sullivan, 2312 Buhl Bldg., Detroit, Mich.	16 Mar 66	2 "	Auth. Dump Ground West End Lake Erie	"	* 11,350 "
Dunbar & Sullivan, 2312 Buhl Bldg., Detroit, Mich.	18 Mar 66	2 "	Auth. Dump Ground West End Lake Erie	"	* 36,400 "
Dunbar & Sullivan, 2312 Buhl Bldg., Detroit, Mich.	30 Mar 66	2 "	Auth. Dump Ground West End Lake Erie	"	* 23,500 "
Dunbar & Sullivan, 2312 Buhl Bldg., Detroit, Mich.	15 Apr 66	2 "	Auth. Dump Ground West End Lake Erie	"	* 19,660 "
Dunbar & Sullivan, 2312 Buhl Bldg., Detroit, Mich.	31 Mar 67	2 "	Auth. Dump Ground West End Lake Erie	"	* 5,570 "
Dunbar & Sullivan, 2312 Buhl Bldg., Detroit, Mich.	17 Nov 66	2 "	Auth. Dump Ground West End Lake Erie	"	* 8,400 "
Dunbar & Sullivan, 2312 Buhl Bldg., Detroit, Mich.	18 Nov 66	2 "	Auth. Dump Ground West End Lake Erie	"	* 24,279 "
Dunbar & Sullivan, 2312 Buhl Bldg., Detroit, Mich.	20 Feb 67	2 "	Auth. Dump Ground West End Lake Erie	"	* 23,800 "

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Name & Address of Permittee (1)	Date Permit Issued-Renewal (2)	Term of Permit (years) (3)	Name and Location of water receiving dredged material (4)	Permits Issued Under Section 10, RHH Act 1899 (5)	Total quantity of material discharged under this permit (6)
Dunbar & Sullivan, 2312 Buhl Building, Detroit, Mich.	10 Mar 67	2 yrs.	Auth. Dump Ground West End Lake Erie	X	* 3,700 cy
Dunbar & Sullivan, 2312 Buhl Building, Detroit, Mich.	3 Mar 65	2 "	Auth. Dump Ground West End Lake Erie	X	* 4,900 "
Dunbar & Sullivan, 2312 Buhl Building, Detroit, Mich.	16 Mar 65	2 "	Auth. Dump Ground West End Lake Erie	X	* 20,250 "
U.S. Marine Salvage, 222 Lenox, Detroit, Mich.	25 Jun 65	2 "	Auth. Dump Ground Lake St. Clair	X	* 960 "
Gregory Marina, P.O. Box 3247, Detroit, Mich.	21 Jul 65	1 "	Auth. Dump Ground Lake St. Clair	X	* 715 "
Louis J. Mogyoros, 35560 Kenton, Rockwood, Mich.	5 Oct 65	2 "	Auth. Dump Ground Lake Erie	X	* 650 "
Dunbar & Sullivan, 2312 Buhl Building, Detroit, Mich.	1 Dec 65	2 "	Auth. Dump Ground Lake Erie	X	* 10,200 "
Dunbar & Sullivan, 2312 Buhl Building, Detroit, Mich.	31 Mar 66	2 "	Auth. Dump Ground Lake Erie	X	* 12,400 "
Dunbar & Sullivan, 2312 Buhl Building, Detroit, Mich.	12 Apr 66	2 "	Auth Dump Ground Lake Erie	X	* 7,100 "
Dunbar & Sullivan, 2312 Buhl Building, Detroit, Mich.	15 Apr 66	2 "	Auth Dump Ground Lake Erie	X	* 11,500 "
Dunbar & Sullivan, 2312 Buhl Building, Detroit, Mich.	16 Apr 66	2 "	Auth Dump Ground Lake Erie	X	* 12,200 "

TABLE B

MICHIGAN

MICHIGAN

Name & Address of Permittee (1)	Date Permit Issued-Renewal (2)	Term of Permit (years) (3)	Name and Location of water receiving dredged material (4)	Permits Issued Under Section 10, R&H Act 1899 (5)	Total quantity of material discharge under this permit (6)
Dunbar & Sullivan, 2312 Buhl Building, Detroit, Mich.	28 Apr 66	2 yrs.	Auth. Dump Ground Lake Erie	X	* 3,150 cy
Dunbar & Sullivan, 2312 Buhl Building, Detroit, Mich.	10 Mar 67	2 "	Auth. Dump Ground Lake Erie	X	*127,400 "
Dunbar & Sullivan, 2312 Buhl Building, Detroit, Mich.	23 Mar 65	2 "	Auth. Dump Ground Lake Erie	X	* 8,600 "
Dunbar & Sullivan, 2312 Buhl Building, Detroit, Mich.	26 Mar 65	2 "	Auth. Dump Ground West End Lake Erie	X	* 88,190 "
Dunbar & Sullivan, 2312 Buhl Building, Detroit, Mich.	5 May 65	2 "	Auth. Dump Ground West End Lake Erie	X	* 2,700 "
Dunbar & Sullivan, 2312 Buhl Building, Detroit, Mich.	11 May 65	4 "	Auth. Dump Ground West End Lake Erie	X	* 6,600 "
Dunbar & Sullivan, 2312 Buhl Building, Detroit, Mich.	27 Jul 65	2 "	Auth. Dump Ground West End Lake Erie	X	* 20,850 "
George Phillips, 37792 Siesta Rd., Mt. Clemens, Mich.	23 Jul 67	2 "	Lake St. Clair	X	** 200 "
Lisa Braun, 2650 North Channel Dr., Harsens Island, Michigan	7 Dec 66	2 "	St. Clair River	X	** 500 "
Kenneth Anderson, 10639 M-29 Anchorville, Mich.	9 Mar 65	2 "	Lake St. Clair	X	** 533 "
City of Grosse Pointe, 17147 Maumee, Grosse Point, Mich.	17 Feb 65	1 "	Auth. Dump Ground Lake St. Clair	X	* 3,000 "
Shore Club Marina	21 Apr 65	2 "	Auth. Dump Ground Lake St. Clair	X	* 4,050 "

TABLE B

MICHIGAN

Name & Address of Permittee (1)	Date Permit Issued-Renewal (2)	Term of Permit (years) (3)	Name and Location of water receiving dredged material (4)	Permits Issued Under Section 10, RH Act 1899 (5)	Total quantity of material discharged under this permit (6)
Lakecrest Drive Imp. Assoc., 22471 Lakecrest, St. Clair Shores, Mich.	24 May 65	2 yrs.	Lake St. Clair	X	** 200 cy
Seaway Barge Lines, 25318 Harmon St. Clair Shores, Mich.	23 Sep 65	2 "	Lake St. Clair	X	** 1,000 "
Diamond Crystal Salt Co. St. Clair, Mich.	21 Apr 65	2 "	St. Clair River	X	* 600 "
Arthur O. Misch, 6952 Green Dr., Sans Souci, Mich.	13 Aug 65	2 "	St. Clair River	X	** 100 "
Tuscola County Drain Comm. Court House, Caro, Mich.	1 Jun 66	2 "	Lake Huron	X	** 9,700 "
Barrett Logging, Moran, Mich.	13 Jul 66	2 "	Lake Huron	X	** 1,500 "
Durocher Van Antwerp Inc. Cheboygan, Mich.	1 Jun 66	2 "	Lake Huron	X	** 3,000 "
Oakhurst Park Marina Assoc. 10019 Hazel Road, Mich.	22 Apr 65	2 "	Lake Huron	X	** 500 "
Mr. Oliver Porter, 4827 LaClair Rd., Standish, Michigan	22 Sep 66	2 "	Lake Huron	X	** 1,000 "
Mrs. Robert Taylor, Route 1 Box 269A, Pinconning, Mich.	24 Feb 67	2 "	Lake Huron	X	** 11,000 "
Tom Donaldson et al, 3433 South State Rd., Davison, Mich.	11 Oct 67	2 "	Lake Huron	X	** 8,000 "
Williams Brothers, 301 Professional Bldg., Saginaw, Mich.	3 Aug 67	3 "	Lake Huron	X	** 20,000 "

TABLE B

MICHIGAN

Name & Address of Permittee (1)	Date Permit Issued-Renewal (2)	Term of Permit (years) (3)	Name and Location of water receiving dredged material (4)	Permits Issued Under Section 10, R&H Act 1899 (5)	Total quantity of material discharged under this permit (6)
Mr & Mrs Carl Schramm, 35965 13 Mile Rd, Farmington, Mich.	29 Apr 68 9 Dec 69	2 yrs. 2 "	Lake Huron	X	** 15,000 cy
Tuscola County Drain Comm. Court House, Caro, Mich.	9 Aug 68	4 "	Lake Huron	X	** 6,200 "
Chester M. Hanson, 1017 North Leroy, Fenton, Mich.	24 Jul 68	2 "	Lake Huron	X	** 500 "
Bay Park Assoc., 429 Cass Avenue, Vassar, Michigan	13 May 68	2 "	Lake Huron	X	** 1,000 "
Frank Kler, 508 Hollywood W. Detroit, Mich.	12 Jun 68	2 "	Lake Huron	X	** 15,000 "
AuGres Boat Club, Box 127 Au Gres, Michigan	21 Jun 68	2 "	Lake Huron	X	** 300 "
Stanley R. Hare, 1600 Berkley Dr., Lansing, Mich.	14 Nov 68	2 "	Lake Huron	X	** 6,000 "
John Barthel, Route 1, Box 267 Sebewaing, Mich.	16 Sep 68	2 "	Lake Huron	X	** 5,000 "
United States Steel, Rogers City, Mich.	19 Feb 69	2 "	Lake Huron	X	** 14,000 "
William Bredow, 8268 Dodge, Warren, Mich.	27 Feb 69	2 "	Lake Huron	X	** 200 "

TABLE B

Data concerning existing permits issued since January 1, 1965 by the Corps of Engineers to any person for the purpose of discharging DREDGED MATERIAL into navigable waters within or bordering any state

WEST VIRGINIA

Name & Address of Permittee	Date Permit Issued-Renewal	Term of Permit	Name and Location of water receiving dredged material	Section of Refuse Act under which Permit Issued	Total quantity of material discharged under this permit
(1)	(2)	(3)	(4)	(5)	(6)

NONE

TABLE B

Data concerning existing permits issued since January 1, 1965 by the Corps of Engineers to any person for the purpose of discharging DREDGED MATERIAL into navigable waters within or bordering any state

WYOMING

ame & Address of Permittee (1)	Date Permit Issued-Renewal (2)	Term of Permit (3)	Name and Location of water receiving dredged material (4)	Section of Refuse Act under which Permit Issued (5)	Total quantity of material discharged under this permit (6)
NONE					

TABLE B

Data concerning existing permits issued since January 1, 1965 by the Corps of Engineers to any person for the purpose of discharging DREDGED MATERIAL into navigable waters within or bordering any state

NEVADA

Name & Address of Permittee (1)	Date Permit Issued-Renewal (2)	Term of Permit (3)	Name and Location of water receiving dredged material (4)	Section of Refuse Act under which Permit Issued (5)	Total quantity of material discharged under this permit (6)
NONE					

TABLE B

Data concerning existing permits issued since January 1, 1965 by the Corps of Engineers to any person for the purpose of discharging DREDGED MATERIAL into navigable waters within or bordering any state

NEW HAMPSHIRE

ame & Address of Permittee (1)	Date Permit Issued-Renewal (2)	Term of Permit (3)	Name and Location of water receiving dredged material (4)	Section of Refuse Act under which Permit Issued (5)	Total quantity of material discharged under this permit (6)
N O N E					

TABLE B

Data concerning existing permits issued since January 1, 1965 by the Corps of Engineers to any person for the purpose of discharging DREDGED MATERIAL into navigable waters within or bordering any state

NEW JERSEY

Name & Address of Permittee (1)	Date Permit Issued-Renewal (2)	Term of Permit (3)	Name and Location of water receiving dredged material (4)	Section of Refuse Act under which Permit Issued (5)	Total quantity of material discharged under this permit (6)
Atlantic Gulf & Pacific Co. 250 Broadway N.Y., N.Y. 10007	30 Nov 1966	3 Years	Atlantic Ocean Mud Dump Ground	10	Approx. 45,000 cubic Yds.
Shell Oil Co. 50 West 50th St. N.Y., N.Y. 10020	1 June 1966	3 Years	Atlantic Ocean Mud Dump Ground	10	Approx. 10,000 Cubic Yds.
Lipsett Inc. Federal Shipyards Kearny, N.J. 07032	21 July 1967	3 Years	Atlantic Ocean Mud Dump Ground	10	125,000 Cubic Yds.
Wellen Oil Inc. Foot of Howell St. Jersey City, N.J. 07306	12 October 1966	3 Years	Atlantic Ocean Mud Dump Ground	10	20,000 Cubic Yds.
Wellen Oil Inc. Foot of Howell St. Jersey City, N.J. 07306	12 December 1967	3 Years	Atlantic Ocean Mud Dump Ground	10	70,000 Cubic Yds.

TABLE B

Data concerning existing permits issued since January 1, 1965 by the Corps of Engineers to any person for the purpose of discharging DREDGED MATERIAL into navigable waters within or bordering any state

NEW JERSEY

Name & Address of Permittee (1)	Date Permit Issued-Renewal (2)	Term of Permit (3)	Name and Location of water receiving dredged material (4)	Section of Refuse Act under which Permit Issued (5)	Total quantity of material discharged under this permit (6)
American Chemicals, Inc. Central Avenue South Kearny, N.J. 07032	16 November 1966	3 Years	Atlantic Ocean Mud Dump Ground	10	Approx. 33,000 Cubic Yds. (Could go upland too)
Public Service Elec. & Gas Co. 80 Park Place Newark, N.J. 07101	8 December 1966 17 January 1967	3 Years	Atlantic Ocean Mud Dump Ground	10	21,000 Cubic Yds.
Lipsett Inc. Federal Shipyards Kearny, N.J. 07032	13 December 1965	3 Years	Atlantic Ocean Mud Dump Ground	10	Approx. 12,000 Cubic Yds.
Lipsett Inc. Federal Shipyards Kearny, N.J. 07032	21 March 1967	3 Years	Atlantic Ocean Mud Dump Ground	10	65,000 Cubic Yds.

TABLE B

Data concerning existing permits issued since January 1, 1965 by the Corps of Engineers to any person for the purpose of discharging DREDGED MATERIAL into navigable waters within or bordering any state

NEW JERSEY

Name & Address of Permittee (1)	Date Permit Issued-Renewal (2)	Term of Permit (3)	Name and Location of water receiving dredged material (4)	Section of Refuse Act under which Permit Issued (5)	Total quantity of material discharged under this permit (6)
Seatrain Line, Inc. 595 River Road Edgewater, N.J. 07020	23 January 1969	3 Years	Atlantic Ocean Mud Dump Ground	10	430,000 Cubic Yds.
Tribune Development Co. P.O. Box 27 Perth Amboy, N.J. 08861	19 June 1967	3 years	Atlantic Ocean Mud Dump Grounds	10	Approx. 50,000 cu. yds.
American Export Industries, Inc. 26 Broadway New York, N.Y. 10004	26 November 1969	3 years	Atlantic Ocean Mud Dump Grounds	10	Approx. 3,000,000 cu. yds.
The Port of N.Y. Authority 111 Eighth Avenue New York, N.Y. 10011	18 April 1968	3 Years	Atlantic Ocean Mud Dump Ground	10	Approx. 300,000 Cub. Yds.
Atlantic-Gahagan J.V. Jersey Turnpike 250 Broadway New York, N.Y. 10007	29 March 1968	3 Years	Atlantic Ocean Mud Dump Ground	10	Approx. 40,000 Cub. Yds.

TABLE B

Data concerning existing permits issued since January 1, 1965 by the Corps of Engineers to any person for the purpose of discharging DREDGED MATERIAL into navigable waters within or bordering any state

NEW JERSEY

Name & Address of Permittee (1)	Date Permit Issued-Renewal (2)	Term of Permit (3)	Name and Location of water receiving dredged material (4)	Section of Refuse Act under which Permit Issued (5)	Total quantity of material discharged under this permit (6)
Director-Eastern Div. Bur of Yards & Docks Dept. of the Navy 90 Church St. New York, N.Y. 10007	28 February 1966	3 Years	Atlantic Ocean Mud Dump Ground	10	Approx. 976,000 Cub. Yds
Spearin, Preston & Burrows 15 Church St. New York, N.Y. 10006	20 October 1965	3 Years	Atlantic Ocean Mud Dump Ground	10	Approx. 4,000 Cub. Yds.
Spearin, Preston & Burrows 15 Church St. New York, N.Y. 10006	23 May 1966	3 Years	Atlantic Ocean Mud Dump Ground	10	Approx. 4,000 Cub. Yds.

TABLE B

Data concerning existing permits issued since January 1, 1965 by the Corps of Engineers to any person for the purpose of discharging DREDGED MATERIAL into navigable waters within or bordering any state

NEW JERSEY

Name & Address of Permittee (1)	Date Permit Issued-Renewal (2)	Term of Permit (3)	Name and Location of water receiving dredged material (4)	Section of Refuse Act under which Permit Issued (5)	Total quantity of material discharged under this permit (6)
La Fera Contracting Co. 149 Verona Avenue Newark, N.J. 07104	9 May 1969	3 Years	Atlantic Ocean Mud Dump Ground	10	Approx. 18,000 Cub. Yds.
Universal Atlas Cement Div. U.S. Steel Corp. 100 Park Avenue New York, N.Y. 10017	6 May 1965	3 Years	Atlantic Ocean Mud Dump Ground	10	17,650 Cubic Yds.
N.J. Dept Conservation & Economic Development State of New Jersey P.O. Box 1889 Trenton, N.J. 08625	19 March 1968	3 Years	Atlantic Ocean offshore of mean low water line Monmouth Beach	10	84,350 Cubic Yds.
Wall Realty Co., Inc. c/o Bertram F. Bongard 115 Broadway New York, N.Y. 10006	15 December 1966	3 Years	Atlantic Ocean offshore of mean low water line Monmouth Beach	10	Approx. 60,000 Cub. Yds.

TABLE B

Data concerning existing permits issued since January 1, 1965 by the Corps of Engineers to any person for the purpose of discharging DREDGED MATERIAL into navigable waters within or bordering any state

NEW JERSEY.

Name & Address of Permittee (1)	Date Permit Issued-Renewal (2)	Term of Permit (3)	Name and Location of water receiving dredged material (4)	Section of Refuse Act under which Permit Issued (5)	Total quantity of material discharged under this permit (6)
American Dredging Co. 12 South 12th Street Phila., Pa. 19107	Issued 7/31/67	Expires 12/31/70	Rehandling Basin, Delaware R., Burlington Is., Burlington County, N. J.	Section 10. (30 Stat. 1151)	700,000 cy
American Dredging Co. * 12 South 12th Street Phila., Pa. 19107	Issued 11/3/60 Revised 10/11/61	Expires 12/31/71	Rehandling Basin, Delaware R., between Woodbury & Mantua Creeks, Gloucester Co., N. J.	"	27,000,000 cy
American Dredging Co. 12 South 12th Street Phila., Pa. 19107	Issued 3/21/63 Revised 8/2/68 & 1/7/70	Expires 12/31/71	Rehandling Basin, Delaware R., Bridgeport, Gloucester Co., N. J.	"	4,200,000 cy
American Dredging Co. * 12 South 12th Street Phila., Pa. 19107	Issued 4/13/55	Expires 12/31/70	Rehandling Basin, Delaware R., Chester & Monds Island, Gloucester Co., N. J.	"	No work performed to date.

TABLE B

Data concerning existing permits issued since January 1, 1965 by the Corps of Engineers to any person for the purpose of discharging DREDGED MATERIAL into navigable waters within or bordering any state

NEW MEXICO

Name & Address of Permittee (1)	Date Permit Issued-Renewal (2)	Term of Permit (3)	Name and Location of water receiving dredged material (4)	Section of Refuse Act under which Permit Issued (5)	Total quantity of material discharged under this permit (6)
NONE					

TABLE B

New York

Data concerning existing permits issued since January 1, 1965 by the Corps of Engineers to any person for the purpose of discharging DREDGED MATERIAL into navigable waters within or bordering any state

NEW YORK

Name & Address of Permittee (1)	Date Permit Issued-Renewal (2)	Term of Permit (3)	Name and Location of water receiving dredged material (4)	Section of Refuse Act under which Permit Issued (5)	Total quantity of material discharged under this permit (6)
Central Hudson Gas & Electric Co. Poughkeepsie, N.Y. 12602	13 March 1970	3 Years	Hudson River Danskammer Dump	10	Approx. 90,000 Cub. Yds.
Hastings Marina Corp. River St. Hastings-on-Hudson, N.Y.	22 March 1966	3 Years	Hudson River Poughkeepsie, N.Y. Danskammer Dump	10	Approx. 6,000 Cub. Yds.
Mobil Oil Corp. P.O. Box 1145 Albany, N.Y. 12201	17 June 1966	3 Years	Hudson River Danskammer Dump	10	Approx. 40,000 Cub. Yds.
N.Y. Trap Rock Corp. 162 Old Mill Road W. Nyack, N.Y. 10994	13 March 1968	3 Years	Hudson River Storm King Dump	10	Approx. 300 Cub. Yds.

TABLE B

New York

Data concerning existing permits issued since January 1, 1965 by the Corps of Engineers to any person for the purpose of discharging DREDGED MATERIAL into navigable waters within or bordering any state

NEW YORK

Name & Address of Permittee (1)	Date Permit Issued-Renewal (2)	Term of Permit (3)	Name and Location of water receiving dredged material (4)	Section of Refuse Act under which Permit Issued (5)	Total quantity of material discharged under this permit (6)
The Village of Nyack Village Hall 134 Main St. Nyack, N.Y.	6 October 1969	3 Years	Hudson River Kidd Pt. Dump	10	21,000 Cubic Yds.
Philipse Manor Beach Club N. Tarrytown, N.Y.	29 June 1965	3 Years	Hudson River Kidd Pt. Dump	10	600 Cubic Yds.

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Data concerning existing permits issued since January 1, 1965 by the Corps of Engineers to any person for the purpose of discharging DREDGED MATERIAL into navigable waters within or bordering any state

NEW YORK

Name & Address of Permittee (1)	Date Permit Issued-Renewal (2)	Term of Permit (3)	Name and Location of water receiving dredged material (4)	Section of Refuse Act under which Permit Issued (5)	Total quantity of material discharged under this permit (6)
Dept. of Public Works State of New York Albany, N.Y.	16 February 1966	3 Years	Lake Champlain	10	7,000 Cubic Yds.

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TABLE B

New York

Data concerning existing permits issued since January 1, 1965 by the Corps of Engineers to any person for the purpose of discharging DREDGED MATERIAL into navigable waters within or bordering any state

NEW YORK

Name & Address of Permittee (1)	Date Permit Issued-Renewal (2)	Term of Permit (3)	Name and Location of water receiving dredged material (4)	Section of Refuse Act under which Permit Issued (5)	Total quantity of material discharged under this permit (6)
Electric Boat Division of General Dynamics Corp. Groton, Conn. 06340	17 May 1965	3 years	Block Island Sound	10	Approx. 15,000 Cu Yds
Mr. Hugo Spatenga c/o Petrlak & Brierley 2146 Jackson Avenue Seaford, N.Y. 11783	14 June 1967	3 years	Gardiners Bay	10	Approx. 15,000 Cu Yds
Dept of Public Works Suffolk County Yaphank Avenue Yaphank, N.Y. 11980	2 June 1966	3 years	Deep Water in Dering Harbor Shelter Island Sound	10	18,000 Cu Yds.
Dept of Public Works Suffolk County Yaphank Avenue Yaphank, N.Y. 11980	11 February 1965	3 Years	Great South Bay Vicinity Captree Island	10	364,146 Cu Yds.

TABLE B

New York

Data concerning existing permits issued since January 1, 1965 by the Corps of Engineers to any person for the purpose of discharging DREDGED MATERIAL into navigable waters within or bordering any state

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Name & Address of Permittee (1)	Date Permit Issued-Renewal (2)	Term of Permit (3)	Name and Location of water receiving dredged material (4)	Section of Refuse Act under which Permit Issued (5)	Total quantity of material discharged under this permit (6)
Dept. of Sanitation City of New York 125 Worth St. New York, N.Y. 10013	13 April 1965	3 Years	Long Island Sound Eatons Neck Dump	10	Approx. 4,500 Cub. Yds.
Dept. of Sanitation	13 February 1969	3 Years	Long Island Sound Eatons Neck Dump	10	Approx. 4,850 Cub. Yds.
Dept. of Sanitation	8 July 1968	3 Years	Long Island Sound Eatons Neck Dump	10	Approx. 7,850 Cub. Yds.
Weeks Dredging & Contracting Inc. 570 North Broad St. Elizabeth, N.J. 07208	10 December 1965	3 Years	Long Island Sound Eatons Neck Dump	10	Approx. 6,500 Cub. Yds.

TABLE B

Data concerning existing permits issued since January 1, 1965
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discharging DREDGED MATERIAL into navigable waters within
or bordering any state
NEW YORK

Name & Address of Permittee (1)	Date Permit Issued-Renewal (2)	Term of Permit (3)	Name and Location of water receiving dredged material (4)	Section of Refuse Act under which Permit Issued (5)	Total quantity of material discharged under this permit (6)
Ralph W. Fox 116 Halet Avenue Port Jefferson, N.Y. 11777	29 Jan 1968	3 years	Long Island Sound Eatons Neck Dump	10	400 to 600 Cu Yds
North Shore Marine Center, Inc. West Shore Road Flower Hill, N.Y.	17 July 1968	3 years	Long Island Sound Eatons Neck Dump	10	Approx 50,000 Cu Yds (if not suitable for upland)
Dept of Public Works Suffolk County Yaphank Avenue Yaphank, N.Y.	20 August 1968	3 Years	Long Island Sound Eatons Neck Dump	10	Approx. 175,000 Cub. Yds.
Steers Sand & Gravel Corp. 17 Battery Place New York, N.Y. 10004	24 May 1966	3 Years	Long Island Sound Eatons Neck Dump	10	Approx. 30,000 Cub. Yds.

TABLE B

Data concerning existing permits issued since January 1, 1965
by the Corps of Engineers to any person for the purpose of
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or bordering any state
NEW YORK

Name & Address of Permittee (1)	Date Permit Issued-Renewal (2)	Term of Permit (3)	Name and Location of water receiving dredged material (4)	Section of Refuse Act under which Permit Issued (5)	Total quantity of material discharged under this permit (6)
Commander Third Coast Guard Dist Governors Island New York, N.Y. 10004	4 Oct 1968	3 years	Long Island Sound Eatons Neck Dump	10	Approx 1,300 Cu Yds
Commander Third Coast Guard Dist Governors Island New York, N.Y. 10004	28 Oct 1968	3 years	Long Island Sound Eatons Neck Dump	10	Approx 15,000 Cu Yds
Mr. Joseph Guastavino 691 Bridge Street City Island Bronx, N.Y. 10464	3 Nov 1965	3 years	Long Island Sound Eatons Neck Dump	10	Approx 850,Cu Yds

TABLE B

Data concerning existing permits issued since January 1, 1965 by the Corps of Engineers to any person for the purpose of discharging DREDGED MATERIAL into navigable waters within or bordering any state

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Harbor Marine & Dock Building, Inc 14 Greeley Square Glen Head, N.Y. 11545	21 March 1967	3 Years	Long Island Sound Eatons Neck Dump	10	Approx. 6,000 Cub. Yds.
Mr. H.L. Meckler 249 Kings Point Road Kings Point, N.Y. 11024	23 June 1967	3 Years	Long Island Sound Eatons Neck Dump	10	250 Cub. Yds.
Nassau County, Dept Public Works Executive Bldg. Mineola, N.Y. 11501	21 June 1967	3 Years	Long Island Sound Eatons Neck Dump	10	Maximum 70,000 Cub. Yds.
Town of North Hempstead Plandome Road Manhasset, N.Y.	28 May 1965	3 Years	Long Island Sound Eatons Neck Dump	10	6,800 Cub. Yds.
Northport Boat Yard, Inc. Route 25A Northport, N.Y. 11768	2 February 1968	3 Years	Long Island Sound Eatons Neck Dump	10	Approx. 7,500 Cub. Yds.

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Data concerning existing permits issued since January 1, 1965 by the Corps of Engineers to any person for the purpose of discharging DREDGED MATERIAL into navigable waters within or bordering any state

NEW YORK

Name & Address of Permittee (1)	Date Permit Issued-Renewal (2)	Term of Permit (3)	Name and Location of water receiving dredged material (4)	Section of Refuse Act under which Permit Issued (5)	Total quantity of material discharged under this permit (6)
Commander Oil Co. Foot of South St. Oyster, N.Y. 11771	8 December 1966	3 Years	Long Island Sound	10	Approx. 1,840 Cub. Yds.
Mr. Ralph W. Fox 116 Halet Avenue Port Jefferson, N.Y. 11777	2 August 1968	3 Years	Former Seaboard Hole at Northwest corner of Port Jefferson Harbor	10	Approx. 1,500 Cub. Yds.
Shelter Island Asso. Shelter Bay Drive Great Neck, N.Y. 11024	22 December 1967	3 Years	Long Island Sound Eatons Neck Dump	10	Approx. 3,000 Cub. Yds.

TABLE B

New York

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NEW YORK

Name & Address of Permittee (1)	Date Permit Issued-Renewal (2)	Term of Permit (3)	Name and Location of water receiving dredged material (4)	Section of Refuse Act under which Permit Issued (5)	Total quantity of material discharged under this permit (6)
City of N.Y. Economic Development Admin. Dept. Ports & Term Battery Maritime Bldg. New York, N.Y. 10004	30 December 1969	3 Years	Long Island Sound Eatons Neck Dump	10	Approx. 133,000 Cub. Yds.
N.Y. Fruit Auction Corp. c/o Praeger, Kavanagh & Waterbury 200 Park Avenue New York, N.Y. 10017	10 January 1969 30 April 1969	3 Years	Long Island Sound Eatons Neck Dump	10	Approx. 11,500 Cub. Yds.
Village of Port Chester 110 Willett Avenue Port Chester, N.Y. 10573	16 Aug 1967	3 years	Long Island Sound Stamford Dump	10	Approx 17,000 Cu Yd
Bernard & Irene Rickenback Byram Shore Road Byram, Conn. 10573	8 Mar 1967	3 years	Long Island Sound Stamford Dump	10	Approx 400 Cu Yds

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Data concerning existing permits issued since January 1, 1965 by the Corps of Engineers to any person for the purpose of discharging DREDGED MATERIAL into navigable waters within or bordering any state

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Port of N.Y. Authority 111 Eighth Avenue New York, N.Y. 10011	5 Sep 1963 19 Apr 1965 12 Aug 1965 30 Dec 1996	3 years	Long Island Sound Eatons Neck Dump	10	Approx 2,000,000 Cu Yds
Mr. Raymond Wagner 5919 71st Avenue Brooklyn, N.Y. 11227	19 Sep 1966	3 years	Long Island Sound Eatons Neck Dump	10	Approx 2,400 Cu Yds
City of New Rochelle Dept of Public Works 515 North Avenue New Rochelle, N.Y. 10801	1 Dec 1966	3 years	Long Island Sound Stamford Dump	10	Approx 2,000 Cu Yds
Dept of Public Works County of Westchester County Office Building White Plains, N.Y. 10601	24 Nov 1969	3 years	Long Island Sound Stamford Dump	10	

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Data concerning existing permits issued since January 1, 1965 by the Corps of Engineers to any person for the purpose of discharging DREDGED MATERIAL into navigable waters within or bordering any state

NEW YORK

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Larchmont Yacht Club Club Road Larchmont, N.Y. 10538	25 Mar 1970	3 years	Long Island Sound Stamford Dump	10	20,000 Cu Yds
Pirates Cove Harbor Assoc. 1030 Greacen Point Road Mamaroneck, N.Y. 10543	27 Nov 1968	3 years	Long Island Sound Stamford Dump	10	9,600 Cu Yds
Mr. Alan L. Gershbein 652 Shore Acres Drive Mamaroneck, N.Y. 10543	21 Apr 1967	3 years	Long Island Sound Stamford Dump	10	Approx 200 Cu Yds
Mr. Paul Mancuso 526 Shore Acres Drive Mamaroneck, N.Y. 10543	27 Mar 1968	3 years	Long Island Sound Stamford Dump	10	Approx 112 Cu Yds

TABLE B

Data concerning existing permits issued since January 1, 1965

by the Corps of Engineers to any person for the purpose of

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or bordering any state

NEW YORK

Name & Address of Permittee (1)	Date Permit Issued-Renewal (2)	Term of Permit (3)	Name and Location of water receiving dredged material (4)	Section of Refuse Act under which Permit Issued (5)	Total quantity of material discharged under this permit (6)
American Yacht Club Milton Point Rye, N.Y. 10580	29-May 1967	3 Years	Long Island Sound Stamford Dump	10	300 Cu Yds
Erbsland Boat Yard 568 Milton Road Rye, N.Y. 10580	11 July 1967	3 Years	Long Island Sound Stamford Dump	10	1,200 Cu Yds
Rye Fish & Game Club, Inc. 660 Milton Road Rye, N.Y. 10580	12 July 1967	3 Years	Long Island Sound Stamford Dump	10	500 Cub. Yds.
City of Rye City Hall Rye, N.Y. 10950	1 January 1966 Modified 21 April 1966	3 Years	Long Island Sound Stamford Dump	10	42,000 Cu Yds

TABLE B

Data concerning existing permits issued since January 1, 1965 by the Corps of Engineers to any person for the purpose of discharging DREDGED MATERIAL into navigable waters within or bordering any state

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Name & Address of Permittee (1)	Date Permit Issued-Renewal (2)	Term of Permit (3)	Name and Location of water receiving dredged material (4)	Section of Refuse Act under which Permit Issued (5)	Total quantity of material discharged under this permit (6)
McMichael Yacht Yard 700 Rushmore Avenue Mamaroneck, N.Y. 10543	13 Sept 1968	3 years	Long Island Sound Stamford Dump	10	Approx 500 Cu Yds
Shore Acres Point Corp Shore Acres Mamaroneck, N.Y. 10543	7 July 1966	3 years	Long Island Sound Stamford Dump	10	Approx 6,000 Cu Yds
Mr. Ernest Wilvonseder 550 Shore Acres Drive Mamaroneck, N.Y. 10543	18 May 1966	3 years	Long Island Sound Stamford Dump	10	Approx 555 Cu Yds
Beach Point Yacht Club Orienta Point Mamaroneck, N.Y. 10543	11 Dec 1969	3 years	Long Island Sound Stamford Dump	10	Approx 6,300 Cu Yds
Mr. James F. Fulton 606 The Crescent Mamaroneck, N.Y. 10543	20 Feb 1968	3 years	Long Island Sound Stamford Dump	10	Approx 2,000 Cu Yds

TABLE B

Data concerning existing permits issued since January 1, 1965
by the Corps of Engineers to any person for the purpose of
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NEW YORK

ame & Address of Permittee (1)	Date Permit Issued-Renewal (2)	Term of Permit (3)	Name and Location of water receiving dredged material (4)	Section of Refuse Act under which Permit Issued (5)	Total quantity of material discharged under this permit (6)
Mr. Fred Kern 15 Water St. New Rochelle, N.Y. 10802	30 September 1968	3 Years	Long Island Sound Stamford Dump	10	2,000 Cu Yds
Mr. Peter Lind Hayes 103 Mt. Tom Road New Rochelle, N.Y.	29 April 1966	3 Years	Long Island Sound Stamford Dump	10	680 Cu Yds
Lewis Brothers Boat Yard 90 Drake Avenue New Rochelle, N.Y. 10801	21 November 1967	3 Years	Long Island Sound Stamford Dump	10	5,000 Cu Yds
N.Y.A.C. Yacht Club Travers Island Pelham Manor, N.Y.	2 April 1965	3 Years	Long Island Sound Stamford Dump	10	9,000 Cu Yds
Board of Education City of New York 110 Livingston St. Brooklyn, N.Y. 11201	24 January 1969	3 Years	Long Island Sound Stamford Dump	10	1,000 Cu Yds

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Data concerning existing permits issued since January 1, 1965 by the Corps of Engineers to any person for the purpose of discharging DREDGED MATERIAL into navigable waters within or bordering any state

NEW YORK

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American Export Industries, Inc. 26 Broadway New York, N.Y. 10004	21 May 1969	3 Years	Atlantic Ocean Mud Dump Ground	10	Approx. 1,000,000 Cub. Yds.
Consolidated Edison Co. 4 Irving Place New York, N.Y. 10003	9 March 1967	3 Years	Atlantic Ocean Mud Dump Ground	10	Approx. 25,000 Cub. Yds.
Dept. of Sanitation City of N.Y. 125 Worth St. New York, N.Y. 10013	19 August 1969	3 Years	Atlantic Ocean Mud Dump Ground	10	Approx. 485,000 Cub. Yds.
Texas Eastern Cryogenic, Inc. P.O. Box 1612 Texas Eastern Bldg. Shreveport, La. 71102	18 July 1968	3 Years	Atlantic Ocean Mud Dump Ground	10	Approx. 5,000 Cub. Yds.

TABLE I

Data concerning existing permits issued since January 1, 1965 by the Corps of Engineers to any person for the purpose of discharging DREDGED MATERIAL into navigable waters within or bordering any state

NEW YORK

Name & Address of Permittee (1)	Date Permit Issued-Renewal (2)	Term of Permit (3)	Name and Location of water receiving dredged material (4)	Section of Refuse Act under which Permit Issued (5)	Total quantity of material discharged under this permit (6)
City of N.Y Economic Development Admin Dept of Ports & Term Battery Maritime Bldg New York, N.Y. 10004	9 January 1970	3 Years	Atlantic Ocean Mud Dump Ground	10	Approx. 167,000 Cub. Yds.
City of N.Y. Dept of Sanitation 125 Worth St. New York, N.Y. 10013	8 July 1968	3 Years	Atlantic Ocean Mud Dump Ground	10	Approx. 7,723 Cub. Yds.
N.Y. Plaza Bldg Co. 33 Whitehall St. New York, N.Y. 10004	3 May 1968	3 Years	Atlantic Ocean Mud Dump Ground	10	Approx. 1,200 Cub. Yds.

TABLE B

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The Arundel Corp. 334 Furman St. Brooklyn, N.Y. 11201	29 April 1966	3 Years	Atlantic Ocean Mud Dump Ground	10	Approx. 200,000 Cub. Yds.
City of New York Economic Devel Admin Dept. of Ports & Term Battery Maritime Bldg. New York, N.Y. 10004	6 November 1969	3 Years	Atlantic Ocean Mud Dump Ground	10	Approx. 60,000 Cub. Yds.
Dept. of Public Works City of N.Y. Municipal Bldg. New York, N.Y. 10007	6 July 1965	3 Years	Atlantic Ocean Mud Dump Ground	10	Approx. 100,000 Cub. Yds.
The Port of N.Y. Authority 111 Eighth St. New York, N.Y. 10011	21 December 1966	3 Years	Atlantic Ocean Mud Dump Ground	10	Approx. 250,000 Cub. Yds.

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Data concerning existing permits issued since January 1, 1965 by the Corps of Engineers to any person for the purpose of discharging DREDGED MATERIAL into navigable waters within or bordering any state

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Dept. of Public Works Suffolk County Yaphank, N.Y. 11980	16 June 1969	3 Years	Atlantic Ocean at Great South Beach	10	75,000 Cubic Yds.
Dept. of Public Works Suffolk County	31 March 1969	3 Years	Atlantic Ocean at Great South Beach	10	187,394 Cubic Yds.
Dept. of Public Works Suffolk County	27 December 1967	3 Years	Atlantic Ocean at Great South Beach	10	(Combined Total)
Dept. of Public Works Suffolk County	3 May 1967	3 Years	Atlantic Ocean Beach East of Moriches Inlet	10	135,773 Cubic Yds.
Dept. of Public Works Suffolk County	19 December 1966	3 Years	Atlantic Ocean at Great South Beach	10	293,318 Cubic Yds.
Dept. of Public Works Suffolk County	8 August 1966	3 Years	Atlantic Ocean Beach East of Moriches Inlet	10	135,338 Cubic Yds.

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NEW YORK

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Dept. of Public Works Suffolk County Yaphank, N.Y. 11980	16 December 1965 3 May 1967	3 Years	Atlantic Ocean East of Moriches Inlet	10	Approx. 420,000 Cub. Yds
Dept of Sanitation City of New York 125 Worth St. New York, N.Y. 10013	12 February 1969	3 Years	Atlantic Ocean Mud Dump Grounds	10	Approx. 5,000 Cub. Yds.

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Data concerning existing permits issued since January 1, 1965
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NEW YORK

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The Port of NY Authority 111 Eighth Avenue New York, N.Y. 10011	10 April 1968	3 years	Atlantic Ocean Mud Dump Ground	10	Approx 4,000 Cu. Yds
Commanding Officer NY Coast Guard Base Governors Island New York, N.Y. 10004	25 April 1966	3 years	Atlantic Ocean Mud Dump Ground	10	Approx 400,000 Cu Yds
Commander Third Coast Guard District Governors Island New York, N.Y. 10004	8 Dec 1965	3 years	Atlantic Ocean Mud Dump Ground	10	Approx 22,000 Cu Yds
Dept of Sanitation City of New York 125 Worth Street New York, N.Y. 10013	13 April 1965	3 years	Atlantic Ocean Mud Dump Ground	10	Approx 6,000 Cu Yds

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Data concerning existing permits issued since January 1, 1965
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Dept of Sanitation City of New York 125 Worth Street New York, N.Y. 10013	13 April 1965	3 years	Atlantic Ocean Mud Dump Ground	10	Approx 6,000 Cu Yds
City of New York Dept of Ports & Terminals Battery Marit me Bldg. New York, N.Y 10004	23 Jan 1970	3 years	Atlantic Ocean Mud Dump Ground	10	Approx 945,000 Cu Yds
Dept of Public Works Suffolk County Yaphank Avenue Yaphank, N.Y. 11980	8 December 1967	3 Years	Atlantic Ocean offshore low water line at Westhampton, N.Y.	10	16,000 Cubic Yds.
Dept of Public Works Suffolk County Yaphank Avenue Yaphank, N.Y. 11980	19 December 1967	3 Years	Atlantic Ocean offshore low water line at Westhampton, N.Y.	10	114,000 Cubic Yds.

TABLE B
NEW YORK

Data concerning existing permits issued since January 1, 1965 by the Corps of Engineers to any person for the purpose of discharging DREDGED MATERIAL into navigable waters within or bordering any state

NEW YORK

Name & Address of Permittee (1)	Date Permit Issued-Renewal (2)	Term of Permit (3)	Name and Location of water receiving dredged material (4)	Section of Refuse Act under which Permit Issued (5)	Total quantity of material discharged under this permit (6)
St. Lawrence Seaway Development Corp. Seaway Circle Massena, New York	6-11-65	12-31-68	St. Lawrence River	10	43,990 cy
Commissioner of Public Works City of Buffalo, 202 City Hall Buffalo, New York	7-27-65	12-31-68	Lake Erie	10	9,657 cy
Niagara Frontier State Pk Comm. Niagara Falls, New York	11-4-65	12-31-68	Lake Ontario	10	28,750 cy.
Town of Irondequoit 1280 Titus Avenue Rochester, New York	6-27-66	12-31-69	Lake Ontario	10	0 (a)
Town of Webster 1000 Ridge Road East Webster, New York	7-6-66	12-31-69	Lake Ontario	10	0 (a)
County of Onondaga Water Auth. Syracuse, New York	2-15-66	12-31-69	Lake Ontario	10	0 (a)
Rochester Portland Cement Corp. 361 Bozart Street Rochester, New York	4-18-67	12-31-70	Lake Ontario	10	3,900 cy

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Data concerning existing permits issued since January 1, 1965

NEW YORK

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Arthur Hayes RD.#1, East Lake Road Huron, Ohio	6-21-67	12-31-70	Lake Ontario	10	1,000 (b) cy
City of Dunkirk Dunkirk, New York	2-11-69	12-31-72	Lake Erie	10	0 (c)
City of Rochester Rochester, New York	5-6-69	12-31-72	Lake Ontario	10	0 (c)
James McHugh Construction Co. 5449 South Park Ave. Chicago, Illinois	7-20-67	12-31-70	Lake Ontario	10	0

(a) Permit authorized the disposal on the established dumping ground, of excess excavated material from an outfall pipeline. Outfall completed; use of the lake dump not required.
(b) Permit authorized disposal of material at the shoreline for beach building. This generally is sand that has shoaled and closed the channel.
(c) Permit authorized the disposal on the established dumping ground, of excess excavated material from an outfall pipeline. Material generally rock. Lake dump not used to date.

TABLE II

Data concerning existing permits issued since January 1, 1965 by the Corps of Engineers to any person for the purpose of discharging DREDGED MATERIAL into navigable waters within or bordering any state

NORTH CAROLINA

Name & Address of Permittee (1)	Date Permit Issued-Renewal (2)	Term of Permit (3)	Name and Location of water receiving dredged material (4)	Section of 1899 Act under which Permit Issued (5)	Total quantity of material discharged under this permit (6)
N. C. State Highway Commission, Raleigh, N. C.	16 Mar 65	31 Dec 68	Cape Fear River at Federal Point in New Hanover County, N. C.	10	100,000 c.y.
N. C. State Ports Authority, Wilmington, N. C.	29 Mar 65	31 Dec 68	Newport River at Morehead City, N. C.	10	450,000 c.y.
Duke University, Durham, N. C.	17 Aug 65	31 Dec 68	Beaufort Harbor at Pivers Island near Beaufort, N. C.	10	25,300 c.y.
N. C. State Highway Commission, Raleigh, N.C.	15 Oct 65	31 Dec 68	Pamlico River near Bath, N. C., and Aurora, N. C.	10	115,000 c.y.
Texas Gulf Sulphur Company, Aurora, N. C.	7 Jan 66	31 Dec 69	Pamlico River near Aurora, N. C.	10	400,000 c.y.
U. S. Dept. of Interior, Nat'l Park Service, Philadelphia, Pa.	26 Apr 66	31 Dec 69	Atlantic Ocean Shoreline near Buxton in Dare County, N. C.	10	115,000 c.y.
U. S. Dept. of Interior, Fish & Wildlife Service, St. Petersburg Beach, Fla.	15 Sep 66	31 Dec 69	Beaufort Harbor at Pivers Island near Beaufort, N. C.	10	28,000 c.y.
Redevelopment Commission of the City of Washington, Washington, N. C.	12 Dec 66	31 Dec 69	Pamlico River along the Shoreline at Washington, N. C.	10	50,000 c.y.

TABLE 3

NORTH CAROLINA (Cont'd)

Name & Address of Permittee (1)	Date Permit Issued-Renewal (2)	Term of Permit (3)	Name and Location of water receiving dredged material (4)	Section of 1899 Act under which Permit Issued (5)	Total quantity of material discharged under this permit (6)
N. C. State Highway Commission, Raleigh, N. C.	17 Jan 67	31 Dec 70	Cape Fear River at Federal Point In New Hanover County, N. C.	10	68,700 c.y.
Georgia Timberlands, Inc., Engelhard, N. C.	15 Mar 67	31 Dec 70	Alligator River in Hyde County, N. C.	10	126,000 c.y.
Town of Sunset Beach, Sunset Beach, N. C.	19 Sep 67	31 Dec 70	Tubbs Inlet in Brunswick County, N. C.	10	750,000 c.y.
U. S. Dept. of Interior, Nat'l Park Service, Philadelphia, Pa.	7 Mar 68	31 Dec 71	Atlantic Ocean Shoreline at Cape Hatteras in Dare County, N. C.	10	550,000 c.y.
Dare County Board of Commissioners, Manteo, N. C.	15 Mar 68	31 Dec 71	Kitty Hawk Bay and Roanoke Sound in Dare County, N. C.	10	800 c.y.
N. C. State Highway Commission, Raleigh, N. C.	26 Mar 68	31 Dec 71	The Straits, at Harkers Island in Carteret County, N. C.	10	200,000 c.y.
N. C. State Ports Authority, Wilmington, N. C.	21 Jun 68	31 Dec 71	Brunswick River in Brunswick County, N. C.	10	65,000 c.y.
Redevelopment Commission of the City of Washington, Washington, N. C.	2 Aug 68	31 Dec 71	Pamlico River along Shoreline at Washington, N. C.	10	92,000 c.y.
Island Development Corp., Box 738, Wilmington, N. C.	28 Jan 69	31 Dec 72	Middle Sound at Figure Eight Island in New Hanover County, N. C.	10	50,000 c.y.

Name & Address of Permittee (1)	Date Permit Issued-Renewal (2)	Term of Permit (3)	Name and Location of water receiving dredged material (4)	Section of 1899 Act under which Permit Issued (5)	Total quantity of material discharged under this permit (6)
United Methodist Board of Education, Inc., Box 10957, Raleigh, N. C.	10 Dec 69	31 Dec 72	Neuse River along Shoreline at Camp Don-Lee in Pamlico County, N. C.	10	30,000 c.y.
Pungo District Hospital Corp., Belhaven, N. C.	9 Jan 70	31 Dec 73	Pantego Creek at Belhaven, N. C.	10	4,000 c.y.
James C. Fox, 16 N. 5th Ave., Wilmington, N. C.	13 Jan 70	31 Dec 73	Bradley Creek near Wrightsville Beach in New Hanover County, N. C.	10	600 c.y.
Town of Topsail Beach, Topsail Beach, N. C.	14 Jan 70	31 Dec 73	Topsail Sound between Mainland and Topsail Beach, N. C.	10	50,000 c.y.
Redevelopment Commission of the City of New Bern, New Bern, N. C.	16 Jan 70	31 Dec 73	Trent River at New Bern, N. C.	10	150,000 c.y.
Coastal Boat Works & Marina, Inc., Morehead City, N. C.	25 Mar 70	31 Dec 73	Calico Creek at Morehead City, N. C.	10	10,000 c.y.

TABLE B

Data concerning existing permits issued since January 1, 1965 by the Corps of Engineers to any person for the purpose of discharging DREDGED MATERIAL into navigable waters within or bordering any state

NORTH DAKOTA

Name & Address of Permittee	Date Permit Issued-Renewal	Term of Permit	Name and Location of water receiving dredged material	Section of Refuse Act under which Permit Issued	Total quantity of material discharged under this permit
(1)	(2)	(3)	(4)	(5)	(6)
NONE					

TABLE B

OHIO

* Verified by inspection reports
** Amount authorized - no record of Quantity Dredged

Data concerning existing permits issued since January 1, 1965 by the Corps of Engineers to any person for the purpose of discharging DREDGED MATERIAL into navigable waters within or bordering any state

OHIO

Name & Address of Permittee (1)	Date Permit Issued-Renewal (2)	Term of Permit (3)	Name and Location of water receiving dredged material (4)	Section of Refuse Act under which Permit Issued (5)	Total quantity of material discharged under this permit (6)
Great Lakes Dredge & Dock Co. 1630 Williamson Bldg. Cleveland, Ohio	1-7-66	12-31-69	Lake Erie	10	0
Chagrin Lagoons Yacht Club Eastlake, Ohio	9-21-65	12-31-68	Lake Erie	10	7,000 (est.) (a) c.y.
Pittsburgh & Conneaut Dock Co., Conneaut, Ohio	10-28-65	12-31-68	Lake Erie	10	74,233 c.y.
Cleveland Yachting Club, Inc. Rocky River, Ohio	5-23-66	12-31-69	Lake Erie	10	2,778 (a) c.y.
City of Eastlake Eastlake, Ohio	5-31-66	12-31-69	Lake Erie	10	7,400 (a) "
Dunbar & Sullivan 1648 Standard Bldg. Cleveland, Ohio	6-15-66	12-31-69	Lake Erie	10	79,070 "
Great Lakes Dredge & Dock Co. 1630 Williamson Bldg. Cleveland, Ohio	1-7-66	12-31-69	Lake Erie	10	195,819 "
Dunbar & Sullivan Dredging Co. 1648 Standard Bldg. Cleveland, Ohio	10-10-68	12-31-71	Lake Erie	10	7,000 (Clean sand c.y. gravel from cellular cofferdam

TABLE B
OHIO

* Verified by inspection reports
** Amount authorized - no record of Quantity Dredged

Data concerning existing permits issued since January 1, 1965 by the Corps of Engineers to any person for the purpose of discharging DREDGED MATERIAL into navigable waters within or bordering any state

OHIO

Name & Address of Permittee (1)	Date Permit Issued-Renewal (2)	Term of Permit (3)	Name and Location of water receiving dredged material (4)	Section of Refuse Act under which Permit Issued (5)	Total quantity of material discharged under this permit (6)
Great Lakes Dredge & Dock Co. 1630 Williamson Bldg. Cleveland, Ohio	3-17-67	12-31-70	Lake Erie	10	0
Erie Marine, Inc. (Litton)	6-12-68	12-31-71	Lake Erie	10	0 (b)
Great Lakes Dredge & Dock Co. 1630 Williamson Bldg. Cleveland, Ohio	12-2-68	12-31-68	Lake Erie	10	3,852 (c) c.y.
Baltimore & Ohio Railroad Co. Chesapeake & Ohio Bldg. Huntington, West Virginia	1-29-69	9-30-69	Lake Erie	10	40,150 (c) c.y.
Ashland Oil Ashland, Kentucky	5-24-65	2	Behind Harbor Line in Maumee River	10	** 7,500 "
Gulf Oil Co., P.O. Box 1023 Toledo, Ohio	10-11-65	2	Behind Harbor Line in Maumee River	10	* 8,975 "
Department of Natural Resources 910 Ohio Dept Bldg. Columbus, Ohio	9-6-66	3	Lake Erie (East Harbor)	10	* 5,000 "
Department of Natural Resources 910 Ohio Dept Bldg. Columbus, Ohio	8-22-66	2	Lake Erie (Waterway)	10	** 137,000 "

(a) Permit authorized disposal of material at the shoreline for beach building. This generally is sand that has shoaled and closed the channel.
(b) Permit authorized disposal of 60,000 c.yds. of rock on the established dumping ground in Lake Erie and 30,000 c.yds. of overburden on upland property. Permittee however, placed all material on upland property above high water.
(c) Permit authorized one time dredging only following discussions between the Secretaries of the Army and Interior

TABLE B

Data concerning existing permits issued since January 1, 1965
by the Corps of Engineers to any person for the purpose of
discharging DREDGED MATERIAL into navigable waters within
or bordering any state

OKLAHOMA

Name & Address of Permittee (1)	Date Permit Issued-Renewal (2)	Term of Permit (3)	Name and Location of water receiving dredged material (4)	Section of Refuse Act under which Permit Issued (5)	Total quantity of material discharged under this permit (6)
NONE					

TABLE B

Data concerning existing permits issued since January 1, 1965 by the Corps of Engineers to any person for the purpose of discharging DREDGED MATERIAL into navigable waters within or bordering any state

OREGON

OREGON

Name & Address of Permittee (1)	Date Permit Issued-Renewal (2)	Term of Permit (3)	Name and Location of water receiving dredged material (4)	Section of Refuse Act under which Permit Issued (5)	Total quantity of material discharged under this permit (6)
Rogue River Mail Boat Service Box 1165 Gold Beach, Oreg. 97444	9 April 1968	31 Dec 1971	Rogue River South Oregon Coast	R & H Section 10	Unknown
Port of Astoria P. O. Box 569 Astoria, Oreg. 97103	18 March 1970	31 Dec 1970	Youngs Bay, Oreg. (Lower Columbia River)	"	75,000 C.Y.

TABLE B
PENNSYLVANIA

Data concerning existing permits issued since January 1, 1965
by the Corps of Engineers to any person for the purpose of
discharging DREDGED MATERIAL into navigable waters within
or bordering any state
PENNSYLVANIA

Name & Address of Permittee (1)	Date Permit Issued-Renewal (2)	Term of Permit (3)	Name and Location of water receiving dredged material (4)	Section of Refuse Act under which Permit Issued (5)	Total quantity of material discharged under this permit (6)
Esco Dredge & Fill Corp. Foot of Sassafras St. Erie, Pennsylvania	1-11-65	12-31-68	Lake Erie	10	13,075 c.y.
Esco Dredge & Fill Corp. Foot of Sassafras St. Erie, Pennsylvania	1-12-65	12-31-68	Lake Erie	10	0
Port Commission - City of Erie 507 Municipal Bldg. Erie, Pennsylvania	7-15-66	12-31-69	Lake Erie	10	5,471 c.y.
Bessemer & Lake Erie RR Co. Greenville, Pennsylvania	4-7-67	12-31-70	Lake Erie	10	18,223 "
Esco Dredge & Fill Corp. Foot of Sassafras St. Erie, Pennsylvania	4-28-67	12-31-70	Lake Erie	10	1,935 "
" " " "	5-29-67	12-31-70	Lake Erie	10	0
" " " "	5-28-69	12-31-70	Lake Erie	10	0. (a)
Commonwealth of Pennsylvania Dept. of Forests and Waters P.O. Box 1467, Harrisburg, Pa.	10-2-69	12-31-72	Lake Erie	10	30,000 (b) c.y.

(a) This entry is a revalidation of a permit issued 4-28-67 (Item 20) and authorized the disposal of non-polluted material on the established dump ground. Polluted material placed on upland property above high water.

(b) Beach disposal of material at the shoreline for beach building. This generally is sand that has shoaled and closed the channel.

TABLE B

Pennsylvania

Data concerning existing permits issued since January 1, 1965 by the Corps of Engineers to any person for the purpose of discharging DREDGED MATERIAL into navigable waters within or bordering any state

PENNSYLVANIA

Name & Address of Permittee (1)	Date Permit Issued-Renewal (2)	Term of Permit (3)	Name and Location of water receiving dredged material (4)	Section of Refuse Act under which Permit Issued (5)	Total quantity of material discharged under this permit (6)
American Dredging Co. 12 South 12th Street Phila., Pa. 19107	Issued 7/11/69 Revised 1/12/70	Expires 12/31/72	Rehandling Basin, Delaware R., Walt Whitman Bridge, Phila., Pa.	10	50,000 cy
Del. River & Bay Authority Delaware Memorial Bridge New Castle, Del.	Issued 5/8/68	Expires 12/31/71	Disposal Area, Delaware Bay, Crow Shoal Channel	"	300,000 cy
American Dredging Co. 12 South 12th Street Phila., Pa. 19107	Issued 5/3/68 Revised 7/18/68	Expires 12/31/71	2 Rehandling Basins, Delaware R., Essington, Pa., Delaware Co.	"	4,250,000 cy

SECTION B

Data concerning existing permits issued since January 1, 1965 by the Corps of Engineers to any person for the purpose of discharging DREDGED MATERIAL into navigable waters within or bordering any state

PUERTO RICO & VIRGIN ISLANDS

Name & Address of Permittee (1)	Date Permit Issued-Renewal (2)	Term of Permit (3)	Name and Location of water receiving dredged material (4)	Section of 1899 Act under which Permit Issued (5)	Total quantity of material discharged under this permit Cu. Yd. (5)
Texaco Petro. Industries, Inc. P. O. Box 5212 Puerto de Tierra Sta. San Juan, P. R.	4-15-65	3 years	Bahia de Guayanilla at Guayanilla, P.R.	10	333,000
U. S. Navy Area Public Works Office U. S. Naval Station San Juan, P. R.	4-21-65	3 years	Vieques Passage, Vieques, P. R.	10	500,000
Hess Oil Virgin Islands Corp. Kings Hill Estate Hope St. Croix, V. I.	11-24-65	3 years	Approx. 3 miles from St. Croix, V.I. Atlantic Ocean	10	1,250,000
Puerto Rico Ports Auth. P. O. Box 3508 San Juan, P. R.	1-7-66	3 years	San Antonio Channel, San Juan Harbor, P.R.	10	17,000
Puerto Rico Ports Auth. P. O. Box 3508 San Juan, P. R. 00902	Mod.& Ext. 1-19-68	3 years	Atlantic Ocean, Approx. 1 mile north of San Juan, Puerto Rico	10	11,500
Puerto Rico Ports Authority P. O. Box 3508 San Juan, P. R.	3-26-68	3 years	Atlantic Ocean, 1 mile north of San Juan, Puerto Rico	10	3,800

TABLE B

Data concerning existing permits issued since January 1, 1965 by the Corps of Engineers to any person for the purpose of discharging DREDGED MATERIAL into navigable waters within or bordering any state

RHODE ISLAND

Name & Address of Permittee (1)	Date Permit Issued-Renewal (2)	Term of Permit (3)	Name and Location of water receiving dredged material (4)	Section of Refuse Act under which Permit Issued (5)	Total quantity of material discharged under this permit (6)
Commanding Officer U.S. Navy Public Works Center, File # D-10/ CRW:jpb Melville Station Portsmouth, R.I.	2 Nov 65	3 yrs.	Narragansett Bay	Section 10 of River & Harbor Act of March 3, 1899	6,100 cu. yds.
Providence Gas Co. 100 Weybosset St. Providence, R.I.	1 Nov 65	3 yrs.	Narragansett Bay	"	1,500 cu. yds.
Perini Corp. c/o Mr. C.A. Richardson Vice-President Framingham, Mass.	16 Feb 66	3 yrs.	Narragansett Bay	"	80,000 cu. yds.
Federal Project Providence River, R.I.	16 Aug 67	3 yrs.	Gulf of Rhode Island	"	3,780,000 cu. yds.
Interstate Navigation Block Island, R.I.	2 Dec 69	3 yrs.	Block Island Sound	"	14,000 cu. yds.

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TABLE I

Data concerning existing permits issued since January 1, 1965 by the Corps of Engineers to any person for the purpose of discharging DREDGED MATERIAL into navigable waters within or bordering any state

SOUTH CAROLINA

Name & Address of Permittee (1)	Date Permit Issued-Renewal (2)	Term of Permit (3)	Name and Location of water receiving dredged material (4)	Section of 1899 Act under which Permit Issued (5)	Total quantity of material discharged under this permit (6)

No Permits Issued.

TABLE B

Data concerning existing permits issued since January 1, 1965
by the Corps of Engineers to any person for the purpose of
discharging DREDGED MATERIAL into navigable waters within
or bordering any state

SOUTH DAKOTA

me & Address of Permittee (1)	Date Permit Issued-Renewal (2)	Term of Permit (3)	Name and Location of water receiving dredged material (4)	Section of Refuse Act under which Permit Issued (5)	Total quantity of material discharged under this permit (6)

N O N E

TABLE-B

DIVISION - OHIO RIVER

DISTRICT - NASHVILLE

STATE - TENNESSEE

Data concerning existing permits issued since January 1, 1965 by the Corps of Engineers to any person for the purpose of discharging DREDGED MATERIAL into navigable waters within or bordering any state

TENNESSEE

Name & Address of Permittee (1)	Date Permit Issued-Renewal (2)	Term of Permit (3)	Name and Location of water receiving dredged material (4)	Section of Refuse Act under which Permit Issued (5)	Total quantity of material discharged under this permit (6)
Tenn. Dept. of Conservation 701 West End Avenue Nashville, Tenn. 37203	5 December 69	3-year	Tenn. River Mile 207.5	10	100,000 c. y.
Volunteer Army Ammunition Plant Hamilton County Chattanooga, Tenn. 37393	16 August 67	3-year	Tenn. River Mile 477.3	10	5,300 c. y.

TEXAS

Data concerning existing permits issued since January 1, 1965
by the Corps of Engineers to any person for the purpose of
discharging DREDGED MATERIAL into navigable waters within
or bordering any state
TEXAS

Name & Address of Permittee	Date Permit Issued-Renewal	Term of Permit	Name and Location of water receiving dredged material	Section of Refuse Act under which Permit Issued	Total quantity of material discharged under this permit
(1)	(2)	(3)	(4)	(5)	(6)
Heldenfels Brothers P. O. Box 1917 Corpus Christi, Tex 78403	11 Jan 65	31 Dec 68	Copano Bay, 9 mi NW fr Rockport, Tex	Sec 10, R & H Act of 3 Mar 1899	175,000 cu yd
Standard Oil Company of Texas Division of Chevron Oil Company P. O. Box 66247, Fairview Station Houston, Tex 77006	2 Apr 65 23 Oct 68	31 Dec 71	Galveston Bay, 6 mi E fr Seabrook, Tex	"	No dredging performed
Texas Parks and Wildlife Department John H. Reagan Bldg Austin, Tex 78701	28 Jan 65	31 Dec 68	Galveston Bay, at Seabrook, Tex	"	4,122 cu yd
Southwestern Oil & Refining Company P. O. Drawer 809 Corpus Christi, Tex 78403	23 Mar 65 28 Mar 68	31 Dec 71	Port Aransas - Corpus Christi Waterway, 2 mi NW fr Corpus Christi, Tex	"	53,333 cu yd
Standard Oil Company of Texas Division of Chevron Oil Company P. O. Box 66247, Fairview Station Houston, Texas 77006	5 Apr 65 21 Oct 68	31 Dec 71	Aransas Bay, 7 mi E fr Aransas Pass, Tex	"	21,352 cu yd

TABLE B

Data concerning existing permits issued since January 1, 1965
by the Corps of Engineers to any person for the purpose of
discharging DREDGED MATERIAL into navigable waters within
or bordering any state
TEXAS

Name & Address of Permittee	Date Permit Issued-Renewal	Term of Permit	Name and Location of water receiving dredged material	Section of Refuse Act under which Permit Issued	Total quantity of material discharged under this permit
(1)	(2)	(3)	(4)	(5)	(6)
Humble Oil & Refining Company P. O. Box 2180 Houston, Tex 77001	9 Mar 65 21 Oct 68	31 Dec 71	San Antonio, Shoalwater and Espiritu Santo Bays, 8 mi SE fr Seabrook, Tex	Sec 10 of R & H Act of 3 Mar 1899	158,542 cu yd
Humble Oil & Refining Company P. O. Box 2180 Houston, Tex 77001	10 Mar 65	31 Dec 68	West Bay, 4½ mi SE fr La Marque, Tex	"	62,907 cu yd
Gordon Street, Inc. P. O. Box 13204 Houston, Tex 77019	9 Apr 65	31 Dec 68	Laguna Madre, 7 mi N fr Port Isabel, Tex	"	66,815 cu yd
Humble Oil & Refining Company P. O. Box 2180 Houston, Texas 77001	22 Mar 65	31 Dec 68	Nueces Bay, 6 mi NW fr Corpus Christi, Tex	"	16,667 cu yd
Andrau, Hada & Davis 909 Bank of the Southwest Houston, Tex 77002	29 Mar 65	31 Dec 68	Lavaca Bay, 7 mi N fr Port Lavaca, Tex	"	No dredging performed
Gordon Street, Inc. P. O. Box 13204 Houston, Tex 77019	9 Apr 65	31 Dec 68	Laguna Madre, 6½ mi N fr Port Isabel, Tex	"	No dredging performed

TABLE D

Data concerning existing permits issued since January 1, 1965
by the Corps of Engineers to any person for the purpose of
discharging DREDGED MATERIAL into navigable waters within
or bordering any state
TEXAS

Name & Address of Permittee	Date Permit Issued-Renewal	Term of Permit	Name and Location of water receiving dredged material	Section of Refuse Act under which Permit Issued	Total quantity of material discharged under this permit
(1)	(2)	(3)	(4)	(5)	(6)
Coastal States Gas Producing Company P. O. Box 521 Corpus Christi, Tex 78403	28 May 65 28 Jan 69	31 Dec 71	St Charles Bay, 12 mi N fr Fulton, Tex	Sec 10, R & H Act of 3 Mar 1899	5,883 cu yd
The Timewealth Corporation 800 Sheraton-Lincoln Center Houston, Tex 77002	3 Sep 65	31 Dec 68	West Bay, 5½ mi W fr Galveston, Tex	"	50,000 cu yd
Mobil Oil Corporation P. O. Box 2448 Corpus Christi, Tex 78403	11 Oct 65	31 Dec 68	Baffin Bay, 30 mi SE fr Kingsville, Tex	"	No dredging performed
Port Arthur Chamber of Commerce P. O. Box 650 Port Arthur, Tex 77641	24 Jun 65	31 Dec 68	Sabine Lake at Port Arthur, Tex	"	1,111 cu yd
Heldenfels Brothers P. O. Box 1917 Corpus Christi, Tex 78403	7 Sep 65	31 Dec 68	Aransas and St Charles Bays, 1½ mi E fr Lamar, Tex	"	No dredging performed
Southern Minerals Corporation P. O. Box 716 Corpus Christi, Tex 78403	15 Jul 65	31 Dec 68	Copano Bay, 10 mi NW fr Rockport, Tex	"	No dredging performed

TABLE B

Data concerning existing permits issued since January 1, 1965
by the Corps of Engineers to any person for the purpose of
discharging DREDGED MATERIAL into navigable waters within
or bordering any state

TEXAS

Name & Address of Permittee	Date Permit Issued-Renewal	Term of Permit	Name and Location of water receiving dredged material	Section of Refuse Act under which Permit Issued	Total quantity of material discharged under this permit
(1)	(2)	(3)	(4)	(5)	(6)
Cities Service Oil Co. Bartlesville, Oklahoma 74003	19 Aug 65	31 Dec 68	Corpus Christi Bay, 6 mi NE fr Corpus Christi, Tex	Sec 10, R & H Act of 3 Mar 1899	No dredging performed
Mobil Oil Corp P. O. Box 2448 Corpus Christi, Tex 78403	20 Sept 65 14 Nov 68	31 Dec 71	Laguna Madre, 29 mi NE fr Raymondville, Tex	"	No dredging performed
Gulf Oil Corp P. O. Drawer 1453 Victoria, Tex 77901	17 Sept 65	31 Dec 68	Laguna Madre, 29 mi NE fr Raymondville, Tex	"	75,055 cu yd
City of Port Isabel City Hall Port Isabel, Tex 78578	1 Sept 65	31 Dec 68	Laguna Madre, at Port Isabel, Tex	"	7,000 cu yd
Mr. George J. Raymond Port Isabel, Tex 78578	1 Sept 65	31 Dec 68	Laguna Madre, at Port Isabel, Tex	"	4,200 cu yd
B & A Inc. P. O. Box 245 Port Isabel, Tex 78578	16 Aug 65	31 Dec 68	Laguna Madre, at Port Isabel, Tex	"	5,000 cu yd
Mr. M. L. Scott Katy, Tex 77450	17 Aug 65	31 Dec 68	In Bayou near Sargent, Tex	"	50,000 cu yd

TABLE B

Data concerning existing permits issued since January 1, 1965
by the Corps of Engineers to any person for the purpose of
discharging DREDGED MATERIAL into navigable waters within
or bordering any state
TEXAS

Name & Address of Permittee	Date Permit Issued-Renewal	Term of Permit	Name and Location of water receiving dredged material	Section of Refuse Act under which Permit Issued	Total quantity of material discharged under this permit
(1)	(2)	(3)	(4)	(5)	(6)
Phillips Petroleum Co. P. O. Box 1381 Corpus Christi, Tex 78403	11 Oct 65	31 Dec 68	Laguna Madre, 17 mi N fr Port Isabel, Tex	Sec 10, R & H Act of 3 Mar 1899	No dredging performed
Phillips Petroleum Co. P. O. Box 1381 Corpus Christi, Tex 78403	25 Oct 65 29 Oct 68	31 Dec 71	Aransas Bay, 4 mi E fr Fulton, Tex	"	No dredging performed
Texas Crude Oil Co. First City National Bank Building Houston, Tex 77002	2 Sept 65	31 Dec 66	Espiritu Santo Bay, 10½ mi SW fr Port O'Connor, Tex	"	No dredging performed
Marine Mart Inc. P. O. Box 296 Port Isabel, Tex 78578	5 Oct 65 8 Oct 68	31 Dec 71	Laguna Madre, at Port Isabel, Tex	"	4,100 cu yd
Aluminum Company of America Point Comfort, Tex 77978	4 Oct 65	31 Dec 68	Lavaca Bay, at Point Comfort, Tex	"	18,333 cu yd
Mr. J. P. Owen P. O. Box 51288 Lafayette, Louisiana 70501	24 Sept 65	31 Dec 67	Cox and Lavaca Bays, 7½ mi E fr Port Lavaca, Tex	"	No dredging performed

TABLE B

Data concerning existing permits issued since January 1, 1965 by the Corps of Engineers to any person for the purpose of discharging DREDGED MATERIAL into navigable waters within or bordering any state

TEXAS

Name & Address of Permittee	Date Permit Issued-Renewal	Term of Permit	Name and Location of water receiving dredged material	Section of Refuse Act under which Permit Issued	Total quantity of material discharged under this permit
(1)	(2)	(3)	(4)	(5)	(6)
Apache Corp. 2000 Wilco Bldg Midland, Tex 79704	9 Nov 65	31 Dec 68	Nueces Bay, 7½ mi NE fr Corpus Christi, Tex	Sec 10, R & H Act of 3 Mar 1899	No dredging performed
William Herbert Hunt Trust Estate 1401 Elm Dallas, Tex 75202	1 Dec 65 29 Oct 68	31 Dec 71	Copano Bay and Swan Lake, 8 mi W fr Fulton, Tex	"	No dredging performed
Aluminum Company of America Point Comfort, Tex 77978	1 Nov 65	31 Dec 65	Lavaca Bay, at Point Comfort, Tex	"	31,111 cu yd
Phillips Petroleum Company P. O. Box 1381 Corpus Christi, Tex 78403	8 Oct 65	31 Dec 68	Laguna Madre, 14 mi N fr Port Isabel, Tex	"	51,846 cu yd
Associated Oil & Gas Exploration, Inc. P. O. Box 66465 Houston, Tex 77006	29 Nov 65	31 Dec 68	Trinity Bay, 5½ mi W fr Anahuac, Tex	"	No dredging performed
Mr. Robert F. Rcloff Port Isabel, Tex 78578	29 Oct 65	31 Dec 68	Laguna Madre, 5½ mi NW fr Port Isabel, Tex	"	3,300 cu yd

TABLE B

Data concerning existing permits issued since January 1, 1965
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TEXAS

Name & Address of Permittee	Date Permit Issued-Renewal	Term of Permit	Name and Location of water receiving dredged material	Section of Refuse Act under which Permit Issued	Total quantity of material discharged under this permit
(1)	(2)	(3)	(4)	(5)	(6)
Lone Star Producing Company P. O. Drawer L Pleasanton, Tex 78064	7 Dec 65	31 Dec 68	Laguna Madre, 15 mi SE fr Corpus Christi, Tex	Sec 10, R & H	66,111 cu yd
Lone Star Producing Company P. O. Drawer L Pleasanton, Tex 78064	23 Dec 65	31 Dec 68	Laguna Madre, 15 mi SE fr Corpus Christi, Tex	"	No dredging performed
Mr. Robert Mosbacher 602 Bank of Commerce Building Houston, Tex 77002	15 Dec 65	31 Dec 68	Lavaca Bay, 1 mi SE fr Port Lavaca, Tex	"	No dredging performed
Lone Star Producing Company P. O. Drawer L Pleasanton, Tex 78064	23 Dec 65	31 Dec 68	Matagorda Bay, 11 mi SE fr Port Lavaca, Tex	"	No dredging performed

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Data concerning existing permits issued since January 1, 1965
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Name & Address of Permittee	Date Permit Issued-Renewal	Term of Permit	Name and Location of water receiving dredged material	Section of Refuse Act under which Permit Issued	Total quantity of material discharged under this permit
(1)	(2)	(3)	(4)	(5)	(6)
Tenneco Oil Company P. O. Box 1011 Corpus Christi, Tex 78403	9 Feb 66	31 Dec 68	St Charles Bay, 11½ mi NE fr Rockport, Tex	Sec 10, R & H Act of 3 Mar 1899	No dredging performed
Brazos Oil and Gas Company Div of The Dow Chemical Company P. O. Box 22468 Houston, Tex 77027	7 Feb 66	31 Dec 69	Matagorda Bay, 12 mi NE fr Port O'Connor, Tex	"	17,806 cu yd
Pan American Petroleum Corporation P. O. Drawer 1980 Corpus Christi, Tex 78403	11 Apr 66	31 Dec 69	Laguna Madre, 7 mi S fr Flour Bluff, Tex	"	No dredging performed
Pan American Petroleum Corporation P. O. Drawer 1980 Corpus Christi, Tex 78403	20 May 66	31 Dec 69	Laguna Madre, 17 mi NW fr Port Isabel, Tex	"	212,700 cu yd
Lower Neches Valley Authority P. O. Box 3007 Beaumont, Tex 77704	11 Aug 66	31 Dec 69	Pine Island Bayou, 2½ mi E fr Voth, Tex	Sec 9, R & H Act of 3 Mar 1899	5,963 cu yd

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(1)	(2)	(3)	(4)	(5)	(6)
City of Corpus Christi 302 South Shoreline Corpus Christi, Tex 78403	16 Feb 66	31 Dec 69	Corpus Christi Bay, at Corpus Christi, Tex	Sec 10, R & H Act of 3 Mar 1899	1,130 cu yd
Tenneco Oil Company P. O. Box 1011 Corpus Christi, Tex 78403	14 Mar 66	31 Dec 69	Baffin Bay, 12 mi E fr Riviera, Tex	"	No dredging performed
Gulf Oil Corporation P. O. Drawer 1458 Victoria, Tex 77901	27 Apr 66	31 Dec 72	Laguna Madre, 27 mi N fr Port Mansfield, Tex	"	154,118 cu yd
Texas Oil & Gas Corporation 1025 Petroleum Tower Corpus Christi, Tex 78401	30 Jun 66	31 Dec 72	San Antonio Bay, 12 mi SSE fr Seadrift, Tex	"	No dredging performed
Houston Pipe Line Company P. O. Box 1188 Houston, Tex 77001	15 Jul 66	31 Dec 69	Corpus Christi Bay, 8 mi E fr Corpus Christi, Tex	"	98,444 cu yd
W. A. Kelso Building Materials Co., Inc. P. O. Box 659 Galveston, Tex 77550	15 Jul 66	31 Dec 69	Galveston Bay, at Galveston, Tex	Sec 10, R & H Act of 3 Mar 1899	159,840 cu yd

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(1)	(2)	(3)	(4)	(5)	(6)
Pan American Petroleum Corporation Sweeny, Tex 77480	4 Oct 66	31 Dec 69	Matagorda Bay, 9 mi SW fr Palacios, Tex	Sec 10, R & H Act of 3 Mar 1899	No dredging performed
Humble Oil & Refining Company P. O. Box 2180 Houston, Tex 77001	10 Nov 66	31 Dec 69	Trinity Bay, 6 mi SW fr Anahuau, Tex	"	16,074 cu yd
The Goldston Company, Inc. P. O. Box 1918 Corpus Christi, Tex 78403	22 Sept 66	31 Dec 69	Nueces Bay at Corpus Christi, Tex	"	22,222 cu mi
Austral Oil Company 2700 Humble Bldg Houston, Tex 77002	18 Oct 66 9 Oct 69	31 Dec 72	Powderhorn Lake, 4 mi NW fr Port O'Connor, Tex	"	No dredging performed
Pan American Petroleum Corporation P. O. Drawer 1980 Corpus Christi, Tex 78403	21 Oct 66	31 Dec 69	Laguna Madre, 16 mi SE fr Port Mansfield, Tex	"	415,000 cu yd
Brazos Oil and Gas Company Division of The Dow Chemical Company P. O. Box 22468 Houston, Tex 77027	15 Nov 66 29 Sept 69	31 Dec 72	Matagorda Bay, 13 mi SE fr Port Lavaca, Tex	"	No dredging performed

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(1)	(2)	(3)	(4)	(5)	(6)
Humble Oil & Refining Company Wilson Tower Corpus Christi, Tex 78403	2 Nov 66	31 Dec 69	Aransas Bay, 2½ mi E fr Rockport, Tex	Sec 10, R & H Act of 3 Mar 1899	10,005 cu yd
Pan American Petroleum Corporation P. O. Box 3092 Houston, Tex 77001	19 Sept 66	31 Dec 69	Laguna Madre, 15½ mi N fr Bayview, Tex	"	60,463 cu yd
Mr. Robert T. Hogdon 1915 Bank of the Southwest Building Houston, Tex 77002	17 Jan 66	31 Dec 69	West Bay, 12 mi SW fr Galveston, Tex	"	No dredging performed
Humble Oil & Refining Company Baytown, Tex 77520	12 Jan 66	31 Dec 69	Mitchell Bay, at Baytown, Tex	"	14,074 cu yd
Mobil Oil Company P. O. Box 2448 Corpus Christi, Tex 78403	1 Mar 66	31 Dec 69	Laguna Madre, 25 mi NE fr Harlingen, Tex	"	No dredging performed
Pan American Petroleum Corporation P. O. Drawer 1980 Corpus Christi, Tex 78403	7 Jul 66 16 Oct 69	31 Dec 72	Corpus Christi Bay, 9 mi E fr Corpus Christi, Tex	"	No dredging performed

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Data concerning existing permits issued since January 1, 1965 by the Corps of Engineers to any person for the purpose of discharging DREDGED MATERIAL into navigable waters within or bordering any state

TEXAS

ame & Address of Permittee	Date Permit Issued-Renewal	Term of Permit	Name and Location of water receiving dredged material	Section of Refuse Act under which Permit Issued	Total quantity of material discharged under this permit
(1)	(2)	(3)	(4)	(5)	(6)
Coastal States Gas Producing Company P. O. Drawer 521 Corpus Christi, Tex 78403	28 Mar 66	31 Dec 69	Baffin Bay and Alazan Bay, 40 mi SE fr Kingsville, Tex	Sec 10, R & H Act of 3 Mar 1899	No dredging performed
Mobil Oil Company P. O. Box 2448 Corpus Christi, Tex 78403	25 Mar 66 16 Oct 69	31 Dec 72	Laguna Madre, 38 mi NE fr Raymondville, Tex	"	160,000 cu yd
Mobil Oil Company P. O. Box 2448 Corpus Christi, Tex 78403	14 Apr 66 16 Oct 69	31 Dec 72	Redfish Bay, 1 mi S fr Aransas Pass, Tex	"	No dredging performed
Texas Oil & Gas Corp 1025 Petroleum Tower Corpus Christi, Tex 78401	7 Apr 66 9 Oct 69	31 Dec 72	Nueces Bay, at Corpus Christi, Tex	"	No dredging performed
Carrl Oil P. O. Box 576 Corpus Christi, Tex 78403	12 Apr 66 9 Dec 69	31 Dec 72	Baffin Bay, 40 mi SE fr Kingsville, Tex	"	18,000 cu yd
Pan American Petroleum Corporation P. O. Drawer 1980 Corpus Christi, Tex 78403	26 Apr 66 16 Oct 69	31 Dec 72	Baffin Bay, 21 mi E fr Riveria, Tex	"	No dredging performed
King Fisher Marine Service Inc P. O. Box 186 Port Lavaca, Tex 77979	22 Jul 66 20 Oct 69	31 Dec 72	Neches River, 7 mi SE fr Beaumont, Tex	"	46,815 cu yd

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(1)	(2)	(3)	(4)	(5)	(6)
Lo-Vaca Gathering Co P. O. Drawer 52. Corpus Christi, Tex 78403	15 Sept 66	31 Dec 69	East Matagorda Bay, 1 mi fr Gulf, Tex	Sec 10, R & H Act of 3 Mar 1899	3,392 cu yd
North Central Oil Corp 1300 Main Street, Suite 1000 Houston, Tex 77002	13 Sept 66	31 Dec 69	East Matagorda Bay, 8 mi E fr Matagorda, Tex	"	No dredging performed
North Central Oil Corp 1300 Main St. Suite 1000 Houston, Tex 77002	16 Sept 66	31 Dec 69	East Matagorda Bay, 2 mi SE fr Old Gulf, Tex	"	94,722 cu yd
Pan American Petroleum Corporation P. O. Drawer 1930 Corpus Christi, Tex 78403	5 Oct 66 2 Oct 69	31 Dec 72	Laguna Madre, 40 mi SE fr Raymondville, Tex	"	No dredging performed

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(1)	(2)	(3)	(4)	(5)	(6)
GAF Corporation 140 West 51 Street New York, N. Y. 10020	9 Jun 67	31 Dec 70	Moses Lake, at Texas City, Tex	Sec 10, R & H Act of 3 Mar 1899	320,000 cu yd
Humble Oil & Refining Company Wilson Tower Corpus Christi, Tex 78401	19 Jan 67	31 Dec 70	Laguna Madre, 27½ mi fr Corpus Christi, Tex	"	32,948 cu yd
Southern Minerals Corporation P. O. Box 716 Corpus Christi, Tex 78403	20 Jan 67	31 Dec 68	Lavaca Bay, 5½ mi N fr Port Lavaca, Tex	"	No dredging performed
Humble Oil & Refining Company Wilson Tower Corpus Christi, Tex 78401	10 Mar 67	31 Dec 70	Laguna Madre, 27 mi S fr Corpus Christi, Tex	"	30,548 cu yd
Southland Royalty Company 1603 First National Building Fort Worth, Tex 76102	27 Jan 67	31 Dec 70	San Antonio Bay, 6½ mi SE fr Austwell, Tex	"	No dredging performed
Houston Contracting Company P. O. Box 66862 Houston, Tex 77006	20 Jan 67	31 Dec 70	Neches River, 3½ mi E fr Port Neches, Tex	"	27,778 cu yd

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(1)	(2)	(3)	(4)	(5)	(6)
Mr. Adolph S. Terrebonne Route 1, Box 29[illegible] Galveston, Tex 77550	16 Mar 67	31 Dec 70	Galveston Bay, 5½ mi W fr Galveston, Tex	Sec 10, R & H Act of 3 Mar 1899	5000 cu yd
Houston Pipe Line Company P. O. Box 1188 Houston, Tex 77001	1 Mar 67	31 Dec 70	Redfish Bay, 2 mi SE fr Aransas Pass, Tex	"	5,785 cu yd
City of Port Lavaca P. O. Box 105 Port Lavaca, Tex 77979	1 Mar 67	31 Dec 70	Lavaca Bay, at Port Lavaca, Tex	"	19,375
Phillips Petroleum Company P. O. Box 272 Alvin, Tex 775[illegible]1	10 Mar 67	31 Dec 70	Galveston Bay, 15 mi NE fr Kemah, Tex	"	No dredging performed
Mr. D. H. Locke 513 Travis Street Liberty, Tex 77571	17 Feb 67	Indefinite	Trinity Bay, 4½ mi S fr Anahuac, Tex	"	6,000 cu yd
Gulf Oil Corporation P. O. Box 5294 Beaumont, Tex 77706	23 Mar 67	31 Dec 70	Galveston Bay, at Galveston, Tex	"	36,148 cu yd

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(1)	(2)	(3)	(4)	(5)	(6)
Mr. C. L. Gilliam P. O. Box 5295 San Leon, Tex 77539	29 Mar 67	31 Dec 70	Galveston Bay, at San Leon, Tex	Sec 10, R & H Act of 3 Mar 1899	4,267 cu yd
Carrl Oil P. O. Box 576 Corpus Christi, Tex 78403	10 Apr 67	31 Dec 69	Laguna Madre, 40 mi SE fr Raymondville, Tex	"	19,718 cu yd
Midwest Oil Corporation 710 The Main Building 1212 Main Street Houston, Tex 77002	12 May 67	31 Dec 70	St. Charles Bay, 17 mi NE fr Rockport, Tex	"	No dredging performed
Union Oil Company of California P. O. Box 250 Bellaire, Tex 77401	14 Jun 67	31 Dec 70	Matagorda Bay 6½ mi SW fr Matagorda, Tex	"	No dredging performed
Union Oil Company of California P. O. Box 250 Bellaire, Tex 77401	16 Jun 67	31 Dec 70	Matagorda Bay, 6½ mi SW fr Matagorda, Tex	"	42,667 cu yd
Texas Crude Oil Company First City National Bank Building Houston, Tex 77002	24 May 67	31 Dec 68	Laguna Madre, 27 mi NE fr Raymondville, Tex	"	No dredging performed

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(1)	(2)	(3)	(4)	(5)	(6)
Texas Parks and Wildlife Department John H. Reagan Building Austin, Tex 78701	6 Jun 67	31 Dec 70	Matagorda Bay 8 mi SW fr Palacios, Tex	Sec 10, R & H Act of 3 Mar 1899	17,000 cu yd
Pan American Petroleum Corporation P. O. Drawer 1930 Corpus Christi, Tex 78403	14 Jul 67	31 Dec 70	Grullo Bayou (Cayo Del Grullo) 12 mi fr Riviera, Tex	"	No dredging performed
Midwest Oil Corporation 710 The Main Building 1212 Main Houston, Tex 77002	3 Jul 67	31 Dec 70	Lavaca Bay, 4½ mi E fr Port Lavaca, Tex	"	No dredging performed
Jake L. Hamon 1102 Vaughn Plaza Building Corpus Christi, Tex 78403	14 Jul 67	31 Dec 70	Hynes Bay, 3 mi E fr Austwell, Tex	"	No dredging performed
Midland Production Corporation 808 Americana Building Houston, Tex 77002	14 Aug 67	31 Dec 70	Laguna Madre, 18 mi S fr Corpus Christi, Tex	"	38,856 cu yd
Mr. Kelly Bell 1411 Wilco Building Midland, Tex 79701	26 Sept 67	31 Dec 70	Laguna Madre, 20 mi SE fr Corpus Christi, Tex	"	6,222 cu yd

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(1)	(2)	(3)	(4)	(5)	(6)
Phillips Petroleum Company P. O. Box 272 Alvin, Tex 77511	3 Feb 67	31 Dec 70	Matagorda Bay, 5½ mi SE fr Matagorda, Tex	Sec 10, R & H Act of 3 Mar 1899	No dredging performed
Flournoy Production Company P. O. Box 751 Corpus Christi, Tex 78403	14 Nov 67	31 Dec 70	Nueces Bay, 6 mi NE fr Corpus Christi, Tex	"	5,000 cu yd
Gulf Oil Corporation P. O. Box 45297 Houston, Tex 77045	1 Dec 67	31 Dec 70	Galveston Bay, 3 mi NE fr La Porte, Tex	"	85,722 cu yd
Sun Oil Company P. O. Box 2831 Beaumont, Tex 77704	30 Oct 67	31 Dec 70	Trinity Bay, 24 mi N fr Galveston, Tex	"	82,000 cu yd
Mr. H. L. Hunt 1401 Elm Dallas, Tex 75202	28 Nov 67	31 Dec 70	Corpus Christi Bay, 2½ mi SE fr Aransas Pass, Tex	"	No dredging performed
Galveston Wharves 802-25 th Street Galveston, Tex 77550	13 Dec 67	30 Jun 68	Galveston Channel, at Galveston, Tex	"	130,000

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(1)	(2)	(3)	(4)	(5)	(6)
Mayo Shell Company P. O. Box 784 Houston, Tex 77001	5 Jul 68	31 Dec 71	Galveston Bay, 1½ mi E fr Seabrook, Tex	Sec 10, R & H Act of 3 Mar 1899	No dredging performed
Mayo Shell Company P. O. Box 784 Houston, Tex 77001	5 Jul 68	31 Dec 71	Galveston Bay, 4 mi SE fr Morgan Point, Tex	"	No dredging performed
Mayo Shell Company P. O. Box 764 Houston, Tex 77001	5 Jul 68	31 Dec 71	East Bay, 10 mi E fr San Leon, Tex	"	No dredging performed
Texas Oil & Gas Corporation 1025 Petroleum Tower Corpus Christi, Tex 78401	19 Jan 68	31 Dec 71	Aransas Bay, 7½ mi S fr Rockport, Tex	"	No dredging performed
San Jacinto Girl Scouts, Inc. 1902 Commonwealth Houston, Tex 77006	19 Feb 68	31 Dec 71	Galveston Bay, 2½ mi NE fr Seabrook, Tex	"	35,000 cu yd
Southland Royalty Company 1603 First National Bank Building Fort Worth, Tex 76102	19 Jan 68	31 Dec 71	Corpus Christi Bay, 4 mi SE fr Aransas Pass, Tex	"	No dredging performed

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(1)	(2)	(3)	(4)	(5)	(6)
Neil E. Hanson 1234 Americana Building 811 Dallas Avenue Houston, Tex 77002	25 Jan 68	31 Dec 71	San Antonio Bay, 6 mi SW fr Seadrift, Tex	Sec 10, R & H Act of 3 Mar 1899	No dredging performed
Padre Island Investment Corporation P. O. Box 1168 Corpus Christi, Tex 78403	16 Feb 68	31 Dec 71	Laguna Madre, 17 mi SE fr Corpus Christi, Tex	"	1,117,700 cu yd
Mr. R. B. Mitchell First City National Bank Building Houston, Tex 77002	15 Mar 68	31 Dec 71	Espiritu Santo Bay, 3½ mi S fr Port O'Connor, Tex	"	No dredging performed
Sunray DX Oil Company P. O. Box 498 Corpus Christi, Tex 78403	19 Feb 68	31 Dec 68	Corpus Christi Bay, 9 mi SW fr Port Aransas, Tex	"	No dredging performed
Midwest Oil Corporation 1212 Main Houston, Tex 77002	14 Mar 68	31 Dec 71	Laguna Madre, 5½ mi N fr Port Mansfield, Tex	"	No dredging performed
Texas Oil & Gas Corp. 1025 Petroleum Tower Corpus Christi, Tex 78401	5 Apr 68	31 Dec 71	Nueces Bay, 3½ mi N fr Corpus Christi, Tex	"	No dredging performed

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(1)	(2)	(3)	(4)	(5)	(6)
Mr. W. Earl Rowe 930 Milam Building San Antonio, Tex 78205	17 Apr 68	31 Dec 69	Laguna Madre, 18 mi N fr Port Mansfield, Tex	Sec 10, R & H Act of 3 Mar 1899	No dredging performed
Burns Trust No. 2 and 3 & 1 Trusts Suite 620, Guaranty National Tower Corpus Christi, Tex 78401	15 May 68	31 Dec 71	San Antonio Bay, 6 mi S fr Seadrift, Tex	"	No dredging performed
Horton & Horton P. O. Box 1669 Houston, Tex 77001	20 Aug 68	31 Dec 71	San Antonio & Guadalupe Bays, 5 mi SW fr Seadrift, Tex	"	743, 690 cu yd
Horton & Horton P. O. Box 1669 Houston, Tex 77001	5 Jul 68	31 Dec 71	East Bay, 18 mi NE fr Texas City, Tex	"	No dredging performed
Mayo Shell Company P. O. Box 784 Houston, Tex 77001	5 Jul 68	31 Dec 71	East Bay, 16½ mi NE fr Texas City, Tex	"	No dredging performed
Tri-City Dredging Company P. O. Box 874 Bridge City, Tex 77611	4 Jan 68	31 Dec 71	Sabine Lake (Texas Part) 3 mi E fr Port Arthur, Tex	"	40,000 cu yd

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(1)	(2)	(3)	(4)	(5)	(6)
Twin City Dredging Company P. O. Box 140 League City, Tex 77573	11 Sept 68	31 Dec 71	East Bay, 20 mi NE fr Galveston, Tex	Sec 10, R & H Act of 3 Mar 1899	12,000 cu yd
Parker Brothers & Co., Inc. P. O. Box 107 Houston, Tex 77001	20 Aug 68	31 Dec 71	San Antonio and Guadalupe Bays, 5 mi SW fr Seadrift, Tex	"	571,728 cu yd
Parker Brothers & Co., Inc. P. O. Box 107 Houston, Tex 77001	20 Aug 68	31 Dec 71	San Antonio and Guadalupe Bays, 5 mi SW fr Seadrift, Tex	"	0
Parker Brothers & Co., Inc. P. O. Box 107 Houston, Tex 77001	5 Jul 68	31 Dec 71	Galveston, Trinity and East Bays, 14 mi NE fr Texas City, Tex	"	28,497 cu yd
Lone Star Cement Corporation P. O. Box 3006 Houston, Tex 77001	5 Jul 68	31 Dec 71	Galveston and East Bays, 14 mi NE fr Texas City, Tex	"	No dredging performed
Midwest Oil Corporation 1212 Main Street Houston, Tex 77002	21 Jun 68	31 Dec 71	Copano Bay, 6 mi W fr Rockport, Tex	"	No dredging performed

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(1)	(2)	(3)	(4)	(5)	(6)
ntral Oil Company, Incorporated 00 Humble Building uston, Tex 77002	19 Jul 68	31 Dec 71	San Antonio Bay, 12 mi S fr Seadrift, Tex	Sec 10, R & H Act of	No dredging performed
eward & Edwards 10 Vaughn Plaza Building orpus Christi, Tex 78401	11 Jul 68	31 Dec 71	Laguna Madre, 27 mi N fr Port Mansfield, Tex	"	45,226 cu yd
aldenfels Brothers . O. Box 1917 orpus Christi, Tex 78403	20 Aug 68	31 Dec 71	San Antonio and Guadalupe Bays, 5 mi SW fr Seadrift, Tex	"	No dredging performed
one Star Cement Corporation . O. Box 3006 ouston, Tex 77001	20 Aug 68	31 Dec 71	San Antonio Bay, 5½ mi SW fr Seadrift, Tex	"	677,165 cu yd
idwest Oil Corporation 212 Main Street ouston, Tex 77002	13 Sept 68	31 Dec 71	Aransas and Redfish Bays, 6½ mi NE fr Aransas Pass, Tex	"	63,759 cu yd
auer Dredging Co, Inc. . O. Box 83 ort Lavaca, Tex 77979	20 Aug 68	31 Dec 71	San Antonio and Guadalupe Bays, 5 mi SW fr Seadrift, Tex	"	89, 651 cu yd

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(1)	(2)	(3)	(4)	(5)	(6)
Tarpon Oil Company 518 Praetorian Building Dallas, Tex 75201	12 Sept 68	31 Dec 70	Galveston Bay, 17½ mi SW fr Anahuac, Tex	Sec 10, R & H Act of 3 Mar 1899	No dredging performed
Aluminum Company of America Point Comfort, Tex 77978	7 Oct 68	31 Dec 71	Lavaca Bay, 4½ mi NE fr Port Lavaca, Tex	"	10,555 cu yd
Little Riviera Civic Association P. O. Box 16080 Houston, Tex 77022	23 Sept 68	Indefinite	Dickinson Bay, at San Leon, Tex	"	3,555 cu yd
Roy M. Huffington, Inc. 2210 Tennessee Building Houston, Tex 77002	11 Oct 68	31 Dec 71	Laguna Madre, 16 mi SE fr Corpus Christi, Tex	"	71,000 cu yd
Roy M. Huffington, Inc. 2210 Tennessee Building Houston, Tex 77002	21 Nov 68	31 Dec 71	Laguna Madre, 16 mi SE fr Corpus Christi, Tex	"	No dredging performed
Pennzoil United, Inc. P. O. Box 2827 Corpus Christi, Tex 78403	19 Nov 68	31 Dec 71	Corpus Christi Bay, 3½ mi SE fr Aransas Pass, Tex	"	No dredging performed
Samedan Oil Corporation 1212 Main Street Houston, Tex 77002	25 Nov 68	31 Dec 71	Laguna Madre, 23 mi E fr Sarita, Tex	"	No dredging performed

TABLE B

Data concerning existing permits issued since January 1, 1965 by the Corps of Engineers to any person for the purpose of discharging DREDGED MATERIAL into navigable waters within or bordering any state

TEXAS

Name & Address of Permittee	Date Permit Issued-Renewal	Term of Permit	Name and Location of water receiving dredged material	Section of Refuse Act under which Permit Issued	Total quantity of material discharged under this permit
(1)	(2)	(3)	(4)	(5)	(6)
The Cherryville Corp. 700 Houston Natural Gas Building Houston, Tex 77002	25 Nov 68	31 Dec 71	Laguna Madre, 23 mi SE fr Sarita, Tex	Sec 10, R & H Act of 3 Mar 1899	No dredging performed
Pennzoil United, Inc. P. O. Box 2827 Corpus Christi, Tex 78403	29 Nov 68	31 Dec 71	Corpus Christi Bay, 4½ mi SE fr Aransas Pass, Tex	"	116,300 cu yd
Mr. A. C. Sien, Jr. P. O. Box 7294 Station A San Antonio, Tex 78207	20 Dec 68	31 Dec 71	San Antonio Bay, 1½ mi SW fr Seadrift, Tex	"	No dredging performed
Gulf Coast Natural Gas Company 800 Houston Natural Gas Building Houston, Tex 77002	20 Dec 68	31 Dec 71	St. Charles Bay, 16 mi NE fr Rockport, Tex	"	No dredging performed
Samedan Oil Corporation 942 The Main Building 1212 Main Street Houston, Tex 77002	16 Dec 68	31 Dec 71	Trinity Bay, 5 mi SSW fr Anahuac, Tex	"	No dredging performed
Coastal States Gas Producing Company P. O. Drawer 521 Corpus Christi, Tex 78403	18 Dec 68	31 Dec 71	Corpus Christi Bay, 7 mi SSE fr Aransas Pass, Tex	"	16,421 cu yd

TABLE B

Data concerning existing permits issued since January 1, 1965
by the Corps of Engineers to any person for the purpose of
discharging DREDGED MATERIAL into navigable waters within
or bordering any state

TEXAS

Name & Address of Permittee	Date Permit Issued-Renewal	Term of Permit	Name and Location of water receiving dredged material	Section of Refuse Act under which Permit Issued	Total quantity of material discharged under this permit
(1)	(2)	(3)	(4)	(5)	(6)
Samedan Oil Corporation 942 The Main Building 1212 Main Street Houston, Tex 77002	19 Dec 68	31 Dec 71	Laguna Madre, 18½ mi SE fr Corpus Christi, Tex	Sec 10, R & H Act of 3 Mar 1899	1,720 cu yd
Mrs. James R. Dougherty P. O. Box 640 Beeville, Tex 78102	26 Dec 68	31 Dec 71	Laguna Madre, 16 mi SE fr Corpus Christi, Tex	"	46,626 cu yd
Lone Star Producing Company P. O. Drawer L. Pleasanton, Tex 78064	18 Dec 68	31 Dec 71	San Antonio Bay, 7½ mi SE fr Seadrift, Tex	"	No dredging performed
Mobile Oil Corporation P. O. Box 2448 Corpus Christi Tex 78403	23 Dec 68	31 Dec 70	Laguna Madre, 40 mi S fr Corpus Christi, Tex	"	No dredging performed
Mr. Kelly Bell 1411 Wilco Building Midland, Tex 79701	28 Jan 69	31 Dec 72	Laguna Madre, 25 mi N fr Port Mansfield, Tex	"	85,200 cu yd

TABLE D

Data concerning existing permits issued since January 1, 1965
by the Corps of Engineers to any person for the purpose of
discharging DREDGED MATERIAL into navigable waters within
or bordering any state
TEXAS

Name & Address of Permittee	Date Permit Issued-Renewal	Term of Permit	Name and Location of water receiving dredged material	Section of Refuse Act under which Permit Issued	Total quantity of material discharged under this permit
(1)	(2)	(3)	(4)	(5)	(6)
Livingston Oil Co. P. O. Box 2848 Tulsa, Okla 74161	26 Feb 69	31 Dec 72	Laguna Madre, 21½ mi SE fr Corpus Christi, Tex	Sec 10, R & H Act of 3 Mar 1899	42,778 cu yd
Meeker & Co. 6000 Camp Bowie Blvd Fort Worth, Tex 76116	6 Aug 69	31 Dec 72	Corpus Christi Bay, 4½ mi SE fr Aransas Pass, Tex	"	No dredging performed
Meeker & Co. 6000 Camp Bowie Blvd Fort Worth, Tex 76116	9 May 69	31 Dec 72	Corpus Christi Bay, 4 mi SE fr Aransas Pass, Tex	"	62,715 cu yds
Houston Pipe Line Co. P. O. Box 1188 Houston, Tex 77001	30 Apr 69	31 Dec 72	Laguna Madre, 33 mi SE fr Kingsville, Tex	"	5,167 cu yd
Kilroy Company of Tex. Inc 1908 First City National Bank Building Houston, Tex 77002	15 Apr 69	31 Dec 71	Corpus Christi Bay, at Corpus Christi, Tex	"	No dredging performed
Cities Service Oil Company 800 Main Building Houston, Tex 77002	29 May 69	31 Dec 72	Laguna Madre, 18 mi SE fr Corpus Christi, Tex	"	No dredging performed

TABLE B

Data concerning existing permits issued since January 1, 1965
by the Corps of Engineers to any person for the purpose of
discharging DREDGED MATERIAL into navigable waters within
or bordering any state
TEXAS

Name & Address of Permittee	Date Permit Issued-Renewal	Term of Permit	Name and Location of water receiving dredged material	Section of Refuse Act under which Permit Issued	Total quantity of material discharged under this permit
(1)	(2)	(3)	(4)	(5)	(6)
Texas Parks and Wildlife Department John H. Reagan Building Austin, Tex 78701	22 Apr 69	31 Dec 72	Matagorda Bay, 8 mi SW fr Palacios, Tex	Sec 10, R & H Act of 3 Mar 1899	19,000 cu yd
Mr. H. L. Brown, Jr. 909 Midland Tower Midland, Tex 79701	9 Jun 69	31 Dec 72	Aransas Bay, 6 mi E NE fr Aransas Pass, Tex	"	No dredging performed
Republic Industries 3700 Spencer Highway Pasadena, Tex 77504	15 Jul 69	31 Dec 72	Galveston Bay, 4 3/4 mi SE fr La Porte, Tex	"	150,000 cu yd
Sun Oil Co. Sunoco Div. P. O. Box 2831 Beaumont, Tex 77704	19 Jun 69	31 Dec 72	Galveston Bay, at Galveston, Tex	"	58,565 cu yd
Mesa Petroleum Co. P. O. Box 2009 Amarillo, Tex 79105	9 Jun 69	31 Dec 72	Lavaca Bay, 4½ mi S fr Point Comfort, Tex	"	No dredging performed
McMoran Exploration Co. 1012 Pere Marquette Bldg New Orleans, Louisiana 70112	30 Jun 69	31 Dec 72	Matagorda Bay, 9 mi SE fr Port Lavaca, Tex	"	No dredging performed

TABLE B

Data concerning existing permits issued since January 1, 1965 by the Corps of Engineers to any person for the purpose of discharging DREDGED MATERIAL into navigable waters within or bordering any state

TEXAS

Name & Address of Permittee	Date Permit Issued-Renewal	Term of Permit	Name and Location of water receiving dredged material	Section of Refuse Act under which Permit Issued	Total quantity of material discharged under this permit
(1)	(2)	(3)	(4)	(5)	(6)
Mr. Robert K. Franklin P. O. Box 22113 Houston, Tex 77027	18 Sept 69	31 Dec 72	Aransas Bay, 4 mi E SE fr Rockport, Tex	Sec 10, R & H Act of 3 Mar 1899	12,000 cu yd
Mr. Bobby M. Burns 620 Guaranty National Tower Corpus Christi, Tex 78401	20 Aug 69	31 Dec 72	St. Charles Bay, 12 mi NE fr Fulton, Tex	"	No dredging performed
McMoran Exploration Co. 1314 The 600 Building Corpus Christi, Tex 78401	30 Sept 69	31 Dec 72	Laguna Madre, 19 mi SE fr Corpus Christi, Tex	"	21,000 cu yd
Prudential Minerals Exploration Corp. 540 Meadows Bldg Dallas, Tex 75206	13 Oct 69	31 Dec 72	Laguna Madre, 18 mi N NW fr Port Isabel, Tex	"	170, 148 cu yd
Buttes Gas & Oil Co. Southwest Tower Bldg Houston, Tex 77002	17 Oct 69	31 Dec 72	Lavaca Bay, 6 mi NE fr Port Lavaca, Tex	"	17,556 cu yd
Coastal States Gas Producing Company P. O. Drawer 521 Corpus Christi, Tex 78403	31 Oct 69	31 Dec 72	East Matagorda Bay, 6 mi fr Matagorda, Tex	"	No dredging performance

TABLE B

Data concerning existing permits issued since January 1, 1965
by the Corps of Engineers to any person for the purpose of
discharging DREDGED MATERIAL into navigable waters within
or bordering any state

TEXAS

Name & Address of Permittee	Date Permit Issued-Renewal	Term of Permit	Name and Location of water receiving dredged material	Section of Refuse Act under which Permit Issued	Total quantity of material discharged under this permit
(1)	(2)	(3)	(4)	(5)	(6)
Getty Oil Co P. O. Box 1404 Houston, Tex 77001	4 Nov 69	31 Dec 72	Laguna Madre, 14 mi SE fr Corpus Christi, Tex	Sec 10, R & H Act of 3 Mar 1899	No dredging performed
Coastal States Gas Producing Company P. O. Drawer 521 Corpus Christi, Tex 78403	2 Dec 69	31 Dec 72	East Matagorda Bay, 3 1/4 mi S SE fr Old Gulf, Tex	"	282,501 cu yd
Mr. Kelly Bell 1411 Wilco Bldg Midland, Tex 79701	29 Oct 69	31 Dec 72	San Antonio Bay, 7 mi S SE fr Seadrift, Tex	"	No dredging performed
Aluminum Company of America Point Comfort, Tex 77978	16 Dec 69	31 Dec 72	Lavaca Bay, at Point Confort, Tex	"	188,889 cu yd
Southland Royalty Co. 1600 First National Bldg Fort Worth, Tex 76102	29 Dec 69	31 Dec 72	Redfish Bay, ½ mi NE fr Aransas Pass, Tex	"	34,939 cu yd
Monsanto Company P. O. Box 1311 Texas City, Tex 77590	26 Nov 69	31 Dec 72	Galveston Bay, at Texas City, Tex	"	100,000 cu yd

TABLE B

Data concerning existing permits issued since January 1, 1965
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TEXAS

Name & Address of Permittee	Date Permit Issued-Renewal	Term of Permit	Name and Location of water receiving dredged material	Section of Refuse Act under which Permit Issued	Total quantity of material discharged under this permit
(1)	(2)	(3)	(4)	(5)	(6)
Samedan Oil Corp. 942 The Main Bldg 1212 Main St Houston, Tex 77002	3 Dec 69	31 Dec 70	Matagorda Bay, 8 mi SW fr Matagorda, Tex	Sec 10, R & H Act of 3 Mar 1899	No dredging performed
Gibson, Edwards & Lively Exploration Company 300 Wilson Tower Corpus Christi, Tex 78401	24 Dec 69	31 Dec 71	Redfish Bay, 6 mi S SW fr Rockport, Tex	"	24, 000 cu yd
Clark Oil & Refining Corporation 1620 Vaughn Plaza Building Corpus Christi, Tex 78401	14 Feb 69	31 Dec 72	Copano Bay and Mission Bay, 7 mi NW fr Fulton, Tex	"	No dredging performed
Livingston Oil Company P. O. Box 2848 Tulsa, Oklahoma 74101	17 Feb 69	31 Dec 72	Laguna Madre, 21 mi SE fr Corpus Christi, Tex	"	No dredging performed
Cities Service Oil Company 800 Main Building Houston, Tex 77002	21 Mar 69	31 Dec 72	Trinity Bay, 10 mi S SW fr Anahuac, Tex	"	No dredging performed
Mitchell-Dobbins Land Corporation Twelth Floor, Houston Club Building Houston, Tex 77002	27 Jan 69	31 Dec 72	West Bay, 12 mi W SW fr Galveston, Tex	"	27, 000 cu yd

TABLE B

Data concerning existing permits issued since January 1, 1965
by the Corps of Engineers to any person for the purpose of
discharging DREDGED MATERIAL into navigable waters within
or bordering any state

TEXAS

Name & Address of Permittee	Date Permit Issued-Renewal	Term of Permit	Name and Location of water receiving dredged material	Section of Refuse Act under which Permit Issued	Total quantity of material discharged under this permit
(1)	(2)	(3)	(4)	(5)	(6)
Mr. Lowell Lebe:man P. O. Box 5207 Austin, Tex 78703	1 Apr 69	31 Dec 72	Corpus Christi Bay, 6 mi SW fr Aransas Pass, Tex	Sec 10, R & H Act of 3 Mar 1899	50, 000 cu yd
Sun Oil Company Gulf Coast Division P. O. Box 2831 Beaumont, Tex 77704	7 Jan 69	31 Dec 72	Trinity Bay, 7 mi SE fr Baytown, Tex	"	9, 956 cu yd
Mr. H. L. Brown, Jr. 309 Midland Tower Midland, Tex 79701	31 Jan 69	31 Dec 72	St. Charles Bay, 12 mi NE Fulton, Tex	"	No dredging performed
Parker Brothers & Co., Inc. 1801 First City National Bank Building Houston, Tex 77001	28 May 69	31 Dec 72	Matagorda Bay, 10 mi SE fr Port Lavaca, Tex	"	24,177 cu yd
Mr. Kelly Bell 1411 Wilco Building Midland, Tex 79701	13 Jan 69	31 Dec 72	Laguna Madre, 25 mi N fr Port Mansfield, Tex	"	No dredging performed
Humble Oil & Refining Company Wilson Tower Corpus Christi, Tex 78401	28 May 69	31 Dec 72	Laguna Madre, 33 mi SE fr Kingsville, Tex	"	1, 827 cu yd

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Data concerning existing permits issued since January 1, 1965

by the Corps of Engineers to any person for the purpose of

discharging DREDGED MATERIAL into navigable waters within

or bordering any state

TEXAS

Name & Address of Permittee	Date Permit Issued-Renewal	Term of Permit	Name and Location of water receiving dredged material	Section of Refuse Act under which Permit Issued	Total quantity of material discharged under this permit
(1)	(2)	(3)	(4)	(5)	(6)
Mr. Neil E. Hanson 811 Dallas Avenue Houston, Tex 77002	8 Jul 69	31 Dec 72	Aransas Bay, 6 mi E fr Rockport, Tex	Sec 10, R & H Act of 3 Mar 1899	No dredging performed
Heldenfels Brothers P. O. Box 1917 Corpus Christi, Tex 78403	11 Sept 69	31 Dec 72	Nueces Bay, 5 mi NW fr Corpus Christi, Tex	"	No dredging performed
Getty Oil Company P. O. Box 1404 Houston, Tex 77001	3 Jul 69	31 Dec 71	Redfish Bay, 3 ½ mi E NE fr Aransas Pass, Tex	"	No dredging performed
Coastal States Crude Gathering Company P. O. Drawer 511 Corpus Christi, Tex 78403	28 Aug 69	31 Dec 72	Nueces Bay, at Corpus Christi, Tex	"	23, 333 cu yd
Fiber Steel, Inc. P. O. Box SS Aransas Pass, Tex 78336	2 Sept 69	Indefinite	Redfish Bay on Bishop's Channel at Aransas Pass, Tex	"	6, 900 cu yd
Sun Oil Company Gulf Coast Division P. O. Box 2831 Beaumont, Tex 77704	27 Aug 69	31 Dec 72	Matagorda Bay, 10 mi E fr Matagorda, Tex	"	No dredging performed

TABLE B

Data concerning existing permits issued since January 1, 1965
by the Corps of Engineers to any person for the purpose of
discharging DREDGED MATERIAL into navigable waters within
or bordering any state
TEXAS

Name & Address of Permittee	Date Permit Issued-Renewal	Term of Permit	Name and Location of water receiving dredged material	Section of Refuse Act under which Permit Issued	Total quantity of material discharged under this permit
(1)	(2)	(3)	(4)	(5)	(6)
The Cherryville Corp. 700 Houston Natural Gas Building Houston, Tex 77002	3 Oct 69	31 Dec 72	Corpus Christi Bay, 3½ mi S fr Aransas Pass, Tex	Sec 10, R & H Act of 3 Mar 1899	59, 150 cu yd
Standard Oil Company of Texas Division of Chevron Oil Company P. O. Box 66247, Fairview Station Houston, Tex 77006	11 Sept 69	31 Dec 72	East Bay, 12 mi NE fr Texas City, Tex	"	No dredging performed
Flournoy Production Company P. O. Box 751 Corpus Christi, Tex 78403	31 Jul 69	31 Dec 70	San Antonio Bay, 15 mi S fr Seadrift, Tex	"	No dredging performed
Prudential Minerals Exploration Corp. 540 Meadows Building Dallas, Tex 75206	5 Sept 69	31 Dec 72	Aransas Bay, 3½ mi E SE fr Lamar, Tex	"	No dredging performed
Texas Oil & Gas Corp. 1025 Petroleum Tower Corpus Christi, Tex 78401	5 Dec 69	31 Dec 72	Espiritu Santo Bay, 15½ mi SW fr Port O'Connor, Tex	"	No dredging performed

TABLE B

Data concerning existing permits issued since January 1, 1965 by the Corps of Engineers to any person for the purpose of discharging DREDGED MATERIAL into navigable waters within or bordering any state

TEXAS

me & Address of Permittee	Date Permit Issued-Renewal	Term of Permit	Name and Location of water receiving dredged material	Section of Refuse Act under which Permit Issued	Total quantity of material discharged under this permit
(1)	(2)	(3)	(4)	(5)	(6)
Westland Oil Development Corporation 6060 Hillcroft Houston, Tex 77036	6 Aug 69	31 Dec 71	Aransas Bay and Redfish Bay, 5 mi S fr Rockport, Tex	Sec 10, R & H Act of 3 Mar 1899	No dredging performed
Prudential Minerals Exploration Corp. 540 Meadows Building Dallas, Tex 75206	19 Sept 69	31 Dec 72	Laguna Madre, 18 mi N fr Port Isabel, Tex	"	No dredging performed
Southern Minerals Corporation P. O. Box 716 Corpus Christi, Tex 78403	17 Sept 69	31 Dec 72	Redfish Bay, 5 mi NE fr Aransas Pass, Tex	"	No dredging performed

TABLE D

Data concerning existing permits issued since January 1, 1965
by the Corps of Engineers to any person for the purpose of
discharging DREDGED MATERIAL into navigable waters within
or bordering any state

TEXAS

Name & Address of Permittee	Date Permit Issued-Renewal	Term of Permit	Name and Location of water receiving dredged material	Section of Refuse Act under which Permit Issued	Total quantity of material discharged under this permit
(1)	(2)	(3)	(4)	(5)	(6)
Central Power and Light Company 120 N Chaparral St. Corpus Christi, Tex 78403	10 Feb 70	31 Dec 73	Cox Bay, at Point Comfort, Tex	Sec 10, R & H Act of 3 Mar 1899	103, 200 cu yd
Timewealth Corp 800 Sheraton-Lincoln Center Houston, Tex 77002	3 Apr 70	31 Dec 73	West Bay, at Galveston, Tex	"	115, 000 cu yd
Ka-Matt Enterprises, Inc. 7077 San Pedro Suite 103 San Antonio, Tex 78216	2 Feb 70	31 Dec 73	Nueces Bay, 6 mi N fr Corpus Christi, Tex	"	103, 800 cu yd
Champlin Petroleum Co P. O. Box 728 Bishop, Tex 78343	22 Jan 70	31 Dec 73	Lavaca Bay, 5 mi N fr Port Lavaca, Tex	"	No dredging performed
Union Oil Company of California Suite 100, 2300 West Loop South Houston, Tex 77027	6 Feb 70	31 Dec 73	Laguna Madre, 7½ mi N fr Port Manifield, Tex	"	No dredging performed
Messrs. Edwin L. Cox and Robert J. Hewitt 3800 First National Bank Building Dallas, Tex 75202	10 Mar 70	31 Dec 73	Baffin Bay, 29 mi SE fr Kingsville, Tex	"	No dredging performed

TABLE B

Data concerning existing permits issued since January 1, 1965
by the Corps of Engineers to any person for the purpose of
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or bordering any state

TEXAS

Name & Address of Permittee	Date Permit Issued-Renewal	Term of Permit	Name and Location of water receiving dredged material	Section of Refuse Act under which Permit Issued	Total quantity of material discharged under this permit
(1)	(2)	(3)	(4)	(5)	(6)
Ferguson & Bosworth P. O. Bin 2427 Bakersfield, California 93303	25 Mar 70	31 Dec 73	Espiritu Santo Bay, 9 mi SW fr Port O'Connor, Tex	Sec 10, R & H Act of 3 Mar 1899	No dredging performed
Mitchell-Dobbins Land Corporation Twelfth Floor, Houston Club Building Houston, Tex 77002	3 Apr 70	31 Dec 73	West Bay, 15 mi SW fr Galveston, Tex	"	59, 000 cu yd
Mr. S. Jansma Box 94, Star Route Port Isabel, Tex 78578	14 Apr 70	31 Dec 73	Laguna Madre, 3½ mi W fr Port Isabel, Tex	"	1, 167 cu yd
Reynolds Metals Co. P. O. Box 2311 Corpus Christi, Tex 78403	2 Mar 70	31 Dec 70	Corpus Christi Bay, 11 mi NE fr Corpus Christi, Tex	"	814, 815 cu yd
W. Earl Rowe 930 Milam Bldg San Antonio, Tex 78205	16 Apr 70	31 Dec 70	Matagorda Bay, 8 mi SW fr Matagorda, Tex	"	No dredging performed
Tenneco Oil Co P. O. Box 1011 Corpus Christi, Tex 78403	17 Apr 70	31 Dec 70	Matagorda Bay, 6½ mi SW fr Matagorda, Tex	"	No dredging performed

Table II

Data concerning existing permits issued since January 1, 1965

by the Corps of Engineers to any person for the purpose of

discharging DREDGED MATERIAL into navigable waters within

or bordering any state

TEXAS

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Name & Address of Permittee	Date Permit Issued-Renewal	Term of Permit	Name and Location of water receiving dredged material	Section of Refuse Act under which Permit Issued	Total quantity of material discharged under this permit
(1)	(2)	(3)	(4)	(5)	(6)
W. T. Burton Co., Inc. P. O. Box 100 Sulphur, Louisiana 70663	29 Jan 70	31 Dec 73	Sabine Lake, at Port Arthur, Tex	Sec 10, R & H Act of 3 Mar 1899	33,257 cu yd
Brown & Root, Inc. P. O. Box 3 Houston, Tex 77001	17 Mar 70	31 Dec 73	Tabbs Bay, 3 mi S fr Baytown, Tex	"	107,111 cu yd

TABLE B

Data concerning existing permits issued since January 1, 1965 by the Corps of Engineers to any person for the purpose of discharging DREDGED MATERIAL into navigable waters within or bordering any state

UTAH

Name & Address of Permittee	Date Permit Issued-Renewal	Term of Permit	Name and Location of water receiving dredged material	Section of Refuse Act under which Permit Issued	Total quantity of material discharged under this permit
(1)	(2)	(3)	(4)	(5)	(6)

NONE

TABLE B

Data concerning existing permits issued since January 1, 1965 by the Corps of Engineers to any person for the purpose of discharging DREDGED MATERIAL into navigable waters within or bordering any state

VERMONT

Name & Address of Permittee (1)	Date Permit Issued-Renewal (2)	Term of Permit (3)	Name and Location of water receiving dredged material (4)	Section of Refuse Act under which Permit Issued (5)	Total quantity of material discharged under this permit (6)
NONE					

TABLE B

Virginia

Data concerning existing permits issued since January 1, 1965 by the Corps of Engineers to any person for the purpose of discharging DREDGED MATERIAL into navigable waters within or bordering any state

VIRGINIA

Name & Address of Permittee (1)	Date Permit Issued-Renewal (2)	Term of Permit (3)	Name and Location of water receiving dredged material (4)	Section of Refuse Act under which Permit Issued (5)	Total quantity of material discharged under this permit (6)
Virginia Dept. of Highways Richmond, Va. 23219	2/17/65	Approx 3 yrs	James River, Va.	Sec 10	1500 cu. yds.
Radcliffe Materials P. O. Box 816 Norfolk, Va. 23501	4/22/65	Approx 3 yrs	Tangier Sound, Va.	Sec 10	Indeterminate (Washing Oyster Shells)
Jamestown Foundation Williamsburg, Va. 23081	4/28/65	Approx 3 yrs	James River, Va.	Sec 10	56,000 cu. yds.
Jordan Pt. Yacht Haven, Inc. c/o Mr. Willie Jordan, Jr. Gloucester, Virginia	8/24/66	Approx 3 yrs	James River, Va.	Sec 10	12,800 cu. yds.
Allied Chemical Corp. Nitrogen Division P. O. Drawer 61, Hopewell,Va.	2/2/67	Approx 3 yrs	James River, Va.	Sec 10	75,000 cu. yds
Radcliff Materials P. O. Box 816 Norfolk, Va. 23501	2/9/67	Approx 3 yrs	Hampton Roads, Va.	Sec 10	Indeterminate (Washing Oyster Shells)

TABLE B

Virginia

Data concerning existing permits issued since January 1, 1965 by the Corps of Engineers to any person for the purpose of discharging DREDGED MATERIAL into navigable waters within or bordering any state

Virginia

VIRGINIA

Name & Address of Permittee (1)	Date Permit Issued-Renewal (2)	Term of Permit (3)	Name and Location of water receiving dredged material (4)	Section of Refuse Act under which Permit Issued (5)	Total quantity of material discharged under this permit (6)
Hess Oil & Chemical Corporation 6200 Pennington Ave. Baltimore, Maryland	23 Jan 70	31 Dec 73	Potomac River at Dyke Marsh, Virginia	Section 10 of 3 March 1899	None
Prestwick, Inc. 12301 Fort Washington Rd. Washington, D. C.	20 Nov 69	31 Dec 72	"	"	2,535 cu. yds.
Government of the District of Columbia Dept. of Sanitary Engineering Washington, D. C.	2 Mar 70	31 Dec 73	"	"	None

TABLE B

Data concerning existing permits issued since January 1, 1965
by the Corps of Engineers to any person for the purpose of
discharging DREDGED MATERIAL into navigable waters within
or bordering any state
WASHINGTON

State of Washington

Name & Address of Permittee (1)	Date Permit Issued-Renewal (2)	Term of Permit (3)	Name and Location of water receiving dredged material (4)	Section of Refuse Act under which Permit Issued (5)	Total quantity of material discharged under this permit (6)
Georgia Pacific Bellingham	8/05/68	3 year	Bellingham Bay	10	5,000 yds
Weyerhaeuser Co. Chehalis	7/24/68	3 "	Case Inlet Puget Sound	10	20,000 yds
West Tacoma Newsprint Steilacoom	6/09/69	3 "	Puget Sound near Chamber Creek	10	20,000 yds
Port of Anacortes	2/04/66	3 "	Cap Sante Basin Anacortes Harbor	10	116,000 yds
Port of Olympia	6/27/68	3 "	Budd Inlet Olympia	10	27,600 yds
Manson Const. Co. Seattle	3/28/67	3 "	Commencement Bay Tacoma	10	50,000 yds
Port of Port Angeles	6/23/67	3 "	Dungeness Bay Strait of Juan de Fuca	10	8,000 yds
Ideal Cement Co. Seattle	6/02/65	3 "	Elliott Bay	10	134,800 yds

TABLE B

Data concerning existing permits issued since January 1, 1965
by the Corps of Engineers to any person for the purpose of
discharging DREDGED MATERIAL into navigable waters within
or bordering any state
WASHINGTON

Washington

Name & Address of Permittee (1)	Date Permit Issued-Renewal (2)	Term of Permit (3)	Name and Location of water receiving dredged material (4)	Section of Refuse Act under which Permit Issued (5)	Total quantity of material discharged under this permit (6)
Monsanto Company Seattle	7/08/68	3 year	Elliott Bay	10	3,500 yds
Manson Construction Seattle	3/27/69	3 "	Elliott Bay	10	20,000 yds
Kaiser Cement & Gypsum Corp. Seattle	7/10/69	3 "	Elliott Bay	10	6,000 "
Port of Seattle	12/19/69	3 "	Elliott Bay	10	190,000 "
Seattle Ready Mix Seattle	1/22/70	3 "	Elliott Bay	10	4,000 "
Port of Seattle	3/07/68	3 "	Elliott Bay	10	50,000 "
Port of Seattle	2/25/70	3 "	Elliott Bay	10	40,000 "
Port of Seattle	3/10/70	3 "	Elliott Bay	10	22,000 "
Puget Service Co. Seattle	11/30/69	1 year	Elliott Bay	10	80,000 "

TABLE B

Data concerning existing permits issued since January 1, 1965
by the Corps of Engineers to any person for the purpose of
discharging DREDGED MATERIAL into navigable waters within
or bordering any state
WASHINGTON

Washington

Name & Address of Permittee (1)	Date Permit Issued-Renewal (2)	Term of Permit (3)	Name and Location of water receiving dredged material (4)	Section of Refuse Act under which Permit Issued (5)	Total quantity of material discharged under this permit (6)
Lockhead Shipbuilding & Construction Co. Seattle	3/07/68	3 year	Elliott Bay	10	6,000 yds
Lockhead Shipbuilding & Construction Co.	6/11/68	3 year	Elliott Bay	10	7,100 "
Hurlen Construction Seattle	11/05/68	3 "	Elliott Bay	10	1,300 "
Todd Shipyards Corp. Seattleq	10/25/68	3 "	Puget Sound off Alki Point	10	4,000 "
Todd Shipyards Corp.	6/04/69	3 "	Elliott Bay	10	6,000 "
Todd Shipyards Corp	8/26/69	3 "	Puget Sound off Alki Point	10	2,000 "
Port of Seattle	9/03/69	3 "	Elliott Bay	10	26,000 "
Port of Seattle	3/10/70	3 "	Puget Sound off Duwamish Head	10	13,000 "
Pacific Towboat Co. Seattle	6/23/67	3 "	Port Gardner Everett	10	35,000 "
Port of Everett	6/16/69	3 "	Port Gardner, Everett	10	6,200 "

TABLE B

Data concerning existing permits issued since January 1, 1965 by the Corps of Engineers to any person for the purpose of discharging DREDGED MATERIAL into navigable waters within or bordering any state

WASHINGTON

Washington

Name & Address of Permittee (1)	Date Permit Issued-Renewal (2)	Term of Permit (3)	Name and Location of water receiving dredged material (4)	Section of Refuse Act under which Permit Issued (5)	Total quantity of material discharged under this permit (6)
Anacortes Veneer Inc. Anacortes	10/01/63	3 year	Guemes Channel	10	46,000 yds
Washington State Highway Commission, Olympia	3/12/63	3 "	San Juan Channel	10	4,500 "
Richard J. Ross Pt. Roberts	5/31/68	3 "	Boundary Bay	10	1,000 "
Quigg Bros-McDonald Inc. Hoquiam	7/16/69	3 "	Grays Harbor North Channel	10	10,000 "
ITT Rayonier Inc. Hoquiam	1/09/70	3 "	Grays Harbor North Channel	10	4,000 "
Port of Grays Harbor	4/08/70	3 "	Grays Harbor, North Channel	10	1,500 "
Manson Construction & Engineering Co., Seattle	4/12/65	3 "	Guemes Channel	10	9,000 "
Pope & Talbot Inc. Port Gamble	8/12/65	3 "	Hood Canal near mouth	10	3,000 "
Lloyd A. Dealer Tacoma	6/06/67	3 "	Commencement Bay Tacoma	10	8,000 "
Foss Launch & Tug Co. Seattle	12/12/67	3 "	Commencement Bay Tacoma	10	15,500 "

TABLE B

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WASHINGTON

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Ivar Haglund Seattle	8/18/67	3 year	Shilshole Bay	10	4,500 yds
Meydenbauer Bay Yacht Club Seattle	12/15/65	3 "	Lake Washington	10	9,000 "
Puget Sound Power & Light Co. Bellevue	6/23/67	3 "	Lake Washington	10	1,000 "
Foss Launch & Tug Co. Seattle	11/02/67	3 "	Shilshole Bay off Puget Sound	10	5,000 "
Foss Launch & Tug Co.	10/01/68	3 "	Shilshole Bay	10	25,000 "
Manson Construction & Engineering Co., Seattle	12/02/68	3 "	Shilshole Bay off Puget Sound	10	6,000 "
Midtown Investment Co. Seattle	6/09/69	3 "	Shilshole Bay off Puget Sound	10	67,200 "
Tom Wheeler, Seattle	3/06/70	3 "	Shilshole Bay	10	4,000 "
E.I. DuPont de Nemours Co., Dupont	10/10/67	3 "	Nisqually Reach of Puget Sound	10	4,000 "
Friday Harbor Sand & Gravel Co. Friday Harbor	4/05/65	3 "	North Bay San Juan Island	10	20,000 "

TABLE B

Data concerning existing permits issued since January 1, 1965 by the Corps of Engineers to any person for the purpose of discharging DREDGED MATERIAL into navigable waters within or bordering any state

WASHINGTON

ame & Address of Permittee (1)	Date Permit Issued-Renewal (2)	Term of Permit (3)	Name and Location of water receiving dredged material (4)	Section of Refuse Act under which Permit Issued (5)	Total quantity of material discharged under this permit (6)
Pope & Talbot Inc. Port Gamble	9/23/69	3 year	Hood Canal off Port Gamble	10	500 yds
Port of Tacoma	7/12/67	3 "	Commencement Bay, Tacoma Harbor	10	230,000 "
Normandy Cove Boat Club Seattle	10/14/69	3 "	East Passage of Puget Sound	10	1,200 "
Union Oil Company of California, Seattle	8/06/69	3 "	Puget Sound near Edmonds	10	1,000 "
City of Seattle	4/15/70	6 months	Puget Sound at Meadow Point	10	850 "
Constructors - PACCO Seattle	3/26/65	3 year	Shilshole Bay of Puget Sound	10	4,000 "
Port of Tacoma	6/07/65	3 "	Commencement Bay, Tacoma Harbor	10	26,000 "
Port of Tacoma	9/25/67	3 "	Commencement Bay, Tacoma Harbor	10	48,000 "
Norton Clapp Seattle	11/17/67	3 "	West Sound off Orcas Island	10	2,000 "

TABLE B

Data concerning existing permits issued since January 1, 1965
by the Corps of Engineers to any person for the purpose of
discharging DREDGED MATERIAL into navigable waters within
or bordering any state
WASHINGTON (Walla Walla District Only)

me & Address of Permittee (1)	Date Permit Issued-Renewal (2)	Term of Permit (3)	Name and Location of water receiving dredged material (4)	Section of Refuse Act under which Permit Issued (5)	Total quantity of material discharged under this permit (6)
pper Columbia River onstruction Co. . O. Box 2160 ri-City, Wash 99302	18 Feb 1970	31 Dec 1973	Snake River below El. 420	10	1,000 yds

TABLE B

Data concerning existing permits issued since January 1, 1965
by the Corps of Engineers to any person for the purpose of
discharging DREDGED MATERIAL into navigable waters within
or bordering any state
WASHINGTON

WASHINGTON

Name & Address of Permittee (1)	Date Permit Issued-Renewal (2)	Term of Permit (3)	Name and Location of water receiving dredged material (4)	Section of Refuse Act under which Permit Issued (5)	Total quantity of material discharged under this permit (6)
Washington Mineral Prod., Inc. P. O. Box 488 Ilwaco, Wash. 98624	19 July 1966	31 Dec 1969	Baker Bay, Wash. (Lower Columbia River)	R&H Section 10	None
Columbia Minerals, Inc.. 8204 Maple St.,Southwest Tacoma, Wash. 98498	12 July 1968	31 Dec 1971	"	"	"

TABLE B

MICHIGAN

Name & Address of Permittee (1)	Date Permit Issued-Renewal (2)	Term of Permit (years) (3)	Name and Location of water receiving dredged material (4)	Permits Issued Under Section 10, RHA Act 1899 (5)	Total quantity of material discharged under this permit (6)
Robert Mott, 1700 Genesee Towers, Flint, Mich.	21 Mar 69	1 yrs.	Lake Huron	X	** 3,000 cy
Mich. Dept. of Nat. Resources Stevens T. Mason Bldg, Lansing, Mi.	11 Jul 69	4 "	Lake Huron	X	** 1,500 "
Massey Marine Salvage Lockwood St., Alpena, Mich.	12 Jul 69	1 "	St. Clair River	X	** 10,000 "
City of Detroit, 735 Randolph St. Detroit, Mich.	11 Feb 65 21 Jul 68	3 " 3 "	Lake Huron	X	**300,000 (Note Major part of fill on shore) "
U. S. Steel Corp, Mich. Limestone, Rogers City, Mich.	25 Jun 65	4 "	Lake Huron (Deep water)	X	* 26,000 "
U. S. Steel Corp Rogers City, Mich	24 May 65	4 "	Lake Huron (Deep water)	X	* 57,000 "
Detroit Edison Co., 2000 Second Ave., Detroit, Mich	18 Aug 65	2 "	Lake Huron (Deep Water)	X	* 399,847 "
Hazel M. Watt, 13035 Loretta Ave., Detroit, Mich.	8 Dec 65	2 "	Lake Huron	X	** 1,000 "
Crescent Stone Co., 3000 Monticelo Blvd., Cleveland, Ohio	10 Sep 65	2 "	Lake Michigan	X	* 23,600 "

TABLE B

MICHIGAN

MICHIGAN

Name & Address of Permittee (1)	Date Permit Issued-Renewal (2)	Term of Permit (years) (3)	Name and Location of water receiving dredged material (4)	Permits Issued Under Section 10, RSH Act 1899 (5)	Total quantity of material discharged under this permit (6)
Robert Taylor, 1106 N. Dragoon, Detroit, Mich.	18 May 65	2 yrs.	Lake Huron	X	** 11,000 cy
Spencer, White, Prentis Penn-Dixie Cement Corp, 60 East 42nd St, N.Y., N.Y.,	17 Jul 66	2 "	Lake Michigan (deep water)	X	* 24,000 "
Luedtke Engineering Frankfort, Mich.	12 Feb 68	4 "	Lake Michigan (deep water)	X	* 4,000 " ** 110,000 "
Consumers Power Co. 212 West Mich Ave, Jackson, Mich.	31 Mar 67	4 "	Lake Michigan (deep water)	X	** 35,000 "
City of Ludington, Michigan	19 Feb 69	4 "	Lake Michigan (deep water)	X	** 10,000 "

TABLE B

MINNESOT/

Data concerning existing permits issued since January 1, 1965 by the Corps of Engineers to any person for the purpose of discharging DREDGED MATERIAL into navigable waters within or bordering any state

MINNESOTA

Name & Address of Permittee	Date Permit Issued-Renewal	Term of Permit	Name and Location of water receiving dredged material	Section of Refuse Act under which Permit Issued	Total quantity of material discharged under this permit
(1)	(2)	(3)	(4)	(5)	(6)
Duluth, Mesabi & Iron Range Ry. Co. Duluth, Minnesota	16 July 1965	General w/cond. K	Lake Superior	Sec. 10 River & Harbor Act 1899	1,300,000 Cu.Yds for fill in dockin area.

TABLE I

Data concerning existing permits issued since January 1, 1965 by the Corps of Engineers to any person for the purpose of discharging DREDGED MATERIAL into navigable waters within or bordering any state

MISSISSIPPI

Name & Address of Permittee (1)	Date Permit Issued-Renewal (2)	Term of Permit (3)	Name and Location of water receiving dredged material (4)	Section of 1899 Act under which Permit Issued (5)	Total quantity of material discharged under this permit (6)
Gulf Central Seafood, Inc. P. O. Box 373 Biloxi, Miss. 39533	29 Mar 68	3 years 9 mos.	Biloxi Bay at Biloxi, Mississippi	10	Approx. 4,000 cu.yds.
Mississippi State Highway Department Jackson, Miss. 39205	22 Sep 69	3 years 3 mos.	Back Bay of Biloxi near Biloxi, Miss.	10	Approx. 280,000 cu.yds.
Harrison County Development Commission P. O. Box 569 Gulfport, Mississippi 39502	21 Sep 66	3 years 3 mos.	Biloxi Bay at Biloxi, Mississippi	10	Approx. 500,000 cu.yds.
Jackson County Port Authority Jackson County Bd. of Supervisors State of Mississippi Agricultural & Industrial Board Pascagoula, Miss. 39567	6 Jun 68	3 years 6 mos.	Mississippi Sound near Pascagoula, Miss.	10	Approx 4,000,000 cu.yds. (diked)
Mississippi State Port Authority Gulfport, Miss. 39502	16 Dec 68	3 years	Mississippi Sound at Gulfport, Miss.	10	Approx. 50,000 cu.yds.
Gulfport State Port Authority P. O. Box 40 Gulfport, Mississippi 39502	21 Sep 66	3 years 3 mos.	Mississippi Sound at Gulfport, Miss.	10	Approx. 2,500,000 cu.yds. (diked area)
City of Gulfport Gulfport, Mississippi 39501	7 Nov 68	3 years 1 mo.	Mississippi Sound at Gulfport, Miss.	10	-

TABLE I

MISSISSIPPI (Cont'd)

Name & Address of Permittee (1)	Date Permit Issued-Renewal (2)	Term of Permit (3)	Name and Location of water receiving dredged material (4)	Section of 1899 Act under which Permit Issued (5)	Total quantity of material discharged under this permit (6)
Biloxi Freezing Co. 402 Bohn Street Biloxi, Mississippi 39530	9 Sep 66	3 years 3 mos.	Mississippi Sound at Biloxi, Miss.	10	Approx. 5,000 cu.yds.
Creare Corporation Ocean Springs, Miss. 39569	20 Aug 69	3 years 4 mos.	Mississippi Sound near Ocean Springs, Miss.	10	Approx. 105,000 cu.yds.

TABLE B

MISSOURI

Data concerning existing permits issued since January 1, 1965 by the Corps of Engineers to any person for the purpose of discharging DREDGED MATERIAL into navigable waters within or bordering any state

MISSOURI

me & Address of Permittee (1)	Date Permit Issued-Renewal (2)	Term of Permit (3)	Name and Location of water receiving dredged material (4)	Section of Refuse Act under which Permit Issued (5)	Total quantity of material discharged under this permit (6)
able Rock Asphalt Const Co. . O. Box 14 ranson, Missouri	12 Sep 68	2 yrs	White River Miles 520.8 to 524.1	10	5,000 tons

ll of the above are engaged in dredging sand and gravel for placing on shore for commercial purposes. The material discharged consists of fines having no ommercial value which are separated and returned to the riverbed.

TABLE B

Data concerning existing permits issued since January 1, 1965 by the Corps of Engineers to any person for the purpose of discharging DREDGED MATERIAL into navigable waters within or bordering any state

MONTANA

State of Montana

ame & Address of Permittee (1)	Date Permit Issued-Renewal (2)	Term of Permit (3)	Name and Location of water receiving dredged material (4)	Section of Refuse Act under which Permit Issued (5)	Total quantity of material discharged under this permit (6)

NONE.

TABLE B

Data concerning existing permits issued since January 1, 1965 by the Corps of Engineers to any person for the purpose of discharging DREDGED MATERIAL into navigable waters within or bordering any state

NEBRASKA

ame & Address of Permittee (1)	Date Permit Issued-Renewal (2)	Term of Permit (3)	Name and Location of water receiving dredged material (4)	Section of Refuse Act under which Permit Issued (5)	Total quantity of material discharged under this permit (6)

N O N E

Senator HART. The committee will be in order.

Our concluding witnesses today are from the Army Corps of Engineers, or at least speaking for the Army Corps of Engineers. The general counsel of the Department of the Army and his Special Assistant to the Secretary of the Army for civil functions, Mr. Robert Jordan.

May I welcome to the hearing and the committee table a distinguished member of the Kansas Legislature. I invited him to join us because in addition to his interest in the subject matter demonstrated by his presence here throughout the morning, since our colleague on the committee from Kansas, Senator Pearson, I am sure Senator Fred Linde would act in his stead. We welcome you.

STATEMENT OF ROBERT E. JORDAN III, GENERAL COUNSEL AND SPECIAL ASSISTANT TO THE SECRETARY OF THE ARMY FOR CIVIL FUNCTIONS; ACCOMPANIED BY J. LANKHORST, ASSISTANT GENERAL COUNSEL, ARMY CORPS OF ENGINEERS; AND MARK S. GURNEE, CHIEF, OPERATIONS DIVISION, CIVIL WORKS, OFFICE, CHIEF OF ENGINEERS, U.S. ARMY

Mr. JORDAN. Mr. Chairman.

I am Robert Jordan, general counsel of the Army and Special Assistant to the Secretary of the Army for civil functions. In the latter capacity I supervise, for the Secretary of the Army, the Corps of Engineers civil works program. I appreciate the opportunity to testify before this committee on the role of the Department of the Army in the control of discharges into navigable waters of the United States under statutory authorities administered by the Secretary of the Army acting through the Corps of Engineers.

Mr. Lankhorst is with me this morning.

At an earlier hearing of your subcommittee on May 8, 1970, at Mount Clemens, Mich.,[1] the statutory authorities under which the Department of the Army and the Corps of Engineers operate were discussed. However, for the benefit of those who have not had the opportunity to review the record, I would like to summarize those authorities.

The Rivers and Harbors Act of 1899 contains a number of provisions which operate to give the Department of the Army and the Corps of Engineers considerable control over activities affecting navigable waters of the United States. Section 10 of that act (33 U.S.C. 403) prohibits the erection of structures or the undertaking of work in navigable waters except on plans recommended by the Chief of Engineers and authorized by the Secretary of the Army and provides the basis for the permit program administered by the Department of the Army and the corps.

Section 13 of the 1899 act, now codified at 33 U.S.C. 407, is commonly referred to as the Refuse Act. Section 13 prohibits the discharge of matter of any kind, whether from ship or from shore, into the navigable waters of the United States, unless flowing from streets or sewers

[1] See serial 91–73, pt. 1.

in a liquid state. The act can be enforced through the imposition of criminal or civil penalties and injunctive relief is also available.

Although the Refuse Act has been used for some time to prosecute those responsible for discharges or deposits which adversely affect the navigable capacity of a waterway, its utilization in connection with discharges or deposits having an adverse impact on water quality has been comparatively recent. This is not at all surprising since water pollution was not the serious problem in 1899 that it is today. The preservation of the navigable capacity of our Nation's waterways was perhaps uppermost in the minds of men 70 years ago. Viewed in this light, the uncertainties associated with utilization of the Refuse Act for purposes unrelated to navigation are more readily understood.

Despite this history, the court cases to date clearly hold that the Refuse Act may be used independently of other legal authority to prevent, through injunction, or to prosecute those responsible for discharges or deposits which have an adverse impact on water quality even though such discharges or deposits may have no impact on the navigability of a waterway. The question that must be addressed, a question which we have been addressing within the executive branch for the last several months, concerns the extent to which the Refuse Act should be relied upon in instances when a discharge or deposit and any resulting impact upon water quality is subject to administrative proceedings under the Federal Water Pollution Control Act, as amended.

There are at least three types of cases in which there is no overlapping jurisdiction between the responsibilities of the Department of the Army and the Corps of Engineers under the Refuse Act and the responsibilities of the FWQA under the Federal Water Pollution Control Act. In each of these areas the Army has been and will continue to make full use of the Refuse Act to prosecute offenders who are responsible for discharges or deposits which are violative of the provisions of the act.

The first type of case involves a discharge or deposit which affects navigation—for example, the depositing of scrap lumber or some other type of floating material in a navigable waterway. Another good example of this first type of case, one which has attracted considerable publicity, is the accidental oil spill.

The second type of case involves an isolated or occasional discharge or deposit which although not having any substantial impact upon navigability has a clearly adverse environmental or water quality impact. An example of this type of case might be a one-time or occasional flushing of some fluid or substance into a waterway. The Refuse Act is relied upon in such a case because discharges of this type are somewhat different from discharges which are associated with the day-to-day or routine operations of an industrial facility and, accordingly, are not the type of discharges which readily lend themselves to enforcement proceedings of the type generally initiated by the FWQA.

The third type of case involves a discharge or deposit into a navigable but intrastate waterway. Such discharges or deposits, even if frequent or continuous and resulting from the ordinary operations of an industrial or other facility, would appear to us to present appropriate grounds for reliance upon the Refuse Act since the FWQA is restricted from initiating enforcement proceedings in all but a limited

set of circumstances when the discharge occurs in an intrastate waterway.

The type of case which presents the greatest difficulty for the Army, both because it involves overlapping jurisdiction with the FWQA and because its detection and investigation involve expertise which is not readily available within the Department of the Army and the Corps of Engineers, involves interstate discharges or deposits of a frequent or continuous nature resulting from the ordinary operations of an industrial or other permanent facility. Discharges of this type, although violative of the Refuse Act, may not be inconsistent with FWQA approved pollution abatement proceedings, or may, in the judgment of the FWQA, present a case that should be subjected to the remedies afforded under the Federal Water Pollution Control Act.

As you know, a number of Departments of the executive branch are directly involved in the fight to abate and control water pollution, and several of these Departments, because of their responsibilities, are concerned with finding a vehicle which will provide for interagency cooperation in the utilization of the Refuse Act to abate and control water pollution. To assure such cooperation and to resolve the questions associated with overlapping jurisdiction, the Army has been working with the Department of the Interior and with the Department of Justice and with the Environmental Quality Council to come up with an interagency memorandum of understanding that will identify the cases in which the Refuse Act can best supplement the Federal Water Pollution Control Act and advance the purposes associated with that act and other water quality legislation.

As Mr. Lanhorst mentioned in his testimony before your subcommittee we began working on this back in March at an Army sponsored meeting involving a number of agencies. I expect that we will have agreement on a memorandum of understanding involving utilization of the Refuse Act and investigations of violations in the near future.

We also have to coordinate with other interested agencies on the establishment of a new permit program, which I will address later in my testimony.

I would like to make it very clear that the Department of the Army recognizes that it has primary responsibility for enforcement of the Refuse Act pursuant to 33 U.S.C. 413 and that we are prepared to do everything we can to assist in implementing plans and programs which contribute to the abatement of water pollution. It should be understood, however, that, in view of the overall responsibility for water pollution abatement and control vested in the Federal Water Quality Administration by the Federal Water Pollution Control Act and the expertise that has been developed by that agency, the Army must look to the FWQA for both technical assistance in investigating violations of the Refuse Act which have water quality implications and, to a more limited extent, for policy guidance, particularly where a discharge might also be addressed in the context of an FWQA administrative proceeding. With such assistance from FWQA, the Department of the Army and the Corps of Engineers can, through their administration of the Refuse Act, make a significant contribution in the fight against water pollution. The extent of that contribution will be limited only by the limitations inherent in manpower shortages in our District offices.

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The Corps has been criticized for not making full use of the Refuse Act. I think our awareness in the Army and the Corps has lagged behind the problem just as I feel the awareness of much of the country, including portions of the Congress and other agencies, has lagged behind the problem. We now recognize the magnitude of the problem and are prepared to utilize available authority to contribute to its resolution.

Before we can proceed with the violation we have to have an adequate investigation. Otherwise referral to the Department of Justice for prosecution will not be of any value. The personnel resources of the District Engineers are not unlimited. For example, the U.S. Army Engineer District, Detroit, Mich., in its permits and enforcement office, has only two men. Along with other assigned duties, these men have surveillance responsibility for over 3,000 miles of shoreline. If increased reliance is to be placed upon the Refuse Act to supplement enforcement remedies under the Federal Water Pollution Control Act and other water quality legislation, it is clear that both the FWQA and the Corps of Engineers will need additional personnel to effectively meet their statutory responsibilities.

I would like to make it clear we are not engaged in a contest with the FWQA. This is a national problem and should be addressed in a concerted but integrated fashion. We want to do what we can but we don't want to be contesting with another Federal agency when we should be cooperating with them in the enforcement of our statutory responsibilities.

Senator HART. Interrupting you there, I have been stewing since the hearings at St. Clair over this problem of how—I think you are right in saying everybody was asleep at the switch. Literally, everybody. But thinking of how we react now and in the future, I have been stewing over this business of how you can most economically police the—you say the Detroit office of the Corps has 3,000 miles of shoreline. Lakes and rivers and coastlines in this country—how many thousands of miles is there? Do you want to make a guess?

Mr. JORDAN. I don't know offhand but it must be hundreds of thousands of miles of coastline when you take both the ocean coast and the rivers and the streams.

Senator HART. My first thought was ask the Corps how many people they need to make sure that everybody that is dumping or building and planning to dump knows that they should get a permit and make sure they have it. I then realize that you come in here and ask for—your personnel don't come in with a military budget, or does it?

Mr. JORDAN. No, sir. We come in a separate civil works budget.

Senator HART. Do you ask them for personnel on the order of thousands?

Mr. JORDAN. Well, for example, just to get started, I think, in a program of this kind, would involve somewhere between a half a dozen and a dozen people per district. There is an awful lot of paperwork and administrative processing. We had some estimates from one industry, the paper industry, that there might be somewhere between 5,000 and 10,000 potential Refuse Act permit cases for just that industry alone. Not in the one district but around the United States. Multiply that by the other industries, and the administrative problem is substantial.

I recognize that our Nation has many problems and many difficulties in sorting out priorities. Our budget request for people we feel we need is going to have to be weighed and balanced by the Office of Management and Budget and by the President against other national needs. We do plan to incorporate in our fiscal year 1972 budget request, which is the one we are currently working on, 1971 being pretty far along, the concept of increased enforcement of the Refuse Act.

Senator HART. I assume you will but as I thought more about it, it occurred to me that we ought to consider in terms of enforcement a method that would involve the States with their water quality boards and so on. We have to figure out a way effectively to insure against damaging and dumping. That is the first observation.

Then the second is to do it as economically—I think everybody has to not only think about the first but worry about the second as well.

Mr. JORDAN. To do it economically is very important because I think it would be a great tragedy if in an area with so many demands we were duplicating a function that someone else is performing.

Senator HART. Or assuming at the moment that neither is doing it, which could do it at less cost assuming the equivalent capacity.

Mr. JORDAN. That is right, and in our discussions with the Federal Water Quality Administration in the context of our memorandum of agreement, our thinking has been that we ought to utilize and build upon the expertise of the FWQA rather than attempt to duplicate it within the Army. They are perfectly willing to cooperate with us and we visualize a scheme of referrals where their expertise in the chemical and biological field and water quality standards field can be made available to us. We don't plan to substitute our judgment for theirs in these areas.

We have been encouraged by two recent enactments by the Congress. These have reinforced our determination to make effective use of the Refuse Act in attempting to control pollution through the exercise of the permit functions assigned to the Department of the Army and administered by the Corps of Engineers. First, the National Environmental Policy Act of 1969, in addition to its general declarations of national policy with respect to the environment, specifically exhorted agencies to interpret and administer policies, regulations, and public laws of the United States in accordance with the policies set forth in the Act.

We believe that exhortation is particularly applicable to the Refuse Act.

In April of this year, partially in response to the National Environmental Policy Act, we amended our regulations to assure that in the consideration of section 403 permit applications greater weight is given to the impact which proposed work in navigable waters will have on environmental factors, including water quality. One section specifically addresses applications for permits to construction outfall structures for industrial and other plants. Applicants for such permits are now required to identify the character of the effluent and to furnish data pertaining to chemical content, water temperature differentials, toxins, sewage, amount, and frequency of the discharge and the type and quantity of solids involved, if any. We believe that this information will better equip us to evaluation permit applications to insure that permits granted do not permit the erection of structures which

would discharge materials or fluids having any significant adverse impact on water quality.

Although our section 403 permit program is limited to applications for permits for work in navigable waters and we do not have at this moment a program which requires a permit for discharges or deposits into navigable waters, we are presently working on the establishment of a permit program specifically relating to discharges. We believe that such a program is consistent with both the Refuse Act itself and a second recent enactment of the Congress, the Water Quality Improvement Act of 1970. Section 21(b) of that act requires applicants for Federal permits to file with any permit application a certification from the appropriate State or interstate pollution control agency that there is reasonable assurance the activity to be conducted pursuant to the permit will not violate applicable water quality standards. No Federal license or permit can be granted unless such a certificate has been obtained, or has been waived because of failure of the certifying authority to act within a reasonable time; and, significantly, no Federal permit may be granted where certification has been denied.

This gets back to the question: how do we get the States into the act? We feel section 21(b) with its certification requirement will involve the States in these cases because they will have to provide the required certification.

Special provisions apply to cases where actual construction has been lawfully commenced prior to the enactment of the Water Quality Improvement Act. In such cases, no certification is required for a Federal license or permit, but any Federal license or permit issued terminates at the end of a 3-year period beginning on the date of enactment of the 1970 act unless, prior to such time, a certification with respect to compliance with water quality standards has been obtained. Similarly, with respect to applications pending on the date of enactment of the Water Quality Improvement Act, where a permit is issued within 1 year following enactment, such permit will terminate a year from the date of its issuance unless a certification has been obtained.

We believe that our responsibilities are clear, and we propose to meet those responsibilities. Specifically, we are instructing all District Engineers that permits will be required for future discharges into navigable waters and that applications for such permits must be accomplished by an appropriate State certification. The establishment of such a permit program for discharges will involve a considerable amount of work and I have already alluded to our manpower problem. Accordingly, it would be a mistake to expect miracles overnight. Initially we will have to concentrate on applying the permit and certification requirement to discharges from new facilities where the certification requirement is immediately effective and, with the assistance of FWQA, to discharges which are known to have a significant adverse affect on water quality. It will, of course, be impossible to individually notify all companies who now discharge into navigable waters of the requirement to apply for a permit. We will, however, through the Federal Register and other public means, attempt to make industry and concerned persons aware of our regulatory changes.

We are hopeful that the changes which we are working on will, along with other Federal, State, and local antipollution activities, encourage industries to accelerate their antipollution activities.

No doubt the resulting workload will be enormous, and we will experience various problems of interpretation and administration as we move ahead with our program. We believe, however, that the results will justify our efforts.

Mr. Chairman, that completes my prepared statement. I would be pleased to attempt to answer any questions you may have.

We are going to work with FWQA, the Department of Interior, the Justice Department, and Environmental Quality Council to come up with procedures and policies which will achieve the objectives of the recent legislation.

Senator HART. We have, as you heard earlier, introduced in the record the tabulation developed by the Corps of the permits beginning with 1899—perhaps not those that expired but at least those that are now current. Well, I entered a guilty plea of having not been as conscious as I—given an understanding of material in the scientific journals—theoretically could have been and I think you have indicated the Corps itself shares in part the responsibility for that problem.

Let me ask you this: Do you think that the preclearance of the discharge, effluent discharge, by State and Federal agencies, which is now required—preclearance which is required by the combination of the Water Quality Improvement Act and the Refuse Act—I understand is against future mercuries?

Mr. JORDAN. I wish I could say that the answer was yes, but I think it is probably not. The mercury case represents a case where our learning was inadequate. Mercury has been around for a long time. Some of its hazards weren't fully apprehended. I don't doubt but what there are other compounds, organic and inorganic, whose possible adverse effect on human and animal life has not yet been realized.

So research and understanding of what can be harmful must go along with procedures for measuring applications against some test of harmfulness, and one without the other certainly is not enough.

Senator HART. But given a combination of those two acts we do have complete preclearance and they will contribute importantly to the effort to insure against more mercuries.

Mr. JORDAN. We think so. Frankly we hope, Mr. Chairman, that the enforcement of this additional piece of authority will help people in industry develop the interest to take the necessary steps. I think there is a problem there.

Senator HART. I think that is the key. The key is powerful enforcement of the act. I anticipate the industries that will fail to apply for a permit under the act so they won't get the certification from the State water quality group that is a precondition unless we have the kind of enforcement that is sort of the equivalent of the police car at the top of the hill. That sure slows down the drivers, the knowledge that you, or you in association with the State agency, or the State agency is at the top of the hill, is going to have that kind of effect.

Now, do you believe that the guidelines of the Justice Department to enforce the Refuse Act will provide the sort of enforcement that is needed?

Mr. JORDAN. The Justice Department guidelines came out after our initial meeting during which we discussed enforcement of the Refuse Act. I think that to some extent in the public image and in the press they may have been misunderstood.

As I understand the situation, before that time U.S. attorneys really couldn't do anything under the Refuse Act without approval from headquarters, so to speak. The guidelines which were promulgated, decentralized, and delegated authority to U.S. attorneys to move in certain kinds of cases. There are some exceptions dealing with continuous industrial discharges, municipal and governmental plants, and so forth. But my discussions with the Department of Justice officials, Mr. Ashiwa and his associates, have indicated to me that these exceptions do not represent a judgment that these types of cases will not be prosecuted. The guidelines merely impose a requirement that such actions be coordinated. Justice, along with the rest of us to some extent, is groping its way here, we are moving into a new area and we are hoping to do it, not really cautiously, but sensibly, and I think that there will be cases—I know there have been cases—in which Justice has approved prosecutions in cases which would not be within the prerogative of individual U.S. attorneys.

Senator HART. Not quarreling with the interpretation—perhaps you are right that there has been a misunderstanding on occasions about the guideline, but the basic problem, I would suggest, with the guideline is that enforcement—prosecution, if you will—is all hinged on whether there is pollution or not. The law requires a permit. Whether you are putting in water of a quality that improves the stream or damages it, technically under the law, is not relevant.

It would seem to me that it doesn't make sense to exempt any user, any dumper, from the threat of prosecution if we are serious about getting everybody licensed by the corps and certified by the State. It doesn't make any sense to exempt anybody from the threat of prosecution, even if he has spring water that he is putting into a polluted stream.

It is sort of like we will prosecute unlicensed drivers only in the event they cause accidents but you stop and occasionally prosecute a fellow driving within the speed limit just because he doesn't have a license. Would you agree with this?

Mr. JORDAN. What you say is true in many respects. The permit requirement ultimately ought to be enforced against everyone, even the guy putting the spring water in. Unless we enforce it generally we won't really know what is going into our waterways.

Senator HART. That is it.

Mr. JORDAN. Knowing what is going in may help us to prevent a mercury case or some similar case in the future. But then we get up against the really difficult nut to crack.

Let's suppose the guy comes in, he applies for a permit and the State makes the necessary certification under section 21(b). I would anticipate that we are going to find cases where the plant has been in existence for some time and is now coming in for a permit and the States certification is going to, in effect, be a contingent certification. They will certify him provided he is in compliance with their water quality standards, or he has a plan for meeting those water quality standards.

Then the question is, what do we do? Do we go ahead and issue the Federal permit in this type of case?

Let's say, for the sake of argument, that this is an industry whose dedication to antipollution objectives, although recent, has been

laudable. In other words, it is doing the right kind of thing. It is spending the money. It is having the technical studies made to show how it can reduce pollution. It is doing all the right things. Yet, there it sits.

I suspect that we will have to, as a practical matter, grant permits in such cases. Otherwise, Mr. Chairman, quite frankly, we would, to a very large extent, shut down American industry. I don't think we want a strict, literal, blanket—kind of blind—enforcement of the act.

Senator HART. I would agree with you. I would support the modification you added to my comment. I think it would be an imprudent action.

What staff requests are contained in the 1971 corps budget for personnel on the Refuse Act? Do you know?

Mr. JORDAN. We have very limited staff requests in the 1971 budget. There were really none in this area. We were under constraints not to ask for very many additional people for anything. As you know, with the budget cycle as it is, the 1971 budget was prepared initially a long time ago, we started a year or so ago, and here again I think in retrospect we are behind the problem, behind anticipation of how we ought to deal with it.

Senator HART. Do you know where that bill stands now?

Mr. JORDAN. That bill—perhaps someone here would know.

Mr. GURNEE. Mark Gurnee, chief of operations, civil works. I believe, sir, it has passed the House and that the Senate Appropriations Committee proposes, or has it scheduled to be reported out within the next 10 days to the floor.

Senator HART. Given the intervening knowledge that we have accumulated in this area, what would you suggest be done to that in this area?

Mr. JORDAN. Mr. Chairman, as I am sure you know, we are under certain constraints from our bosses about going in and asking for more people and more money in ways that have not been taken through the President's budget process. We can certainly discuss this problem in the Office of Management Budget but it would be improper for me to try to suggest what their reaction would be.

It is late in the cycle of things, with the bill already through the House and having been worked on and considered by the Senate.

Senator HART. It is at this point, at least, young Americans suggest that the system really doesn't make much sense.

Mr. JORDAN. I sometimes think that perhaps all of us currently working in the system have been victims of mercury in one form or another.

Senator HART. Put the monkey on Congress. We should be able to understand that from the time of submission, whatever ceilings you were operating on constructed in part to be sure we could buy an anti-ballistic-missile system, we know now that we don't have the personnel in such number to respond to acknowledged grave domestic threats. I would hope that we can perhaps contribute to the President's complaint about us being big spenders but maybe we can save the money from some of those other things.

Mr. JORDAN. I am sure Chairman Ellender would be receptive to any views you have as a result of your——

Senator HART. Thank you. Even though these hearings will be far from closed in the next 10 days, I will certainly, if it is possible to testify before that subcommittee, do so, and if not, indicate to him an intention to seek to amend on the floor.

Mr. Bickwit?

Mr. BICKWIT. When Senator Hart attempts to do that, it may be found by the Congress that the bill is too high, and, in that event we have been toying with other possible solutions to get the kind of preclearance that we have all acknowledged has got to be obtained to protect our waters. What do you think of the alternative of requiring preclearence through the use of the Federal Water Pollution Control Act? Since that act, the Department of the Interior approves not only water quality standards under that act but also approves enforcement procedures. If the Department were to require all States to effect some kind of a preclearance system so that nothing got into our water without some kind of certification prior to the time it was discharged, that perhaps the need for the Refuse Act would be less noticeable. Perhaps we would be spending a lot less money and perhaps we would be accomplishing the same kind of objectives as preclearance.

Mr. JORDAN. Well, there are various ways to go at the problem. The Federal Water Pollution Control Act has a policy of leaning on the States in terms of responsibility. I think section 21(b) of the Water Quality Improvement Act is consistent with that. I would point out though, that one of the problems we have is a problem of time and then that is related to a problem of people and money.

Realistically, to say it is a State problem because we are unable to put in the people and the money in our budget is just shifting the job somewhere else. Many State legislatures are in session less frequently than the Congress and for shorter periods of time, so in many States the budget problem, the problem of perceiving a need and getting the people and resources in to do something about it, is really an even worse problem for the States than it is for Federal Government.

I am very much aware of that.

Mr. BICKWIT. That may be true, but as you said before we do want to concentrate on eliminating any potential duplication given the funds were short. I think we have to acknowledge that there is some form of duplication in requiring State certification in the Water Quality Improvement Act followed by Federal permitting under the Refuse Act and perhaps we could eliminate some chunk of the cost and it would be a phenomenal cost for you to police that act effectively. Perhaps we could eliminate some chunk of the cost by going directly to the States and requiring them to effect the sort of preclearance and certification that is now required by the combination of the Water Quality Improvement Act and the Refuse Act.

Mr. JORDAN. I would think that if the States had a well worked out certification procedure, that would be where the difficult problems of addressing water quality standards and the nature of the particular discharge would come in. If the States do their job well prior to certification, the needs of the Federal Government would be greatly facilitated. At the Federal level we would have less work. We would, to a large extent, accept the States' actions.

Mr. BICKWIT. I wonder if we could just have your assurance that in your future negotiations with the Department of Interior, which is

designed to produce the memorandum of understanding you referred to, what we want is your assurance that you will raise this alternative and discuss it.

Mr. JORDAN. I will be happy to give you that assurance, and to raise the alternative when we have our discussion.

Mr. BICKWIT. Thank you very much.

Senator HART. I think it is very fortunate for us that Senator Linde is sitting with us today. I identified him as one long concerned with the area. It is reflected in the fact that he is vice chairman of the Kansas Water Resources Senate Committee. Do you have any reaction to any of the suggestions, particularly on this businesss of the coordination of the Federal-State effort?

Senator LINDE. Well, Senator, I didn't expect to speak here without being elected to this distinguished body and I don't think I ever will be, but I do thank you.

These problems are very well known to us. We have the manpower problem, that we carry the fight to the floor to increase—in our State the public health department is charged with the responsibility for water quality certification. We don't have enough people and we don't have enough budget to pay the people we have. We did have a fight, as you may know, in bringing the State within the provisions of the act. This was resolved a month or two ago.

Our problem is magnified because of the scarcity of surface water in the State. Only a small part of the Missouri which flows through Kansas is properly a navigable stream, although the Arkansas is also classified, and these two acts, the one of 1899 I think applies under the navigable water and 21(b) to all waters in the State, and it is 21(b) that concerns us.

The principal contaminant in all water is runoff from these immense concentrations of cattle in a small area. We don't have the surface water to dilute these waters so we have a very serious problem which centers on the depletion of oxygen in the water from these organic-biological wastes. I don't know what the answer is. Unfortunately, we aren't even able to get around and certify all these feedlot operators and we are not able to get around and test them as frequently as we should, so this is one of the problems.

We had massive fish kills in two or three of the reservoirs. They are traceable to the feedlot runoffs. So this is not an industrial waste. It isn't mercury, except incidental to the feedstuffs that go in. I think we share this with Nebraska, Colorado, Oklahoma, parts of Texas. I feel that as a member of the State legislature that we certainly have responsibilities to police our own internal affairs.

I would prefer to do it at the State level. I would much prefer it. I think you people have other responsibilities. I am not saying this as an excuse. I have probably been harder on the feedlot operators than anyone else in the legislature, and I would prefer cracking down even more. We are not able to and we really haven't done the job we should have done, I am sorry to say.

Senator HART. I am sure you are in the company of 49 other States and the Federal Government.

We close on the note Senator Linde happily reminded us of. It is not just the industrial centers of the country that have to perk up. It's everybody, because the problem is literally everywhere.

Thank you very much.
Gentlemen, thank you.
We stand adjourned until 10 a.m. tomorrow.
(Whereupon, at 1:35 p.m., the hearing was adjourned.)

THE EFFECTS OF MERCURY ON MAN AND THE ENVIRONMENT

THURSDAY, JULY 30, 1970

U.S. SENATE, COMMITTEE ON COMMERCE,
SUBCOMMITTEE ON ENERGY,
NATURAL RESOURCES AND THE ENVIRONMENT,
Washington, D.C.

The subcommittee met, pursuant to notice, at 10:08 a.m., in room 5110, New Senate Office Building, the Honorable Philip A. Hart, chairman of the subcommittee presiding.

Present: Senator Hart.

Senator HART. The committee will be in order.

In introducing our first distinguished witness I want to apologize to him. I realize that his own schedule is complicated every day, and asking him to come in today was an additional burden. I realize that he would have much preferred, and I understand did anticipate it would be yesterday. I got my wires crossed on that, so I apologize.

Mr. KLEIN. No apologies necessary, Mr. Chairman.

Senator HART. We welcome the Assistant Secretary of the Interior, Carl Klein.

STATEMENT OF HON. CARL L. KLEIN, ASSISTANT SECRETARY FOR WATER QUALITY AND RESEARCH, U.S. DEPARTMENT OF THE INTERIOR; ACCOMPANIED BY RHEINHOLD THIEME, DEPUTY ASSISTANT FOR ENGINEERING; MURRAY STEIN, ASSISTANT COMMISSIONER, FWQA FOR ENFORCEMENT; VICTOR LAMBAU, BIOLOGIST IN CHARGE OF HEAVY METALS; AND FRANK CLARKE, ASSISTANT DIRECTOR, U.S. GEOLOGICAL SURVEY

Mr. KLEIN. I have with me today my Deputy Assistant Secretary for Engineering, Mr. Rheinhold Thieme; Mr. Murray Stein, Assistant Commissioner, FWQA for Enforcement, is pretty well known around the country.

Senator HART. He is known very well in the Detroit River area, and as far as I am concerned, favorably. I think he did an excellent job there.

Mr. KLEIN. And Mr. Frank Clarke of Geological Survey; and Mr. Victor Lambau of FWQA, a biologist in charge of heavy metals research.

Mr. Chairman, I greatly appreciate the opportunity to appear before the distinguished members of this committee today to discuss the effects of mercury on man and his environment.

Mercury is No. 80 in the table of elements, but it has ranked much higher recently in public attention because of some dramatic revela-

tions regarding its appearance in several of our Nation's waterways. In order to be able to deal effectively with this problem we must understand some facts about mercury and its uses.

Mercury is a heavy, silver-white metallic chemical element; liquid at ordinary temperatures, which sometimes occurs in a free state, but usually in combination with sulfur. It is as noted, an element, No. 80 in the periodic table of elements.

Being an element, the amount of mercury present on the earth and in the earth is always constant. The only changes are the geographic locations and the forms in which mercury appears.

In its elemental state, mercury is measured in flasks, each of which weighs 76 pounds. Most of the production is foreign, but eight of our States do produce elemental mercury—in 1968 these States were:

	Flasks
California	21,417
Nevada	4,780
Oregon	938
Arizona	192
Alaska, Idaho, Texas, and Washington	1,547
Total	28,874

This domestic production amounted to only 28,874 flasks, while world production was 255,474 flasks. U.S. production is thus only about one-ninth of total world production—but the United States uses about 35 percent of the world output, importing enough additional to balance the deficit in U.S. production.

Mr. Chairman, I note one of the witnesses yesterday stated the United States was using 5 million pounds of mercury per year. I used a little elemental mathematics and the total output in pounds per year in 1968 was 20 million pounds, 35 percent of that would be 7 million pounds that the United States uses. The fantastic thing is that we have lost so little into the water out of the 7 million we have used.

Mercury's effects on man have been evident for some time, though its precise damage has been somewhat obscure. In past centuries, liquid mercury was used in the manufacture of felt hats, and hatmakers who came into frequent contact with the material often developed mental instability such as timidity, especially in the presence of strangers.

The tendency for liquid mercury to vaporize at room temperature meant that mercury vapor often was inhaled by hatmakers. The fumes caused their gums to become inflamed, and a metallic taste to develop in their mouths. Hatters also often suffered from diarrhea, tremors, and general mental derangement. This behavior is believed to have inspired the phrase, "mad as a hatter." And undoubtedly the character in Alice in Wonderland came from this.

The uses for mercury today are much more diverse than hatmaking. Manufacturers of electrical apparatus use it, especially in battery cells, and it is also used in the production of chlorine and caustic soda and in mildewproofing compounds. Substantial quantities of mercury are used in dental preparations, in general laboratory work, and in pharmaceuticals.

Agriculture uses compounds of mercury in insecticides and fungicides, while pulp and paper plants use it to control slime. Mercury is also used in the production of protective paints and as catalysts in the manufacture of organic compounds and pigments.

One of the greatest causes for concern about mercury is its relatively high toxicity. It is this toxicity, particularly in its methyl compounds, which makes mercury so dangerous when it is discharged into surface or ground waters.

Official recognition of the harmful effects of mercury dates back at least to 1922 when the Chief Surgeon of the U.S. Bureau of Mines said in a report:

There is probably no industry, trade or art in which mercury is used but what has produced some cases of mercury poisoning.

There is a wide individual variation in susceptibility to poisoning—

The report adds—

which may be due to the fact that the tissues of some persons are able to store mercury in an innocuous form better than the tissues of other individuals.

At any rate, the report cites the cause of industrial mercury poisoning as "the absorption and retention of small quantities of the metal or one of its many compounds over an extended period of time."

The report further states:

Mercury may enter the body through the skin, the gastrointestinal tract or the respiratory tract; when applied to the skin it is more readily absorbed if the person is perspiring or if the mercury is impure and dirty . . . While comparatively large quantities of metallic mercury can be taken at one time by mouth and yet not cause death, small quantities often repeated will lead to chronic poisoning due to absorption and accumulation in the body tissue.

Early symptoms of mercury poisoning were described in the 1922 report as "foul breath, salivation, and metallic taste in the mouth; this may be followed by receding of the gums, which become sore and swollen, together with loosening of the teeth and even ulceration of the cheeks and gums. The skin generally becomes yellowish white, similar to that found in some forms of malaria."

Later symptoms include "bleeding from the intestines, feelings of nausea, colicky pains and sometimes retching."

Some of this terminology may sound rather quaint after almost 50 years, but the results of mercury poisoning are just as serious today as ever, and the menace has grown because of more extensive usage and a population which has almost doubled since.

An information circular published by the Bureau of Mines in November 1941 said:

With the increased demand for mercury incident to preparations for national defense . . . many small mines in the United States are now being worked that ordinarily would be unprofitable . . . . As operating methods at most of these small mines are more or less crude, the workers may be exposed to a serious health hazard from poisoning by mercury, especially in mines where there is an admixture of native quicksilver.

I understand that situation does not apply today, Mr. Chairman.

In April 1942, the Bureau said that the presence of quicksilver in mines producing mercury—

has long been a source of trouble and danger to the workers. Men have been sickened and some of them have been disabled by exposure to the vapors present (even in workings that were well-ventilated by ordinary standards) and to contact with dust, dirt and moisture with which the finely divided quicksilver was mixed. Where the ore was rich and this exposure was considerable,

the report said:

men were able to work only a few days or weeks; where the exposure was less they were weakened and subject to ailments often attributed to other causes.

The most serious incidence of mass mercury poisoning occurred in Minamata, Japan, between 1953 and 1960. Some 111 persons died as a result of eating fish which had been contaminated by mercury discharged into Minamata Bay by a plastics manufacturing plant. Among the 111 were 19 congenitally defective babies born to mothers who had eaten the contaminated fish and shellfish.

In 1965, another poisoning accident was reported in Niigata, Japan, and the same year mercury poisoning was found to have decimated many bird populations in Sweden. Subsequently, it was found that freshwater fish in the Scandinavian country contained large amounts of mercury. In these instance, methyl mercury was found to be the form of mercury most commonly involved.

Mr. Chairman, we started with metallic mercury and now we have been talking about mercury poisonings. How did we get from an inert metal to nationwide contamination?

Even the ancient Greeks and Romans knew of the toxic fumes from metallic mercury—but that is a far cry from the sophisticated tests now necessary to discover the presence of mercuric derivatives in water in the billionths of a part.

(a) One of the steps away from metallic mercury is the result of chlor-alkali process, using a mercury cell. Some mercury is lost in the manufacturing process. Only strict housekeeping and reprocessing can keep the losses to a minimum. And the usage of mercury for this process doubled in the period from 1965 to 1969.

Mercury is also used as a catalyst in the manufacture of certain plastics. It becomes a spent catalyst and is discharged as waste.

Mercury has been, and continues to be, used to remove process-slowing slime from the machines in certain papermaking processes and is then discharged in the waste water.

(b) A second step came when we learned that mercury sometimes appears as a phenyl.

It appeared as an ingredient in the fungicides applied as seed dressing to protect seeds—the seeds with the ingredient mercury were eated by hogs and birds and so introduced into the food chain. This brought about the hog incident in New Mexico this past winter when three children were reported to have gone blind and into comas after eating meat from a hog that had been butchered by their father. The hog was found to have eaten grain containing mercury-based fungicides.

As a phenyl, mercury is an ingredient in certain herbicides used as dressing on lawns and on golf courses. Excessive or continued use can lead to excessive amounts of mercury in runoff during heavy rains.

Mercury also appears as a methyl mercury compound and it is here, Mr. Chairman, that research has only recently shown what does happen.

There are certain bacteria in the muds of our lakes and rivers that operate on the metallic mercury heretofore thought to be inert. These bacteria change that metallic mercury into methyl mercury—a mercuric compound that is water soluble and can be ingested into the food cycle via plants, algae, lower forms of animal life and then to fish—or it can go directly from the water where it is present in the bodies of fish, through the gills or onto the slime of the fish bodies. An experiment in Sweden not only showed that this direct transfer was possible but also, and more importantly, that the concentration factor in the

fish whether from direct or indirect ingestion could be 3,000 to 1 or more. In other words, the danger point is that fish so concentrate this methyl mercury within their bodies that a previously harmless situation in water becomes extremely hazardous in fish. The extreme concentrations in fish are first in the kidneys and liver, and second, in the edible portions.

This does not mean that only methyl mercury causes this hazard in fish. Far from it—for experiments have shown that fish can biologically transform other forms of mercury into methyl mercury inside their bodies or in the mucus covering their bodies. And from these contaminated fish, mercury moves along the food cycle into birds and into humans. And as it moves, it concentrates further with each move.

The human factors are the most important. I have dwelt at length on the basic factors only because of the latent human factors which are now becoming well known.

First. Mercury is cumulative in humans. The exact factors of accumulation and/or excretion are not known yet.

Second. The places of concentration are the brain, the kidney, the liver, and the fetus of pregnant women. Strangely enough, mercury also concentrates in the human hairs—at a ratio of 333 to 1 compared to blood. Tests for mercury in the newer hair on the nape of the neck can determine the time of last exposure to this heavy metal.

Third. Mercury kills the cells of the brain—by absolute destruction.

Fourth. Exposure to mercury causes tremors, loose teeth, ulcers of the mouth, a peculiar timidity and possibly genetic birth defects due to chromosome breakage.

Fifth. Methyl mercury is the most dangerous form of mercury. It tends to associate with red blood cells and nerve tissue. It easily passes the placental barrier, becoming moderately concentrated in the fetus. It causes neurological damage, produces chromosomal aberrations and has teratogenic effects (malformations from genetic defects).

Sixth—While the alarms have been sounding as to extreme toxicity of mercury, tests have been made as to the ability to eat fish with a mercury content. Research thus far tells us that it is safe to eat approximately one-half pound of fish per day if that fish does not contain more than one-half part per million.

Seventh—The fantastic part of this entire story is that mercury can be biologically methylated into a much more toxic form; and that this conversion can take place in the muds or in the fish itself.

Eighth—The final result of accumulated mercuric poisoning is death.

Ninth—The proposed mercury standard for drinking water in the United States is .005 parts per million, or five parts per billion. It has been estimated that brain damage can result from 20 parts per million and that this can start a process leading to paralysis and finally, death.

The symptoms in man of poisoning from alkyl mercury compounds as described in the "Report of an International Committee" (1969) on maximum allowable concentrations of mercury compounds are as follows:

> Symptoms of methyl and ethyl mercury poisoning may occur weeks to months after an acute exposure to toxic concentrations. The symptomatology of acute and chronic poisoning from both compounds is similar, including numbness and tingling of the lips, of hands and feet, ataxia, disturbances of speech, concentric constriction of the visual field, impairment of hearing and emotional disturbances.

With severe intoxication the symptoms are "irreversible". The first epidemic of intoxication by ingestion of contaminated fish occurred in the Minamata District of Japan, and, therefore, this type of intoxication is often called Minamata disease.

In infants born to mothers with exposure to large amounts of methyl mercury, the symptoms are somewhat different, as would be expected. Most children had mental retardation and also cerebral palsy with convulsions.

One characteristic of methyl mercury is its tendency to accumulate in the human brain. According to the International Committee's Report, "Experiments in man with very small doses have shown that about 15 percent of the total body burden of methyl mercury is accumulated in the brain."

Lofroth, the Swedish worker, has noted that: "One of the observable effects of methyl mercury poisoning in man is the impairment of the coordination of muscle movement, and so forth, resulting from damage to certain brain cells." He further states, "As to the gross clinical symptoms one can state that a threshold mechanism is operating. This threshold mechanism is, however, not due to a methyl mercury threshold, but to a threshold in the number of damaged brain cells.

"After damage of one or a few cells, other cells may take over, the net result showing up as no effect on the clinical investigation. When too many cells have been damaged during a short time, the clinical results do show up early." He also states, "However, even a low frequency of brain cell damage, above the natural inactivation rate of these cells, during a long time has an effect on the organisms as the number of available cells for each brain function is limited. Such damage may then have serious effects in later stages of life."

Recent surveys conducted by the Department of the Interior show that mercury contamination of the aquatic habitat is of national scope. There are contaminated rivers in Maine and Georgia, in New York and Louisiana, in Tennessee, in Kentucky, in Washington, in Delaware, in Alabama, in Texas, in North Carolina, and in West Virginia. We all know of the present contamination of 350 miles of the Wisconsin River, even though the sources of that contamination closed down in 1958—12 years ago.

Also because this is an intensive far-reaching ever-continuing investigation, I shall not designate by name at this time the specific rivers, companies, and States now being tested.

On July 14, Secretary Hickel said:

To insure immediate action, I have today designated a special investigating team of water quality and minerals experts from the Federal Water Quality Administration, and the U.S. Geological Survey, to pinpoint areas of mercury contamination and to provide the basic data needed for effective control.

The Secretary further stated:

The Administration is developing hard evidence and will seek court action in any confirmed case of mercury pollution if corrective measures are not taken swiftly on local levels.

It is the belief of this administration that the discharge of mercury as an artificial pollutant into our waters presents an intolerable threat to the health and safety of Americans. The discharge of this artificial pollutant cannot be tolerated. Therefore, such discharges must be eliminated.

Based on new techniques of discovery and detection so fine as to distinguish in the billionth parts—new techniques that have only recently

become available as the state of the art has improved—the Interior Department was able to pinpoint discharges by making tests of effluent flows as well as upstream and downstream concentrations.

By these precise analytic techniques and through knowledge of the volume of discharge and stream flow, Walter J. Hickel, Secretary of the Interior, was able to refer the following cases to the Department of Justice on July 22, 1970, for immediate abatement by injunction:

Name:	*Receiving waters*
Allied Chemical Co., Solvay, N.Y.	Onondaga Lake.
Diamond Shamrock Corp., Delaware City, Del.	Delaware River.
Diamond Shamrock Corp., Muscle Shoals, Ala.	Pond Creek to Tennessee.
International Mining & Chemical Co., Orrington, Maine	Penobscot River.
Olin Mathieson Chemical Corp., Augusta, Ga.	Savannah River.
Olin Mathieson Chemical Corp., Niagara Falls, N.Y.	Niagara River.
Oxford Paper Co., Rumford, Maine	Androscoggin River.
Pennwalt Chemical Co., Calvert City, Ky.	Tennessee River.
Weyerhaeuser Co., Longview, Wash.	Columbia River.

While these cases are being forwarded for court action, other locations are being tested. The results will be made public as soon as they are verified.

I might state, Mr. Chairman, that some of the companies that are on that list have within a very short period of time, and due to the fact that they have started action within the last 2 or 3 months, abated to less than half a pound per day, which is fantastic for a short period of time. And we are now running tests to doublecheck out the abatement, the reduction of these discharges.

Mr. Chairman, it is noteworthy that many States and many companies have already reduced the discharge or caused the reduction of the discharge of mercury. The first public cases brought immediate action from the governors of Ohio and Michigan for abatement and elimination. These steps are being followed by their fellow Governors in many instances.

In April, 1970, after a tour of the Baton Rouge area, I was moved publicly to commend Dow Chemical for immediate reduction of their discharge into the Mississippi. Their action is being followed by other industries throughout the United States.

The Water Quality Standards for all interstate waters provide as to toxicity: None in concentrations or combinations which would be harmful to human, animal, or aquatic life. Naturally, mercury as well as other toxic substances would be included in the criteria.

These standards are based on artificially introduced pollutants. We are aware that there can be natural increments of mercury into waters from natural sources. The problem here, as in all other pollutant factors, is the addition of another manmade or artificial pollutant into our waters.

The crisis has been and remains a serious one. Nevertheless, this Administration has moved rapidly and forcefully to bring this threat under control. The Administration's leadership is being followed by States and industries. The Interior Department and Secretary Hickel will continue to focus on the problem until the danger point is passed, until the mercury threat has been removed from our lives and our waters.

Mr. Chairman, President Nixon has moved through the Interior and Justice Departments to protect the quality of life in the United States. Immediate action was essential and that immediate action was taken.

Thank you, Mr. Chairman.

Senator HART. Thank you, Mr. Secretary.

The last few pages of your statement I think make clear your approach to the problem. Just let me ask a couple of questions to be sure I do understand it.

In mid-July, the Secretary sent out teams and they are ranging the country?

Mr. KLEIN. Yes, sir. If I may, I can give you a breakdown I think that will give you where we started and when we started. On April 2 we received a telegram from Canada as to the contamination in Lake St. Clair, where the contamination began out below Sarnia, Canada, from a Canadian-based firm.

At that point we had an emergency meeting in Interior and Secretary Hickel directed that all phases of Interior would be used to work on this mercury and other heavy metals problem, with particularity on mercury.

At that time we stood ready to file suit in the event that Michigan and Ohio did not file suit. But they took all necessary actions on Wyandotte Chemical and Detrex Manufacturing at Detroit.

We then set the hearings on Lake Erie with special emphasis on the mercury poisoning and Commissioner Stein finished all of these hearings, because that is where the first pinpoint was. At the same time all of the regions of FWQA were directed to make a survey through the States and on their own to find out where mercury was appearing.

The Bureau of Mines was asked to put together everything they had, the Geological Survey worked on this, and the Fish and Wildlife Service worked on it. We put together everything we had, and then we started sending out the teams.

The July 14 was actually was the result of what the teams were starting to bring in on specific analytical reports. At that time, since that time, we have been moving very specifically on what we have discovered generally.

Senator HART. The cases that you referred to Justice which you enumerate here all represent situations where this field testing turned up induction by them into the water of mercury producing a concentration harmful to human, animal, or aquatic life. Is that the judgment that that reflects?

Mr. KLEIN. Yes, sir.

Senator HART. The conclusion that reflects?

Mr. KLEIN. Yes, sir.

Senator HART. Now once you identify by test, tests which satisfy you, verified tests, that there is induction to a point where the concentration would be harmful—you took this action in the case of enumerated companies. What action generally do you take? Do you always refer, when you make this finding?

Mr. KLEIN. Mr. Chairman, the Federal Water Quality Act has nothing in it by which Interior or this administration or any body can get to court immediately. There is at least a 6-month delay after a 180-day abatement proceeding notice. There is anywhere from 16 to 18 to 24 months built in delay under the enforcement contracts.

We sought to remedy this by the bills that were sent up to Congress after President Nixon's statement of February 10 and Secretary Hickel sent them forward. They have been under consideration but have not been passed as yet, whereby we would have been able to go in directly under the Federal Water Quality Act.

We have no such jurisdiction here and we therefore have been forced to use the 1899 act, the Refuse Act, which deals with navigational waters and the discharge of refuse into them.

We feel we have a case here which constitutes refuse under the 1899 act.

But in this case we can get immediate court action for an injunction, abatement. This is a civil suit, to get this over and done with.

Senator HART. Well, acknowledging then the inadequacy in terms of quick response under the Water Quality Act, you turn to the Refuse Act in the enumerated cases you have given us here.

Mr. KLEIN. Yes, sir.

Senator HART. Then I will rephrase the question.

In any case, in addition to these, where you find the induction of mercury which produces the concentration harmful to life, would you automatically, at least until your law is changed, refer those findings to Justice?

Mr. KLEIN. Sir, the crisis caused by a toxic compound such as mercury brooks no delay. You use whatever tools are on hand to get the results that are necessary to protect the people of the United States. In this case, the tool that is at hand is the Refuse Act of 1899.

Senator HART. I take it your answer is yes, you would make such a reference.

Mr. KLEIN. Yes, sir; this is the answer from our solicitor and Justice to date.

Senator HART. Are there any water quality standards for mercury which have been promulgated by the States and approved by the Federal Government?

Mr. KLEIN. Not specifically, sir, except the toxic item that I spoke of on page 18 of my statement, "None in concentrations or combinations which would be harmful to human, animal, or aquatic life."

I might say under Mr. Lambo, in cooperation with Geological Survey and Bureau of Mines and all of the expertise we have there, as well as Fish and Wildlife, we are attempting to define this. We find ourselves in a state-of-the-art that does not give us exact answers on this other than the Food and Drug 0.005 standards for drinking water.

Senator HART. What discharge, what level of mercury—I am pushing you for what you told me you don't have. What level of mercury do you feel would violate the general standard, namely "harmful to human, animal, or aquatic life"?

Mr. KLEIN. This administration, the Department of the Interior, is pushing for complete elimination of emercury as a discharge.

Senator HART. Does that mean if you find mercury being discharged that you will refer it to Justice under the Refuse Act?

Mr. KLEIN. If we find it being discharged in any sort of substantial quantity and no effort being made to abate and eliminate, we will do this. If they don't start abatement, we will move forward on them because we want complete elimination, insofar as the state-of-the-art will do it. We are not sure of the state-of-the-art, but we think we can get it down to where there are just traces.

I think Mr. Clark the other day said we now can test for billionths of a part, but we better get the testing down to trillionths of a part to be sure. We have to go one step further and we are not quite that far yet.

Senator HART. You say you will refer to Justice unless, after the discovery of the mercury, there is abatement, abatement in process, abatement attempted. Can you narrow the time factor a little? Suppose the abatement effort will take 3 years or it will take 3 days.

Mr. KLEIN. No, sir; we expect extreme action by the part of the industry or anybody else who is discharging mercury. We expect that they will immediately institute correct housekeeping procedures to remove all negligence in the handling of mercury.

Thereafter we expect that they will install the necessary procedures and we are aiming for recirculation, so that we have none of these discharges.

It is my understanding, for instance, that one of them named here, Georgia Pacific, has informed us that they have gone to complete recirculation as a result of work started several months ago and that they are now almost to the point of complete elimination of mercury in the discharge.

So this is what we are aiming for, sir. And it takes, I would say, 3, 4, or 6 months for the installation of the best systems on a crash program. But they can abate, they can reduce considerably immediately in our opinion, in most of the cases, but substitution of processes, by careful housekeeping.

But for complete elimination, we have to have entirely new systems and this takes 3, 4 to 6 months.

Senator HART. Should they continue to discharge during the 3, 4 or 6 months?

Mr. KLEIN. We have had this problem come up, and we have found that if they get below a pound or a half pound of mercury per day—we have been monitoring these, and we do not see where this, for a short period of time, causes difficulty.

The difficulty we are facing is that ordinarily most of these companies have built up sludge banks and there is more input of mercury from the sludge banks that have accumulated than there is from this half pound to a pound of mercury.

We have had to adopt a rule of thumb for the time being at about a half pound of mercury per day, which is very, very small, in the billionths of a part. We have been monitoring this and we are going to keep on monitoring this and see whether we, together with the major toxicologists in the country, find that this is a factor.

We are going to make it as low as possible. As I said, we are aiming for complete elimination.

Senator HART. I am sure you understand the reason I push to try and develop as clear an understanding as we can as to what kind of response you think adequately protects is because of your statement, among others, that "It is the belief of this Administration that the discharge as an artificial pollutant into our waters presents an intolerable threat to the health and safety of America."

That is a pretty ringing, impressive sentence to drop into any speech.

Mr. KLEIN. Yes, sir.

Senator HART. "The discharge of this artificial pollutant cannot be tolerated." That adds emphasis. But what you really mean is that some discharges will be for a period of time?

Mr. KLEIN. Very short period of time.

Senator HART. I take it if you cannot get down to half a pound almost overnight, you would then refer it to Justice; is that right?

Mr. KLEIN. Yes, sir; but we have found that every one of these processes, when they put in strict housekeeping and emergency measures, they can get down to a half pound almost within a few days or a week or so.

Senator HART. Then why didn't these firms that are being sued do it?

Mr. KLEIN. I would not be able to answer for them, except that since the mercury crisis has developed, beginning in April, which is when it really began developing all of them have been working at this situation, or a good many of them have.

Senator HART. But the fact that you have referred them to Justice would indicate, based on your earlier answers, that they did not satisfy you?

Mr. KLEIN. That is right, on actual discharge tests.

Senator HART. But your belief is that they could have, under existing technology?

Mr. KLEIN. As I stated, since that was referred to Justice, it is surprising that Georgia Pacific now has reduced it to less than half a pound a day. They have started something. But again, here a communication factor on their part in letting us know they were even doing this, when we are making the test, brought about this situation as far as they were concerned.

Senator HART. All of us talk back and forth about our ignorance over the years that preceded the current concern over mercury. You indicate clearly that the discharge of mercury is, as you say, intolerable, and does constitute a health threat. When should we have done this?

Mr. KLEIN. As far as I can gather, it would be sometime early this year, when the techniques for beginning to detect a billionth of a part, and second, the new types of testing for the actual—we only have two laboratories really that can do this satisfactorily, and that is the Taft Center at Cincinnati and the Geological Survey lab at Denver that can render exact analytical reports on mercury in these small quantities. It was just a question of getting the state of the art to find it in these quantities.

So it would be, in my opinion, sometime early this year.

Is that right, Mr. Lambau?

Mr. LAMBAU. Yes.

Senator HART. Let me see if I get that. Are you saying that until early this year it was not possible to identify mercury in the waters or that until early this year it was not realized that mercury in the water would be dangerous?

Mr. KLEIN. It was not able to identify mercury in the billionths of parts in water. The problem we have is that it is showing up in very, very minor concentrations. But the flow of water from these plants is in the millions of gallons. When you multiply these very, very small concentrations by the millions of gallons of water used by each plant, you get a concentration factor.

So it is a process of discovering the presence of this, and second, the other factor is the final realization that mercury, metallic mercury, could become methyl mercury in one of several different ways.

Senator HART. Now, it is the latter point I am trying to pin down in my questioning. When should we have known that mercury, which could be converted, if that is the layman's way of describing it, into the dangerous hazard; when should we have known that?

Mr. LAMBAU. Well, very recently. Most of this work has been Swedish work and a lot of it has just very recently become available.

Mr. KLEIN. They had this problem up there and they started running tests. When I talked about the concentration of 3,000 to 1, what we are talking about is the fact that if a fish is in water with a certain amount of mercury, after repeated exposure to this small amount of mercury in the water, it will, after a long period of time, accumulate this mercury at a rate of 3,000 to 1.

This is the factor that nobody knew about in the early days, that metallic mercury became methyl mercury and that it did concentrate so as to become a hazard.

Senator HART. Now, the realization that it could become converted into methyl mercury, that discovery, if you would call it that, occurred in Sweden?

Mr. LAMBAU. Yes.

Senator HART. In 1967?

Mr. LAMBAU. I do not have the exact date, but in the late 1960's.

Senator HART. And we were told yesterday, if I understood correctly, that in the 1930's a paper was published in Germany suggesting or stating that this was a fact—no, the German paper stated the levels of mercury at which hazard would attach. The testimony yesterday was in the mid-thirties; a German study shows mercury levels in humans. In 1967 the Swedish paper identifies the process which we now describe as the conversion of the mercury into methyl mercury, which triggered in Sweden immediate restriction on the use. Then in 1968 our witness yesterday said a major magazine carried the report of the conversion.

Is that the chronology as you understand it?

Mr. KLEIN. The German one, I understand, was the ingestion from food, the paper in the 1930's. I know about the Swedish one. I do not know about the national magazine carrying it in 1968, sir. But it takes a combination of factors in order to get to this. It is not only the knowledge of what happens, that methyl mercury can be biologically methylated, but also the ability to find it, to test it, and be sure it is there.

I may point out to you that even the Public Health Service drinking water standards in 1962 did not even list mercury in its hazards. In other words, sir, we are faced with a proposition that we now realize from the state of the art which has been advancing that we have a problem and from the state of the art in detection and the state of the art as to the results of mercury intoxication, we now have to move forward in the state of the art to get the removal of mercury, to eliminate it in the discharges. So it is one, two, and three, and these things do not always fall together too neatly.

Senator HART. I take it the one, two, and three is first the discovery that mercury can methylate?

Mr. KLEIN. Right.

Senator HART. And that this is dangerous?

Mr. KLEIN. Right.

Senator HART. Second, the discovery that there is discharge of mercury under circumstances that would suggest the possibility of methylating; and third, the testing devices that will enable you to identify the presence of the methylated mercury?

Mr. KLEIN. Yes. The discharge in effluents of mercury in such small quantities that we were not able to locate it before. As I said, we now can locate it in the billionths, and we must develop some instrumentalities to locate it in the trillionths, if we are to get a totally safe health factor involved here.

Senator HART. You mentioned the Georgia Pacific case. There I understand there was 45 pounds a day. The state of the art was adequate to catch that, wasn't it?

Mr. KLEIN. No. The problem we have, as Mr. Stein has been running into, is getting accurate stream flows. What is the total effluent flow per day. Due to an error on the part of Georgia Pacific they had given us an erroneous stream flow of 19 million gallons a day and they corrected it to 5.34, so their discharge was not 41 pounds per day, but 11 pounds.

Senator HART. Are you now in the process of checking yourself the figures that are presented to you, such as the Georgia Pacific case?

Mr. KLEIN. We had analytical methods on that, sir, and we made the test and will stand on it. We are making new tests as to what their discharge is right now. The latest I have is that as of last Saturday they were down below a half pound a day.

Senator HART. Getting back to the basic facilities available to the Department to stay abreast, if not ahead of developing knowledge, if, as I am informed, there was a 1968 publication in a magazine regarded as major in the scientific community, reporting the hazard, why was that not caught by the Department? Why did that not serve to trigger? Why did we need to get a telegram from Ontario in April of this year?

Mr. KLEIN. The problem is, as I said before, it is a combination of factors. I do not know who read it in Interior in 1968. I know I did not read it in Illinois in 1968. I think at the time the people were in the middle of worrying about, first, sewage, and second, major industrial items, and we are just now getting to the, if I may put it, the trace items that are going into our water.

This is one of the trace items. We had covered it by general water quality standards, as I stated, on toxicity. I doubt if even now we could give you an exact part per million that could be discharged or that could be in the water quality and be safe. We just do not know.

Mr. Lambau has been working on this for a period of months trying to find answers to this and the other heavy metals.

Senator HART. In light of the experience that we have just discussed, the availability in 1968 of this information and, as you say, you do not know who in Interior read it, what reforms, if that is the word for it, is the Department comtemplating to insure that when somebody does publish a thing like that, and somebody does read it, that the bell rings?

Mr. KLEIN. There are so many publications—I am not making any excuse—that it is impossible to keep up with all of them. However, Secretary Hickel has set up, as you know, an early warning environ-

mental system and we are on the lookout for any and all items that may lead to a crisis and we move on them quite quickly.

Nobody actually knew that we had moved as we did on mercury starting in April, until I made the disclosure today, by a concentrated effort. And this has culminated in the actions I spoke of. I think it will finally result in the elimination of mercury as a problem in our waters.

Senator HART. This I think is a good example—you are right—of the problem of accumulating and disseminating in manageable form, the increasing literature in the whole field of science. I think, though I did not anticipate it, this is a good example of the justification for a bill, S. 4044, that the chairman of the committee, Senator Magnuson and I introduced not too long ago, and I am sure we gave it a fancy title, "Technology Assessment Act," something like that, "Commercial Technology Assessment Act," which attempts to commit some resources of the Federal Government to insure what ultimately I would like to visualize as a computer system that inhales all of this stuff, and a person in Interior or Commerce or any other agency that has a responsibility for water quality, or elements discovered to be hazardous if introduced into air, you can just punch it every morning to find out what happened yesterday around the world.

That is the ultimate. But given the incredible dangers that technology advances add to our life, we better use technology to try and learn what those threats are, and that bill will do it.

Mr. KLEIN. If I may comment on it, there were to be three additional parties on my staff for the proposition of coordinating water resources research within Interior, which does 80 percent of this work for the Federal Government, and it got lost somewhere in an appropriation, I understand, so I will not have that. But in FWQA——

Senator HART. Did it get lost here or in the Bureau of the Budget?

Mr. KLEIN. It got lost in Congress, I am sorry to say, sir.

Senator HART. It is not too late. Given the kind of testimony you are giving us, why can't we add three bodies?

Mr. KLEIN. The bill has been passed. Now with the reorganization, I do not know what will happen. However, I may say this to you, that we had basin control regulations which were promulgated just recently. These basin control regulations will be asking for parameters in connection with all sewage treatment construction grants. From these parameters that are furnished to us on all of the rivers by all of the States, it is expected that FWQA will have water quality mathematical models of every river basin and lake basin in the United States, doing the critical ones first.

It will take 3 or 4 years in order to build this up, but we have a mathematical model study going; we are building it up; we are trying to work it out.

Mr. Stein, in the hearings on Lake Michigan, got enough data from all of the States surrounding Lake Michigan so we could move forward with that portion of it. So we will have a partially correct mathematical model on Lake Michigan. But we do expect to put these mathematical models into data computing as a result of our basin control regulations.

Senator HART. That is good. But you still have to know what is dangerous in what you are monitoring. Until you also feed in that

first part of the problem, you have got a nice profile, but it may or may not be healthy.

Mr. KLEIN. Yes.

Senator HART. That gets us to the business of trying to know what is going into these streams. Yesterday the Corps of Engineers was here and we discussed with them how the Refuse Act could be used to keep sort of an inventory of effluent, an inventory of what was being introduced, and perhaps if it worked right it would be a sort of preclearance mechanism for effluents.

But couldn't that kind of preclearance come more directly through the use of your Water Quality Act than the Corps of Engineers?

Mr. KLEIN. Yes, sir. As a matter of fact, the set of bills that were sent up under President Nixon's program, Mr. Stein and Mr. Thieme and I did a great deal of work on it, it calls for precise effluent requirements to be set by the State. These local effluent controls, once set, could stop the introduction of mercury and other heavy toxic metals into our streams. And these have not yet been acted on by Congress since their introduction, but they would be one more step forward toward getting control of situations such as this before they happen.

Senator HART. The State would be required to set standards?

Mr. KLEIN. Yes, sir. We would recommend the standards and then we would accept them, and if they are not acceptable to our standards, we would not accept them, and ask them to go back and get better standards.

Senator HART. All right, you have made the deal, you have the standard. What about the enforcement of it?

Mr. KLEIN. Yes, sir. We have asked for a great deal in the enforcement package that is also now before Congress. One of the items we were asking for is the right to an injunction upon an immediate showing that it affected the health and welfare of the people.

Senator HART. Did you give any thought to approving State submissions only if they outlined enforcement procedures of their own at the State level which would include the requirement for a permit before any effluent was discharged?

Mr. KLEIN. That is included in the standards, sir; and it also is included in the basin control regulations. Where they have any industry, municipality, or major agricultural polluter, they are not only to diagram what the effluent is, but what they are doing to abate it and the timetable for abatement. And this is in the basin control regulations, besides what is in the standards. So we have a two-pronged effect going forward.

Senator HART. So you have got a procedure now that requires the State to submit water quality standards. You pass upon that. If, in your judgment, the standard is not adequate, it is upgraded. Once that is accepted by the State and yourselves, that becomes the standard that must be met.

Now, in addition you say that there is a requirement that the introducer of a material into the water must first get clearance before the introduction of it? Does it go that far?

Mr. KLEIN. No. They call it a merit system, as to how much he will be putting in. I dislike the word "merit." We want it reduced as far as it can go on any pollutants, and that is the theory upon which we op-

erate. If the pollutant is such as to destroy water quality, or to affect health and welfare, at that time we would like to have it eliminated.

There we run into technological processes, what can be done technologically.

Senator HART. Let us take Illinois and yourself and me. I have got a factory. Tell me how this system works. At Illinois you develop standards for the body of water on which I am located.

Mr. KLEIN. Yes, sir.

Senator HART. And you review them here in Washington. Once they are at a level you think is adequate, they are adopted, ratified, whatever you call it. Is that right?

Mr. KLEIN. Yes. If I may, though, I would say to you that the only thing we can require water quality standards on to date are interstate waters. We have no jurisdiction on intrastate, and that was to be remedied by this set of bills, also.

Senator HART. All right. I am on an interstate body of water.

Mr. KLEIN. Lake Michigan, Mississippi River.

Senator HART. What do you know about what I am doing, based on existing law?

Mr. KLEIN. A manufacturing industry?

Senator HART. Yes, right now.

Mr. KLEIN. Very little. We haven't even the right——

Senator HART. So all of this exchange of information, setting of standards, enforcement procedure, and so on, you still do not know much about what I am doing.

Mr. KLEIN. No.

Senator HART. Who is supposed to know what I am doing?

Mr. KLEIN. The State is supposed to get that information when we request it and then forward it to us. Some of the States have laws keeping us from getting that information. We have no right of entry under the Federal Water Pollution Control Act to go onto an industry or a municipality and test. Every one of these tests that have been made have been made in cooperation with industry who have let us on their premises voluntarily.

Senator HART. What do you propose in the bills you sent up to do about that?

Mr. KLEIN. Right of entry.

Senator HART. Right of entry?

Mr. KLEIN. Yes, sir.

Senator HART. What do you do——

Mr. KLEIN. And the necessity to produce records.

Senator HART. What are you able to do, if anything, to persuade the State to make sure it knows what I am doing?

Mr. KLEIN. I think the new basin control regulations will straighten out any items that are missing therein by having the State required to furnish us all of this data. When they furnish us this data they will have to go and get it.

This is by control of the grants, sir. If we are going to spend $5 billion at least, and the States and local communities are spending another seven for a total of 12, which is what $4 billion plus $800 million at 40 percent comes to, we better make sure the rest of the stream is cleaned up from industrial and agricultural pollution as well as municipal pollution.

Senator HART. Now, you say you do not like the word "merit." But what is wrong with the notion? Why isn't it, given all of the flap we have around here about mercury and the possibility of other materials about which we may make discovery tomorrow having the same kind of threat, what is wrong with at this moment in history saying if you are going to dump anything into an interstate waterway, you have to get preclearance before you do it? Get a permit.

Mr. KLEIN. This is what the States are using. They call it a permit. It is not actually a permit; it is an abatement device in order to reduce it so that the discharge will not lower the water quality below the standards that are set for that portion of the stream.

Senator HART. Do you know that all 50 States are doing that?

Mr. KLEIN. Mr. Stein says yes and I will take his word on it.

Senator HART. I want to make sure my question is clear. Before anything goes in, do all 50 States clear it? Approve it? Permit it?

Mr. KLEIN. This is required under the Federal Water Pollution Control Act. Under the water quality standards also.

Senator HART. It is a requirement that is imposed by the Federal act on the State or on the dumper?

Mr. STEIN. The States have to have a program. We have a program grant to the States to help the States with their administration. They have to have a program for an approved water pollution control or water quality program. All States have a permit system on the books. Your question is directed to whether all sources have to have a permit. Of course that depends on how well the States apply that permit system. But all States are legally authorized and directed now to have this permit system.

No one can discharge wastes into a stream unless they have a permit from the approved State agency.

Senator HART. Well, on the books, I am sure that looks great. In practice, I am sure you wouldn't have to spend many days roaming the country to find there is an awful lot of dumping by people who never even heard of this. Would you agree with this?

Mr. STEIN. I would agree with that, but——

Senator HART. What are we going to do about that?

Mr. STEIN. We have a program, again, to improve the State programs. May I point out that I think possibly the greatest area of vigilance is not people who don't have permits, but people who do have the permits, but are exceeding the restrictions of those permits. Because I don't think you are going to find many major dischargers that don't have some kind of permit in their files from a State agency. I think as Assistant Secretary Klein pointed out, our basin regulations will get to that. And if we can have jurisidiction, as has been proposed in the legislation, over the effluents, rather than just setting standards on water quality, or stream quality, we can begin to get to that pretty directly, too. Right now under the law we have to work at that relatively indirectly, either on a case-by-case basis, through our enforcement techniques, or by this river basin regulation requiring the State to give it to us in order to be eligible for grants.

Senator HART. Mr. Secretary, you said that you are testing now across the country. If there is all of this magnificent network, why all of a sudden did you fellows have to ride out and do all of this?

Mr. KLEIN. It would seem, Mr. Chairman, that nobody really knew about mercury, that it could be biologically methylated, except very, very few people, one of whom may have been your witness yesterday. By the way, I had the pleasure in April of talking with Prof. David Klein, and I was impressed by his knowledge of it, both Mr. Thieme and I have talked to him. He has an application for a grant in to FWQA to consider going forward with what he has been doing as a result of our conversation. The States were not geared up for this. They don't have the know-how. The only two really good public laboratories that can do this type of testing are FWQA's laboratory in Cincinnati and Geological Survey's laboratory in Denver.

We were able, by our work herein, to find that there are about in the low thirties in the number of mercury dischargers that were of considerable import. And this is where our first thrust has been, first to find out who is doing it and then we were able with the Bureau of Mines to look at others who may be users and we are doublechecking to see whether any discharges at all come from these.

And a good many are already falling on the wayside, that while they are users, they have no discharge. So we have the entire operation going in Interior to get a complete, a nationwide view of this entire procedure, and eliminate it as much as it can be technologically eliminated. That is the only thing that is holding us back, the question of technological answers in a few areas.

Senator HART. It is your practice to disclose verified instances of mercury discharge to the public, even though you concluded you will not refer it to Justice?

Mr. KLEIN. I think that the ones that should be brought to the public's attention—I am not the final word on this, sir—are the ones that we are ready to go to suit on, where we have everything, so that we know what is there, we know it is a considerable discharge, and that we think a legal basis lies for a suit. As to everyone that is putting some in, I cannot give that answer at this time. I would say that the ones who have taken steps, and I named one of them, Dow Chemical, I named another, Georgia Pacific, and there are several others that have taken steps, we congratulate them for taking these steps before we came to the threat of legal action.

And they are moving to eliminate it. One of the things that was brought home to me by one of my subordinates is that Dow Chemical, in a reversal of image, has put four scientists, biologists and what have you, on this to get a full independent study of mercury, what it does, and what you can do to get ride of it.

In other words, they have a full team on this for which nobody is paying them and they are helping all of the people in the United States to get an answer on this. I think industries that do this should be commended.

Senator HART. You know, they are using our water to dump refuse, which we now discover can poison us, and they dump it in an effort to achieve a profit. There is nothing wrong with that, as long as once they are on notice that it is a threat to everybody, that they do everything they can to eliminate the threat. Now I think it would be the minimum corporate responsibility that would persuade them to hire four guys to help. It doesn't say they ought to get a medal for it.

Mr. KLEIN. This is going beyond what they have to do at their own plants to eliminate it. This is to add to the elemental, basic research on mercury, to go steps, giant steps forward from what anybody knows today. This is the thing that is to be commended. They are no longer doing something that falls just within their corporate purview of eliminating it on their own plantsites. They are doing so to add to the basic knowledge of the United States of America and the world in this field. This is the differentiation I make. I make no commendation to them for eliminating it, because this is what they should do.

Senator HART. Well, your answer is you commend those companies that take prompt action to correct, but you don't necessarily agree that you should identify the companies that are making a discharge which might have interest to people living downstream unless you are going to sue them?

Mr. KLEIN. No, that isn't quite what I meant, Mr. Chairman. What I meant is that where we——

Senator HART. Isn't that a pretty good paraphrase of what you said?

Mr. KLEIN. No, I didn't mean, if you think that is a paraphrase, that isn't what I meant. What I meant is that the companies that are abating and reducing their pollutants today, with a view to complete elimination, we have not made public now as long as they are below what our best scientists and engineers tell us are the danger levels.

Senator HART. You say that the Department announced that the Water Quality Administration would prepare a list of all toxic substances now being discharged into interstate waters, U.S. waters, a list of all toxic substances. Is there a time estimate on that, as to when that list would be available?

Mr. KLEIN. No, sir; except as under Public Law 91–224, which was just passed by Congress, and enacted into law by signature of the President, which calls for a list of hazardous substances, and this is what we are working on right at this time.

I believe there is a due date on it. It is within several months, sir, I believe.

Senator HART. Is it correct that you have found fair substantial amount of lead and arsenic in Louisiana?

Mr. STEIN. Our preliminary tests show that there are substantial amounts being discharged of those materials.

Senator HART. Substantial amounts of lead and arsenic?

Mr. STEIN. And that is intrastate.

Mr. KLEIN. They are being verified right now, sir.

Senator HART. Have you any doubt that it is lead and arsenic?

Mr. KLEIN. If I may, I will interject here, because the final determination I think will be made by a judge, and I would rather not have Mr. Stein make that determination until an analytical test has been run on it.

Senator HART. Do you intend to announce it when you have made the analysis?

Mr. KLEIN. That will be policies at a higher level than mine, sir.

Senator HART. What possible reason would you have for waiting for a judge finally to determine whether lead or arsenic were being introduced into waters in Louisiana?

Mr. KLEIN. For the simple reason, sir, that as an attorney you can only say so much in order not to preclude the right of a defendant at a trial.

Senator HART. He still has the right to say it doesn't hurt, but——

Mr. KLEIN. He may wish to object that the case had been tried before the public instead of before the bar.

Senator HART. What are you going to do about this list of toxic substances that you say in a couple of months you are going to publish? That would show lead and arsenic, wouldn't it, in Louisiana, if in fact there is lead and arsenic there?

Mr. KLEIN. No, the list that will be published is what are the toxic substances, the hazardous substances. It will try to define the parts per million or parts per billion that make it dangerous or bring it to the list of where it is hazardous.

Senator HART. Well, assume we all live in Louisiana. When that list comes out, will we know there is lead and arsenic out front?

Mr. KLEIN. I trust that in certain of these areas we will already know. However, as you know and as we stated, or maybe I didn't state it, but the thrust of the Federal Water Pollution Control Act is that the States are to do the work first. In certain of these, in determining what is a hazardous substance and the parts per million, that I think should be the responsibility of the Federal Government, and Congress has made it so by its late act just passed. But as to funding this, we just do not have the facilities to go into every stream in the United States and determine it. The amount of work that has had to go into just mercury is almost incredible and has slowed down a great deal of other work in the Department of Interior. It was necessary, because we realized what a great threat this was to the health and welfare and therefore we put aside other functions in the Department of Interior to be able to move ahead here. But we cannot do this on every one. The States are going to have to do a great deal of this themseves, especially on the intrastate waters.

Senator HART. Getting back to lead and arsenic in interstate waters in Louisiana——

Mr. KLEIN. That is intrastate we are talking about.

Senator HART. I am talking about interstate.

Mr. STEIN. The waters may be interstate, but the geographic location of Louisiana is such that the waters don't flow from Louisiana to another State in the lower Mississippi River.

Senator HART. You mean because the Mississippi empties into the gulf, therefore you don't have jurisdiction?

Mr. STEIN. Sir, we have to institute an enforcement case on our own. And this again is to be remedied by the proposal that Secretary Klein worked on. We have to have two factors. One, there must be pollution of an interstate or navigable waterway, and, two, that pollution must endanger the health or welfare of persons in the State other than that in which the pollution originates. This does not obtain in Louisiana, because of the geographic locations. There are many other coastal States such as Florida, California, which are largely exempt from the jurisdiction, enforcement jurisdiction, of our act unless the Governor of the State requests us to come in.

Senator HART. Well, that sure is nutty. It is navigable water we are talking about and you could use the Refuse Act, couldn't you, for the lead and arsenic?

Mr. KLEIN. I think so, sir, but again it is a question of the capability that we have in FWQA and the rest of Interior. We just do not

have the capability, the people that are available to track down all of the toxic substances all over the country.

Senator HART. But let's assume our information is correct, and Mr. Stein says it is, lead and arsenic has been discovered in Louisiana. I don't want to precipitate a lead crisis and an arsenic crisis in conjunction with the mercury crisis, but are we going to have to wait for your list of toxic substances that may come out in a couple of months? Are we going to wait for a new law? When are you going to tell us about this? Because I may be eating fish that have been exposed to lead and arsenic.

Mr. KLEIN. I do not think that the question is a question of telling. The question is abating it. And that is the important proposition, to stop it from going in.

Senator HART. It is a question of telling, if I am the fellow eating the fish.

Mr. KLEIN. Oh, I agree with that, but first of all you must find out where it is going in, what is doing, how much is going in, how fast we can abate it. Then downstream the Fish and Wildlife have to put together their actions on how much is going into the fish, and then we have to find out how much of that in fish is dangerous to people. This is where the mercury crisis comes from. All of a sudden we are able to put together a number of factors and come up with answers. We don't have all of the answers in all of them yet. However, I assure the chairman that where in the pursuit of mercury or any other types of contamination we run into one of these heavy metals we move. One of the hearings that Mr. Stein just had in Kansas City, Kans., was based upon chromium salts, which is not quite as bad as mercury, but it is along that line.

By the way, on the arsenic and lead, if it gets into the fish, Mr. Stein says it kills the fish.

Mr. STEIN. It is not like mercury. This will be lethal to the fish, so I think, although this is small consolation to the fish, I don't think there is quite the danger from lead and arsenic getting into the human food chain as mercury.

Senator HART. The judgment you just made; namely, that it does not accumulate in the food chain——

Mr. STEIN. No; I would say that while mercury evidently does not hurt the fish, and it concentrates in the fish and we eat it, if the fish get enough lead or arsenic in them, as I understand it, this will be lethal to the fish, and it won't be concentrated and you wouldn't have a live fish.

You said something and I felt we were possibly misleading you. I do not think we have the same dangers possibly in the food chain concentrations from arsenic and lead and some of the other metals as we have from mercury. I think of all of the heavy metals, mercury may have that quality itself. I think I am right on that.

Mr. LAMBOU. I would say so; yes.

Senator HART. You say it will kill the fish, hence not us. Is it possible, have any tests been run to find out whether it kills them instantly? Or is there a period during which there is a buildup in them, during which time I might catch and eat that fish?

Mr. STEIN. It might be a danger point, I am not sure that the fish don't have a lower tolerance point than we have.

Senator HART. We don't know, is that right?

Mr. STEIN. We don't know. We did have a case like that as you know in the massive fish kills in the Mississippi where we did discover Andrin, a pesticide, was doing that, and it took us a long time to find out what the lethal level was in the fish.

Senator HART. I will ask Mr. Bickwit to conclude and following this we will have to recess briefly, there is a call from the floor on a resolution.

Mr. BICKWIT. Just to pursue this, if it is possible that there could be an accummulation in fish that while not killing the fish could kill those humans who ingest that fish, and that is possible, is it not, in that case doesn't the public really have a right to know exactly where this lead and arsenic is coming from, just as soon as you corroborate that it is in fact coming from there?

Mr. KLEIN. Yes. The question of whether the public is entitled to knowledge or not is not debatable. The public is entitled to knowledge and it will be made public. But if you want the technical answers to this question, I suggest that we furnish it for the record, because it will take a number of people to put this together to get what the tolerable levels are. And actually whether or not there is any danger from arsenic and lead in fish.

I think this could be better answered that way. Let's say we will get it to you within the next 10 days.

Mr. BICKWIT. Thank you very much.

Now in the case of mercury, has it been your practice whenever you do corroborate evidence of this sort, that mercury in substantial amounts is coming from a given plant, that you release this information to the press?

Mr. KLEIN. Yes, we release it each and everytime. We hold back no information of this sort.

Mr. BICKWIT. Has any mercury been discharged from any plant in North Carolina?

Mr. KLEIN. Outside of the list that I gave you, I cannot substantiate any by analytical methods at this time. The tests have not come in on all of these. We have heard that name in North Carolina and I am sure it is under observation. I don't even know whether they have had a chance to test the effluent there yet.

I also got the name of one in Connecticut from the testimony yesterday and it will be covered also.

Mr. BICKWIT. We have been told by the State of North Carolina that on July 8 they received a letter from the Federal Water Quality Administration saying that a given amount of mercury was found in the industrial effluent of a plant in North Carolina. And that this information corroborated earlier evidence.

Mr. KLEIN. What office of FWQA? Was that the Atlanta office?

Mr. BICKWIT. I do not know.

Mr. KLEIN. I dont' think it came from Washington.

Mr. BICKWIT. I do not know where it came from.

Mr. KLEIN. Neither do Mr. Stein and I. If we may, we will try to run that down. It may be lost in the files of bureaucracy some place.

Mr. BICKWIT. I hope you will.

We were also told on July 8 the State received a letter again from the Federal Water Quality Administration stating that fish containing excess levels of mercury had been found in North Carolina.

Again you don't know what office of FWQA that was?

Mr. KLEIN. No. We would have to run that down.

I may say to you that it may appear in fish, and we may give a warning on it, but that is not a case, you cannot use that as a basis for refuse action. You must test the effluent, you must test upstream and downstream and get the stream flow to find out what the concentrations come out to.

Mr. BICKWIT. I am not taking issue with you not bringing suit under the Refuse Act.

Mr. KLEIN. You are talking about preliminary steps before getting into the case?

Mr. BICKWIT. No, what I am talking about is letting the press know about this. If you had been aware of this, you would have let the press know?

Mr. KLEIN. I am sure that we let the press pretty well know from all different regions. I think they were flying pretty well for a time there.

Mr. BICKWIT. Has a memo ever gone from the Department of Interior to the Federal Water Quality Administration asking that information not be released to the press?

Mr. KLEIN. No.

Mr. BICKWIT. I am glad to hear that, although we have heard to the contrary.

Senator HART. Mr. Secretary, did any of the gentlemen accompanying you have any comments they would like to add in light of the discussions we have had?

Mr. KLEIN. Mr. Clarke?

Mr. CLARKE. No, I just came to support the analytical program, any questions that might arise out of that, the network coverage, the difficulty of analysis, what we do and don't know, that sort of thing. If anyone has a question on that, I will be glad to speak to it. We are an administrative agency and we support Mr. Klein in his efforts to find out what is going on.

Mr. STEIN. I am in charge of disseminating information for FWQA on the mercury situation. I would like to reinforce Mr. Klein's statement that if any memorandum came from the Department to anyone, I would be the operative person to whom it would have directed, and I have received no such instructions.

Senator HART. Mr. Secretary, thanks very much.

Mr. KLEIN. You are quite welcome, it was a pleasure sir.

Senator HART. Next we are going to hear the testimony of the chief of Disaster Assistance Division, Office of Emergency Preparedness, and the position of that office will be voiced by Mr. James Lewis.

STATEMENT OF JAMES LEWIS, CHIEF, DISASTER ASSISTANCE DIVISION, OFFICE OF EMERGENCY PREPAREDNESS, ACCOMPANIED BY RICHARD MURRAY, ASSISTANT GENERAL COUNSEL, GORDON GILLIS, CONGRESSIONAL LIAISON, AND JAMES TOOHY, DISASTER ASSISTANCE DIVISION

Mr. LEWIS. Mr. Chairman, gentlemen of the subcommittee, I am James Lewis, chief, Disaster Assistance Division, Office of Emergency Preparedness, and I am here at your invitation to discuss the role of our agency in coping with mercury pollution of our country's lakes, rivers, and streams.

Accompanying me are Mr. Richard Murray, representing our general counsel, Mr. Gordon Gillis, our congressional liaison, and Mr. James Toohy from my staff.

As background to our discussion, I have a prepared statement and a series of charts, which provide coverage of the role of the Office of Emergency Preparedness in major disasters. I shall refer to these charts in the remarks which follow.

After this introduction to the Federal disaster assistance program, I will conclude my statement by specific comments on mercury pollution.

(Chart 1 follows:)

FEDERAL DISASTER ASSISTANCE

NATIONAL POLICY

FEDERAL DISASTER ASSISTANCE IS A SUPPLEMENT TO---NOT A SUBSTITUTE FOR---RELIEF PROVIDED BY THE STATES AND THEIR POLITICAL SUBDIVISIONS. PRIMARY RESPONSIBILITY FOR DISASTER RELIEF RESTS WITH THE STATE AND LOCAL AGENCIES, WITH FEDERAL ASSISTANCE PROVIDED ONLY WHEN STATE AND LOCAL RESOURCES ARE INSUFFICIENT TO COPE WITH THE EFFECTS OF THE DISASTER.

Mr. LEWIS. Chart 1 states our national policy. Federal disaster assistance is provided to supplement, not to substitute for, State and local efforts when their resources are insufficient to cope with a major disaster.

(Chart 2 follows:)

OEP'S DISASTER MISSION

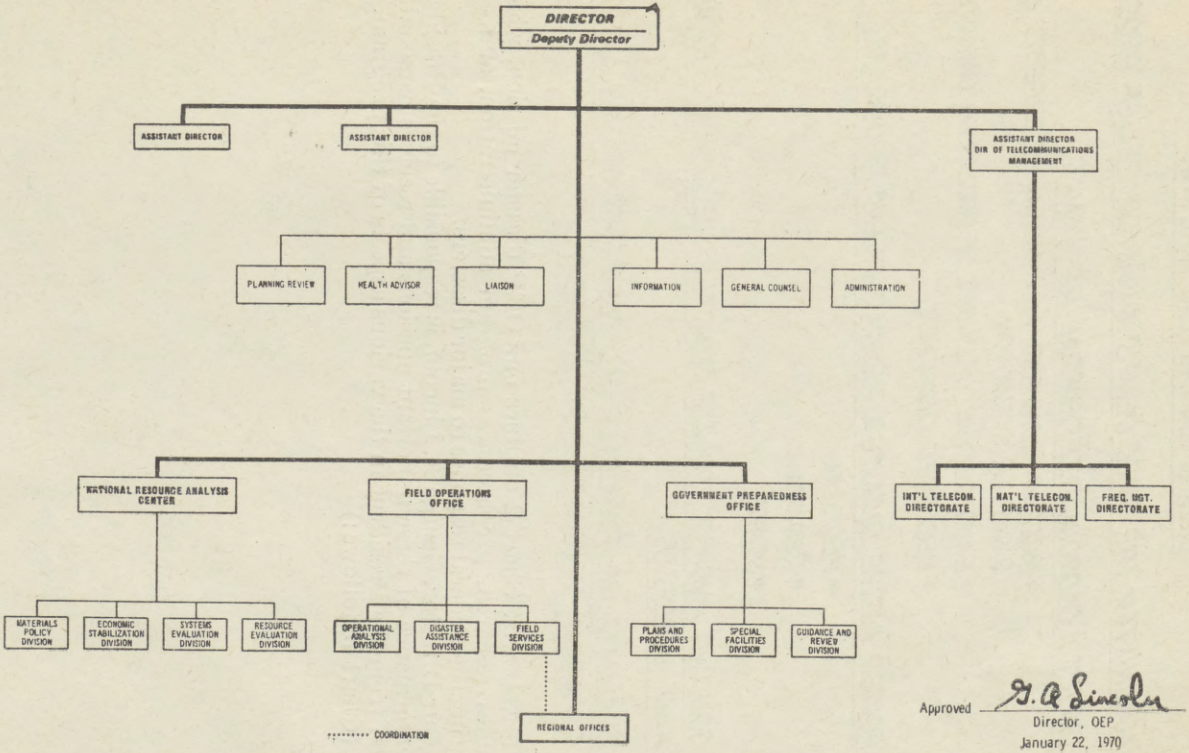
- ADMINISTER THE PRESIDENT'S DISASTER RELIEF PROGRAM
- DIRECT A COORDINATED FEDERAL RESPONSE
  - PREPARATION FOR (OR MINIMIZE EFFECTS OF) DISASTER SITUATION
  - EMERGENCIES (SHORT OF DECLARED DISASTER)
  - DECLARED DISASTER
- FOSTER ACTIVE DISASTER PREPAREDNESS PROGRAMS
  - FEDERAL
  - REGIONAL
  - STATE
- CONDUCT AND COORDINATE DISASTER RESEARCH, STUDIES, AND ANALYSIS
- EVALUATE CONTINUOUSLY ALL ELEMENTS OF THE NATIONAL PROGRAM OF DISASTER ASSISTANCE

Mr. LEWIS. Chart 2 outlines our OEP disaster mission, which includes research, preparedness program administration, and coordinating the Federal response to major disasters.

Our Director, George A. Lincoln, is responsible to the President for performance of these important missions and receives personal direction from the President in the various aspects of this program.

(Chart 3 follows:)

OFFICE OF EMERGENCY PREPAREDNESS



Approved D. A. Sinclair
Director, OEP
January 22, 1970

Mr. LEWIS. Our organization is shown by Chart 3. The Director has decentralized our activities to eight regional offices, where close working relationships are maintained at regional level with interested Federal agencies, State and local officials. At the national level, the Director, field operations, is responsible to the Director for the Federal disaster assistance program. During emergencies, Field Operations Office is augmented and assisted by other OEP staff elements. Administration, information, general counsel, and congressional liaison are involved with our day-to-day activities in support of field operations.

(Charts 4, 5 and 6 follow:)

FEDERAL DISASTER RESPONSIBILITIES

Public Law 81-875 - 1950

1. Financial Assistance
2. Direct Federal Agency Assistance
3. Foster Preparedness

Public Law 89-769 - 1966

1. Disaster Assistance for Damaged Incomplete Public Facilities
2. Expanded Planning, Coordination and Evaluation Roles of OEP for Major Disasters

Public Law 91-79 - 1969

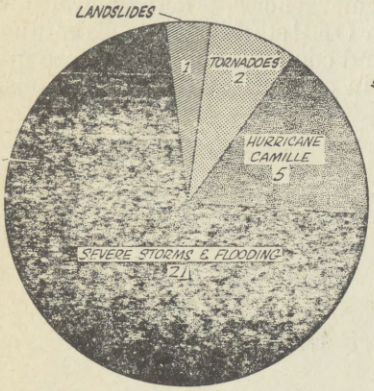
1. Increased Disaster Assistance for Individuals
2. Increased Disaster Assistance; State Planning; Private Property; Timber and Debris Removal; Fire Suppression; Unemployment Assistance.

Executive Orders 10427 (1953), 10737 (1957), and 11495 (1969)

Establish OEP as President's Staff Agency for Disaster Activities.

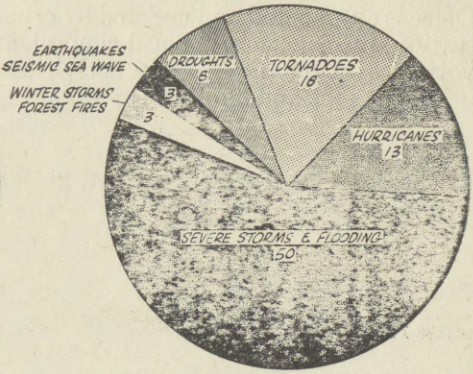
DISASTER CAUSES

NUMBER OF DECLARATIONS
CY 1969



29 DECLARATIONS

NUMBER OF DECLARATIONS
CY 1964-1968



91 DECLARATIONS
18 AVERAGE PER YEAR

MAJOR DISASTERS 1950 - 1969

Type	Requests	Declarations	%Turndowns
Floods	259	203	22%
Tornados	54	31	43%
Hurricanes	43	41	5%
Droughts	26	16	38%
Fires	14	6	57%
Earthquakes	4	4	0
Other	46	20	57%
TOTAL	446	321	28%
Yearly Average	23	17	
Range		8-29	

Mr. LEWIS. Chart 4 indicates the basic laws and executive orders related to this mission of the Office of Emergency Preparedness. I will comment further on these public laws later in my statement.

Chart 6 tabulates our experience in processing requests from Governors for declarations of the a major disaster by the President. Note that we have averaged 23 requests per year with 17 declarations resulting. Twenty-eight percent of the requests tabulated were not adequately justified to warrant a Presidential declaration of a major disaster.

Charts 5 and 6 illustrate the types of major disasters, floods, tornadoes, hurricanes, drought, fires, and earthquakes, and others. Over 70 percent have involved major flooding damages and practically all relate to natural causes. Note in chart 5 that during 1969 we had an unusually heavy workload of 29 declarations.

(Chart 7 follows:)

CATEGORIES OF P L 81 - 875 WORK

A. DEBRIS CLEARANCE

B. PROTECTIVE, HEALTH & SANITATION MEASURES

C. STREETS, ROADS & BRIDGES

D. DIKES, LEVEES & DRAINAGE FACILITIES

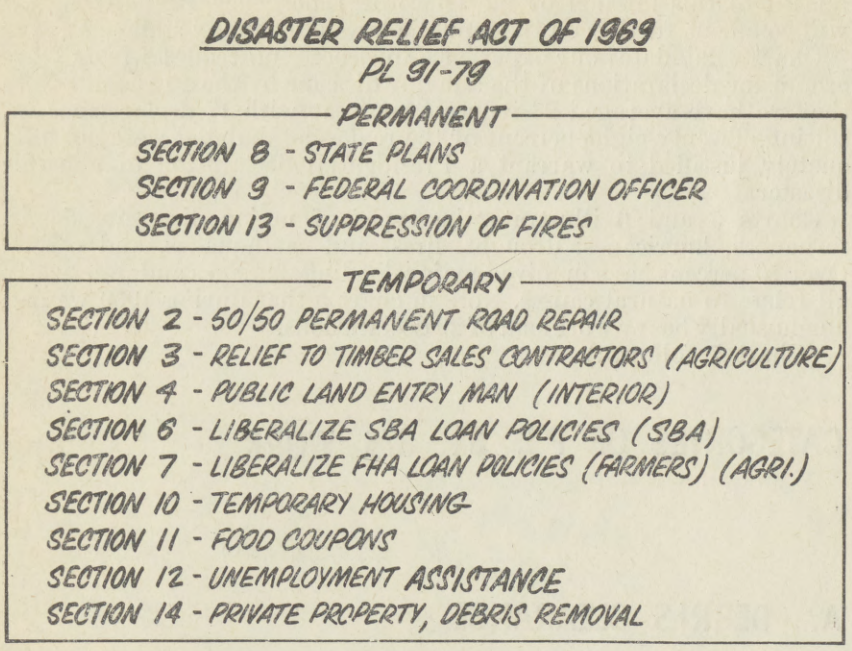
E. PUBLIC BUILDINGS & RELATED EQUIPMENT

F. PUBLIC UTILITIES

HOUSING

Mr. LEWIS. Chart 7 lists the categories of disaster assistance available under Public Law 81–875, the Disaster Act of 1950. The categories of debris clearance, streets, roads and bridges; dikes, levees and drainage facilities; public buildings and equipment; public utilities; and housing clearly do not apply to mercury pollution. Category B includes measures essential for preservation of life and property. Such measures in the past have generally been related to imminent threats to life and property that are experienced immediately following the occurence of a major disaster.

(Chart 8 follows:)



Mr. LEWIS. Chart 8 tabulates categories of work or program authorities under Public Law 91–79. Note that with the exception of sections 8, 9, and 13 these are temporary and expire December 31, 1970 unless extended by the Congress.

We have one other category of Federal assistance, which involves section 9, Public Law 89–769, repair of uncompleted public facilities damaged or destroyed by a major disaster. It would have no application to problems of mercury pollution.

Before discussion any of these categories of disaster assistance resulting from a major disaster declaration we should consider whether or not such a declaration can be justified due to mercury pollution.

The problem of mercury pollution is clearly a long-term one and thus a major disaster declaration by the President appears inappropriate. Public Law 81–875 is intended to supplement State and local efforts during relief and rehabilitation efforts which follow upon a catastrophe. Neither the language of the law nor the type of relief the law provides suggests that this problem is within its purview.

On the positive side, the statutory authorities and programs of other Federal agencies are available to cope with the long-range problems of water pollution.

The Council for Environmental Quality under Chairman Russell E. Train is providing overall coordination of long-term Federal efforts to cope with mercury pollution. He recognizes the gravity of this pollution problem and has assured our Director that the involved Federal agencies are seeking workable solutions for overcoming it.

The Departments of Agriculture, Health, Education, and Welfare, and the Interior have been working actively on mercury pollution, co-

operating with each other, the Office of Science and Technology, and State and local officials.

Tests have been made recently in many States to determine the extent of the mercury pollution in our lakes and streams. Responsible Federal agencies are studying the test results and are using them in their efforts to cope with mercury pollution.

I was present when Secretary Klein testified, so I will omit the reference to what his Department is doing, and continue in my statement to note that restrictions on further disposal of mercury in our lakes, streams, and coastal areas have already been made by several States. Restrictions have also been placed upon human consumption of fish and widespread publicity is being given to the problem. State and local governments are cooperating with the Federal agencies in devising ways to cope with mercury pollution.

Mr. Chairman, from our consultations with the Federal agencies involved, we have concluded that, at this time, the Office of Emergency Preparedness could not offer any significant assistance to those areas which have suffered mercury pollution.

We shall continue to monitor current developments, working with the Council for Environmental Quality, the involved Federal agencies, and the affected States.

Senator HART. Thank you very much. Mr. Lewis, you say that the disaster declaration is inappropriate because of the long-term nature of the problem.

Develop that just a little. Why does the long-term aspect of it cause you to think it is not appropriate to make available disaster relief?

Mr. LEWIS. I will comment on that briefly by referring to the definition of a major disaster in Public Law 81–875. It lists the certain types of disaster, most frequent types, which I mentioned in my testimony, floods, earthquakes, tornadoes, and so forth, which are essentially natural disasters and they are of relatively short duration. They are all natural events, relatively short in duration and they require assistance in terms of relief and rehabilitation, as distinguished from long-term programs where you have an accumulative buildup such as in the gradual increase of mercury in the streams and in the fish and in the long-term programs that are needed to overcome it of all types. Would you care to comment further, Mr. Murray?

Mr. MURRAY. In addition to that point, Mr. Chairman, also it is generally a specific catastrophe or event that takes place. The act itself, section 2(a) of Public Law 81–875, defines a "major disaster". The various causes of major disaster are; fire, drought, hurricane, storm, and so on. These are specific sudden type calamities, which are different in kind than the long-term gradual effect of pollution.

Senator HART. What if instead of this long-term buildup, economic injury has been caused to commercial fishing, marine operators, and resort proprietors by something that was the result of instant introduction into the lakes of a chemical or product that had an instant effect? For example, the damage was done to the fish life instantly. Is the fellow who rents fishing boats qualified for disaster assistance in that event because it happened quickly?

Mr. LEWIS. I think in connection with a declaration of a major disaster, the President has to consider a number of different factors and actually we have to weigh the facts involved in any one case before

we would prepare a recommendation to him as to whether a declaration should or should not be made.

An unqualified answer to a hypothetical question I don't think would be appropriate.

Senator HART. You say that practically all disasters you are involved with relate to natural causes.

Incidentally, my hypothetical question would include an act of nature: reversal of nature's process.

But what are the exceptions, if any, to the general statement that you handle disasters resulting from natural causes? Are there any exceptions?

Mr. LEWIS. Actually, there have been very few that have not related directly to natural causes and they were either accidental or of some nature such as a chlorine barge being sunk in the Mississippi River and a potential threat of escaping chlorine gas posing a threat to life and property, where prompt action was required. That was one such instance by way of example.

Mr. MURRAY. Other than perhaps "fire," which is specifically stated in the act, which could be accidental or perhaps by lightning. In the whole basic history of the act over the years, I think the chlorine barge situation is in a class by itself.

Senator HART. But in the case of a disastrous fire which was the result of negligence or arson, the fact that it didn't have a natural cause triggering it would not necessarily bar you from giving an affirmative answer to a request for disaster designation. Is that right?

Mr. LEWIS. Again we would examine the facts and prepare a determination based on all of the different factors which would be involved. And I don't think we could give you an unqualified answer. I do think though in connection with the subject of forest fires, or any other types of disaster that might have some manmade accidental origin, we would carefully examine any liability or any insurance or other alleviating conditions where such factors could be used in lieu of Federal assistance, because we only supplement the State and local governments and the other Federal agencies' ability to cope with it without a declaration.

We would not normally propose a declaration that would be based on in any way substituting our program for some other program, either local or Federal or State or private.

Senator HART. Now you have given us your conclusion. You say that the Office of Emergency Preparedness could not offer any significant assistance to those areas which suffered mercury pollution. Maybe I should renew hope here. Are you in a position to suggest some, perhaps to you, minor assistance? Is that the distinction you are making?

Mr. LEWIS. No. I simply meant in connection with this that there is nothing at this time we can offer in the way of a direct contribution to the problem of mercury pollution, of overcoming problems of mercury pollution.

Actually, from the standpoint of the overall situation, I don't feel that we have actually anything we could offer in the situation as it exists at this time.

Do you care to add anything Mr. Murray?

Mr. MURRAY. Just that our assistance is based on this major disaster declaration that has to be made and the declaration should

be similar to the types of catastrophes just discussed. And other than that we are continuing to look at the situation, trying to get evidence and statistics about what is going on, trying to help in every way we can; but as to specific relief which we can provide under the act, if a declaration is not made, there doesn't seem to be much available, if anything.

Senator HART. Is there a possibility that something may be?

Mr. LEWIS. Again we would have to look at each case in terms of the facts involved and we would have to determine what might be appropriate only after considering what everybody else, Federal, State, or local, might be able to do in the situation, and the determination would be made by our Director and by the President as to whether or not our programs were appropriate.

Senator HART. Well, in the region of Lake St. Clair, and it is my impression in Lake Erie, at least as it abuts Ohio, there has been substantial economic harm done to the whole variety of boat liveries, bait sellers, with supporting interests.

Now are you in a position to advise whether or not the Office of Emergency Preparedness under the circumstances as you have heard them, is in a position to offer any assistance?

Mr. LEWIS. I would like to comment that what I had in mind when I first mentioned about the conclusion, is that our staff at the regional level, and our own staff here, monitor all of these situations and we try to identify things where we might be of some assistance or even advise some agency as to what program might be appropriate.

We frequently, with the numerous Federal programs that there are, get questions about who should they see, which route should they follow to get to the right place to get Federal assistance. In that sense we are always alert to try to assist in any way we can.

But insofar as actual financial assistance under Public Law 81–875, or 89–769, or 91–79, our three basic authorities, there would have to be a request from a Governor and a recommendation by our Director, and a declaration by the President of a major disaster before we would undertake to provide any assistance under our authority.

Senator HART. Has the Governor of Ohio or Michigan made such a request?

Mr. LEWIS. No, sir; they haven't.

Senator HART. In the absence of such a request, under your law there is nothing you can do but give counsel?

Mr. MURRAY. Just say that supposing the President did declare a major disaster. What benefits would be forthcoming is really the question. There would be very little. Basically our statute provides for the repair and reconstruction of public facilities, that is our major job. We have very little of this economic benefit which you are talking about, with perhaps the exception of unemployment assistance, and certain loans, that is, Small Business Administration loans. But this is very little assistance relatively in the problem of pollution.

So it is really a two-pronged thing, I think. That is, (1) it is not the kind of catastrophe that we have ever declared, ever has been declared a disaster; and (2) even if it were declared, what benefits would be forthcoming.

Mr. LEWIS. These are all part of the facts. There are other conditions, but generally this is all part of the facts that have to be evaluated in

determining whether a declaration will be made and the President has to make that decision first.

Senator HART. I guess I go back to the question the President doesn't consider the problem until a request is made for the declaration?

Mr. LEWIS. A request is made from the Governor first; that is right.

Senator HART. Have any Governors requested it in connection with this?

Mr. LEWIS. Alabama has made a request.

Senator HART. The Governor of Alabama did request it?

Mr. LEWIS. Yes.

Senator HART. Have you acted upon that?

Mr. LEWIS. It has just been decided that the request be turned down.

Senator HART. Do you recall what reason or reasons he assigned in support of his request?

Mr. LEWIS. This is somewhat of a privileged communication between our Director and the Governor until it is officially released by both parties, I would say, and we would be happy to file with you a copy of the statement on which it was turned down, the letter also, if you would like to have it.

Senator HART. Which could be made a part of the record?

Mr. LEWIS. Yes; after we are sure the Governor has received it.

Senator HART. Just as an aside, what information would the request from a Governor have which, if disclosed, would aid our enemy?

Mr. LEWIS. There is no such intention; it is just a communication between them which should not be released before the Governor's receipt of it, I would say.

Senator HART. Well, I think it would be of benefit, not alone with respect to any actions which might be considered by the executives of Ohio and Michigan in this matter, but for others in the future if we could put into the record such communications and exchanges as have occurred between you and Alabama.

Mr. LEWIS. This would be the Governor's request and our reply.

Mr. MURRAY. We will make that available.

Senator HART. Since we haven't had a request from Ohio and Michigan, let's take the case of Alabama, assuming that you have considered and concluded that it is not appropriate to recommend a declaration of emergency for the Alabama region or area.

Do you know from any prior experience whether there is precedent for relief by special act? A situation somewhat like this?

Has there been any legislation tailored for a specific disaster? You say that unemployment insurance and small business loans really aren't very much. But you are really not speaking for the unemployed or the businessmen who need the money.

Mr. LEWIS. That isn't exactly what we said, sir.

Senator HART. I don't mean to twist it. But given this, do you recall any instance where a request was made by a Governor, it was found that it was not appropriate under the general emergency act, and later specific legislation was introduced and adopted?

Mr. LEWIS. I don't know of any case where specific legislation was introduced for that reason. However, in several large disasters there has been special legislation introduced, like after the Alaskan earthquakes and after the Betsy hurricane in 1965. Some of the current legislation now is designed to get a uniform program so there will be no need for special legislation.

Senator HART. What I had in mind, in addition to the problem of Michigan, Ohio, and Alabama is this: Is there a possibility that in the years ahead we will have, if you will, pollution disasters of rather startling economic consequences, quite aside from health and safety? Should we consider a general pollution disaster amendment to your act?

Mr. LEWIS. I don't consider myself in a position to speak for the Director on this. We have had discussions about legislative proposals which have been coordinated within the Executive and there are certain bills now before the Public Works Committee on this subject. If you would like, I could get a statement of the Director's position on this.

Senator HART. I would appreciate it. And if you could, some counsel or recommendation on it.

Mr. LEWIS. Yes, sir. Again it would be a mistake to try to cover all different situations under one general category. We would have to consider the different possibilities.

Senator HART. Mr. Bickwit?

Mr. BICKWIT. I know this is out of your sphere of responsibility, but I wondered if you have any view on whether the Commercial Fisheries Research and Development Act of 1964 could be used to help this situation?

Mr. LEWIS. Yes, I am familiar with that and I know that the Secretary of the Interior has authority under that act to take certain actions. How he would interpret that phrase "arising from natural or undetermined causes," is something that I don't know; whether in a mercury pollution situation he would determine that he could act or not. I think you would have to ask the Secretary. That would be a legal determination.

Mr. Murray, would you care to add to that?

Mr. MURRAY. No; I think it would be more appropriate for him to answer that. It is really his bailiwick.

Mr. BICKWIT. We will submit a request to him on that. Thank you very much.

Senator HART. Gentlemen, do you have anything to add?

Mr. LEWIS. I believe not.

Senator HART. Thank you very much.

Mr. LEWIS. Thank you.

Senator HART. Our concluding witness this afternoon is the assistant professor of clinical medicine of Washington University School of Medicine, Dr. Neville Grant.

STATEMENT OF DR. NEVILLE GRANT, ASSISTANT PROFESSOR OF CLINICAL MEDICINE, WASHINGTON UNIVERSITY SCHOOL OF MEDICINE, ST. LOUIS, MO.

Dr. GRANT. Senator Hart, much of the history as well as the real seriousness of the environmental mercury pollution problem has already been outlined in great part here yesterday and today and I don't really want to repeat all of this material.

But at the risk of some repetition, I would like to present this material in the following fashion, to just outline it first.

I would like to ask and then try to answer two rather simple but very basic questions, and those are: (1) Is there a disease, chronic mer-

cury poisoning, and can it be caused by a low-level continuous environmental exposure?

And the second: (2) What is the likelihood that this can happen at the present levels of mercury contamination?

I will try to answer the first question at the beginning and the second question at the end of my presentation.

Then I would like to review very briefly the forms that mercury exists in, the importance of the interconversions of these forms, and the properties that allow these forms of mercury to be distributed differently in the body and excreted differently and therefore determine to a large extent the clinical manifestations of the disease chronic mercury poisioning.

Finally, I would like to attempt to analyze the levels of mercury exposure that would, number one, cause definite mercury poisoning, and number two, be a—and I will put it in quotation marks—"safe level" that we could take in in any one period of time. And with that information try to judge as best as possible what would be a safe residual level in food.

In the course of presenting this material, I would like to try to point out some of the many gaps, really important gaps, in our knowledge that make precise understanding of the real nature of the problem and its seriousness hard to come by.

Mercury is a heavy metal, and as a heavy metal it is a poison to living cells. This is the property that makes mercury a very effective and very valuable fungicide, looked at particularly from the point of agricultural production.

Celluar damage is done by its ability to bind quite tightly certain groups in the body called thiol groups, and these are sulphur-containing side chains that are present everywhere in all tissue and are essential for the stability and function of all cell membranes and for the many enzyme reactions that essentially run the body's machinery.

Now to go back to the first question, the very simple question, is there a disease chronic mercury poisoning, and can it be caused by low level environmental exposure, the answer is obvious and emphatically yes.

The best illustration we have already heard about was the very dramatic and tragic Minamata Bay episode which really began in the early 1950's, and we have heard here the extent of the damage, 110 people afflicted, probably more, of 40 people who died as a result, and as a result of this, the disease chronic mercury poisoning got the name Minamata disease for some period of time.

There have been many other examples, but these generally fall in the category which can be best described as "hot spot" exposures. That is, not chronic low level environmental exposure, but situations in which mercury got into one place and a small group of people were exposed to it in a very intense exposure. And there are numerous examples of this that can be brought out.

And finally, of course, the industrial mercury exposure is terribly important, it has been known for years, and in a sense it is environmental, but for the moment I am not going to talk to that point of industrial mercury exposure.

The two forms of mercury—and we know this of course, and it has been reviewed here—are inorganic and organic. But it is important

to make a distinction and to realize the interrelationships of those two, because this can be critically important when we talk for example about mercury fungicides.

Inorganic mercury historically was the one that caused mercury industrial poisonings. This is the one of course that was used in the hatting industry and probably was the origin of the phrase "mad as a hatter," and there is some reason to think that Louis Carroll used this as his model for the Mad Hatter, although there are a number of other theories about that point.

An exposure to workers produced symptoms characterized by tremor, psychological disturbances and we had a very accurate description of it yesterday. And this was the elemental mercury. Inorganic mercury being elemental accumulates in the liver, kidney, causes damage there, and accounts for the more rapid elimination in the urine. The elemental vapor has a greater capacity for diffusing across the blood brain barrier and for flowing into the brain, therefore giving more central nervous system symptoms.

Organic mercury is mercury that is attached to a carbon atom. Organic mercury, its biological effects are determined to a large degree by the particular organic molecule to which it is attached.

There are two basic types that we are going to be talking about. I am working down to talking about methyl mercury finally, which is the one we are really concerned about.

But prior to that, there are phenylmercuric acetate and methoxyethyl mercury. These are other forms of organic mercury. But these are a little different and concern us in a little different way, because they break down in the body to inorganic mercury. In other words, if you inject either of these forms of organic mercury, they break down to a large extent and are excreted as inorganic mercury and behave as inorganic mercury and don't penetrate the blood brain barrier nearly as readily.

An example of poisioning from these compounds, however, can be cited and there is one in the Turkish Pediatric Journal that I retrieved in which in eastern Anatolia at least 20 persons became ill after eating flour made from wheat seed that had been treated with a mercurial fungicide.

There are several other examples of this in which seed grain treated with fungicides have been sent to countries and have been clearly marked in English "Do Not Eat" and they have been shipped out into starving areas and of course the inevitable happens, it is baked into flour and eaten and this is a clear example of what you might call a "hot spot."

These forms of mercury, however—and this is the point that we were talking about before—can be methylated in the environment. And they are methylated largely by micro-organisms found in the muds of rivers and lakes. And we really don't know the answer as to the extent of the methylation that takes place.

I would like to point out here a gap in our knowledge. There is some real indication that this methylation can take place in the intestinal tracts of higher organisms. It has been shown you can introduce phenyl mercury and other forms of mercury into the GI tract and it will be methylated by the micro-organisms, the conditions apparently being satisfactory. The extent to which this happens is not known at present.

This is particularly true in poultry. The implication is obvious. You can't just clearly switch from methyl mercury to another organic mercury and expect hens eating that treated seed not to end up with some methyl mercury. It has been shown that they do. We don't know how much that takes place, we don't know the real consequences of that. But it is something that has to be looked into.

Finally we get to monoalkyl mercury, which are the methyl and ethyl mercuries. These mercury compounds can be combined with certain other compounds to reduce their volatility. Methyl and ethyl mercury are quite volatile and therefore have real disadvantages in uses that would require it to be there. So to do this, you can put other compounds on it and make it more stable. But insofar as we know, this doesn't really basically change their effects on the biological system.

This important form, methyl mercury, is for the moment what we are talking about in terms of an environmental hazard for the following reasons: It penetrates and accumulates in the central nervous system; symptoms are delayed frequently in onset; the damage is irreversible; it penetrates into and concentrates in the fetus, and it clearly disrupts chromosome and cell division in extremely low concentrations. And this property is shared also by certain other organic mercurial compounds.

No. 1, it penetrates and accumulates in the brain tissue by certain characteristics that it has, solubility characteristic and so forth, and brain disfunction may occur as a result of damage to the so-called blood brain barrier, damage to that itself, which is critical in regulating brain metabolism.

It has a direct toxic effect on brain cell enzymes. And its distribution, if you look at the pathology of the brain after intoxication, its distribution is to those areas where the clinical signs appear; that is to say, the cerebellum, which results in loss of balance, and the cortex, particularly the speech, hearing, and vision areas, as well as the control of emotion.

And other areas, including the cells of the spinal cord. It appears that nervous system tissue may selectively concentrate or be more sensitive to mercury or the disruption of the function may be much more manifest.

The Minamata Bay episode was the classic example of methyl mercury poisoning and here the problem of methylation and mercury is an interesting one. Early on the Japanese thought and speculated about the possibility of methyl mercury, of mercury discharging from the Japan Nitrogen Co. in the bay being methylated somewhere outside in the environment, but then they found that the particular process they used could within the factory methylate mercury and they discarded that possibility and it wasn't until 1967 that the Swedes, after showing that methyl mercury was showing up in the animals who were exposed only to phenyl mercuric acetate, speculated about methylation in the environment and the reaction was shown in 1967.

The other examples of methyl mercury poisoning are largely drawn from again "hot spot" exposures, and there were a number of cases reported earlier in the literature, but as the total number of cases increases in any illness the enthusiasm for reporting them tends to drop off. So you don't see them as much, perhaps.

A neurological disorder of unknown cause by the long name of amyotrophic lateral sclerosis, was reported as definitely to be caused

in a number of instances in farmers who were dusting their seed with methyl mercury and who were exposed to it by inhalation.

This particular disease is a well-recognized one and it happens to be the one that afflicted the baseball player Lou Gehrig. The implication is not that Lou Gehrig had mercury poisoning, but this is the disease of—a well-recognized disease of unknown cause—that can be mimicked precisely by chronic mercury poisoning.

The evidence suggests that methyl mercury, once having penetrated the blood brain barrier, may be slowly excreted. Here again the data is just a little bit slippery. Because the tests that we do vary from animal to animal, and the tests that we do in man are clearly going to be difficult to perform. You have to do external counting of radioactive labeled material, you can't tell how much is in the blood, how much is in the brain tissue, how much is in the hair. So estimates are really difficult. But it seems to me that it is eliminated slowly from the brain. But if it is eliminated in the same fashion as from other parts of the body, it seems to redistribute itself and concentrate in certain sensitive areas.

The late onset of symptoms is important, because the symptoms may not occur for weeks or sometimes months or more following exposure and as a consequence measurements of mercury in the urine and other places may be misleadingly normal and symptoms may be attributed to some other cause.

Of course, the one we think about is knocking out of a few brain cells, not enough to show clinical manifestations, because the other brain cells are available to perform those functions.

But as some other process occurs—the obvious one is aging—and a sufficient number of them are knocked out by some other process. symptoms that might be attributed let's say to aging could have been aggravated by an earlier exposure to mercury.

There is no known instances in which this has been documented. This is a speculation. But it is a speculation that surely is food for thought.

The irreversibility of the damage has clearly been shown by long term followup of the Minamata Bay victims. And the penetration into and concentration in the fetus is extremely important. There were a number of cases well documented in Minamata Bay where the babies were born with congenital mercury poisoning manifested by convulsions, cerebral palsy and so forth. And the autopsy of two of them showed mercury was at high levels.

The key thing here is that the mothers had no symptoms at all. So we are again talking about the possibility of illnesses that we are all familiar with and we all recognize that we don't know the cause of.

Again, there is no implication that mercury causes cerebral palsy or convulsions or still births or spontaneous abortions, but people have been looking around for the cause of these things, and it is again food for thought.

The disturbances of chromosomes by mercury have been documented in plant cells and in flies in the classical ways one demonstrates disturbances of cell division and chromosomes. There are a number of well-recognized disturbances of sex chromosome distribution in humans and we don't know the causes of them. And these same types of abnormalities occur in plants and flies and there is no real reason, just

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on the surface of it, to think that human cells would react any differently.

I am really, I guess, setting a level to show then what we don't know.

Now finally, at what level might we expect to encounter chronic mercury poisoning? The data are really incomplete. But there is enough evidence by three different methods to get roughly to a figure of 1 milligram of mercury per day ingested over a period of a year's time, or somewhat less, would be associated, as far as we can tell, with the brain symptoms of chronic mercury poisoning.

These have been estimated from data in Japan, roughly suggesting that people eating one-half to three fish meals per day with fish containing 5 to 20 parts per million of mercury developed the disease.

Also, blood levels of 65 to 100 micrograms of mercury per 100 cubic centimeters of blood are known to be associated with the symptoms and it can be calculated that approximately 1 milligram of mercury per day would reach this level.

These calculations are subject to the difficulties that I have talked about earlier, they are based on calculations of what we call a half-life of mercury in various animals. This can be arrived at and we then multiply the half-life by five to come to the equilibrium point.

I don't want to belabor this too much, but irreversible damage has been shown to occur at between 8 to 10 parts per million, and you can set up a table indicating that if you take in 1 milligram of mercury per day over a period of time, you will reach an equilibrium which includes a certain excretion, or 1 percent. Thus, 1 milligram per day will clearly reach toxic levels.

One other thing on that point. If you consider damage to the fetal brain tissue occurring at lower levels, and it has been estimated and judged pretty accurately that the blood concentration in the fetus is about 20 percent higher than in the mother, so rather than 1 milligram per day you would have to reduce that to about 0.8 milligram per day as a level that would cause damage in the fetus. And probably because of increased sensitivity of fetal brain tissue, you would even have to go lower, maybe 0.5 milligram per day. That is a level that as far as we can tell probably would cause definite clinical damage to a developing baby.

If we can say that, what can we say about levels that wouldn't cause any damage? You can't ever say of course for certain, because we don't know that there is any threshold level, we don't know there is any level below which no damage will occur and, of course, we encounter this same thing in radiation problems, how you decide how much radiation we can have.

But being realistic about it, it has been estimated that 10 to 20 micrograms of mercury per 100 cc.'s of blood is not associated with symptoms and an intake of 0.1 milligram per day would roughly reach a level that would give you a safety factor of very roughly 10.

So by several different methods you can arrive at a level that would cause trouble, 1 milligram per day. And if one is willing to accept a safety factor of only 10, you could come to an intake of 0.1 milligram as a level that probably wouldn't cause obvious clinical disease as we know it.

Now it may cause some of these unexplained diseases and it may cause chromosome damage. So, therefore, you have to reduce the levels to really be safe to clearly below that.

Even doing that, there is no way of knowing what kind of damage may occur to the brain in transit, that is to say, in passing through the brain and not accummulating. When you eat one whopping big fish meal, that mercury is distributed instantly, virtually through the entire body and then it is excreted, half of it is excreted in 70 days. Well, you never would accummulate to what we associate as a toxic level, but we don't know what happened in the passage through.

I made a little calculation, just on the basis of some figures that were in some of the recent Canadian fishery journals. If you went to Clarkboro Ferry on the Saskatchewan River in October 1969 and ate two fish meals a day for 10 days—and that is possible—you could calculate on the basis of an average fish with 6.7 parts per million of mercury that you would have a brain concentration at the end of that time of about roughly 2 parts per million. Two parts per million is below any known toxic level in the brain that we know of. But it is well above where this trouble causes damage to chromosomes. And it would probably be in the range where you could have some subclinical disease that would not show up until later.

If you stayed for 20 days you would get to a concentration of 3.7 parts per million of brain tissue or roughly a third to a half of the toxic level. And this would only reduce by one-half in 70 days.

Now, assuming the things that we really don't know about this problem, and assuming the problems of technique in really getting accurate measurements, and assuming that there are some errors in the calculations, roughly if these calculations are anywhere near correct—and they are the best we have and they are really all from the Swedish literature—if we are in any kind of borderline area, why aren't we seeing more of the disease?

The experimental data on which the calculations are based may be wrong or may be misinterpreted or the data may have to come in terms of methyl mercury, rather than total mercury in the whole blood. Methyl mercury is bound 90 percent to the red blood cells, therefore it is a trickier measurement. It has been done, but these have not been readily available in the quantity that you really need.

The present levels may be safe. It may be the levels that we are working at are safe. Or as I have already mentioned, they may be attributed to some other causes.

So we have come down to an allowable daily intake of roughly 0.06 to 0.1 milligrams per day. And if you assume that that is a safe level, a safety factor of roughly 10, well above what we usually accept as a safety factor. The World Health Organization originally set 0.05 parts per million and I understand the FDA set 0.5 part per million.

So there are several pertinent questions. One of them is if you set a level, setting a level is one thing, and enforcing it, really enforcing it is another. Because you can take an example if you set the level at 0.5 parts per million for fish, and you had a fish that—you had a lake that you had to monitor, how would that be done? Would you take out five fish? You can't take them all out, it is impractical. You have to sample them. You take out say 50 fish and five of them have greater than 0.5 parts per million. That is to say, one-tenth above your level that is acceptable. What do you do with the lake?

It would seem to me you would have to ban the whole lake. Because if you didn't, you would clearly be getting one out of every 10 fish above your limit. If you did it on that basis, then at the level of 0.5 parts per million, the practical level that finally got into the market would be much lower than that. But on the other hand, if all of your fish had 0.5 that would mean that many of them had much more than that. That is to say, all of your sample fish were roughly 0.5. So I don't know the answer really as to what level should be set. I don't think anybody really knows that answer. So I have plenty of company.

I have just a little calculation based on some of the Swedish data and this is going away from fish into meat, eggs, and poultry, and trying to get at the final question of how close are we to the problem of widespread mercury poisoning.

First of all, I really don't think—it may be just because I am inept at getting the data, but I must say I tried—I really don't think the data for United States is there. I don't think the Deparment of Agriculture has really important information as to how much mercury is in the food. I know they sample and have sampled it. They may have it all. They may have a lot of data. But it is terribly hard to get to.

So on the basis of not knowing, at least my not knowing what is in the food of the United States, if you look at Sweden, whose problem was very real, at least recognized as real in 1966 and 1967, the meat, and that includes poultry, beef, and pork, averaged about 0.03 part per million. This was true of eggs, too. And if you calculate that a person ate a reasonable diet, and that all of his meat and eggs contained roughly this amount, and any liver he ate had 0.6 part per million and he ate an occasional fish meal, he was getting in 1966 and 1967 approximately 0.1 to 0.3 milligram per day. That was 2 to 10 times lower than a toxic daily intake.

I suspect we would be a little bit higher than that.

The point of all these figures is that—and I think this is a terribly important point to make at this point—I don't think that all of the ill-defined and vague symptoms that we are all subject to from time to time are due to mercury poisoning.

In other words, I don't think we are having an epidemic of mercury poisoning going on. I practice medicine and I just know what happens to people when they can't get some further data about this kind of news, it is tough on them, they don't know what to do with it. And people are very suggestible. So I think it is an important point to make.

Senator HART. I think it is too, Doctor.

Dr. GRANT. It doesn't diminish what I would say would be my strong support to support all measures that would reduce to a minimum the general mercury contamination, including the elimination—and I think this is important—of all potential hot spots.

If you really set out to eliminate hot spots, then you have to do a thorough cleanup job and really have to stop putting mercury into the environment. The threat is very present and legitimate, and the unknown factors make it mandatory that we set about reducing these levels.

I would like to close by asking a couple of questions that I don't have the answers to.

After listening to the earlier testimony this morning, I would like to have asked why they didn't measure the concentration of mercury in

the mud, if it was a problem of the fine-tooling of the technique. Mud, of course, is clearly known to contain the vast majority of the mercury. If you sample the surface waters, or even some water below that, it may be true that the machine won't get down that far, but if you look at the mud, they have been picking up 50 parts per million in the mud. That practically breaks the machine.

Secondly, I am not sure how to handle the set limit of 0.005 in water. They point out—I haven't seen the original article and I am sorry about that—but the figure has been used that fish concentrate mercury 3,000 times. And if you multiply 3,000 times 0.005, you get 15 parts per million. There is no way that we can have that. So I would think that you would have to reduce acceptable water limits to lower than that.

Now I am sure there are mechanisms by which you can get around this, and explain it by mud and so forth and so on. But it would seem that if you just took those bits of information, the acceptable water limit and the concentration in fish, you would get to a concentration in fish that would be totally unacceptable.

Now that concludes my statement.

(The complete statement follows:)

STATEMENT OF NEVILLE GRANT, M.D., ASSISTANT PROFESSOR OF CLINICAL MEDICINE, WASHINGTON UNIVERSITY SCHOOL OF MEDICINE, AND MEMBER, SCIENTIFIC DIVISION, COMMITTEE FOR ENVIRONMENTAL INFORMATION, ST. LOUIS, MO.

The problem of the effects of mercury on man and the environment can be approached by asking the following questions:

(1) Is there a disease-chronic mercury poisoning and can it be caused by low level "envornmental" exposure?

(2) What is the likelihood that it can happen at present levels of mercury contamination?

The answers to these questions are in some cases known; in others incomplete; in still others, speculative.

(1) Is there a disease-chronic mercury poisoning? Yes. In order to clarify thinking on the environmental hazard one must divide mercury poisoning into two categories: (a) inorganic mercury (elemental-salts); and (b) organic mercury (bound to carbon atoms).

The form in which mercury contaminates the body determines its distribution as well as its speed and route of elimination and therefore the type of clinical disease caused. There are intimate relationships between these forms because of transformations (one-to-the-other) in the enviroment and in the body. Bodily damage by mercury (a heavy metal) is done by its ability to bind to thiol groups (present in all tissue and essential for cell membrane stability and function and for enzyme action).

(*a*) *Inorganic mercury.*—Historically inorganic mercury poisoning was recognized years ago in many industries—in particular the hatting industry in which mercuric salts were used. Exposure of workers produced symptoms characterized by tremor and psychological disturbances that probably was the origin of the phrase "mad as a hatter". Inorganic mercury accumulates in liver and kidney (causing damage but also accounting for more rapid elimination in the urine). The elemental vapor has a greater capacity for diffusion into the brain causing central nervous system symptoms and damage.

(*b*) *Organic mercury.*—The biological effects are determined to a large extent by the particular organic group to which the mercury is attached.

(i) Phenylmercuric acetate and methoxyethyl mercury are examples of organic mercury that break down in the body and behave as inorganic mercury. Examples of poisoning from these compounds can be readily sited. One of the most dramatic occurring in Eastern Anatolia where at least 20 persons became ill after eating flour made from wheat seed treated with a mercurial fungicide. It has been clearly demonstrated that these forms of mercury may be transformed into the potentially even more hazardous alkyl-mercury compounds by microorganisms found in the mud of rivers and lakes. An important unanswered question is the extent to which this transformation takes place.

(ii) Monoalkyl mercury (methyl and ethyl mercury salts): These may be combined with certain other compounds (anions) to reduce their volatility (make them more stable for use as fungicides, etc.), but this does not change the nature of their biological effects.

This form of mercury is most important as an environmental hazard because of: (A) Penetration and accumulation in brain tissue (central nervous system.); (B) Delay in onset of symptoms; (C) Irreversibility of damage; (D) Penetration to and concentration in fetus; (E) Disturbance of chromosome and cell division (mitosis) in low concentrations (a property shared with some other organic mercurials).

(A) Penetration and accumulation in brain tissue: Certain characteristics of monoalkyl mercury allow it to penetrate the blood brain barrier. Brain disfunction may occur as a result of (1) damage to this essential blood brain barrier resulting in impairment of its function as a regulator of brain metabolism, (2) direct toxic effect on brain cell enzymes and membranes. Distribution in central nervous system to (a) the granular cells of the cerebellum (resulting in loss of balance—ataxia) (b) cerebral cortex including those areas involving speech, hearing and vision as well as control of emotions, (c) motor (and other) cells of the spinal cord. It appears that nervous tissue selectively concentrates or is more sensitive to mercury.

The "epidemic" of chronic mercury poisoning in Minamata, Japan (Minamata Disease) shows clear examples of this type of damage. In 1952 the Japan Nitrogen Company began to mass produce organic synthetic products. Cats were reported as going berserk, becoming spastic and dying within the next year. Villagers about the bay noted symptoms in 1953. During the next 10 years 44 persons died and 70 were crippled. The damage came from mercury effluent from the plant discharged into Minamata Bay; and taken up by fish which were eaten by the villagers. Other examples include farmers exposed to methylmercury fungicides in the disting of seeds with the development of amyotrophic lateral sclerosis (a well recognized progressive neurological disorder of unknown cause—the disease that afflicted Lou Gherig).

Evidence suggests that methylmercury once having penetrated the blood brain barrier may be only slowly excreted from that location, (Arch. Environ. Health 19:478, 1969) or, if eliminated in the same fashion as from other parts of the body it may redistribute and concentrate in certain sensitive brain areas.

(B) Delay in onset of symptoms of brain damage may make it difficult to find and implicate any previous mercury exposure. Symptoms may not occur for weeks to years following exposure. As a consequence measurements of mercury in urine etc. may be misleadingly normal and symptoms may be attributed to other causes (premature senility, neurological disease of unknown cause).

(C) Irreversibility of damage has been clearly shown by long-term followup of Minamata victims.

(D) Penetration to and concentration in fetus: Inorganic mercury does not penetrate the placenta and therefore does not concentrate in the fetus. Methylmercury does penetrate to and concentrate in the fetus (perhaps by the same properties that allows penetration of the blood brain barrier). Concentration in fetal blood is 20 percent higher than in mothers and of great significance is the greater sensitivity of developing fetal tissue to the damaging effects of mercury. Several clear-cut examples of fetal mercury poisoning in which the mother had minimal or no symptoms (Matsumoto: Jour. of Neuropath. Exp. Neur. 24: 563 1965). A total of 17 cases of cerebral palsy were reported in Minamata from 1953 to 1960. This is a higher incidence than would be expected and in two autopsy studies were shown to be due to mercury.

(E) Disturbance of chromosome and cell division has been shown to occur with exceedingly low concentrations of organic mercury. These studies have been done in plant and Drosophila flies. The effect on chromosome breakage and cell division are striking.

The mechanism by which organic mercury alters cell division is not yet entirely clear. There is an inactivation of the spindle mechanism by which the cell pulls itself apart. In the extreme form the chromosome itself may divide but the cell not—resulting in a cell with twice the number of chromosomes (polyploid cells). It is known that a specific protein (6S) is critical to the unit that forms the microtubule of the spindle apparatus. It is likely that 6S protein is formed from smaller protein units by the formation of disulfide-bridges via the oxidation of sulfhydryl groups. Mercury, being extremely reactive with sulfhydryl groups, could easily interfere with spindle formation at this stage. In

flies, as well as plant cells, mercury may interfere with the proper segregation of sex chromosomes such that a gamete may have two sex chromosomes—or none.

Subsequent generations will reflect this abnormal sex chromosome pattern. These exact same abnormalities are well recognized, and unexplained, in humans in which nondisjunction (failure of proper segregation) of maternal or paternal germ cells may result in offspring of abnormal number and type of sex chromosomes. The normal female is XX chromosome—the normal male XY. A few of the many recognized abnormalities include: XXX ("super female"); XXY (Klinefelter's syndrome); XO (Turner's syndrome). These same types of abnormalities may occur by mitotic nondisjunction in the fertilized egg which may be more sensitive to disruptive effects. Experimental evidence clearly shows that these patterns may occur at very low levels of mercury exposure in plants and flies. There is no reason to believe that human cells would react differently.

At what level might one expect to encounter chronic mercury poisoning? Data on this point are incomplete but sufficient evidence is available to arrive at some estimation. Several methods of determination have been used.

(a) At what level will brain damage almost certainly occur?

(i) Data from Niagata, Japan indicate that persons ingesting ½ to 3 fish meals per day of fish with 5–20 ppm developed mercury poisoning. It is not clear how long this took (though the data is probably available). If one used a conservative figure of 1 meal per day (averaging 100 gm fish) and containing 10 ppm Hg (1 mgm Hb/100 gm) then it would appear that *1 mgm per day* of mercury taken over (probably) several months would produce symptoms.

(ii) Blood levels of 65–100 micrograms of mercury per 100 cc blood are known to be associated with symptoms. It has been calculated that an intake of approximately *1 mgm mercury per day* corresponds to about 60 micrograms mercury per 100 cc blood when equilibrium is reached. Based on calculations using the biological ½-life of mercury in various animals it has been calculated that equilibrium will be reached.

(iii) Irreversible brain damage or death occurs in different species, including man, at a brain concentration of 800–1,000 microgram mercury per 100 gm of tissue. At an intake of *1 mgm per day* of mercury and an excretion of 1% of the total body burden per day the whole body content at steady state would be 100 mgm Hg. It is known that 15% of total body mercury is located in the brain—thus a brain tissue level of 1,000 microgram Hg/100 gm brain tissue would be reached in 1 year.

Conclusion.—1 meal of 10 ppm (fish), or a total of 1 mgm Hg/day taken daily over 1 year would clearly cause damage. Several factors must be kept in mind: (a) some damage almost surely occurs at steady-state levels lower than this. (b) though it may take 350 days to reach 97% of steady-state it would take much less than this to reach 70–80% of steady-state (i.e. 800 microgram HG/100 gm brain=8 ppm) a level of which brain damage would almost certainly be occurring.

Damage to fetal brain tissue will occur at much lower levels of mercury intake. Data indicates that fetal blood (and most probably brain) concentration of mercury is 20% higher than in the mother. In addition fetal tissue is more sensitive than adult (by a considerable but unknown factor). This would indicate that an intake of *0.84 mgm mercury per day* in the mother would cause fetal damage and evidence would suggest this may be as low as *0.5 (or less) mgm mercury per day.* This would correspond to 1 fish meal (100 gm) of 4 ppm per day. If teratogenic or chromosomal effects could be shown to occur at lower levels this would have to be even further reduced.

At what level will brain damage not take place? This, of course can never be said for certain. Based on the observation that blood levels of 10 to 20 microgram mercury per 100 cc whole blood is not associated with symptoms it has been estimated that an intake of *0.1 mgm mercury per day* is a safe intake. This would allow for a very rough "safety factor" of 10. (See Table I)

Conclusion.—(1) certain toxic level: 1 mgm mercury per day for 6-12 months (or 1 meal per day of fish with 10 ppm) (2) "safe level": 0.06 to 0.1 mgm per day (or 1 meal per day of fish with 0.5–1 ppm). Because of the many uncertainties there should be a wider margin of safety than this.

(1) If several foodstuffs contained mercury (meat, eggs, etc.) so that mercury were ingested 3 times each day then *the safe level must average 0.1–0.3 ppm.* Based on these calculations food containing 3 ppm (assuming an average 100 gm serving and eaten 3 times a day) would produce chronic mercury poisoning.

(2) There is no way to know what damage might occur to the brain by mercury "in transit"; that is, mercury passing into brain tissue and then out without continued accumulation.

(3) Chromosomal or teratogenic effects may occur at lower levels.

Example.—If one fished at Clarkboro Ferry in the Saskatchewan River, Canada during Oct. 1969 and ate 2 fish meals per day for 10 days the following exposure would occur. Fish averaged 6.7 ppm Hg=0.67 mgm Hg/100 gm average meal 150 gm=1.0 mgm Hg/meal daily intake=2 x 1.0 mgm Hg=2.0 mgm/day total intake per 10 days=20 mgm Hg total excretion (at 1% per day)=1.0 mgm Hg total accumulation in body=19 mgm Hgm total accumulation in brain=15% x 19 mgm=2.85 mgm Hg. concentration of Hg in brain=2.0 mgm/kg=2 ppm=⅕ to ¼ of toxic concentration. If one stayed on for 20 days of fishing total intake would equal 40 mgm—3 mgm (excretion)=37 mgm, total brain mercury would equal 5.5 mgm with a concentration of 3.7 mgm/kg (3.7 ppm) brain tissue or ⅕ to ½ the toxic level. At the end of 70 days after exposure ceased the level would be 200 microgram/100 gm brain tissue—still ⅕ to ¼ the toxic level.

In as much as damage surely occurs at levels well below the established toxic (irreversible) dose it seems likely that this exposure would cause damage to the brain.

If these calculations are substantially correct and the levels of mercury are at levels that are the borderline of safety, why are we not seeing cases of environmental mercury poisoning in North America?

(a) The experimental data on which the calculations are based may be wrong or misinterpreted. Data should be in methyl mercury rather than total mercury. When these measurements are available the safety levels may be changed upward—or downward.

(b) The present levels may indeed be safe.

(c) Symptoms may be present but obscured (or attributed to) other causes—aging, slow-learner, neuroses, etc.

(d) Symptoms may be misdiagnosed as other diseases. They may mimic, both in clinical symptoms and neuropathological findings, certain neurological disorders such as: amyotrophic lateral sclerosis, cerebellar atoxia and cerebral palsy.

(e) Damage may be occurring that may not be grossly evident or may not show up until aging takes place.

Days	Hg 1 mgm. per day		Hg 0.5 mgm. per day		Hg 0.1 mgm. per day	
	Total body Hg (mgm.)	Brain conc. (p.p.m.)	Total body Hg (mgm.)	Brain conc. (p.p.m.)	Total body Hg (mgm.)	Brain conc. (p.p.m.)
10	9.5	0.95	4.7	0.47	0.95	0.09
20	18.0	1.8	9.0	.9	1.8	.18
30	26.0	2.6	13.0	1.3	2.6	.26
40	33.0	3.3	16.0	1.6	3.3	.33
50	39.0	3.9	19.0	1.9	3.9	.39
60	45.0	4.5	23.0	2.3	4.5	.45
75	53.0	5.3	26.0	2.6	5.3	.53
100	63.0	6.3	31.0	3.1	6.3	.63
150	78.0	7.8	39.0	3.9	7.8	.78
200	86.0	8.6	43.0	4.3	8.6	.86
250	90.0	9.0	45.0	4.5	9.0	.90
300	95.0	9.5	47.0	4.7	9.5	.95
350	97.0	9.7	48.0	4.8	9.7	.97

Note: Based on calculations of brain distribution of mercury (15 percent of total body Hg) and a fixed excretion rate of 1 percent per day of total body mercury the above table may be set up.

Senator HART. You have handled in very understandable fashion a subject that you could have made completely obscure for your nonprofessional audience. I think the record benefits enormously from what you have told us.

You were the author of the magazine article in *Environment?*

Dr. GRANT. I was one of them. We had one issue devoted to mercury, and three of us contributed. Mine happened to be the clinical article.

Senator HART. That was published or bears a date of May 1969. This is sort of like asking a politician why somebody didn't vote for him, but why wasn't your article picked up by the regulatory agencies?

Dr. GRANT. Obviously I can't answer that. It was picked up by a lot of people. We have a reasonably good circulation. And we heard a lot about the article afterwards. I don't know. I don't really think though that it would be fair to ask why it didn't get picked up from our article, because the question that has come consistently and legitimately right along is, why didn't we know about it sooner.

It seems to me that it is very clear that there are a lot of people who share the blame about that. Including scientists, because this was in the scientific literature. And there is just no reason in the world, it seems to me, why it shouldn't have been at least when the Swedes were tangling with it in 1967. It was a vinyl plastic plant in Japan, and as I understand it we did at NIH the mercury determinations in the brains of some of these people, so I really am not sure why somebody didn't add one and one, except that somebody wasn't there and it didn't happen.

Senator HART. What suggestion do you offer to the problem of which this is dramatic but nonetheless a tiny part, the business of everyone having only 24 hours a day. The printing presses roll fast and lecture material spews out. How can we as a Government assist in insuring that there is a collection of data in manageable form for prompt availability to somebody that has the responsibility to be informed?

Dr. GRANT. Of course the problem exists not just in this very important area of monitoring pesticides and poisons and things in food, it is true in all areas of medicine, science, and everything else.

I think any opinion I have really wouldn't be expert enough to make it worthwhile when I render it. Clearly it needs to be done. I don't know how it can be done.

Senator HART. If we agree it has to be done, I would sort of like to cite getting to the moon——

Dr. GRANT. Yes, I am sure it can be done. If you have the two parts of the equation, it has to be done, it can be done, surely the mechanism can be found.

Senator HART. Mr. Bickwit?

Mr. BICKWIT. In our May hearing we were told that one reason for establishing the interim guideline of 0.5 parts per million was that the courts of law do not have confidence in test methods capable of detecting mercury at levels below that amount.

Do you agree with the courts in this regard?

Dr. GRANT. Again, I would like to be precise, at least as precise as I can in what I know and what I don't know. And I don't know precisely what the machines that are available can do. I think they can go lower than that.

Mr. BICKWITT. They can. We were told by FDA that they can, but that courts require a check analysis done by a different chemist by another method before they will accept this as evidence.

Dr. GRANT. There are several different methods by which these can be done and some of them are much more precise than others. If you are asking me whether it is right that they should be cross-checked by someone else or by another method——

Mr. BICKWIT. I was wondering if you knew anything about the methods and whether it was possible that we could develop technological methods in the near future that would allow the courts, assuming they required checks, to approve methods which were capable of detecting levels below that?

Dr. GRANT. I would think so. Again not being an expert in the methods, I would think this could easily be done.

Mr. BICKWIT. This would require expertise in the methods.

Dr. GRANT. Yes.

Mr. BICKWIT. In your statement you give the toxic residue level, assuming one fish meal per day as 10 parts per million and the safety level at 5 to 1 parts per million, based on a safety factor of 10.

Dr. GRANT. There is nothing official of course about that. With that you would fall into taking below 0.1 milligrams per day.

Mr. BICKWIT. FDA told us that the safety factor for residue tolerance is normally 100. If they are using a safety factor of 10 in this instance, does it follow that the public health is jeopardized? I speak from ignorance.

Dr. GRANT. I would say that at that level—and I wish to push it down a little further because we know that damage can occur in fetuses at lower levels than that. Let's put it down to 0.5 milligrams per day—excuse me, 0.05.

Mr. BICKWIT. 0.05 parts per million?

Dr. GRANT. I lost the train of thought there as far as the question.

Mr. BICKWIT. I was wondering whether if the safety factor of 100 is generally used in setting residue tolerances if we are not jeopardizing the public health by using a safety factor of 10 here?

Dr. GRANT. I think we might be, because there is this large vast unknown area of chromosome damage and of "threshold" level that we just don't know about. One of the problems with the other pesticides is, at least as far as chronic exposure is concerned, we know something about the levels in man for example of DDT, but as far as chronic disease in man from DDT, we don't really know of any at the present time for sure.

So we are talking about a fixed disease at a fixed point. To get a safety factor of 100, we would be down to background levels as far as mercury is concerned.

Mr. BICKWIT. We have calculated that and we would have a level above background levels by a little bit. What is background level prescisely? I was told it was 0.1. It varies, but that it generally is 0.1 part per million. And we calculated that on the basis of the test, if you used a safety factor of 100, you would get down to 0.15.

Dr. GRANT. You would be down to levels that are there.

It would be awfully nice, but I don't think we can get down there. Although if we did what we propose to do, eliminate hot spots, you would have to eliminate the discharge of mercury into the environment and if you did that, you would be down. We don't really know the contribution of mercury in the air. I don't think we really know that. It is all right to say only a certain number of pounds has gone into the water. But where has the rest of it gone?

Mr. BICKWIT. That brings to mind a related question, which is, is this guideline of 0.5 parts per million arrived at on the assumption that fish is the only quantity that we are eating that contains mercury?

Dr. GRANT. I think you might even have to make a double standard here for at least a period of time of fish in one and the rest of the things we eat in another. Possibly. The Swedes as you know set it at one part per million. If they had set it at 0.5, they would have virtually eliminated half of the fishing in Sweden. If we set it, fish, at 0.5, and

other food and produce at 0.05, then we might, then I think we could be in a pretty reasonable state of affairs, if it were enforced.

Mr. BICKWIT. One thing I wish we had asked the Department of Interior is if we lowered this guideline to 0.15 or as some have recommended, all the way down to 0.05, I wonder how many States at this point would have fish with levels higher than that amount. We have been assuming this is a 20-State crisis.

Dr. GRANT. Any State that has an industry would be one. Missouri has recently been found to have mercury in the water. We don't know what it means, I don't know that anybody has measured the fish level. I am sure, I am confident that as it is looked for wider, it will be found wider. And I am disappointed in a way that we don't know something more about the agricultural situation, because this is also potentially——

Mr. BICKWITT. The point I am making is, even if we don't find any more, if we lower that guideline to 0.05, we may expand the crisis to God knows how many States.

Dr. GRANT. Yes.

Mr. BICKWIT. And since FDA says that guideline is based in part on technological limitations in detection, if we get those technological limitations removed and we apply the one-hundred-fold safety factor which we do in all other residue tolerances, merely by that action alone we may be expanding this crisis to 50 States.

Dr. GRANT. There is no question about that, at least I would think so. That shouldn't be the determining factor in what the guideline is. But I think perhaps under some of those circumstances you could say that a safety factor of 100 doesn't have to be applied, because I think we really would be, let's say you set 50, you would still be way, way down. There were some calculations as far as fishermen were concerned, that fished and lived around an inland water in Sweden and ate about four meals a day of fish. I guess fishermen—four meals a week of fish. They don't eat it every day, twice a day or anything like that. If you calculate that out at one part per million, they were taking in 0.05 milligrams per day, which is about 50 below—the safety factor of 50. None of them was sick.

Mr. BICKWIT. Thank you very much.

Senator HART. Doctor, let me wind up with a practical question. Do you know what the average fish intake per year is in this country? How much do we as a people consume?

Dr. GRANT. The total amount of fish consumed in the country, or the average amount per person?

Senator HART. Well, we can do the division.

Dr. GRANT. I don't know the total amount of fish that is consumed. And I really don't know that I would be an awfully much better judge than any of us as to how much fish the average person eats. Of course we are perhaps not talking about those select places where fish is a major part of the diet.

Senator HART. Let's take the suggestion that was made that the average for the American consumer is about 10 pounds of fish a year. Most of it I am sure would come from the oceans. Should he be concerned about his fish diet?

Dr. GRANT. Ten pounds—of course if most of it was taken from the ocean, let's say 9 pounds was taken from the ocean and 1 pound from—I made some calculations but I can't find them right now on

the basis of the data that they presented earlier this morning, about half a pound per day of 0.5 parts per million. I can't pick that up here. But in any event, I would say no, he wouldn't have to worry.

Senator HART. Thank you very much.

I would hope most people would agree that the hearings we are concluding have been useful. To the extent that they have been, it is largely because of the responsiveness of the witnesses, some of whom, at least Dr. Grant, have traveled a considerable distance. As with a great many of the hearings here in Congress, they have been useful more in raising the questions, the tough questions, than in providing clearcut answers to the problems that we are discussing.

But I think even based on the record thus far we do have some basis for action that the testimony of the last 2 days indicates, action which should solve in part some of the problems. Steps are clearly dictated to repair the gap in our environmental protection system. We have seen the ravage that can result from inadequate accumulation and dissemination of scientific knowledge. We have learned, however, that even if the knowledge is available to the regulatory agencies, it will not do them much good if they lack a complete inventory of the elements that are being discharged into the water. We have seen that the Refuse Act is a potentially valuable tool for obtaining that inventory, but it has never been used for that purpose, and it is unreasonable, I think, to expect that it could be unless it is substantially funded for that purpose.

Finally, we find that the Disaster Relief Act is not adequate to compensate those who have been victimized by this environmental crisis or by environmental disaster generally, I think.

So I would anticipate several steps, to seek the adoption of an early warning system capable of preventing future "mercuries"—or more particularly to urge Congress to adopt S. 4044, the Magnuson-Hart Commercial Technology Assessment Act.

Second, to see if we can't amend the pending Public Works appropriations bill to provide for increased funds for the administration of the Refuse Act.

Third, at least to consider the advisability of legislation to provide some form of compensation for the innocent victims of pollution.

I would plan also to resume the hearings at an early date and consider further the problems posed by other heavy metals as well as mercury.

Time is clamored for, all of us have a whole variety of problems, but I think none has a more compelling claim on us than the area we have been talking about for 2 days.

We are adjourned at the call of the Chair.

(Thereupon, at 1:30 p.m., the subcommittee was adjourned, subject to the call of the Chair.)

DEPARTMENT OF AGRICULTURE,
Washington, D.C., July 23, 1970.

Hon. PHILIP A. HART,
Chairman, Subcommittee on Energy, Natural Resources, and the Environment, U. S. Senate, Washington, D.C.

DEAR MR. CHAIRMAN: At our meeting in your office today, Dr. Theodore C. Byerly and I informally presented a request that he not be called as a witness at your Committee hearing scheduled for July 29 because of pending litigation involving the subject matter of the Hearing.

Dr. Byerly, as indicated to you, is anxious to cooperate with you and your Committee in every way possible. However, as Assistant General Counsel of the Department after consultation with the attorneys in the Department of Justice concerned with the pending litigation, I advised Dr. Byerly it would be detrimental to the Government's interest in the litigation for him to testify in a public hearing on the subject matter which is at issue before the Court.

On February 18, 1970, an order of suspension was issued to the Nor-Am Agricultural Products, Inc., suspending the registration under the Federal Insecticide, Fungicide, and Rodenticide Act of Panogen products, mercury-based fungicides. The company being advised that the action was taken because of the Alamogordo incident where very serious mental and physical health impairment of three children was attributed to the use of seed treated with mercury-based fungicide and many other reported instances of mercury treated seed screenings and sweepings being fed to livestock or disposed of in a manner that resulted in wildlife feeding on them.

The registrant instituted action in the United States District Court to restrain the Department from enforcing the suspension which prevented it from marketing the product pending hearing and final decision under the statutory administrative procedure. It was alleged that the Department's finding of imminent hazard was not justified. A further plea was made for a declaratory judgment as to whether the Department's regulation placing the burden of proof on the registrant was valid.

On April 21, 1970, the District Court issued a preliminary injunction restraining the Department from enforcing or taking further action pursuant to the suspension order. The Court held that the finding of imminent hazard was arbitrary and capricious and, therefore, the suspension order was improperly issued.

The Department obtained a stay order from a Judge of the United States Circuit Court of Appeals for the Seventh Circuit and appealed the lower court's order. The Court of Appeals on July 15, 1970, in a 2 to 1 decision affirmed the lower court with each of the judges writing a separate opinion. The majority, as indicated in the opinion I left with you, went into substantial consideration of the question of "imminent hazard," and the balancing of interest involved in determining questions in connection with cancellation or suspension of registrations. This opinion represents the first judicial interpretation of the Congressional intent in the use of the term "imminent hazard."

The Department has recommended further appeal with a stay to prevent the marketing of the mercury-based products in question pending such appeal. Regardless of the outcome of further appellate judicial action a full hearing on all aspects of the use of the mercury-based products will be necessary either before the District Court on permanent injunction or under the statutory procedure for administrative hearings.

In view of Dr. Byerly's responsibilities in the area in question, he may well be a witness in the aforementioned hearings and it is felt, therefore, that it would be highly undesirable for him at this time to testify in a public hearing on matters that are at issue in the pending litigation.

For the foregoing reasons it is respectfully requested that Dr. Byerly be excused from testifying at the hearing before your Committee scheduled for July 29.

Sincerely yours.

CHARLES W. BUCY,
Assistant General Counsel.

AUGUST 24, 1970.

Hon. WALTER J. HICKEL,
Secretary of the Interior,
Washington, D.C.

DEAR SECRETARY HICKEL: In the past few weeks, your Department has amassed considerable information about the sources and magnitude of corporate mercury pollution of the nation's waters. Some of these polluters have been recommended for prosecution by your Department. However, apart from about 10 companies, there has been no identification for the public of scores of company mercury contaminators. As you have recognized, mercury poisoning of the lakes, rivers, streams and waterways is a most serious and lasting health hazard, particularly in fish whose bodies concentrate the mercury. At least seventeen states have waterways with significant mercury contamination. Yet your Department refuses to release the names of the mercury polluters to the public.

On July 30, 1970, Assistant Secretary Carl Klein testified before Senator Philip Hart's Subcommittee on Environment. It was clear from the testimony that your Department has information on many companies which dump mercury into public waterways where people swim and fish and receive their drinking water. Mr. Klein made it clear, via his characteristically undulating and evasive replies, that he does not want to name the mercury polluters and their location. He had no reason for his position that could stand more than a second's scrutiny and he displayed deep insensitivity to Senator Hart's plea that citizens had a right to know in order to take their own precautions.

Further along in the hearing, Mr. Klein denied that any memo had been sent to the Federal Water Quality Administration warning against "leaks" and further release of information that the Department was concealing regarding mercury polluters. Vairous informed sources, both within and without the Department, assert that two memos from Klein to David Domick, head of the Federal Water Quality Administration, focused on the need to prevent certain information from seeping out to the press. The dates of the alleged memos were July 7 and July 13, 1970. At the very least, Mr. Klein's negative reply about the existence of any such memos before the Subcommittee requires immediate explanation and your personal attention. If there is a discrepancy, serious doubt about the credibility of your immediate subordinate is bound to arise that would impair what is left of the Department's effectiveness in controlling water pollution. Full restitution of the public's trust demands that you order an immediate release of all companies' and other persons' names who are contaminating waterways with the no-threshold poison—mercury. There is no place for Departmental secrecy over such corporate lethality. I look forward to your response.

Thank you.

Sincerely yours,

RALPH NADER.

JULY 17, 1970.

SUBCOMMITTEE ON ENERGY, NATURAL RESOURCES, AND THE ENVIRONMENT,
Old Senate Building,
Washington, D.C.:

The Lake St. Clair Anti-Pollution League wants to take this opportunity to register its strong support of Bill S. 3537.

Since water and air cross state boundaries, environmental protection is rightly the concern of the Federal government. Moreover, history proves that states do not cooperate to accomplish the job. Many avenues for checking land, water, and air pollution *must* be made available for ecological protection. Government agencies are often lethargic due to influential pressure groups, red tape, heavy schedules, etc. This act will not only supplement these agencies but might force them to action. It is important, at the same time, to ensure adequate court facilities for prompt hearings for the current and future case load. Suits initiated by the individual might act as a deterrent. Companies might be more conscientious when they realize how strongly people feel about survival. Suits must not only stop pollution but also, restore the environment where feasible. The term "unreasonable pollution" is necessary to provide adequate flexibility for standards when ascertained and new pollution control devices when developed.

Bill S. 3537 is a beginning in the urgent fight for self-preservation.

KAREN STEBNER,
Secretary, Lake St. Clair Anti-Pollution League.
Dr. WILLIS W. MATHEWS,
Vice President, Lake St. Clair Anti-Pollution League.

U.S. DEPARTMENT OF THE INTERIOR,
Washington, D.C., August 25, 1970.

Hon. PHILIP A. HART,
Chairman, Subcommittee on Energy, Natural Resources, and the Environment, Senate Committee on Commerce, Washington, D.C.

DEAR MR. CHAIRMAN: During the course of my testimony before your Subcommittee on July 30, 1970, I indicated that I would furnish for the Subcommittee's information detailed reports concerning the hazards of lead and arsenic in the environment. Two studies concerning those hazards are forwarded herewith. These studies represent the latest scientific findings on these questions and were prepared by our aquatic specialists in the Department of the Interior.

If we can provide you with any further information or data, please advise us.

Sincerely yours,

CARL L. KLEIN,
Assistant Secretary, Water Quality and Research.

HAZARDS OF ARSENIC IN THE ENVIRONMENT, WITH PARTICULAR REFERENCE TO THE AQUATIC ENVIRONMENT

(Prepared by Victor Lambou and Benjamin Lim, Federal Water Quality Administration, U.S. Department of the Interior)

ABSTRACT

Arsenic is widely distributed in nature. The average concentration in seawater has been reported as 0.003 ppm. Levels are quite variable, however, because arsenic is usually present wherever any metal sulfides occur, and normally is not removed from the high levels present in pesticides and detergents before wastes from these materials reach local waterways and the coastal zone. Arsenic concentrations in water in and around Lawrence, Kansas were reported as ranging from 0.4 ppb to 8.0 ppb, with tap water ranging from the lower level of detection 0.4 ppb to 0.5 ppb. The U.S. Public Health Service Drinking Water Standards set a maximum concentration of 0.05 mg/l for arsenic. At the present time there are no tolerances established for arsenic in seafood.

In general the organic arsenicals are not as toxic to man as the inorganic forms and organic arsenicals are not common in the environment. Acute inorganic arsenic poisoning results in violent gastroenteritis, fatty degeneration of cells, disturbances of nutrition and metabolism and in some cases direct paralysis of the heart. Chronic poisoning may cause indefinite symptoms of illness such as nephritis, neuritis, etc. Arsenic is a cumulative poison which slowly builds up in the body to levels that may not be detectable for two to six years or longer.

Arsenic in some form has been shown to be toxic at various concentrations to organisms in most levels of the aquatic food chain. Concentrations of arsenic reported as toxic to fish contrasted against concentrations reported as tolerable show relatively small differences for most forms. More long term study is required because arsenic is readily concentrated by marine organisms. No safe levels for natural waters are reported.

Production of arsenic as a by-product in the smelting of lead, copper, and gold ores far exceeds the demand. Prior to 1959 the U.S. consumption of white arsenic varied between 13,000 and 40,000 short tons per year. No consumption statistics have been published since 1959. Disposal of the large quantities of arsenic they produce is a major problem of mining industries.

INTRODUCTION

Arsenic has gained notoriety as a poison—figuring in Renaissance political plots and in modern fiction. Arsenic trioxide, or "white arsenic," was first discovered in the eighth century by an Arab alchemist. Use of the compound added new dimensions to the poisoner's craft, because its presence was difficult to detect. The symptoms that resulted from "white arsenic" intoxication were not likely to arouse suspicion, because they often resembled the symptoms of nephritis, neuritis, or general gastrointestinal disorders. More sophisticated procedures for detecting arsenic have greatly reduced the incidence of intentional arsenic poisoning.

Arsenic and its related compounds are often used in the United States. Various insecticides and herbicides contain the element. Other common uses for arsenic include ammunition, glass manufacture and pigment production. It also occurs as an impurity in detergents. The element is often found in association with sulfur-bearing coal and can be released to the air when the fuel is combusted.

DISTRIBUTION OF ARSENIC IN NATURE

The average abundance of the element arsenic is 1.8 parts per million in the earth's crust (Krauskopf 1967). Arsenic is present in seawater at an average concentration of 0.003 ppm (Krauskopf 1967).

Junkins (1963) has compiled the following review of the distribution of arsenic:

"Arsenic is widely distributed in nature. It most commonly occurs as a pyrite (FeAsS), but usually is present wherever any of the metal sulfides occur. The primary commercial sources of arsenic are copper and lead ores. Arsenic is recovered as a by-product during the smelting process.

"Arsenic is also redistributed in nature indirectly. The mining and smelting of ores and the burning of coal are examples.

"The arsenic content of soils varies from less than one part per million to as much as 40 parts per million (Vallee et al., 1960).

"The concentration in sea water apparently varies from about one to 50 micrograms of arsenic per liter (Smales and Pate, 1952). Gorgy et al. (1948) reported 15 to 50 micrograms of arsenic per liter in the Pacific Ocean. More recent results indicate lower values: 2.5 to 6.6 micrograms of arsenic per liter in the Pacific (Ishibashi, 1954), and in the Atlantic Ocean near Great Britain, 1.6 to 5 micrograms per liter (Harvey, 1955). The Atlantic Ocean near the Canadian shore was reported to contain about two micrograms per liter (Young and Langille, 1958). It is not clear whether arsenic content of the ocean varies systematically. Most of the arsenic found in sea water (40 to 60 per cent) is inorganic and usually considered to be in the form of arsenite (Smales and Pate, 1952; Gorgy et al., 1948).

"Early investigations of the arsenic content of sea water were undertaken as a supplement to studies of the arsenic content of edible marine organisms. The work was stimulated by an outbreak of arsenical posioning near the turn of the century. Analytical techniques at the time were rather crude. The sensitivity was adequate for the determination of arsenic in marine organisms, which was present in tens of parts per million. However, the application of these techniques to sea water entailed evaporation of large sample volumes yielding results which were of doubtful validity and often contradictory."

ARSENIC IN THE ENVIRONMENT

Sources of arsenic to the environment

Sources of arsenic to the aquatic environment include natural deposits, industrial discharges, acid mine drainage, pesticides, lead shot, combustion of sulfur-bearing coals, detergents, smelting of lead, copper, and gold ores.

Arsenic in detergents may be one of the more significant sources to the aquatic environment. Magnuson et al. (1970) found arsenic at a concentration of 10 to 70 ppm in several common presoaks and household detergents. Analysis of laundry products by FWQA have revealed arsenic concentrations ranging up to 36 ppm. According to Magnuson et al. (1970), waste treatment processes now used in many sewage or waste effluents plants do not remove arsenic. Therefore, much of the arsenic from laundry products would be discharged to local waterways.

Sulfuric acid made from sulfide ores probably contains arsenic. The arsenic either remains in the acid or is removed at the sulfuric acid plant and probably appears in the wastewater streams. Hence arsenic could occur in the waste streams or manufactured product of any industry using low grade sulfuric acid.

Because arsenic is soluble in acids, acid mine drainage containing arsenic from active and abandoned coal mines is likely. Coals bearing sulfide and shale impurities are potential sources. The concentrations of arsenic in typical acid mine waters is unknown, because iron interferences have prevented the accumulation of representative data. The large quantities of arsenic-based pesticides utilized across the country can be important sources of arsenic contamination to the aquatic habitat.

Finally, immense quantities of sulfur-bearing coals are burned for power production in the United States, and this industrial source of arsenic should not be overlooked. Fly ash and stack scrubber drainage and storm runoff from the power plant compound could contain arsenic.

In natural waters, arsenic is most often found as an anion, either as arsenate (AsO_4^{--}) or arsenite (AsO_4^{-}). In seawater it supposedly exists largely as arsenite (Hutchinson 1957).

Large quantities of sodium arsenite have been applied to the aquatic habitat as herbicides to control aquatic plants. Some extensive studies have been conducted to determine the fate of their application. Mackenthun (M.S.) studied Pewaukee Lake near Milwaukee which had received 218,000 pounds of As_2O_3.

He stated: "If retained and evenly distributed over the entire lake, the chemical would amount to 87 lbs. per acre or 380 ppm in the uppermost one inch of bottom. We found bottom samples to have an As_2O_3 content ranging from 10 to 82 ppm with a mean of 49 ppm. It appears that much arsenic will be stored in lake and river bottoms."

Lawrence (1957) studied the application of sodium arsenate to farm ponds. He reported:

"Chemical analyses of the water from ponds treated with 4 ppm As_2O_3 as sodium arsenite indicated a uniform distribution (approximately 3 ppm As_2O_3) of arsenic in the upper 2.5 feet of water within 24 hours after treatment. The amount of soluble arsenic was rapidly reduced by organic and inorganic combination and, at the end of 24 days after treatment, the concentration from the surface to a depth of 12 feet ranged from 0.3 to 0.8 ppm As_2O_3."

Dupree also studied the arsenic content of water and soil treated with sodium arsenite. He found high initial concentrations after 24 hours ranging up to 2.6 ppm. Approximately 10 months later no arsenic was detected in the water. More important were Dupree's measurements of sodium arsenite content in 1956 for small ponds that had been drained and refilled from 2 to 3 times after treatment with sodium arsenite in 1955. He found sodium arsenite content in water ranging up to 0.3 ppm; in plankton up to 714 ppm; and in bottom soil ranging up to 0.38 ppm. It would seem that under many conditions arsenic is released from bottom muds and can be a source of arsenic to water and the biota for a considerable period after application.

Lawrence (1957) found that arsenic replaced phosphorous in bottom muds and perhaps plankton:

"In one large pond treated with sodium arsenite, the phosphorus content of the water increased from a trace immediately prior to treatment to approximately 0.6 ppm 5 days later. Similar results were obtained in other ponds treated with sodium arsenite. It would appear that the arsenic replaced phosphorus in the bottom muds and perhaps in the plankton as well. There was no death of plants during this period to account for this release of phosphorus. It is probable that this increase in soluble phosphorus partially explains why ponds treated with sodium arsenite often produce a heavy plankton growth within a few days after treatment."

Arsenic, like many other toxic substances, can be biologically concentrated and magnified through food chains.

Lowman (1970) summarized concentration factors for arsenic in the marine environment:

Organism:	*Concentration factor*
Benthic algae	2, 000
Mollusk muscle	650
Crustacean muscle	400
Fish muscle	700

Junkins (1963) also summarized data relative to concentration of arsenic by aquatic organisms and residues of arsenic in fish:

"Arsenic is concentrated by some of the marine organisms. Various species of seaweed also on the coast of Nova Scotia concentrate arsenic to 200 to 600 times the abundance in the sea water of 0.002 part per million; range of 5 to 94 parts per million was observed in 11 species of algae; and 4 to 14 parts per million occurred in most species of seaweeds except *Phaeophyceae*, which range from 30 to 70 parts per million. No seasonal trends were noted in monthly analyses which extended over a 15-month period (Young and Langille, 1958).

"Marine organisms with a higher trophic level also contain significant concentrations of arsenic accumulated through feeding on the primary concentrators. The arsenic content of edible tissue from samples along the British Isles is as much as three parts per million in oysters and as high as 174 parts per million in shrimp (Chapman, 1926). Shrimp along the southeastern coasts of the United States contain up to 42 parts per million of arsenic (Coulson et al., 1935).

"* * * It has been shown that fish concentrate arsenic from the trace quantities which are present naturally. Large-mouthed black bass (*Huro floridana*) from the southeastern coasts of the United States contain as much as 40 parts per million in the liver and extractable oils (Ellis et al., 1941). Fish from the Bengal River in India are also rich in arsenic (Bagchi and Ganguly, 1941).

"Apparently the extent of arsenic concentration by fresh water fish varies markedly with limnological conditions. Calico bass (*Pamoxis sparoides*) from

Cassadaga Lake in New York (Ullmann et al., 1961) contained less than 0.1 ppm of arsenic on the average, with a maximum concentration of 0.14 ppm. The lake water had concentrations of arsenic ranging from 0.04 to 0.10 ppm during the year preceding this study. Presumably the arsenic content of the lake was naturally occurring arsenic. Hence, the calico bass in the particular environment of Cassadaga Lake showed only a slight tendency to concentrate arsenic."

Lucas (M.S.) recently found arsenic concentrations in whole fish from the Great Lakes to range up to .043 ppm with an average of .016 ppm.

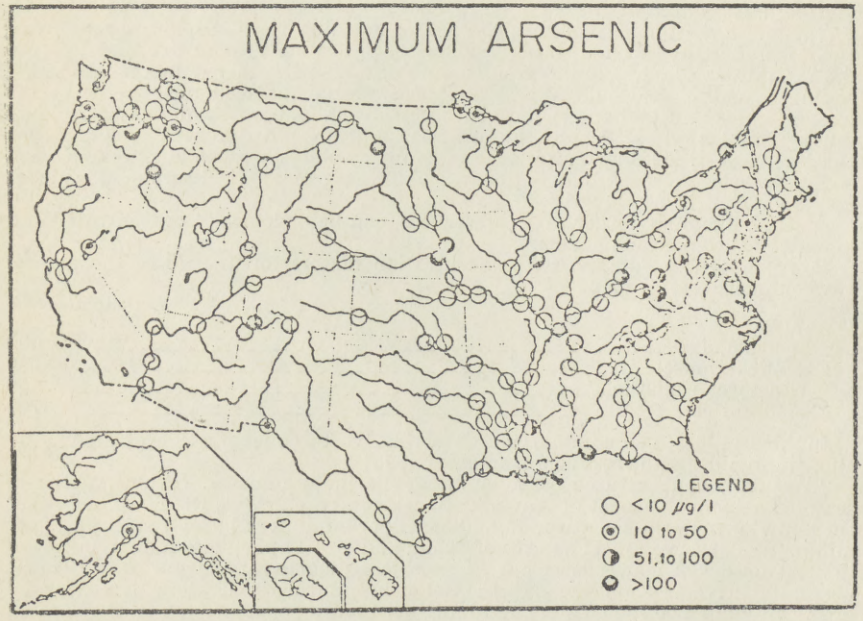
Coulsun et al., (1935) found that shrimp along the northeastern coasts of the United States contain arsenic in a complex organic form with arsenic content ranging up to 42 ppm.

Undoubtedly the form in which arsenic is accumulated in seafood, organic versus inorganic and pentavalent versus trivalent forms, will influence its toxicity when ingested by man or other animals.

ARSENIC CONTENT IN U.S. SURFACE WATERS

Gunnerson (1966) summarized results from the water quality surveillance system for the period 1957–1965 and the following is included from his publication.

FIGURE 1



In some streams arsenic concentrations could be approaching high levels. Magnuson et al. (1970) reported arsenic concentrations in water at Lawrence, Kansas. The following table is abstracted from their publication:

TABLE A.—ARSENIC CONCENTRATION (P.P.B.) IN WATER IN LAWRENCE, KANS.

[The U.S. Public Health Service mandatory maximum is 50 p.p.b.; the recommended maximum is 10 p.p.b.]

Sample	Average	Range
Input, Lawrence water plant	3.1	2.6–3.6
Lawrence tap water [1]	.4	.4–0.5
Raw sewage (Lawrence plant) input	2.7	2.0–3.4
Treated sewage (Lawrence plant) output to river	1.8	1.5–2.1
Kansas River at Lawrence	[2] 3.3	
Kansas River at Topeka	8.0	

[1] Lawrence water treatment includes "cold-lime softening"; the value of 0.4 p.p.b. is at the lower limit of detection.
[2] Single determination.

SAFE LIMITS FOR ARSENIC

In 1942, the U.S. Public Health Service Drinking Water Standards set a maximum concentration of 0.05 ppm for arsenic. The U.S. Public Health Service 1962 Drinking Water Standards stated:

"In light of our present knowledge concerning the potential health hazard from the ingestion of inorganic arsenic, the concentration of arsenic in drinking water should not exceed 0.01 mg/l and concentrations in excess of 0.05 mg/l are grounds for rejection of the supply."

Conventional methods for treating water supplies have little effect on removing arsenic. Magnuson et al. (1970), found that at an initial arsenic concentration of .200 ppm, cold-lime softening treatment removed 85 percent of the arsenic and charcoal filtration removed 70 percent.

At the present time, there are no tolerances established for arsenic in seafoods. Inasmuch as arsenic is readily concentrated by marine organisms, there is great need for such guidelines for arsenic in seafood.

TOXICITY OF ARSENIC—EFFECTS ON MAN

Pharmacology

The pharmacology of arsenicals falls into two major categories; namely, inorganic and organic arsenic compounds. The latter type has been used extensively in chemotherapy, especially against protozoan infections, before the advent of antibiotics and other more effective pharmaceuticals. In general, the organic arsenicals are not as toxic to man as the inorganic forms and organic arsenicals are not common in the environment. This discussion will address itself principally to the inorganic arsenic compounds.

Arsenicals act locally as mild and slow corrosives. Systemically, they relax the capillaries and increase their permeability; thus, stimulating inflammation. This change is most conspicuous in the visceral area. In acute arsenic poisoning, it results in violent gastroenteritis, closely resembling cholera. The dilation of capillaries introduces changes in the circulation which cause secondary disturbances in the function of more remote organs, particularly in the nervous system. Fatty degeneration of the cells is seen, especially in glands and muscles, with other disturbances of nutrition and metabolism, particularly in chronic poisoning. There may also be a direct paralysis of the heart.

Arsenic trioxide, As_2O_3, or "white arsenic" was formerly used extensively for criminal poisoning. It is readily obtainable, and is easily administered without suspicion, since it is odorless and nearly tasteless. The symptoms also are not likely to arouse suspicion—the acute and subacute course resembling that of a severe gastrointestinal upset. Repeated graduated administration may cause indefinite symptoms of illness, such as nephritis, neuritis, and so forth.

SPECIFIC PHYSIOLOGICAL REACTIONS

A. Acute arsenic poisoning

The symptoms of acute arsenic poisoning start with vomiting and profuse and painful diarrhea. The withdrawal of water from the body leads to great thirst, dryness of the mouth and throat, and difficulty in swallowing and articulation. The nervous symptoms consist of vertigo, headache and pain in the limbs. The patient is cyanotic, with cold extremities. Toward the end, syncope, coma, clonic and toxic spasms and general paralysis occur. Death usually occurs by exhaustion as a result of the prolonged gastroenteritis, as in cholera.

B. Subacute and chronic arsenic poisoning

Subacute and chronic arsenic poisoning may produce chronic gastrointestinal catarrh, sometimes ulcerative; some kidney injury and degeneration; considerable tendency to edema; swelling of the eyelids as an early indication of high intake; and liver injury involving swelling of fatty tissue leading possibly to acute and fatal hepatitis. Subacute and chronic arsenic poisoning may occur, but be diagnosed as another ailment. Where lead arsenate has been ingested, an unfavorable synergistic action may result from the two elements.

C. Toxicity of arsenicals

Arsenic is toxic to all animals which have a central nervous system; also to most of the higher plants, but not all lower organisms. The mortality in acute clinical arsenic poisioning is high, 50 to 75 percent. The fatal dose varies, especially with the solubility of the preparation. Of the trioxide, As_2O_3, 5 to 50 mg. are toxic; 0.06—0.18g to 1–3 grains are usually fatal. However, tolerance of arsenic poisoning in man and in other animals can be induced through gradual habituation.

Trivalent arsenicals, As^{+3} (arsenites), are generally much more toxic than are the pentavalent arsenic compounds (arsenates). Depending upon the route of entry into the body the toxicity decreases in the order of: arsenites, arsenates, colloidal arsenic, atoxyl, and cacodyl.

The toxicity of arsenic results from its combination with certain protoplasmic sulfhydryl groups thereby inhibiting oxidation. A considerable number of animal enzymes are sensitive to arsenic.

Absorption of inorganic arsenicals occurs readily, to some extent from the intact skin. Poisoning may result from the external use of arsenical cosmetic preparations and handling. Excretion occurs by all the usual channels; urine, feces, perspiration and epithelium of the skin. Excretion is always very slow and incomplete, especially after prolonged exposure or intake, so that retention of arsenicals is considerable. The highest concentrations of such compounds are found in the liver, kidneys, and spleen. The hair has a high concentration in cases of chronic poisoning.

The following shows the relation of the inorganic trivalent and pentavalent compounds.

Trivalent, As^{+3}:

1. $As_2O_3 + H_2O \longrightarrow H_2As_2O_4 \longrightarrow 2HAsO_2$
   (arsenous) (trioxide) — Arsenous Acid=
2. $HAsO_2 + NaCL \longrightarrow NaAsO_2$ (sodium arsenite)

Pentavalent, As^{+5}:

1. $As_2O_5 + H_2O \longrightarrow H_2As_2O_6 \longrightarrow 2HAsO_3$
   (arsenic) (pentoxide) — arsenic acid, (nuta)
2. $As_2O_3 + 3H_2O \longrightarrow 2H_3AsO_4$
   arsenic acid, (ortho)
3. $H_3AsO_4 + 3NaCl \longrightarrow Na_3AsO_4 + 3HCl$
   sodium arsenate

Etiology of arsenic poisoning

The most common causes of arsenic poisoning to man are:

1. Accidental or suicidal ingestion.
2. Overdosage of prolonged therapeutic use.
3. Absorption through handling and external use.
4. Ingestion of contaminated foods.

The last route presents the greatest public danger because arsenical insecticides are widely used. Arsenic is issued chiefly as Paris Green (copper acetoarsenite, $3Cu\ (AsO_2)_2\ Cu\ (COOCH_3)_2$, and as calcium arsenate ($Ca_3\ (AsO_4)_2$), and lead arsenate Pb H AsO_4, the latter involving the additional risks of lead poisoning as well. Lead arsenate, the most common arsenical insecticide, is relatively insoluble, but is partly hydrolyzed by water to basic lead acetate and arsenous acid and may scorch foliage.

Hazards to aquatic biota may exist because arsenicals are widely used in industry, in addition to their application in controlling insects, weeds, and rodents. The relative insolubility of arsenicals renders them potentially harmful to those organisms that accumulate such compounds in their tissue. Arsenic is a cumulative poison which slowly builds up in the body. According to some medical sources, long-term arsenosis may not be detectable for two to six years or longer.

Carcinogenesis

Sullivan (1969) states that the possibility that arsenic induces cancer, makes the present levels of arsenic compounds in the air a matter of concern:

"As early as 1820, arsenical compounds were suspected of carcinogenic action. This impression was based on the observation that skin cancer frequently occurred following therapeutic administration of arsenic for psoriasis and other disorders. According to Buchanan, nearly all of these cases of skin cancer followed a prolonged period of medicinal administration (averaging 18 years) of inorganic trivalent arsenic. He states that cancer frequently (80 percent of published cases) follows the nonmalignant manifestation of keratosis, commonly on the palms of the hands or soles of the feet."

"In 1963, Heuper listed arsenic as one of the recognized human carcinogens. The skin, lung, and liver were listed as recognized sites of arsenic cancers, and the mouth, esophagus, larynx, and bladder as suspected sites:

"The role of arsenic as a respiratory carcinogen has received some support from the finding of above-average mortality from lung cancer in South Rhodesian miners of gold-arsenical ores and the frequent occurrence of lung cancer in German vineyard workers exposed to lead arsenate dust.

"In opposition, Frost argued that the carcinogenic action was inappropriately attributed to arsenic because of the tendency to specify arsenic as the carcinogen even when other materials were present. Nickel in particular, appears to be a carcinogen which occurs together with arsenic in industrial dusts. The strongest arguments against arsenic as a carcinogen are the failure to show increased prevalence of cancer among industrial workers and failure to induce cancer in experimental animals.

"Snegireff and Lombard examined the records of two industrial plants in relation to the number of employees who died of cancer. In a plant where the workers were exposed to arsenic, 18 of 146 deaths (12.3 percent) were caused by cancer. In the second plant, where the workers were not exposed to arsenic, 12 of 109 deaths (11.0 percent) were caused by cancer. The authors concluded that there was no significant difference in cancer mortality between plant employees who handled arsenic and those who were not exposed.

"In another study, Pinto and Bennett compared the mortality of employees who handled arsenic for the American Smelting and Refining Company at Tacoma, Washington, with those who were not exposed to arsenic. (This smelter is the only plant presently producing arsenic commercially in the United States. . . .) They observed that 6 of 38 deaths (15.8 percent) among workers who were exposed to arsenic trioxide were caused by cancer, while 37 of 191 deaths (19.4 percent) were due to cancer among workers not exposed to arsenic. The evidence that these arsenic workers excreted an average of 820 ug/liter of arsenic in the urine compared to 130 ug/liter for unexposed workers. The authors found no evidence that arsenic trioxide caused systemic cancer or fatal cardiovascular disease in humans.

"Attempts to demonstrate through animal studies that arsenic is carcinogenic have often met with failure. In fact, one study showed that arsenic suppressed the appearance of spontaneous tumors of the lung. However, a few cases have been reported in which arsenical cancer was induced in animals.

"Some investigators have mentioned that the type of arsenic compounds involved may play a role in the carcinogenesis. Cornelius and Shelley suggest that arsenic trioxide to which most smelter workers are exposed is probably not as carcinogenic as other soluble arsenic compounds."

EFFECTS ON FISH AND WILDLIFE

McKee and Wolf (1963) have summarized the effects of arsenic compounds on fish and aquatic life. The summary is quoted below:

"The following concentrations of arsenic have been reported as toxic to fish:

Concentration of arsenic, mg./l.	Time of exposure	Type of fish	Reference
1.1		Fish	353, 465.
1.1 to 2.2	2 days	Pike perch	2977.
2.2	3 days	Bleak	2977.
3.1	4 to 6 days	Carp	2977.
3.1	3 days	Eels	2977.
4.3	11 days	Crabs	2977.
7.6	10 days	Bass	311.
11.6	36 days	Minnows	617.
15.0		Crappies and bluegills	900.
17.8		Minnows	2962.
60.0	16 hours	do	617.
234.0		do	2962.

"In contrast, the following concentrations have been reported as tolerable within the period specified:

Concentration of arsenic, mg./l	Time of exposure	Type of fish	Reference
0.7 to 1.1	48 days	Pike perch	2977.
0.76		Fish	677.
1.1 to 1.6	11 days	Bleak	2977.
1.5 to 5.3	1 to 7 days	Fish	353.
2.2	13 days	Carp	2977.
2.2	do	Eels	2977.
3.1	90 days	Crabs	2977.
5.3	24 to 148 hours	Fish	313, 778, 1009.
6.0	232 hours	Bass	900.
7.6	30 days	Trout	1012.
13.0	1 hour	Minnows	353.

"With respect to lower forms of aquatic life, arsenic concentrations of 3–14 mg/l have not harmed mayfly nymphs and 10–20 mg/l have been harmless toward dragon and damsel flies. Concentrations of 2–4 mg/l of arsenic are reported not to interfere with the self-purification of streams. Bacteria grow even in the presence of 10,000 mg/l of potassium arsenate and aglae are not killed at 1000 mg/l of arsenate. The fermentation and propagation of yeast are stopped at 300 mg/l of arsenate.

"Arsenic-76 occurs in the effluent from nuclear reactors and may be concentrated to a limited extent in the aquatic food chain.

"The Mersey and Severn River Boards in England have adopted working standards limiting the total concentration in effluents of all heavy metals, including arsenic, to 1.0 mg/l.

Lead arsenate

"A concentration of 25 mg/l of lead arsenate has killed trout within 24 hours, but a concentration of 17.1 mg/l in stablized tap water did not harm minnows during a one-hour exposure.

Sodium arsenate

"It is not highly toxic to fish or other aquatic life. According to Jones the lethal concentration of sodium arsenate toward minnows at 16–20° C is 234 mg/l, as arsenic. It has also been reported that minnows survived for 16 hours in a solution of sodium arsenite equivalent to 250 mg/l of arsenic.

"Toward lower forms of aquatic life, the toxicity of sodium arsentate is variable. The threshold concentration for immobilization of *Daphnia magna* in Lake Erie Water has varried from 18 to 31 mg/l as sodium arsenate, or 4.3 to 7.5 mg/l as arsenic. The toxic threshold for the flatworm *Polycelis nigra*, is reported to be 670 mg/l as AsO_4, or 361 mg/l as arsenic.

Arsenic trioxide

"The following concentrations of arsenic trioxide have been harmful to fish or other aquatic life.

Concentration of arsenic trioxide in mg./l.	Time of exposure days	Type of organism	Reference
1.96		Chironomus	574, 1008.
2 to 3		Fish food organisms	1007.
2.5		do	311.
2.5 to 4		do	313.
5.3	8	Pink salmon	2091.
10		Fish	1011.
10	10	Bass	311.
10		Bass, bluegills, crappies	3005.
16	3 to 16	Mussels	313.
40		Flatworms	353, 313.

"Surber and Meehan carried out a comprehensive study of the toxicity of arsenic trioxide to many different fish food organisms. Their results indicated that important fish food organisms can tolerate 2.0 mg/l of arsenic trioxide.

"The following concentrations of arsenic trioxide have not been harmful to some aquatic organisms in the time specified:

Concentration of arsenic Trioxide in mg./l.	Time of exposure	Type of organism	Reference
1		Fish	677.
1.9		Chironomus larvae	574.
2		Food organisms	353, 1008.
2		do	313.
2 to 6		Bass, bluegills Crappies	3005.
2 to 7	1 to 7 days	Fish	353.
3 to 14		Mayfly nymphs	574.
5		Some zooplankton	574.
5	24 hours	Trout, bluegills, sea lamprey	2976.
5		Fish	353.
5 to 10	15 to 30 minutes.	Coho calmon	2988.
7	24 to 148 hours	Fish	1009, 778, 313.
8		Mussels	313.
10	1 month	Trout	1012.
10 to 20		Insect larvae	574.
17.1	1 hour	Minnows	353.

Sodium arsenite

"Sodium arsenite has been used extensively as a herbicide for the control of mixed submerged vegetation in static water. Commercial sodium arsenite contains varying amounts of other arsenic compounds and impurities; hence it is labeled in terms of equivalent arsenic trioxide (As_2O_3). For the control of submerged vegetation in ponds and lakes, applications of 2 to 5 mg/l as arsenic trioxide (1.5 to 3.8 mg/l as As) have been found effective. Although these concentrations are generally considered to be safe for fish and other aquatic animals, it is advisable to spray only a part of the pond or lake at one time so that fish may avoid the sprayed area. Fish are reported to be sensitive to sub-lethal doses of sodium arsenite and will generally swim away into fresh water. Commercial sodium arsenite in concentrations up to 10 mg/l (arsenic content not stated) have been used for weed control in Wisconsin lakes without harm to the fish population.

"The following concentrations of sodium arsenite, expressed as arsenic, have been reported as lethal, toxic, or otherwise deleterious to aquatic organisms:

Concentration, as arsenic, mg./l.	Time of exposure	Organism	Reference
1 to 2		Fish	1692.
1.4 to 2.3		Fish food organism	574, 1007.
1.9 to 3		Midges, may flies, amphipods	3009.
4.6	48 hours	Daphnia	2158.
5	10 days	Pink salmon	2091.
5	48 hours	Microregma (protozoan)	3343.
5.2		Daphnia magna	352.
8.4	48-hour TL_m	Chum salmon fry	2900.
15	48 and 72-hour TL_m	Fingerling channel catfish	2981.
17.8		Minnow	2920.
20	36 hours	Rainbow trout, minnows	3005.
20	do	Minnows	617.
27	72-hour TL_m	Minnows	3672.
27.6	24-hour TL_m	Fingerling channel catfish	2981.
29	48-hour TL_m	Minnows	3672.
35 to 46	48 hours	Scenedesmus	2158.
45	24-hour TL_m	Minnows	3672.
290	48 hours	Scherichia coli	2158.

"The literature on weed control contains statements that applications of sodium arsenite up to 10 mg/l as As_2O_3 (7.6 mg/l as As) are not harmful to fish, but the foregoing table would indicate that the threshold level is somewhat lower than expected. Furthermore, fish-food organisms are susceptible at concentrations as low as 1.0 mg/l.

"On the other hand, the following concentrations of sodium arsenite, expressed as arsenic, have been reported to have no harmful effects on the organism noted:

Concentration, as arsenic, mg./l.	Time of exposure	Organism	Reference
1.3		Fish or fish-food organism	1007.
1.3 to 1.5		Fish-food organisms	1007, 1008.
1.4 to 2.9		Fish	416.
2.9		Chironomus larvae	574.
5.0	24 hours	Trout, bluegills, sea lamprey	2976.
8 to 16		Damselflies, dragonflies, sowbugs, water mites.	3009.
15	96 hours	Minnows	3672.

"Lawrence reports that two applications of 4 mg/l of sodium arsenite applied one month apart in experimental ponds reduced the number of bottom organisms an average of 34 percent and reduced bluegill production an average of 42 percent as compared with control ponds. Two applications of 8 mg/l of sodium arsenite applied one month apart reduced the number of bottom organisms an average of 45 percent and bluegills 65 percent as compared with control ponds. An application 4 mg/l killed all microcrustacea and greatly reduced the population of rotifers."

Effects on stock and wildlife watering

McKee and Wolf (1963) have summarized the effects of arsenic compounds on stock and wildlife from drinking water containing arsenic compounds. Their summary is quoted below:

"In New Zealand, sickness and death among cattle have been caused by arsenic of natural origin in water supplies (1002, 1049)*. The lethal dose of arsenic for animals is believed to be about 20 mg per animal pound (1003)*. Fowl and pigs have died after eating one feed of contaminated pig meal containing 6.5 mg of arsenic per ounce (1004)*."

"On the other hand, selenium poisoning among cattle, dogs and chickens has been treated by feeding arsenic in concentrations of 12 to 15 mg/l in water (1005); and 5 mg/l arsenic in drinking water has counteracted selenium poisoning among pigs, dogs, and rats (921)*."

"In a brief outline of the toxic effects of some common poisons, Wadsworth (3108)* gives the following toxic doses for arsenic:

*Numbers represent sources cited by McKee and Wolf.

[In grams]

Animal:	*Toxic dose*
Fowl	0.05 to 0.10.
Dogs	0.10 to 0.20.
Swine	0.5 to 1.0.
Sheep, goats, and horses	10.0 to 15.0.
Cows	15 to 30.

For rats and mice, 96-hour LD_{50} doses of arsenic trioxide varied from 15.1 to 214 mg/kg based on oral administration (3341). Another reference (2999)* reported the LD_{50} for female rats was 298 mg/kg based on calcium arsenate, or 112 mg/kg as arsenic. The minimum lethal dose of arsenic trioxide for various laboratory animals ranged from 5 to 100 mg per kg of body weight, solutions being more lethal than powders (364)*. Doses of 324 mg have killed experimental chickens in 24 hours (1004)*.

Lead arsenate

"In doses of 1.3 to 56.7 grams per day, lead arsenate killed 18 out of 31 chickens, but the survivors showed no symptoms of poisoning. Drinking water containing about 4800 mg/l of lead arsenate caused no harm to 10 birds after a 60-day period. Toward male rats, the LD_{50} value of lead arsenate has been reported as 1050 mg/kg. The daily consumption by one cow of 6.48 grams of lead arsenate for an unspecified period was not harmful."

U.S. ARSENITE INDUSTRY

Uses of arsenic compounds

Arsenic compounds are used in medicine, glass manufacture, pigment production, steel making, pesticides, insecticides, fungicides, herbicides, textile printing, tanning and taxidermy preservatives, antifouling paints, the control of sludge formation, the petroleum industry, and ammunition.

Kirk-Orthmer (1963) contains this summary on the use of arsenic:

"The major use of arsenic is in the agricultural field in the form of calcium arsenate, arsenic acid, lead arsenate, and sodium arsenite. Calcium arsenate, during the past several years, has regained its position as a potent compound for the control of boll weevil infestation in cotton. Starting in 1949 there was a trend toward the use of chlorinated organic compounds for the control of boll weevils. By 1956 it was noted that the weevils had developed a resistance to the chlorinated compounds and the cotton growers were advised to change either to calcium arsenate or methlyparathion.

"The demand for arsenic acid as a cotton defoliant is relatively new but over the last two or three years has assumed major proportions and now ranks second to that for calcium arsenate. The demand for lead arsenate, although still widely used, especially in the cultivation of apples is diminishing. The use of sodium arsenate in the control of weeds and as a soil sterilizer continues to hold a large portion of the market, especially in the rubber plantations of Malaya and along railroad right-of-ways in both the United States and Europe. Arsanilic acid is commonly used as a feed additive for poultry in the United States.

"Arsenic trioxide and some of its derivatives are also used in glass manufacture, cattle and sheep dips, wood preservatives, debarking of trees, crabgrass control, and aquatic weed control."

Junkins (1963) states:

"Increased uses in the paper, pulp, textiles, and plastic industries are also foreseen. Some of the newer uses of arsenic are based on the nature of reactions of arsenic with organic compounds. Arsenic frequently reacts to form a compound that preserves the organic compound in its original state but adds the pesticidal properties of arsenic to the product. This phenomenon can be utilized to produce plastics which inhibit molds. Arsenic is also used in the removal of tree bark and in the manufacture of hide preservatives. Arsenic compounds have been used as pigments."

*Numbers represent sources cited by McKee and Wolf.

V. Commercial compounds of arsenic [1]

COMPOUNDS (COMMERCIAL NAMES)	SOLUBILITY IN WATER
1. o-Arsenic acid, $H_3AsO_4.1/2\ H_2O$:	16.7g. in 100 ml of H_2O at 20° C. 50 percent As.
2. Arsenic trichloride, $As\ Cl_3$:	Dissolves in H^2O and decomposes to As_2O_3 and H Cl. 76 percent As.
3. Arsenic trioxide, As_2O_3 (White arsenic):	2g. in 100 ml of H_2O at 25° C and 11.5g. in 100 ml at 100° C. 76 percent As.
4. Arsenic pentoxide, As_2O_5 (Anhydruide of Arsenic acid):	150 g. in 100 ml of water at 16° C.; increasingly soluble with temperature rise. 65 percent As.
5. Calcium arsenate, $Ca_3\ (AsO_4)_2$:	Slightly soluble in H_2O, soluble in dilute acids. 38 percent As.
6. Copper acetoarsenite, 3 Cu $(AsO^2)_2$ Cu $(COOCH_3)_2$; approximate formula (Cooper acetate metarsenate, Imperial, Schwein-furth, Vienna, Parrot, or Paris Green):	Insoluble in H_2O, soluble in dilute acids. 44.3 percent As.
7. Cupric arsenite, Cu $HAsO_3$; approximate formula. (Scheele's Green, Swedish Green):	Insoluble in H_2O and alcalead, soluble in dilute acids and in NH_4OH. 40 percent As.
8. Lead arsenate, $PbHAs\ O_4$:	Approximate formula insoluble in H^2O, soluble in dilute HNO_3 and in caustic alkalies. 21.6 percent As, 60 percent Pb.
9. Lead arsenite, Pb $(AsO_2)_2$;	Approximate formula insoluble in water, soluble in dilute HNO_3. 35 percent As, 49 percent Pb.
10. Sodium arsenite, Na AsO_2 (sodium metarsenite):	Very soluble in hot or cold water. 57.6 percent As.
11. Arsine, AsH_3:	20 ml. in 100 ml. of H_2O at 20° C.

[1] Patty, F. A., *Industrial Hygiene and Toxicology*. Second Edition. Volume II: Toxicology. Insterscience Publishers: New York, New York, 1962.

COMMERCIAL PREPARATION PHYSICAL AND CHEMICAL PROPERTIES OF ARSENIC

A. Commercial preparation:

Arsenical pyrite, FeSAs, a mineral similar to pyrite FeS_2, but containing arsenic in place of half of the sulfur, is one of the commonest ores of arsenic. When this mineral is heated in absence of air, arsenic passes off as vapor and condenses as a crystalline metallic powder, the so-called "gray arsenic." The reaction is:

$$FeSAs \rightarrow FeS + As$$

Most other naturally occurring sulfides also contain more or less arsenic. When these ores are roasted, the metal, sulfur, and arsenic are all converted into oxides. The sulfur dioxide passes off as gas, but the arsenic trioxide, As_2O_3, settles in the flues. By distillation of the deposit with carbon, free arsenic is attained according to the following reaction:

$$As_2O_3 + 3C \rightarrow 2As \uparrow 3CO \uparrow$$

B. Physical and chemical properties

Arsenic is a silvery substance, but tarnishes slowly in moist air, receiving a film of white oxide, As_2O_3. The element can react as metal as well as non-metal. Thus the free element finds little commercial utilization. The greatest use involves the trioxide, which is the source of all manufactured compounds of arsenic.[1] (Ehret, 1946).

Arsenic trioxide (white arsenic, arsenious oxide, As_2O_3) is the common commercial form of arsenic. Most compounds of arsenic, when heated in air, are converted to this tasteless, toxic white powder. Arsenic metal, arsenic sulfides, arsine, arsenic oxides (in the presence of a reducing agent) and organic arsenates, are all converted by heat and oxygen to arsenic trioxide. Because arsenic trioxide sublimes at 193°C, it is easily suspended as small particles in the air. When heated, the free element burns in the air, producing white poisonous vapors of As_2O_3. Likewise, when

[1] Ehret, W. I. Smiths' College Chemistry, 1946.

warmed, it unites directly with the lialogens (F_2,Cl_2, Bi_2, T_2), with sulfur, and with many of the metals.[2]

U.S. PRODUCTION OF ARSENIC

Sullivan (1969) summarized the production of arsenic in the United States. His summary is quoted below:

"Virtually all of the arsenic produced is recovered as a by-product in the melting of lead, copper, and gold ores. The production of white arsenic as a by-product has been so great that the supply usually exceeds the demand. Until this year, the United States' domestic needs have been supplied by the Anaconda Company at Anaconda, Montana, and the American Smelting and Refining Company at Tacoma, Washington, supplemented by some imports. However, the Bureau of Mines reports that the Anaconda Company suspended its sale of arsenic in 1968.

"In order to avoid disclosing company confidential data, the U.S. consumption or production of white arsenic has not been reported since 1959. Prior to that, the U.S. consumption varied between 13,000 and 40,000 short tons per year. The price of arsenic has declined from approximately 6.5 cents per pound to about 4 cents.

"One of the problems facing mining industries has been the disposal of the large quantities of arsenic they produce. A gold smelter in a small Western town produced 14,600 tons per year, almost enough to supply all our domestic needs. These industries are also faced with the disposal of the very poisonous arsenic trioxide.

"The high volatility of arsenic trioxide (sublimes at 193°C) requires that most arsenic-containing ores be specially treated to remove arsenic from the exhaust gases. Lead, copper, and gold ores may contain up to 3 percent arsenic. Arsenic is also a contaminant in some nickel and cadmium ores, and must be removed to improve the quality of the metal. In some processes the arsenic is removed chemically, while in others it is removed by taking advantage of the high volatility of the arsenic trioxide.

"In the commercial production of arsenic, arsenic trioxide is volatilized during the smelting process and concentrated in the flue gases. Crude flue gas dust may contain up to 30 percent arsenic trioxide, the balance being oxides of copper or lead and perhaps of other metals, such as antimony, tin, and zinc. To upgrade the flue dust, a small amount of pyrite or galena is mixed with the concentrate and the mixture roasted. The gases are finally passed through a series of brick cooling chambers called kitchens. The temperatures of the gas and vapor are controlled; they enter the first kitchen at approximately 220°C, and by the time the gas and vapor reach the last kitchen, they have been cooled to 100°C or less. The condensed crude product is 90 to 95 percent arsenic trioxide. Resublimation at about 295°C and recondensing in kitchens at 180 to 120°C produce 99 to 99.9 percent arsenic trioxide.

"Even in the smelters where arsenic is not recovered for commercial use, the tonnages involved are very large. A reverberatory furnace, for example, may smelt as much as 2,100 tons of charge per day, and in doing so, burn 240 tons of coal. The furnace would produce about 90,000,000 cubic feet of gas per day, containing 180 tons of solids. This means that it would be necessary to dispose of up to 60 tons of arsenic daily."

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Appendix: Arsenic in the Lower Mississippi River

A preliminary survey by FWQA of certain discharges of arsenic indicates that at least 100 pounds of arsenic or arsenic compounds are discharged daily to the Lower Mississippi River. Baton Rouge and points downstream from the City are the present areas of concern. Undoubtedly, still-unknown quantities of arsenic are discharged to the River from other sources. The background level of arsenic in the River above Baton Rouge is unknown and requires measurement before the industrial discharges can be fully evaluated.

The Mississippi River has minimum flows of 75,000 C.F.S. based on measurements from 1927–1962. Discharge of 100 pounds of arsenic per day at periods of minimum flow would result in an overall concentration of 0.2 ppb. The calculated concentration of arsenic in the River is below the USPHS mandatory minimum level of 50 ppb for drinking water or the recommended level of 10 ppb. The calculated level is far below drinking water standards, however other discharges, as well as the background level of arsenic in the River, must be considered.

Some forms of arsenic are readily incorporated with sediments and bottom material. The large volumes of water and heavy flows in the Mississippi would appear to carry much of this material downstream, either in association with sediments or in solution and may reach the Delta and estuarine areas.

The City of New Orleans, downstream from Baton Rouge, utilizes the Mississippi River for domestic water supplies. Water from the River is also siphoned to oyster-producing areas downstream from New Orleans. It is possible that the total level of arsenic (background levels, plus discharges) could affect these beneficial uses of the River water. The arsenic in the River may also reach other shellfish areas, where the element is ingested and concentrated in shellfish tissue. Additional data are essential to evaluate these possibilities.

Estimates of arsenic concentrations for shellfish in the Mississippi estuary are not available. Little data on residues in fish from the area are available. At present, no guidelines for safe levels of arsenic in shellfish, fish or other seafoods have been established by the Food and Drug Administration. It is our understanding that such guidelines are being developed. Evaluations of contamination of shellfish and fish should include the FDA guidelines when they become available.

The data available are inadequate concerning the amount of arsenic in the Mississippi River and associated estuarine areas and the movement of the element in the River ecosystem. Further information is urgently needed in order to evaluate the effects of known and unknown discharges.

ARLINGTON, VA., *July 29, 1970.*

I, Mary Ladney Milligan, formerly of the Detroit, Michigan area, now a resident of Arlington, Virginia, am firmly convinced that my mother's prolonged nerve disease was caused by eating mercury-poisoned fish caught in Lake St. Clair during the years 1943 to the time of her death in 1967. My mother and father ate this "nice fresh fish" caught by her grown children in Lake St. Clair morning, noon and night. They enjoyed fish much more than meat, and they ate it constantly.

About 1955, my mother went to Henry Ford Hospital because of an increasing numbness or lack of feeling in her hands and arms. Dr. Knighton, Chief of Neurosurgery at Henry Ford Hospital in Detroit, was puzzled. He said it was a neurological disease that couldn't quite connect down. The diagnosis was rather indefinite. The prognosis was very bad. They did not expect it ever to get better. There was no medication. It was a very fine Neurological Department with excellent doctors.

There was an increasing numbness and pain in her hands during the last ten years of her life. She would take hold of a hot pan on the stove and would not feel it burn her flesh on her hands. At the Hospital, they pricked her arms above and below the elbow with long needles. She felt nothing. The doctors said it was an increasingly degenerating nerve disease, and they could not figure out what caused it. They were quite perplexed. If it was mercury poisoning, it was the last thing they would suspect.

She died of heart block in 1967, but for the last year of her life, she was completely bedridden. She was in a nursing home for the last year of her life. She died at St. Mary's Nursing Home, Nine Mile Road and Jefferson Avenue, St. Clair Shores, Michigan. The immediate cause of death was heart block, but the many, many years of neurological disease had left her immobilized. She wasn't able to do much or get about.

At this point, I am positive that mercury poisoning was what caused my mother's neurological disease. Dow Chemical and Wyandotte Chemical are just up the river from Lake St. Clair. Lake St. Clair then becomes the Detroit River, which in turn empties into Lake Huron. My family had a small crusier, and the grown chileren would come in, fish and swim. My mother's refrigerator was always full of fresh fish. She and my father lived on it. Dow Chemical had been in the area for twenty years at the time the family moved there. If my mother's body should be exhumed now and tested for mercury poisoning, I am sure a lot of it would be found.

Others who can verify the above are my sister and brother-in-law, Mr. and Mrs. Allen Melville, 10805 LaSalle, Huntington Woods, Michigan; my brothers, Mr. Michael Ladney, Jr., 45 Oxford Road, Grosse Pointe Shores, Michigan; and Mr. William Ladney, 22470 Lange, St. Clair Shores, Michigan.

MARY LADNEY MILLIGAN.

STATEMENT OF ALBERT J. MESEROW, ATTORNEY-AT-LAW, CHICAGO, ILL.; CHAIRMAN, ILLINOIS DELEGATION TO THE GREAT LAKES COMMISSION

Mr. Chairman and members of the committee, for the past fifteen years, as a member and chairman of the Great Lakes Commission, and as a citizen interested in the wise use, conservation and quality preservation of the waters of the Great Lakes system, I have worked privately and publicly to bring to the people of the Great Lakes basin and the Nation the message that we must strive for the balanced use of the waters of the Great Lakes, the world's largest reservoir of fresh water, to include (1) a place to live, (2 a place to play and (3) a place to work. These requirements remain incontestable.

Accepting these use requirements, some have been preaching the preservation of water quality for a long time. However, it is only recently that a general public awareness has developed that our Great Lakes waters, once thought to be inexhaustible and unpollutable, are beginning to suffer from a malaise that needs immediate and effective attention.

There are so many relationships, interrelationships, chemical, biological and physical parameters, natural and artifical inputs, and management relationships which contribute to the total picture that we have no intimate knowledge of many major problems and therefore no ready-made or pat solutions.

It is just such a problem that this Committee faces today, the causes, the effects and the remedial measures that have to be considered in mercury contamination. These same considerations must inevitably be dealt with in connection with other pollutants, physical, biological and chemical, as they are introduced or are found in the waters of our Nation.

The recent mercury contamination problem in the Lake St. Clair-Detroit River area came as a near total surprise, without warning or anticipation. Even after the presence of mercury was discovered, evaluation and notification procedures were at best sketchy, somewhat fumbling and indicative of a general lack of knowledge or appreciation for the catastrophic effects this poison might have on public health and the general environment. Governmental machinery especially at the international level just did not function to provide notification of the dangers and the immediate control of the inputs or sources of the contaminating materials.

Mercury poisoning has been experienced throughout the world, in Japan, in Sweden, and elsewhere where many persons have been affected and several have died. It is a serious problem.

For the sake of brevity and knowing that this Committee has been informed of the effects and hazards of mercury poisoning, I shall not go further into the current situation and its possible effects but rather on items that I consider to be remedial in nature.

First, Public Awareness and Education. At the meeting of the Great Lakes Commission June 9, 1970 a formal resolution was adopted by the Commission which supports state and provincial officials and public health authorities in providing information regarding the severe hazard of consuming mercury contaminated fish, supports the various fishing restrictions and regulations established by Ontario and the affected states for the protection of the public; and urges all fishermen and the public to obey all restrictions on fish catch and consumption (copy of Resolution is attached).

Second, International Cooperation and Relationships. The mercury problem pointed out the lack of international governmental channels for quick and decisive action so necessary in a case of this kind.

The Great Lakes Commission, having been a champion of water quality for 15 years in the Great Lakes basin, was responsible for the reference in 1964 to the IJC (International Joint Commission) which led to investigation and report on the pollution of Lakes Erie and Ontario and the International Section of the St. Lawrence River. As early as 1964 the Great Lakes Commission was working with the State Department for a reference to IJC to commence pollution control and abatement investigations of all international waters of the Great Lakes. At that time, it was considered advisable, however, to limit the IJC work to Lakes Erie and Ontario and the International Section of the St. Lawrence River.

At the meeting of the Great Lakes Commission June 9 a resolution was adopted that the Great Lakes Commission request the Secretary of State to furnish a new reference to the U.S. Section of the IJC, and hopefully to the Canadian Section through governmental channels, which would provide for a continuing study of pollution conditions in all international waters of the Great Lakes and which would include regularly scheduled monitoring of waters of the Great Lakes so that the quality of international waters of the Great Lakes will be a matter of official record for the two governments and appropriate states, provinces and agencies within the governments on a annual basis. (A copy of GLC letter to Secretary Rogers is attached.)

Mr. Chairman, I think the value of such a reference and the probable results and advantages that would accrue therefrom are thoroughly and clearly apparent in problems such as the mercury problem.

Third, Evaluation of Poisons and Hazardous Materials. The mercury problem has pointed up the difficulty in obtaining quick valid test results from laboratory analyses of samples. There is no doubt that properly equipped laboratories must be available that can undertake without delay analysis of materials, new products, various inputs and so forth that find their way into our streams, lakes and oceans. There have been proposals presented that call for establishment of such organizations as National Environmental Laboratories (S. 3410). I believe we can all agree that availability of laboratories of adequate technical competence is essential but our experience has shown that the creation of new, specialized facilities sometimes does more harm than good because many of our established facilities are having difficulties in functioning, their interests are diverse, they are competing for a scarce supply of funds and competent personnel.

When the Great Lakes Commission considered this problem, it was agreed that the matter of providing laboratory support for problems associated with environmental poisons should be taken care of within the framework of existing laboratory facilities with strengthened state and university capabilities in their laboratories for environmental protection.

Thank you.

JULY 9, 1970.

Hon. WILLIAM P. ROGERS,
Secretary of State,
Washington, D.C.

DEAR MR. SECRETARY: Article 4 of the Boundary Waters Treaty of January 11, 1909, between the United States and Canada, stipulates that "boundary waters and waters flowing across the boundary shall not be polluted on either side to the injury of health or property on the other side".

Article 7 of the Treaty creates the International Joint Commission to which any problem concerning rights or interests of either country along the common frontier would be submitted.

A pollution reference resulted in 1913 in an investigation covering the entire boundary waters. In 1946 the International Joint Commission received references concerning pollution in the waters of the St. Clair River, Lake St. Clair, the Detroit River, the St. Marys River, and in 1948 the Niagara River.

In response to a letter from the Great Lakes Commission, February 6, 1963, the Department of State noted, "This Department has, since 1956, urged the Canadian Government to agree to a new reference to the International Joint Commission, United States and Canada, to study water pollution and water quality control in Lakes Erie and Ontario and the international section of the St. Lawrence River. The existing reference to the International Joint Commission concerning pollution made in 1946, as expanded in 1946 and 1948, covers only the connecting channels between the Great Lakes but not the Lakes themselves."

On October 7, 1964, a reference was made to the International Joint Commission for a pollution study of the waters of Lakes Erie and Ontario and the international waters of the St. Lawrence River. It is understood that the investigation and study resulting from this reference have been completed, and the findings will be filed with the two governments.

Volume 1—*Summary of the Report to the International Joint Commission on the Pollution of Lake Erie, Lake Ontario and the International Section of the St. Lawrence River* by the Water Pollution Boards in 1969 includes recommendations to the IJC. The Boards' report makes no mention of further or continuing investigations and studies by the IJC.

At its meeting, June 9, 1970, the Great Lakes Commission expressed its belief that a new reference should be extended to the International Joint Commission requesting that a continuing study of polution conditions be made on *all international waters* of the Great Lakes; and that this study include regularly scheduled monitoring of waters of the Great Lakes at selected locations within the scope of the new reference so that the quality of international waters of the Great Lakes will be a matter of official record for the two governments, and appropriate states, provinces and agencies within the governments, on an annual basis.

The Great Lakes Commission approved a resolution on this matter, a copy of which is attached.

It is my pleasure to forward this resolution to you, as Secretary of State, for your consideration; and, hopefully, as a basis for extending an appropriate reference to the International Joint Commission which will provide for full-scope surveillance and monitoring of the water quality of the international waters of the Great Lakes, their connecting channels and the international section of the St. Lawrence River.

Recent water quality or pollution problems have vividly demonstrated the need for a continuing surveillance program.

Thank you very much, Mr. Secretary, for your assistance in this matter.

Sincerely yours,

FRANK J. KELLEY, *Chairman.*

EXCERPT FROM GREAT LAKES COMMISSION MINUTES, JUNE 9, 1970, ERIE, PA

The following resolution was presented for Commission action:

(In summary); *Resolved,* That the Great Lakes Commission, based on information from public health authorities regarding the severe hazard of consuming mercury contaminated fish, supports the various fishing restrictions and regulations, established by Ontario and the effected States, for the protection of the health of the public which may fish in the waters of southern Lake Huron, Lake St. Clair, Lake Erie and their connecting rivers as well as in certain inland waters; encourages wide dissemination of information to alert the public as to the specific waters affected; and urges all fishermen to obey all restrictions and further their compliance.

The resolution was unanimously approved by the Commission.

RESOLUTION

Whereas the Great Lakes Commission at its June 9, 1970 meeting in Erie, Pennsylvania, took recognition of the mercury contamination problem now existing in the waters of southern Lake Huron, Lake St. Clair, Lake Erie and their connecting rivers as well as in certain inland waters of the Great Lakes states and the Province of Ontario; and

Whereas certain species of fish taken in the contaminated waters contain mercury sufficient to, if eaten in quantity, pose a significant or severe health problem; and

Whereas the Governments of the Great Lakes States bordering these waters and the Province of Ontario have placed a ban on the ingestion of contaminated fish: Now, therefore, be it

Resolved, That the Great Lakes Commission, based on information from public health authorities regarding the severe hazard of consuming mercury contaminated fish, supports the various fishing restrictions and regulations established by Ontario and the affected States for the protection of the health of the public which may fish or eat fish taken from the waters of southern Lake Huron, Lake St. Clair, Lake Erie and their connecting rivers as well as in certain inland waters; encourages wide dissemination of information to alert the public as to the specific waters affected; and urges all fishermen and the public to obey all restrictions and further their compliance.

Approved by the Great Lakes Commission June 9, 1970.

[Great Lakes Commission news release]

LAKES OFFICIAL CITES REMEDIES FOR MERCURY POLLUTION

CHICAGO, ILL.—Albert J. Meserow, a Chicago attorney and Chairman of the Illinois Delegation of the Great Lakes Commission, who has been a leader for fifteen years in Great Lakes water resources matters, made known to the Senate Subcommittee on Energy, Natural Resources and the Environment his views in which he stated that mercury is probably the number one health danger of all pollution problems. He also made known his views and recommendations on the remedial measures to combat pollution of the Great Lakes which have been highlighted by the recent problem of mercury pollution.

In a prepared statement Meserow points out the needs for public awareness and education on the mercury pollution problem as well as other deleterious or poisonous substances which may be accidently or inadvertently added to water supply sources. He indicated that recently officials in both Canada and the United States are now discovering arsenic and uranium deposits in fresh water sources which pose a danger equal to mercury. Meserow also stresses the international aspects of the pollution or water quality control problems and advocates a continuing monitoring and surveillance program by the established International Joint Commission, noting that new products may introduce direct or side effects now largely unknown. Meserow recommends the strengthening of existing local, state, university and federal laboratory facilities so that environmental hazards may be quickly and validly analyzed and evaluated.

"Today the tendency is to meet our problems on a 'quick fix' or crisis basis" Meserow stated, "and we just do not have the resources for the luxury approach nor can we afford the hit-or-miss approach. We have to meet Great Lakes problems on the international level, we've got to keep the public informed, and we have to strengthen and keep on a business-like basis our capabilities to analyze and evaluate hazards to the environment through adequate laboratory facilities. We can't afford too many more laboratories, because they just compete with one another for funds and competent personnel. We've got to use local, state, university and federal facilities now existing to maximum advantage."

Meserow further stated that although the Governors of Michigan and Wisconsin, upon the discovery of mercury in fish, issued orders to temporarily discontinue fishing; this, in itself, does not afford a protection to the public. In relatively

short periods after these Governors' orders they rescinded the non-fishing orders and directed that the public may fish but the fish should not be consumed. The danger in these limited publicized directives is that sports fishermen in, for example, Chicago, who travel to Wisconsin and Michigan for fishing, are not aware of these conditions and the existence of mercury in fish that they catch and consume, because the orders of Governors of Wisconsin and Michigan do not ordinarily appear in the public press in the City of Chicago or State of Illinois.

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