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POLYCHLORINATED BIPHENYLS (PCB)

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HEARINGS

BEFORE THE

SUBCOMMITTEE ON FISHERIES AND WILDLIFE CONSERVATION AND THE ENVIRONMENT

OF THE

COMMITTEE ON
MERCHANT MARINE AND FISHERIES
HOUSE OF REPRESENTATIVES

NINETY-FOURTH CONGRESS

SECOND SESSION

ON

OVERSIGHT TO EXAMINE THE IMPACT OF POLYCHLORINATED BIPHENYLS AND SIMILAR TOXIC SUBSTANCES ON FISHERIES AND WILDLIFE RESOURCES

JANUARY 28, 29, 30, 1976

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POLYCHLORINATED BIPHENYLS (PCB)

WEDNESDAY, JANUARY 28, 1976

HOUSE OF REPRESENTATIVES,
SUBCOMMITTEE ON FISHERIES AND WILDLIFE
CONSERVATION AND THE ENVIRONMENT OF THE
COMMITTEE ON MERCHANT MARINE AND FISHERIES,
Washington, D.C.

The subcommittee met at 2:04 p.m., in room 1334, Longworth Building, Hon. Robert L. Leggett, chairman, presiding.

Mr. LEGGETT. The meeting of the Subcommittee on Fisheries and Wildlife Conservation and the Environment will please come to order.

Today the Subcommittee on Fisheries and Wildlife is holding hearings, the first of several days of hearings on a very important subject matter which may seriously affect the health and welfare of our ecosystem. Although this subject has gained considerable recognition over the past several months by the press media and some Federal officials, and some Congressmen, the problem is necessarily and certainly not new, as I am sure we will learn today.

Nevertheless, there remains many unanswered questions as to whether this problem of PCB'c or similar toxic substances can be ameliorated or avoided in the future.

Therefore, the purpose for these hearings over the next several days will be to examine the PCB problem as a case in point to understand its significance, to document its impact, and to assess whether additional legislative authority is required in order to anticipate, prevent, or cure similar problems.

Accordingly, the format for our hearings has been developed such that today we will receive testimony from the administration and industry representatives concerning an overall description of the PCB problem and the action which has been taken to minimize its adverse impacts.

Tomorrow afternoon, scheduled witnesses will provide to the subcommittee documentation of the adverse impacts on our wildlife resources attributed to PCB's; then, Friday morning, the subcommittee will consider the testimony of witnesses regarding the options available to the Congress to assume that we have the capability to deal with these problems before they grow to crisis proportions—if they are not at that point already.

Counsel, let me ask you this, do we have any bills currently assigned to the committee on this subject matter?

Mr. SPENSLEY. No.

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Mr. LEGGETT. The answer to that is negative, so we are generally reviewing the subject matter to determine whether or not in fact there is a problem that regulations in effect or existing executive authority cannot respond to. And if we find that there is a definable problem, we will then resort to Legislative Counsel's Office and the other experts around and attempt to draft legislation to respond to the problem.

Our first witness is the very distinguished Assistant Secretary of the Interior for Fish and Wildlife and Parks, Hon. Nathaniel Reed.

Nat, we are pleased to have you before the committee. You are the first witness.

STATEMENT OF HON. NATHANIEL REED, ASSISTANT SECRETARY OF THE INTERIOR FOR FISH AND WILDLIFE AND PARKS; ACCOMPANIED BY CHARLES R. WALKER, SENIOR ENVIRONMENTAL SCIENTIST

Mr. REED. Thank you, Mr. Chairman.

Mr. LEGGETT. Your statement will be accepted and incorporated in the record at this point as though you read it in full and you can read it in full or highlight it as you may choose.

[Prepared statement follows:]

STATEMENT OF NATHANIEL P. REED, ASSISTANT SECRETARY FOR FISH AND WILDLIFE AND PARKS, U.S. DEPARTMENT OF THE INTERIOR

Mr. Chairman, I am Nathaniel P. Reed, Assistant Secretary for Fish and Wildlife and Parks. I appreciate this opportunity to appear here today to discuss with you a national problem that the U.S. Fish and Wildlife Service has identified in both research and samples in the National Pesticide Monitoring Program—polychlorinated biphenyls—PCB's.

PCB residues have been found in fish samples from all major river systems throughout the United States, and in most of the bird samples taken since 1970. PCB's are literally everywhere. Exceedingly high levels occur in fish from many drainage systems including the Hudson River, the Great Lakes system, the Merrimac and Connecticut Rivers of New England, the Mississippi, Missouri and the Ohio Rivers of middle America, the Columbia River system in the Northwest, the Sacramento River in California, the Rio Grande and other Gulf Coast streams, and even the Yukon in Alaska.

Fish are not alone in accumulating sizeable quantities of PCB's. The birds we are monitoring are equally capable of amassing PCB's. Waterfowl carry the highest residues in the Atlantic Flyway, followed in descending order by the Mississippi, Pacific and Central Flyways. Further, all starlings collected since 1970 contain PCB residues.

The ubiquity of PCB's in our environment looms as a dark cloud casting an ominous shadow upon all of our living natural resources which depend on a clean and healthy environment. With more than one-third of the United States population living near the Great Lakes alone, and a majority of the population residing about other major waterways, we must be cognizant of the potential impact of the tons upon tons of PCB-infested materials which are daily deposited into these waters. Transformer fluids, plastic bottles, hydraulic fluids, carbonless paper, ink and other PCB-loaded wastes all find their way into our waters, where the percentages of PCB's amalgamate malignantly. Scientists have repeatedly demonstrated in laboratory and pen studies that PCB's affect the growth, reproduction and health of many kinds of animal life . . . from the lowly invertebrates and fish to birds and mammals such as mink and monkeys, and now man.

In particular, PCB's pose an immediate threat to our efforts to preserve and protect threatened and endangered species. Under present conditions,

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PCB's may very well be the deciding factor in the survival of some species in spite of our best efforts for preservation.

We cannot wish this problem away. Consider the Atlantic salmon, a species we are striving to reestablish into our New England rivers. Atlantic salmon egg mortality has been associated with a threshold concentration of about 0.5 ppm of PCB. Our scientists state that this threshold concentration in the eggs would be equivalent to residual PCB levels in whole fish of 2.5 to 5.0 ppm, comparable to the levels found in many species throughout the United States. Recent tests show that 75 percent of rainbow trout eggs containing as little as 2.7 ppm of PCB's and 90 ppb of DDT complex did not hatch and the majority of those that did hatch were deformed. Another test demonstrated that fish may accumulate more than 40,000 times the concentration of PCB in the water. I think the fish are trying to tell us something. They are stating unequivocally that our lakes, rivers and streams are sick.

In my capacity as the steward of fish and wildlife for the Department of the Interior and as a Commissioner on the Great Lakes Fishery Commission, I have an overwhelming concern for the protection and management of the Nation's water resources. With regard to the Great Lakes, during this century, the fisheries have suffered from heavy fishing, predation by the parasitic sea lamprey, the influx of alewives, and a diminished quality of habitat as a result of uncontrolled shoreline development and waste disposal including the discharge of PCB's. In recent years Canada, the United States, the Provinces and the States have taken significant steps at great financial cost to restore the Great Lakes fisheries to their former productivity. As a first step, we undertook the control of the sea lamprey. Our cooperative efforts achieved success in all the Great Lakes except Lake Ontario, where intensive control programs are now underway. After 17 years, and $33 million, the sea lamprey, with sustained control efforts, no longer represents a major threat in the upper Great Lakes. The reduction of the lamprey problem has permitted a successful State and Federal stocking program involving more than 150 million lake trout, splake, and coho, chinook, Atlantic, and kokanee salmon. In addition, millions of rainbow, brook and brown trout have also been stocked.

These salmonids feed heavily on the plentiful alewife and grow rapidly to trophy size. The resulting sport fishing contributes approximately $350 million annually to the economy of the Great Lakes States and the Province of Ontario.

All our efforts are for naught if these fish cannot be consumed, and we now face this stark possibility. A significant portion of these fish contain PCB residues in excess of the 5.0 ppm permissible level established by the Food and Drug Administration. As a result, warnings have been issued about the consumption of trout, salmon and other species such as carp, chub, smelt and alewife from Lake Michigan. To varying degrees a similar PCB problem exists in Lakes Superior, Huron, and Ontario. Carp from Lake Michigan have already been declared unmarketable because of PCB's, and chubs appear to be at or just below the 5.0 ppm permissible level.

If FDA lowers the current permissible level, virtually all species would be unmarketable and the Great Lakes commercial fishery would be dead. The current permissible level has already ended any serious consideration of commercially utilizing the salmonid populations in the near future. PCB's present a major problem in the future maintenance and growth of commercial fisheries. These fisheries today have a dockside value of about $19 million annually and a total economic contribution to the United States and Canada of possibly $95 million annually when processing, shipping and retailing are included.

We must now consider the expenditure of millions of dollars for controlling sea lamprey and stocking salmonids in the Great Lakes in light of continued contamination of the fish stocks with unacceptable levels of PCB's. There are important reasons in favor of continuing a stocking program. These include aspects of biology, economics, and ecology. The lake trout restoration program exemplifies these considerations. More than 17 years were required to restore lake trout to its present level in Lakes Superior and Michigan. If we stop our current programs, it is almost certain that the sea lamprey would reestablish itself and the salmonid populations would collapse, thus wiping out our investments of many years and millions of dollars and a Great Lakes fishery worth several hundred million dollars. Although we know

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considerably more now than we did 17 years ago about lamprey control and salmonid stocking programs, it would still require at least 10 years to again control the lamprey and rebuild the lake trout population.

I have been using the Great Lakes as an example. The Great Lakes are a virtual "sink" for PCB's. It takes more than 50 years for water to turn over in Lake Michigan; there is no fast flushing action by mighty rivers or ocean tides. However, many other areas of the country have been just as greatly affected and many other species, not just fish, have hazardous levels of PCB residues. We know that the reproductive success of bald eagles has been greatly reduced in Maine and along the shores of Lake Michigan where high residues of DDE, dieldrin and PCB's are found in eagle eggs. Alarming levels of PCB's have been found in some eggs of inland feeding birds including double-crested cormorants, Caspian terns and Fosters terns. Sixty-six percent of eggs analyzed in a recent study conducted on osprey in the Gulf of California contained PCB's. Among the most profound demonstrations of the adverse effects of PCB were the inhibitions of mink reproduction that were caused by feeding coho salmon containing PCB residues.

As soon as PCB's enter the food chain, the poison is off and running. The fingernail clam has demonstrated an inordinate capacity to concentrate PCB. This is another environmental stress to one of America's favorite waterfowl, the canvasback, which feeds voraciously on the clam. Investigative monitoring for PCB's indicate that the highest residues occur in industrial and urban areas. The clam was once common in the Detroit River, the Illinois River and Lake St. Clair—habitats that used to attract major flights of canvasbacks. The canvasback represents a valuable waterfowl resource struggling against many odds as a declining species, and I foresee little success for such a population which utilizes areas heavily contaminated with PCB's.

Past attempts to control the point-source of PCB's into the environment have failed to bring about any measurable reduction in the contamination of the Nation's lakes and rivers. For example, DDT levels in Lake Michigan fishes and mercury levels in Lake St. Clair fishes have declined from between 50 and 87 percent in the past four to five years as a result of controls on their use. Why have not PCB levels responded similarly? Do they behave so differently from DDT and mercury in the environment that we cannot reasonably expect to have observed some decline by this time? We will never know unless the flow of PCB's to the environment is stopped. It was commonly thought that decades might elapse before DDT and mercury would decline to satisfactory levels in natural waters. It appears highly probable that the primary cause for the failure of PCB's to decline is that their sources have not been curtailed to any significant degree.

To sum up, the insidious character of PCB's is now obvious and presents a very serious problem to all of us. This pollutant affects the very core of State and Federal resource management programs throughout the United States. We urgently need an effective program of control capable of rapidly eliminating the release of PCB's into our environment. Because of my deep concern with the problem, I support a national ban on all domestic and imported PCB's. We must have as our goal the elimination of PCB's from the environment of the United States as rapidly as possible. I recommend that the critical or essential use of PCB's in transformers and capacitors be immediately and critically reviewed in light of current potential replacement products.

The Fish and Wildlife Service's pesticide monitoring program acts as a bellwether for measuring the future environmental impacts of toxic substances upon mankind. The domestic water supplies for many millions of people are drawn from the Great Lakes and other waterways—the same lakes and waterways whose fish populations are so contaminated with PCB's and other chemical toxicants that they are unfit for human consumption even under the present outdated FDA regulations. Mr. Chairman, the health of our fish and wildlife acts as a pulse indicator for human health. All environmental gauges indicate this pulse to be unsteady and irregular. Mr. Chairman, we do not want a repetition of the Japanese "Yusho" intoxication in the United States. In 1968 over 1,000 Japanese experienced PCB poisoning after consuming rice oil contaminated with Kanechlor 400. In addition to causing headaches, swelling of the eyelids, temporary loss of vision and many other symptoms, PCB's affect the fetus of pregnant women. Nine out of ten live-born babies had usually grayish, darkened skin, and most were born

underweight. Much of the same pathology has been reported over the years for fish and wildlife—that tragedy truly was the "miner's canary" for PCB's and many other environmental contaminants. The irony is that our research and monitoring efforts are often ignored. It pains me to remind you that the ban on DDT was not imposed until long after its threat to wildlife was proved, and action was taken only when studies showed the potential hazard to human health. Do we need a body count before we act?

Thank you, Mr. Chairman. I will be pleased to answer any questions you have.

Mr. REED. Thank you, Mr. Chairman and members of the committee.

Mr. LEGGETT. Just a minute—I yield to Mr. Oberstar.

Mr. OBERSTAR. Just a brief comment, Mr. Chairman, to thank the Chair and staff for the work done in initiating these hearings which I think will give significant importance in this very important critical and complex subject area, PCB's, one of the vexing impacts of man on environment, interrupting and involving the food chain all the way through, and one that has not had sufficient attention from committees of Congress. Our committee is taking the lead in this area, and I want to commend you, Mr. Chairman, for your leadership. It is also a matter of great importance to those of us in the Great Lakes area where PCB's have been discovered in waters of Lake Michigan, and some traces have been found in waters of Lake Superior. Just from the standpoint of easing fears and concern, a committee of Congress is looking into this matter and developing solid, scientific, reliable evidence, will be a great service to the public.

Mr. LEGGETT. Very good. Thank you very much.

I hope that we can maintain the interest of all the members of the subcommittee during these important hearings, so that we can reach some kind of agreement with respect to future course of action, particularly in light of the fact that we have no legislation before us. It is going to take our assimilative efforts to come up with something.

I might point up this, that we are holding these hearings also at the instance of Environmental Study Conference, chaired by our distinguished colleague, Dick Ottinger, who has likewise called our attention to some important subject matter.

Mr. Reed, you can proceed.

Mr. Forsythe, nice to have you here.

Very good. We are proceeding together today.

All right, Mr. Reed, please proceed.

Mr. REED. Mr. Chairman, I appreciate this opportunity to appear here today to discuss with you a national problem that the United States Fish and Wildlife Service has identified in both research and samples in the National Pesticide Monitoring program polychlorinated biphenyls—PCB's.

PCB residues have been found in fish samples from all major river systems throughout the United States, and in most of the bird samples taken since 1970. PCB's are literally everywhere. Exceedingly high levels occur in fish from many drainage systems including the Hudson River, the Great Lakes system, the Merrimac and Connecticut rivers of New England, the Mississippi, Missouri, and the Ohio rivers of middle America, the Columbia River system in the Northwest, the Sacramento River in California, the Rio Grande and other Gulf Coast streams, and even the Yukon in Alaska.

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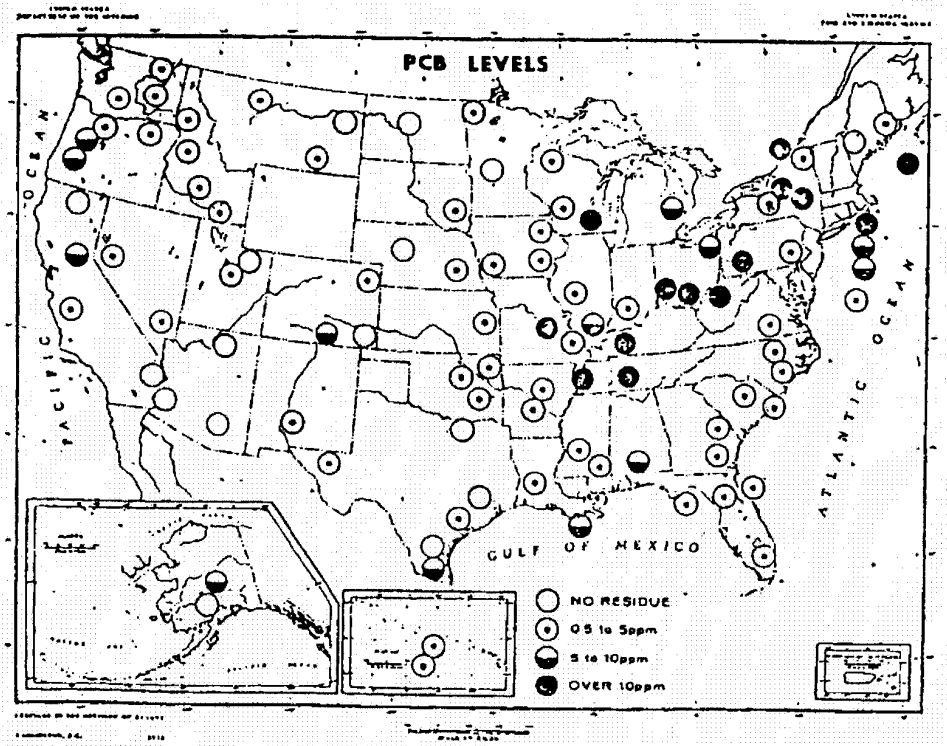
PCB LEVELS
PACIFIC OCEAN
ATLANTIC OCEAN
GULF OF MEXICO
NO RESIDUE
0.5 to 5ppm
5 to 10ppm
OVER 10ppm

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Mr. REED. Fish are not alone in accumulating sizable quantities of PCB's. The birds we are monitoring are also amassing PCB's. Waterfowl carry the highest residues in the Atlantic Flyway, followed in descending order by the Mississippi, Pacific, and Central Flyways. Further, all starlings collected since 1970 contain PCB residues.

The ubiquity of PCB's in our environment looms as a dark cloud casting an ominous shadow upon all of our living natural resources which depend on a clean and healthy environment. With more than one-third of the United States population living near the Great Lakes alone—and a majority of the population residing about other major waterways—we must be cognizant of the potential impact of the tons upon tons of PCB-infested materials which are daily deposited into these waters from industrial and domestic sewage, effluents, landfills, waste incineration, runoff from materials deposited in the soil and from general atmospheric fallout, as was documented by Hessee (55)* and Kleinert (58)* at the November PCB conference in Chicago.

Mr. LEGGETT. Mr. de la Garza wants to interrupt.

Mr. DE LA GARZA. Forgive me, please, you have added something that is not in this. Do you have an amended statement rather than the one we have?

Mr. REED. No, Mr. de la Garza, I have occasionally added for accuracy a word or two and I will note them if you would like.

The only one so far is the November conference; I felt it needed the addition of "November" to explain when we held this conference.

Mr. DE LA GARZA. You added about a study there. I am sorry to interrupt you, but——

Mr. REED. Hesse and Kleinert?

Mr. DE LA GARZA. Yes.

Mr. REED. My statement may have been amended since this morning when I made some corrections.

Mr. LEGGETT. Hesse and Kleinert's statement?

Mr. REED. Hesse and Kleinert are two researchers who documented major studies on the environmental sources of PCB's. They was presented at the November conference on PCB'c held in Chicago.

Mr. LEGGETT. Very good.

Mr. REED. Transformer fluids, plastic bottles, hydraulic fluids, carbonless paper, ink and other PCB-loaded wastes residual to the 1972 voluntary ban and the unknown quantities presently being imported into this country all find their way into our waters, where the percentages of PCB's amalgamate malignantly. Scientists have repeatedly demonstrated in laboratory and penned animal studies that PCB'c affect the growth, reproduction and health of many kinds of animal life—from the lowly invertebrates and fish to birds and mammals such as mink and monkeys, and now man.

In particular, PCB's pose an immediate threat to our efforts to preserve and protect threatened and endangered species. Under

*Reference numbers refer to material a list of which may be found on p. 13.

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present conditions, PCB's may very well be the deciding factor in the survival of some species in spite of our best efforts for preservation. Although we have been unable to document the direct contributary effect of PCB contamination, significant amounts of PCB's have been found in the brain tissues of dead peregrine falcons and bald eagles.

We cannot wish this problem away. Consider the Atlantic salmon, a species we are striving to reestablish into our New England rivers. Atlantic salmon egg mortality has been associated with a threshold concentration of about 0.5 parts per million of PCB. Our scientists state that this threshold concentration in the eggs would be equivalent to residual PCB levels in whole fish of 2.5 to 5 parts per million, comparable to the levels found in many species throughout the United States. A direct correlation has been found by Jansen (56), in Sweden, for equating significant PCB residues with mortality in Atlantic salmon.

Recent tests show that 75 percent of rainbow trout eggs containing as little as 2.7 parts per million of PCB's and 0.09 parts per million of DDT complex did not hatch, and the majority of those that did hatch were deformed.

Another test demonstrated that fish may accumulate more than 40,000 times the concentration of PCB in the water. The present Lake Michigan water concentrations of PCB's are generally below 10 parts per trillion—0.00001 parts per million— and the range of PCB residues in smelt and lake trout is from 2.5 parts per million to 165 parts per million, respectively, yielding a range of biomagnification of 30,000 times for the smelt and 150,000 times for the lake trout.

I think the fish are trying to tell us something. They are stating unequivocally that our lakes, rivers, and streams are sick.

In my capacity as the steward of fish and wildlife for the Department of the Interior and as a Commissioner on the Great Lakes Fishery Commission, I have an overwhelming concern for the protection and management of the Nation's water resources. With regard to the Great Lakes, during this century, the fisheries have suffered from heavy fishing, predation by the parasitic sea lamprey, the influx of alewives, and a diminished quality of habitat as a result of uncontrolled shoreline development and waste disposal—including the discharge of PCB's.

In recent years Canada, the United States, the Provinces, and the States have taken significant steps at great financial cost to restore the Great Lakes fisheries to their former productivity. As a first step, we undertook the control of the sea lamprey. Our cooperative efforts achieved success in all the Great Lakes except Lake Ontario, where intensive control programs are now underway.

After 17 years and $33 million, the sea lamprey, with sustained control efforts, no longer represents a major threat in the upper Great Lakes. The reduction of the lamprey problem has permitted a successful State and Federal stocking program involving more than 150 million lake trout, splake, and coho, chinook, Atlantic, and

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Kokanee salmon. In addition, millions of rainbow, brook, and brown trout have also been stocked.

These salmonids feed heavily on the plentiful alewife and grow rapidly to trophy size. The resulting Sport fishing contributes approximately $350 million annually to the economy of the Great Lakes States and the Province of Ontario.

All our efforts are for naught if these fish cannot be consumed, and we now face this stark possibility.

A significant portion of these fish contain PCB residues in excess of the 5 parts per million permissible level established by the Food and Drug Administration. As a result, warnings have been issued about the consumption of trout, salmon, and other species such as carp, chub, smelt, and alewife from Lake Michigan.

To varying degrees a similar PCB problem exists in Lakes Superior, Huron, and Ontario. Carp from Lake Michigan have already been declared unmarketable because of PCB's, and chubs appear to be at or just below the 5 parts per million permissible level.

Canada recently reduced its administration action level, or the permissible level, for PCB's to 2 parts per million for marketable fish. Should FDA lower the PCB residue tolerance to 2 parts per million, a significant proportion of our commercial fisheries will be forced out of business.

Even with FDA's present permissible level, some species are unmarketable and certain Great Lakes fishermen are being subject to economic hardship.

The current permissible level has already ended any serious consideration of commercially utilizing the salmonid populations in the near future. PCB's present a major problem in the future maintenance and growth of commercial fishing. These fisheries today have a dockside value of about $19 million annually and a total economic contribution to the United States and Canada of possibly $95 million annually when processing, shipping, and retailing are included.

We now must consider the expenditure of millions of dollars for controlling sea lamprey and stocking salmonids in the Great Lakes in light of continued contamination of the fish stocks with unacceptable levels of PCB's.

The current 1976 Fish and Wildlife Service budget contains $1.8 million for sea lamprey control and almost $3 million for the Great Lakes fishery program which annually produces some 11 million fish for stocking.

Mr. LEGGETT. How much do you have for control of PCB's?

Mr. REED. We have no appropriation for the control of PCB's, Mr. Chairman.

Mr. LEGGETT. How much did you ask for control of PCB's-

Mr. REED. Well, that would not be in our budget figures; as a protector of fish and wildlife, you would find correlation in our budget requests for the pesticide monitoring programs and for our pesticide and research labs. You could get some correlation there, but that is about it.

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Mr. RUPPE. Mr. Chairman, will you yield?

Is the lamprey control in your budget?

Mr. REED. No.

Mr. RUPPE. State Department's?

Mr. REED. It is in the State Department budget, but I testified on that, Mr. Ruppe, both in my capacity as Assistant Secretary and as Commissioner. I have been appointed by the President to the Great Lakes Fishery Commission. The total amount has been running about $1.8 million.

There are important reasons in favor of continuing a stocking program. These include aspects of biology, economics, and ecology. The lake trout restormation program exemplifies these considerations.

More than 17 years were required to restore the lake trout to its present level in Lakes Superior and Michigan. If we stop our current programs, it is almost certain that the sea lamprey would reestablish itself and the salmonid populations would collapse, thus wiping out our investments of many years and millions of dollars and a Great Lakes fishery worth several hundred million dollars.

Although we know considerably more now than we did 17 years ago about lamprey control and salmonid stocking programs, it would still require at least 10 years to again control the lamprey and rebuild the lake trout population.

I have been using the Great Lakes as an example. The Great Lakes are a virtual "sink" for PCB's. It takes more than 50 years for water to turn over in Lake Michigan; there is no fast flushing action by mighty rivers or ocean tides. However, many other areas of the country have been just as greatly affected and many other species, not just fish, have hazardous levels of PCB residues.

[The following was submitted:]

DATA ON THE GREAT LAKES SYSTEM[1]

	Lake Superior	Lake Michigan	Lake Erie	Lake Ontario
Length (kilometers)	560	490	385	309
Breadth (kilometers)	256	188	91	81
Area (square kilometers):				
Water surface	82,357	58,016	25,664	19,634
Drainage basin, land	124,838	117,845	58,793	70,418
Total	207,205	175,861	84,459	90,122
Maximum depth (meters)	406	281	60	244
Average depth (meters)	148	84	17	86
Volume of water (cubic kilometers)	12,221	4,871	458	1,636
Average annual precipitation (millimeters)	735	787	853	863
Mean outflow (liters per second)	2,057,360	5,012,600	5,550,720	6,626,880
Average retention time of water (years)	191	30.8	2.6	7.8
Population time, measured (years)[2]	450	70	5	20

[1] Adapted from Ramsey, D.M. Schaare, and [illegible] 1/161(19571).

[2] Time required for the mass in supply to [illegible] level by 63 per [illegible] natural flow when the addition of pollutants is discontinued. The time required for the flow of water through the lake is equal 2.3 times the volume of the lake.

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ake Erie	Lake Ontario
385	309
91	81
566	19,684
193	70,448
459	93,132
60	244
57	86
459	1,534
953	963
9,720	6,626,880
2.6	7.8
5	23

when the addition of
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Mr. REED. We know that the reproductive success of bald eagles have been greatly reduced in Maine and along the shores of Lake Michigan where high residues of DDT, dieldrin, and PCB's are found in eagle eggs. Alarming levels of PCB's have been found in some eggs of inland feeding birds including double-crested cormorants, Caspian terns and Fosters terns.

Recent analyses by Weimeyer and his associates (50) of the Fish and Wildlife Service, for residues in bald eagles from Maine shows that the levels of PCB's in brain and other tissues are increasing. Among the most profound demonstrations of the adverse effects of PCB were the inhibitions of mink reproductions that were caused by feeding the mink coho salmon containing PCB residues.

As soon as the PCB's enter the food chain, the poison is off and running. The fingernail clam has demonstrated an inordinate capacity to concentrate PCB. This is another environmental stress to one of America's favorite waterfowl, the canvasback, which feeds voraciously on the clam. Investigative monitoring for PCB's indicate that the highest residues occur in industrial and urban areas.

The clam was once common in the Detroit River, the Illinois River and Lake St. Clair—habitats that used to attract major flights of canvasbacks.

The canvasback, once the most popular duck in America, represents a valuable waterfowl resource struggling against many odds as a declining species. Canvasback habitat is critically limited and I foresee little success for restoring this species to its former abundance in those many areas which are now subject to PCB contamination.

Past attempts to control the point-source of PCB's into the environment have failed to bring about any measurable reduction in the contamination of the Nation's lakes and rivers. For example, DDT levels in Lake Michigan fishes and mercury levels in Lake St. Clair fishes have declined from between 50 and 87 percent in the past 4 to 5 years as a result of controls on DDT's use.

Why have not PCB levels responded similiarly? Do they behave so differently from DDT and mercury in the environment that we cannot reasonably expect to have observed some decline by this time? We will never know unless the flow of PCB's to the environment is stopped.

It was commonly thought that decades might elapse before DDT and mercury would decline to satisfactory levels in natural waters. It appears highly probable that the primary cause for the failure of PCB's to decline is that their sources have not been curtailed to any significant degree.

To sum up, the insidious character of PCB's is now obvious and presents a very serious problem to all of us. This pollutant effects the very core of State and Federal resource management programs throughout the United States. We urgently need an effective program of control which will rapidly halt the release of PCB's into our environment

Because of my deep concern with the problem, I have reached the conclusion that no matter how painful the decision may be, I sup-

port a national ban on all domestic and imported PCB's. We must have as our goal the elimination of PCB's from the environment of the United States as rapidly as possible.

I recommend that the critical or essential use of PCB's in transformers and capacitors be immediately and critically reviewed in light of current potential replacement products. I recommend to the Congress, the enactment of an effective Toxic Substances Act which contains stringent provisions for control of PCB pollution, and PCB importation, and for the critical premarket testing of substitutes.

The Fish and Wildlife Service's pesticide monitoring program acts as a bellwether for measuring the future environmental impacts of toxic substances upon mankind.

The domestic water supplies for many millions of people are drawn from the Great Lakes and other waterways—the same lakes and waterways whose fish populations are so contaminated with PCB's and other chemical toxicants that they are unfit for human consumption even under the present outdated FDA regulations.

Mr. Chairman, the health of our fish and wildlife acts as a pulse indicator for human health. All environmental gages indicate this pulse to be irregular and unsteady.

Mr. Chairman, we do not want a repetition of the Japanese "Yusho" intoxication in the United States. In 1968, over 1,000 Japanese experienced PCB poisoning after consuming rice oil contaminated wth Kanechlor 400 (60, 61, 62). Nine of 10 babies born to mothers who had consumed the rice oil had unusually grayish, darkened skin and most were born underweight.

Although we have not had an incident of direct ingestation of PCB food poisoning in the United States, J. R. Allen's unpublished studies show similar "Yusho" effects in monkeys that were fed levels of PCB's comparable to those found in our contaminated fish. The irony is that our research and monitoring efforts are often ignored.

It pains me to remind you that the ban on DDT was not imposed until long after its threat to wildlife was proved, and action was taken only when studies showed the potential hazard to human health.

Do we need a body count before we act?

Thank you, Mr. Chairman and members of the committee.

I will be pleased to answer any questions you may have.

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Mr. LEGGETT. Thank you very much, Mr. Secretary.

Certainly nobody can accuse you of having lack of courage after that statement. It is regrettable indeed and I guess we should probe a little bit and find out the degree of the commitment in your agency and when it was discovered.

Is your agency totally polarized on this issue? Because the Chief of Fish and Wildlife Service and your assistants feel as you do?

Mr. REED. Yes, sir.

Mr. LEGGETT. Has there been a recommendation mad by your research analysts on toxic substances that supports your view??

Mr. REED. Yes, sir. In 1960 and 1970 with the development of a new technique and new equipment both of which are patented the Fish and Wildlife Service, that could properly identify toxic substances in fish and wildlife, we made major patented breakthroughs in being able to avoid the lumping of toxic substances together. We know how to separate and measure environmental contaminants in fish, birds and mammals this includes organichlorine contaminants such as PCB, DDT and other pesticides PCB, DDT, DDE, and without confusing one compound with another.

We worked very closely in 1970 and 1971 with the industry and with what at that time was the Federal Water Pollution Control Administration to gain elimination of PCB's into the environment.

Frankly, we thought we had it with the voluntary restriction of PCB's for use only closed cycle equipment. We felt that we had done it.

The industry had made a major commitment to us to go that way and we were very pleased.

Then I think we sat back on our haunches. At that time we were anticipating trends from our national monitoring system on birds and fish which would indicate a decline. Not until 1973 did we begin to realize that something was wrong—instead of going down, which was what DDT, and DDE, and dieldrin residues were doing, the levels of PCB were continuing to grow.

In 1974 and 1974, as the levels escalated, we have come to the conclusion that PCB's are entering all waterways in the United States

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from a multitudinous group of discharges. They are being imported into this country, put into various chemicals for use, and are being discharged into sanitary sewer systems discarded into landfills, dumps or are incinerated and end up in maor waterways throughout the country.

Mr. LEGGETT. You find them in the Yukon River; the inference would be it gets there atmospherically?

Mr. REED. Yes sir, that is one possible source.

Mr. LEGGETT. If it gets there atmospherically, it could well be getting there, I suspect, from Japan, Canada, and the Soviet Union, as well as from the United States?

Mr. REED. We are interested in the results of the ban by the Japanese of PCB's following the Yusho disaster of 1968. Now their levels are still alarmingly high throughout the waterway system in Japan, but are beginning to tell.

We are not showing any tail off at all. We just show a steady incline.

Mr. LEGGETT. I assume you can produce for the committee documentation of PCB levels for various times and places all over the country?

Mr. REED. That would be our pleasure, sir, that is our duty and our responsibility.

(See also references 57, 59, 60, 61, 62, 63, 67, and U.S. map).

[The following was submitted:]

PCB RESIDUES FOUND IN FISH AND LOCATION

River (location) and species	Lipid percent	PCB residues (microgram per gram) as Aroclor		
		1242	1254	1260
Great Lakes				
St. Lawrence (Massena, N.Y.):				
White sucker	2.3	.....	0.70	.....
Do.	1.9	.....	.70	.....
Northern pike	1.9	.....	3.60	.....
Yellow perch	1.7	.....	1.00	.....
Do.	2.0	.....	1.10	.....
Genesee (Scottsville, N.Y.):				
Redhorse sucker	2.9	.....	.42	.....
Northern pike	2.5	.....	.98	.....
Black crappie	2.9	.....	1.20	.....
Do.	3.1	.....	.57	.....
Lake Ontario (Port Ontario, N.Y.):				
Rock bass	3.6	.....	7.00	.....
Yellow perch	5.5	.....	6.30	.....
Do.	5.7	.....	6.60	.....
Do.	7.3	.....	8.00	.....
White perch	13.7	.....	14.1	.....
Lake Ontario Lake (Cape Vincent, N.Y.):				
Brown bullhead	6.1	.....	3.60	.....
Rock bass	2.3	.....	1.70	.....
Yellow perch	4.3	.....	.90	.....
Do.	3.6	.....	1.30	.....
Lake Erie (Erie, Pa):				
White sucker	5.8	.....	.35	.....
Freshwater drum	12.1	.....	1.80	.....
Yellow perch	4.2	.....	.90	.....
Do.	4.9	.....	1.00	.....
Lake Erie (Port Clinton, Ohio):				
Carp	10.3	.....	1.30	.....
White bass	9.9	.....	12.00	.....
Walleye	16.4	.....	5.70	.....

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PCB Residues Found in Fish and Location—Continued

River (location) and species	Lipid percent	PCB residues (microgram per gram) as Aroclor 1242	1254	1260
Lake St. Clair (Mount Clemens, Mich.):				
Carp	11.9		6.3	
Do.	11.3		1.9	
White bass	9.6		1.9	
Walleye	10.7		12.0	
Lake Huron (Bay Port, Mich.):				
Carp	12.0		2.4	
Do.	11.8		3.0	
Channel catfish	13.4		4.7	
Yellow perch	4.3		2.2	
Do.	5.4		3.9	
Lake Huron (Alpena, Mich.):				
White sucker	5.3		.46	
Lake whitefish	10.0		.51	
Yellow perch	5.5		.65	
Do.	5.7		.94	
Do.	5.4		.73	
Lake Michigan (Sheboygan, Wis.):				
White sucker	6.3			1.70
Do.	7.5		2.00	
Bloater	20.1		3.20	
Do.	20.2		11.00	
Do.	19.9		13.00	
Lake trout	16.6			.60
Do.	18.5		19.00	
Lake Michigan (Saugatuck, Mich.):				
Bloater	16.4		4.20	
Lake trout	15.3		13.00	
Yellow perch	7.4		7.70	
Do.	8.2		6.70	
Lake Superior (Bayfield, Wis.):				
Lake whitefish	12.3		.70	
Bloater	14.1		2.70	
Do.	11.4		1.20	
Lake trout	13.4		2.70	
Do.	11.5		2.70	
Lake Superior (Keweenaw Point, Mich.):				
Herring	9.6		1.10	
Bloater	16.6		.79	
Do.	15.3		.61	
Lake trout	24.4		4.50	
Do.	24.5		3.70	
Atlantic Coast				
Penobscot (Old Town, Maine):				
White sucker	4.3		.30	
Chain pickerel	2.5		0.40	
Yellow perch	4.2	(1)	(1)	(1)
Do.	4.4			
Androscoggin (Lewiston, Maine):				
White sucker	7.7		1.40	
Do.	4.3		1.80	
Chain pickerel	3.8		1.30	
Yellow perch	4.4		.80	
Do.	6.2		.90	
Kennebec (Hinckley, Maine):				
White sucker	3.6			
Channel catfish	1.6		.40	
Yellow perch	4.2		.50	
Do.	4.2		.40	
Do.	3.3		.50	
Lake Champlain (Burlington, Vt.):				
Chain pickerel	2.7		.94	
Pumpkinseed sunfish	3.7	(1)	(1)	(1)
Yellow perch	3.3		1.20	
Do.	3.3		1.30	
Merrimack (Lowell, Mass.):				
White sucker	5.4		1.40	
Do.	4.4		1.40	
Chain pickerel	5.3		4.60	
Yellow perch	5.0		5.08	
Connecticut (Windsor Locks, Conn.):				
White catfish	5.2		5.30	
Do.	5.8		5.90	
Brown bullhead	2.2	2.10	1.20	
Yellow perch	5.7		2.40	

(microgram per as Aroclor 1254	1260
0.70	
.70	
3.60	
1.00	
1.10	
.42	
.98	
1.20	
.57	
7.00	
6.30	
6.60	
8.00	
14.1	
3.60	
1.70	
.90	
1.30	
.35	
1.80	
.90	
1.00	
1.30	
12.00	
6.70	

MONS 091328

PCB Residues Found in Fish and Location—Continued

River (location) and species	Lipid percent	PCB residues (microgram per gram) as Aroclor 1242	1254	1260
Atlantic Coast—Continued				
Hudson (Poughkeepsie, N.Y.):				
Goldfish	17.0		75.00	
Do	6.8		30.00	
Pumpkinseed sunfish	3.2		25.00	
Largemouth bass	5.4		13.00	
Susquehanna (Conowingo Dam, Md.):				
Carp	4.9			1.10
Channel catfish	13.1			5.90
Do	12.7			2.80
White perch	7.2			3.20
Do	7.2			3.10
James (Richmond, Va.):				
Redhorse sucker	22.1			4.20
Channel catfish	11.0		.97	
Do	11.2		1.10	
Largemouth bass	3.5		.67	
Roanoke (Roanoke Rapids, N.C.):				
Carp	1.5		.20	
Do	1.4		.20	
Do	2.8		.10	
Channel catfish	5.1		1.10	
Largemouth bass	3.1		.17	
Cape Fear (Elizabethtown, N.C.):				
Gizzard shad	4.1			1.00
Do	2.4			1.60
Brown bullhead	2.1			.40
Largemouth bass	3.9			.90
Pee Dee (Dongola, S.C.):				
Bluegill	5.9		.40	
Warmouth bass	1.6			
Largemouth bass	6.5		.80	
Do	5.8		.75	
Do	2.0		.30	
Cooper-Santee (Summerton, S.C.):				
Redear sunfish	2.1			.10
Largemouth bass	2.9			.20
Do	4.4			.20
Savannah (Savannah, Ga.):				
Striped mullet	4.7			.10
Do	4.7			.20
Do	6.6		.38	
Bluegill	1.9		1.30	
Largemouth bass	3.6		.78	
St. Lucie Canal (Indiantown, Fla.):				
Channel catfish	6.4		.10	
Do	6.6		.10	
Bluegill	1.4		.40	
Largemouth bass	2.6		.20	
Do	1.9		.10	
Gulf Coast				
Rio Grande (Brownsville, Tex.)				
Gizzard shad	3.5			
Do	4.0			
Black bullhead	3.2			
Do	3.0			
Channel catfish	2.7		0.60	
Rio Grande (Elephant Butte, N. Mex.)				
Carp	5.3		.83	
Do	3.9		.34	
Channel catfish	3.8		.57	
Bluegill	2.4			
Pecos (Red Bluff, Tex.)				
Gizzard shad	6.2		.80	
Do	4.2			
Channel catfish	1.8			
White bass	5.5			
Nueces (Mathis, Tex.)				
Smallmouth buffalo	19.0			
Channel catfish	4.0			
Do	4.1			
Do	2.1			

MONS 091329

PCB Residues Found in Fish and Location—Continued

River (location) and species	Lipid percent	PCB residues (microgram per gram) as Aroclor 1240	1254	1260
San Antonio (McFaddin, Tex.)				
Smallmouth buffalo	7.4		.10	
Do	8.5		.10	
Carp	3.5			
Channel catfish	5.3		.60	
Alabama (Chrysler, Ala.)				
Smallmouth buffalo	10.5		2.70	
Do	10.4		2.90	
Freshwater drum	5.7			0.60
Do	15.5		1.90	
Tombigbee (McIntosh, Ala.)				
Smallmouth buffalo	11.4			
Freshwater drum	19.8		2.30	
Apalachicola (Jim Woodruff Dam, Fla.):				
Channel catfish	6.1		.80	
Bluegill	5.2		.60	
Largemouth bass	7.1		1.30	
Do	3.8		.50	
Mississippi River				
Allegheny (Natrona, Pa.):				
Carp	6.4		10.50	
Do	5.7		9.60	
Bluegill	4.6	0.19	1.90	
Do	3.7		1.30	
Walleye	4.4		10.40	
Kanawha (Winfield, W. Va.):				
Carp	4.2		1.80	
Brown bullhead	6.5		1.30	
Black crappie	4.5		6.90	
Do	2.3		1.50	
Ohio (Marietta, Ohio):				
Carp	12.4		2.20	
Do	12.3		2.00	
Channel catfish	10.0		8.70	
Spotted bass	6.3		1.70	
Do	4.3		2.30	
Ohio (Cincinnati, Ohio):				
Carp	9.3		9.10	
White sucker	5.0		[1] 4.10	
Channel catfish	4.4		39.00	
Do	6.7		[1] 26.00	
Wabash (New Harmony, Ind.):				
Carp	4.9		5.10	
Do	5.1		4.50	
White sucker	2.4		.85	
Channel catfish	6.6		[1] 1.40	
Do	6.4		[1] 8.10	
Ohio (Metropolis, Ill.):				
Carp	4.3		[1] 2.50	
White sucker	1.3		1.30	
Do	1.9		1.20	
Channel catfish	7.0		2.20	
Cumberland (Clarksville, Ind.):				
Carp	4.3		4.50	
Do	2.7		5.80	
Do	6.0		3.50	
Bluegill	4.6		3.20	
Largemouth bass	2.4		.88	
Tennessee (Savannah, Tenn.):				
Carp	1.1		1.30	
Do	1.5		1.20	
Channel catfish	8.4		1.10	
Largemouth bass	8.1		.85	
Illinois (Beardstown, Ill.):				
Bigmouth buffalo	5.4		.90	
Black bullhead	3.7		1.10	
White crappie	3.5		4.70	
Wisconsin (Woodman, Wis.):				
Carp	9.2		.57	
Channel catfish	2.2		3.10	
Smallmouth bass	4.2		.23	
Do	4.1		2.50	
Do	4.1		2.40	

MONS 091330

PCB Residues Found in Fish and Location—Continued

River (location) and species	Lipid percent	PCB residues (microgram per gram) as Aroclor 1240	1254	1260
Mississippi River—Continued				
Mississippi (Lake City, Minn.):				
Carp	11.8	.....	7.60	.....
White sucker	6.0	.....	7.50	.....
Sauger	2.7	.....	14.00	.....
Do	10.2	.....	15.00	.....
Yellowstone (Sidney, Mont.):				
Goldeye	13.8	.....	.....	.....
Do	12.8	.....	.....	.....
Do	12.8	.....	.22	.....
Channel catfish	14.7	.....	.67	.....
Sauger	1.4	.....	3.00	.....
Missouri (Garrison, N. Dak.):				
Goldeye	13.4	.....	.....	.....
Do	10.3	.....	.....	.....
White sucker	1.2	.....	.....	.....
Walleye	5.8	.....	.....	.....
James (Olivet, S. Dak.):				
Goldeye	6.6	.....	.20	.....
Do	9.1	.....	6.30	.....
Carp	3.0	.....	.09	.....
Freshwater drum	5.8	.....	.....	.....
Channel catfish	5.0	.....	.33	.....
North Platte (Lake McConaughy, Nebr.):				
Carp	8.1	.....	1.36	.....
Do	7.6	.....	.98	.....
Do	8.3	.....	.40	.....
Channel catfish	7.3	.....	.51	.....
Walleye	6.2	.....	.08	.....
Platte (Louisville, Nebr.):				
Carp	5.8	.....	.20	.....
Do	5.2	.....	.21	.....
Channel catfish	2.6	.....	.26	.....
Miscellaneous	9.2	.....	2.20	.....
Do	8.5	.....	2.40	.....
Missouri (Nebraska City, Nebr.):				
Goldeye	10.4	.....	.....	[1] 1.30
Carp	5.8	.....	.....	.30
Do	6.7	.....	.....	.....
White sucker	1.1	.....	.....	.....
Kansas (Bonner Springs, Kans.):				
Carp	10.7	.....	.50	.....
Do	6.6	.64	.49	.....
Freshwater drum	6.9	.....	.64	.....
Channel catfish	10.0	.....	.55	.....
Missouri (Hermann, Mo.):				
Goldeye	10.4	.....	.....	[1] 1.30
Carp	5.8	.....	.....	.30
Do	6.7	.....	(1)	.....
White sucker	1.10	.....	.32	.....
Des Moines (Keosauqua, Iowa):				
Carp	8.3	.....	.50	.....
Do	9.7	.....	.80	.....
Channel catfish	7.1	.....	.90	.....
Walleye	4.0	.....	.20	.....
Mississippi (Guttenberg, Iowa):				
Carp	8.5	.....	1.50	.....
Bluegill	2.9	.....	1.10	.....
Do	3.3	.....	.60	.....
Largemouth bass	3.7	.....	1.20	.....
Mississippi (Cape Girardeau, Mo.):				
Carp	4.3	.....	2.30	.....
Do	3.2	.....	.....	2.50
White sucker	1.0	.....	1.20	.....
White (DeValls Bluff, Ark.):				
Smallmouth buffalo	7.0	.....	.....	.....
Do	7.8	.....	1.30	.....
Channel catfish	7.6	.....	.....	.....
Arkansas (Keystone Reservoir, Oklahoma):				
Carp	.7	.....	.....	.....
Do	.5	.....	.....	.....
Do	.8	.....	.....	.....
Bluegill	3.7	.....	.....	.....
Largemouth bass	.6	.....	.31	.....
Arkansas (Pine Bluff, Ark.):				
Carp	9.5	.....	1.20	.....

MONS 091331

PCB RESIDUES FOUND IN FISH AND LOCATION—Continued

River (location) and species	Lipid percent	PCB residues (microgram per gram) as Aroclor 1240	1254	1260
Mississippi (Memphis, Tenn.):				
Smallmouth buffalo	11.2			
Freshwater drum	6.2		2.90	
Do.	8.8		1.70	
Channel catfish	17.5		.85	
Yazoo (Redwood, Miss.):				
Carp	5.8			.30
Channel catfish	8.8		1.90	
Red (Alexandria, La.):				
Carp	7.4		.50	
Do.	8.7		.50	
Freshwater drum	6.8		.30	
Do.	7.1		.50	
Channel catfish	6.4		.40	
Pacific Coast				
Sacramento (Sacramento, Calif.):				
Carp	7.5		2.5	
Do.	7.0		2.6	
White catfish	5.2		1.3	
Largemouth bass	5.7		.56	
Do.	6.5		.81	
Klamath (Hornbrook, Calif.):				
Klamath sucker	5.9		.07	
Do.	6.3		.10	
Yellow perch	3.2			
Do.	3.1			
Largemouth bass	3.1		.80	
Willamette (Oregon City, Oreg.):				
Carp	6.0			.32
Largescale sucker	3.1		1.30	
Do.	8.1	4.5	2.70	
Northern squawfish	6.4		2.30	
Columbia (Bonneville, Oreg.):				
Carp	6.4		.18	
Largescale sucker	3.0			
Do.	7.5			
Northern squawfish	6.6		2.60	
Yakima (Granger, Wash.):				
Carp	4.9			.18
Do.	4.9			.14
Do.	5.1			.20
Largescale sucker	5.1			.18
Smallmouth bass	4.8			.19
Columbia (Pasco, Wash.):				
Carp	5.6			.20
Do.	5.2			.20
Largescale sucker	4.4		.21	
North squawfish	2.4			1.20
Columbia (Grand Coulee, Wash.):				
Bridgelip sucker	7.1		.18	
Northern squawfish	1.8			.28
Do.	1.9			.29
Walleye	3.8			.18
Do.	5.2			.43
Snake (Ice Harbor, Wash.):				
Bridgelip sucker	10.7			
Common sucker	4.3			
Do.	5.0			
Channel catfish	14.3		.45	
Snake (Lewiston, Idaho):				
Common sucker	8.4		*	
Do.	8.1			
Northern squawfish	4.7		1.10	
Black crappie	7.5		.27	
Salmon (Riggins, Idaho):				
Carp	3.1			
Common sucker	5.8			
Do.	5.6			
Smallmouth bass	2.1			
Snake (Hagerman, Idaho):				
Carp	8.8		.14	
Do.	6.7		.11	
Northern squawfish	3.3		3.30	
Rainbow trout	2.0		.53	

MONS 091332

PCB Residues Found in Fish and Location—Continued

River (location) and species	Lipid percent	PCB residues (microgram per gram) as Aroclor 1242	1254	1260
Interior				
Truckee (Fernley, Nev.):				
Common sucker	9.0		0.44	
Do.	9.6		.53	
Brown bullhead	2.3		.15	
Largemouth bass	6.9		.81	
Green (Vernal, Utah):				
Carp	4.4			
Flannelmouth sucker	7.5			
Do.	7.9			
Channel catfish	7.7			
Do.	3.6			
Colorado (Imperial Reservoir, Ariz.):				
Carp	5.8			
Bluegill	2.0			
Do.	2.5			
Largemouth bass	1.8			
Colorado (Lake Havasu, Ariz.):				
Carp	1.2			
Do.	3.6			
Do.	3.5			
Channel catfish	10.9		.24	
Largemouth bass	4.0			
Colorado (Lake Powell, Ariz.):				
Carp	2.5			
Rainbow trout	12.2			
Largemouth bass	6.4		.10	
Do.	7.2			
Hudson				
Red (Noyes, Minn.):				
Goldeye	11.6		1.00	
Do.	11.9		.95	
White sucker	6.1		.23	
Sauger	6.0		.92	
Do.	8.1		2.60	
Alaska				
Kenai (Soldotna, Ala.):				
Round whitefish	1.9			
Do.	3.8			
Rainbow trout	12.6			
Lake trout	9.5			
Hawaii				
Manoa (Honolulu, Hawaii):				
Tilapia	2.6			
Do.	2.7			
Chinese catfish	6.0		1.0	
Do.	2.6		.50	
Carbon limits	8.0			
Wahiawa (Waipahu, Hawaii):				
Tilapia	1.3			
Chinese catfish	5.6			
Do.	5.4		1.60	
Carbon limits	4.3			

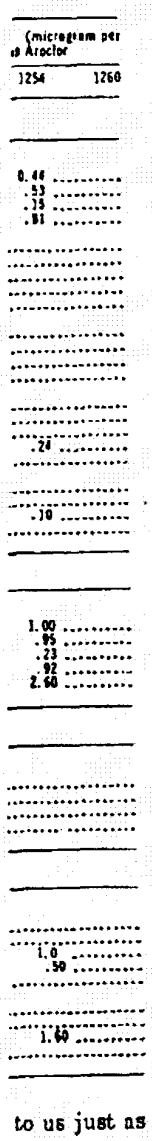
Mr. Leggett. Good. I would hope you would get that to us just as soon as you can.

Now, the voluntary restraints——

Mr. de la Garza. Mr. Chairman, may I interrupt?

Mr. Leggett. Yes.

MONS 091333



to us just as

Mr. DE LA GARZA. I have another question.

Mr. Reed, you stated residues had been found in fish samples. Now, you just answered the Chairman; would you add who did the sampling and where?

Mr. REED. These are samples from the Federal Pesticide Monitoring program, Mr. de la Garza, and they are also from other activities, both Federal and State and analyzed by laboratories, that have the equipment and the ability to make the analyses.

Mr. DE LA GARZA. Could you expand on your statement of fish samples by citing who, how, and when?

Mr. REED. Indeed, sir.

Mr. DE LA GARZA. Will you mention the details of the monitoring? wherein birds and fish are monitored on a year-to-year basis to description of the nationwide fish and wildlife monitoring program wherein birds and fish are monitored on a year-to-year basis to determine the environmental levels and trends of various toxic compounds. We will send you that immediately. (See reference 48).

Mr. DE LA GARZA. Thank you.

Thank you, Mr. Chairman.

Mr. LEGGETT. Have you made any recommendations with respect to the banning of this material?

Mr. REED. Yes, sir.

Mr. LEGGETT. And who have you made those recommendations to?

Mr. REED. To the administration and to the Administrator of the Environmental Protection Agency, and today, to the Congress.

Mr. LEGGETT. And when did you make those recommendations?

Mr. REED. I made the recommendation at the Chicago conference in November 1975.

Mr. LEGGETT. All right. And did EPA indicate they would consider your recommendation?

Mr. REED. I have been in close contact with the Administrator, Mr. Train, who will be testifying before you on the problems with the Water Pollution Control Act and the lack of clear definition of his authority to control PCB emissions, and of our intense interests in the passage of a strong Toxic Substance Act.

Mr. LEGGETT. Now, have you found that there are any PCB's in salt water?

Mr. REED. Yes, sir, in fish and in fish eating birds.

Mr. LEGGETT. And do those appear to be uniform around the country or are they concentrated?

Mr. REED. Sir, they are concentrated in fish and wildlife at the mouths of great rivers.

Mr. LEGGETT. From the mouth of the St. Lawrence?

Mr. REED. Yes, there are also other significant problems on the east coast, in the Hudson, and we note with increasing alarm as we monitor fish from the Chesapeake Bay. The two greatest breeding areas of the striped bass in the East are the Hudson River and the Chesapeake Bay, and both appear to have serious levels of PCB.

Mr. LEGGETT. What levels do you find at the mouth of the Sacramento River? So my adrenalin will run.

Mr. REED. I will have to ask Mr. Walker if he had anything with him for the Sacramento.

I would hate to shock the chairman so early in the hearing on the PCB debate.

While he is digging that up, I am sure he does—Mr. Walker is armed with all kinds of information.

Mr. LEGGETT. Mr. De la Garza, you are recognized.

Mr. DE LA GARZA. What about the quorum call?

[Discussion off the record.]

Mr. LEGGETT. Why do you not commence.

Mr. DE LA GARZA. All right, sir.

Mr. Reed, also you state that scientists have repeatedly demonstrated in laboratory and pen studies that PCB's affect the growth.

Do you have any information, what scientists where?

Mr. REED. Yes, sir. We will be able to cite the scientists and we will be able to give you the study. (See references 10, 12, 13, 19, 22, 28, 29, 33, 44, 49.)

Mr. DE LA GARZA. You also say "Our scientists state that this threshold concentration in the eggs would be equivalent to residual PCB levels in whole fish of 2.5 to 5 p/m."

Would that be the Interior scientists?

Mr. REED. Yes, sir; Fish and Wildlife Service scientists.

Mr. DE LA GARZA. Would you supply that also?

Mr. REED. Yes, sir; with pleasure.

(See references 31 and 49.)

Mr. DE LA GARZA. On page 3, also you state, "Another test demonstrated that fish may accumulate more than 40,000 times the concentration of PCB in the water."

May we have——

Mr. REED. The biomagnification figures are from the Fish Pesticide Research Laboratory.

We will be delighted to furnish those to the committee. See reference (31).

Mr. DE LA GARZA. I sure would appreciate that.

Mr. REED. They interested me, I must admit, and I had them checked just before lunch and the data has been recently updated, also the studies have been supported by studis conducted by EPA (53, 65, 66).

Mr. DE LA GARZA. Very good.

Would you make them available so that we might have the benefit of that information?

(See references 31, 37, 39, 49, 53, 65, 66.)

Mr. REED. Yes, sir.

Mr. DE LA GARZA. Also you state it appears highly probable that the primary cause for failure of PCB's to decline is that their sources have not been curtailed any significant degree.

Now, besides your statement in support of a ban, do you have a program or a plan as to how to—what would your ban be, or what would be your program, or how do you keep PCB's from getting into the waters of——

Mr. REED. I have got to turn that responsibility over to the Administrator of the EPA. That is a function it would seem to me of that Office and of that Agency of government.

Mr. De la Garza. Have you not looked into your input into such plan?

Mr. Reed. We have been involved with EPA in developing our comments on the toxic substance legislation, which is before the Congress, and I know that the Administrator will want to speak more ully about that, but we were preparing to send amendments to the Congres on Friday of this week.

Mr. De la Garza. All right, sir.

And then you made a statement that 9 out of 10 liveborn babies had unusually grayish, darkened skin, and most were born underweight.

Could we have the benefit of the source for that?

Mr. Reed. Yes, sir; these studies were reported by Dr. Keratsune (60, 62).

Mr. De la Garza. I do not know that darkened skin is necessarily bad.

Mr. Reed. No, nor do I sir. If it is artificially done, though, it is a cause of concern.

Mr. De la Garza. Now, can you tell me anything about what your Department has done here to find out what the big bird of the Rio Grande is?

Mr. Reed. I am not certain what bird you are referring to.

Mr. De la Garza. I am talking about the big bird you heard about on Harden and Weaver, 9 foot wing span, 14 feet high.

Mr. Reed. I have not run into him yet.

Mr. De la Garza. Thank you very much. We are always happy to have you here. I appreciate your cooperation in supplying for the record the requests that I have.

Thank you, Mr. Chairman.

Mr. Leggett. Very good. Thank you very much, Mr. De la Garza, for your questions.

Mr. Forsythe. I might state that the second bell has rung. We have got a lot of important witnesses here. I would just as soon proceed, and get as many questions as we can. I am sure the staff has questions.

Very good, proceed.

Mr. Forsythe. Mr. Reed, thank you for the usual good statement. It was very helpful. NOAA, EPA, and the Fish and Wildlife Service all have toxic substances research programs. How do you coordinate between the agencies and are we duplicating their work?

Mr. Reed. I do not think so. As a matter of fact we have a memorandum of agreement with EPA that addresses this specific subject. Under the Fish and Wildlife Coordination Act we have the primary responsibility for the welfare and well-being of fish and wildlife in the United States. We have ironed out most of our problems with the establishment of NOAA in 1970 in the transfer of functions to Commerce. Basically we have laboratories and staffs for monitoring and research activities. We exchange information with NMFS and EPA on environmental contaminants and have furnished expert witnesses, and scientists for committees and technical advice.

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With the establishment of the Environmental Protection Agency and the transfer of the Federal Water Pollution Control Administration and other agencies there may appear to be some duplication in laboratory testing, but our function primarily involves fish and wildlife and is a unique management responsibilty.

We have found that delberate duplication is desirable and necessary especially in the area of analytical methodology. Several important scientific developments have resulted from these deliberate duplications. As an example, in an effort to distinguish PCB from pesticides, our scientists developed reliable methods and specialized equipment that are used by EPA, FDA, USDA and other private and State laboratories. (For other examples, see references 24, 25, 26, 38, 40, 41, 43, 44, 47.)

[The following was submitted.]

U.S. ENVIRONMENTAL PROTECTION AGENCY.
Washington, D.C.

DR. RICHARD SCHOETTGER,
Fish Pesticide Research Laboratory,
Route One,
Columbia, Mo.

DEAR DR. SCHOETTGER: As you know Dr. Stalling prepared and presented a statement summarizing data from the National Pesticide Monitoring Program when he appeared as a rebuttal witness for EPA in the Heptachlor/Chlordane Suspension Hearing. His testimony was crucial to EPA's case in that it refuted testimony of Velsicol Corporation regarding the presence and proliferation of Heptachlor and Chlordane residues in fish, ratios of cis-chlordane to transnonachlor, and bioaccumulation ratios of chlordane in fish. The effectiveness of his statement and appearance is best illustrated by the failure of opposing counsel to contest Dr. Stalling's testimony in their brief.

The quality of Dr. Stalling's performance in the preparation of his statement and on the stand as well as the quality of work of the Fish Pesticide Research Laboratory has been well demonstrated in the Heptachlor/Chlordane suspension proceeding. We are currently engaged in preparations for additional potential cancellation and/or suspension proceedings which would benefit greatly from similar contributions from your laboratory and personnel. Specifically, it appears that the monitoring program included analysis for residues of toxaphene and lindane- BHC. Both compounds are currently under review by EPA. We would appreciate the opportunity initially, to consult with, and if necessary to request statements from your staff regarding studies and monitoring data on these compounds. I trust that our future cooperation in these matters will be as beneficial to the environmental as was achieved in the Heptachlor/Chlordane suspension proceeding.

Sincerely yours,

KEVIN LEE.

U.S. DEPARTMENT OF THE INTERIOR.
FISH AND WILDLIFE SERVICE.
FISH-PESTICIDE RESEARCH LABORATORY.
Columbia, Mo., January 19, 1976.

Mr. KEVIN LEE,
Office of General Counsel,
U.S. Environmental Protection Agency,
Washington, D.C.

DEAR MR. LEE: I want to thank you for your letter concerning Dr. Stalling's testimony during the recent heptachlor/chlordane suspension hearings. I am pleased that his testimony, and results of our research and the monitoring program were pertinent to the proceedings. Naturally, we think highly of our total program here at Columbia, so your acknowledgement is most welcome.

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If we have data pertinent to your needs in the future, we would be happy to share it with you.

Again, thanks for the acknowledgement.

Sincerely yours,

RICHARD A. SCHOETTGER, PH.D.,
Director.

Mr. FORSYTHE. You are satisfied that you do have the responsibility and it is not being bled away?

Mr. REED. Mr. Forsythe, I am satisfied that the clear understanding that I got when I came before this committee in 1971, which was to make the Fish and Wildlife Service responsive to the country and to the Congress as the primary fish and wildlife agency, is being met with a new Director with a very, very topflight group of young men whom we brought to Washington, the best regional directors I could find. With the amount of time and effort we put on it we hope you will see a great transformation in that agency if we keep up with the funding level.

I think we have a winner.

Mr. FORSYTHE. Good.

So far as monitoring, again we are in a multiagency area, are your monitoring programs coordinated so you are sure you are getting maximum effectiveness.

Mr. REED. Mr. Walker is chairman of an interagency coordinating committee that has responsibilities for testing and monitoring pesticides and organochlorines throughout the entire environment. He assures me that type of coordination and communication has really been uplifted enormously in the last 2 years.

Mr. FORSYTHE. Good. I think that is all I have.

Mr. REED. Mr. Chairman, the Sacramento is not as bad off as many other rivers are. The PCB levels in composite samples of three species were: 2.5 and 2.6 parts per million for carp; 1.3 parts per million for white catfish; and 0.56 and 0.81 parts per million for large mouth bass.

These are 1974 samples, but you would lose only one of those species, if the Canadian recommendation limit of 2.7 parts per million were applied.

I want to work to keep the Sacramento River clear of pollutants because of the tremendous interest in that anadromous fish run you all have out there.

Mr. LEGGETT. Now, have you established a correlation between the utilization of these PCB's and the levels you find in adjacent waters?

Do you understand the question?

Mr. REED. No, sir.

Mr. LEGGETT. The question is you use these PCB's apparently in insulative fluids, plasticides, lubricants, carbonless paper, duplicating paper, et cetera.

Now, I do not recall whether I have gotten any of those kinds of facilities in the Central Valley of California which might relate to the fact that some of these levels might be low.

Now, in the Great Lakes region, do you have manufacturing plants that are using these substances in the proximity?

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Mr. REED. We obviously have, because we are picking them up in areas associated with sewage and in industrial wastes. But more importantly, up until the voluntary ban went in in 1972, a great deal of Americana was made partly out of PCB's and that is still out there in the dump or still out there in use.

On top of that, since——

Mr. LEGGETT. What is it?

Mr. REED. Since 1970.

Mr. LEGGETT. What are plasticizers?

I am trying to figure out where does this stuff get into the environment? I do not recall.

Mr. REED. Good question.

Mr. LEGGETT. I do not recall reading, seeing any carbonless duplicating paper.

Mr. REED. Oh, yes, sir, there was a great deal of carbon duplicating paper, up until 1972, and it was——

Mr. LEGGETT. Now, you mean like Xerox paper, stuff like that?

Mr. REED. Exactly.

Mr. Walker will amplify, but it is a very good question, Mr. Chairman.

Mr. LEGGETT. Xerox machines are likely to be contaminated like people with black lung?

Mr. REED. No, if you were not ingesting that paper, which I do not think you were, Mr. Chairman.

Mr. WALKER. Mr. Chairman, I feel that perhaps EPA expertise in this area would be most appropriate to bring to bear on that question when you have that opportunity. However, as we have conducted our own studies and interrogated many of our associates and friends who know more about it than we do, there are certainly instances where we can find high PCB concentrations associated with industrialized areas. Not only in fish but in starlings and in other wildlife.

Also many of our colleagues in the States have been following this problem and have tried to identify the sources of PCB associated with our waterways and fish and wildlife populations. This has been an exceedingly difficult matter. And as mentioned before, Stan Kleinert (58), in Wisconsin, presented some very good information on sources of PCB. But their information is very bothersome inasmuch as they found from 0.17 to 0.27 parts per billion in snow-melt water from Racine, Kenosha, Madison, and Milwaukee. These levels indicate that fallout of PCB's is a major atmospheric pollution problem. And this, of course, would lead to some difficulty in finding some specific sources.

Mr. LEGGETT. Thank you.

Mr. Ruppe.

Mr. RUPPE. Thank you, Mr. Chairman.

I want to thank you, first of all, for bringing this matter before the subcomittee, because I would say to a very great degree in the Great Lakes area, the PCB problem has probably the potential of being the most devastating to all sports fishery and commercial fishery since the introduction of lamprey eels.

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I am very happy that this subcomittee is taking up the issue at the present time.

Mr. Secretary, at this moment does the Government have authority to ban PCB?

Mr. REED. The Department of the Interior or the Assistant Secretary of Fish and Wildlife does not have this authority.

Mr. RUPPE. Does anyone in the Government have that authority?

Mr. REED. It would appear that a close reading of the Water Pollution Control Act does not give the Administrator of EPA that authority.

Mr. RUPPE. So therefore at this time he could really not ban, in your opinion, PCB's?

Mr. REED. Not without a toxic substance bill.

Mr. RUPPE. Yet you would say at this moment—or would you say at this moment any level of PCB's are harmful?

Mr. REED. I would say any level of PCB is potentially harmful and that we should accelerate our efforts in ending the use of PCB's in the United States of America.

Mr. RUPPE. I am very interested in your testimony on page 4 and would like to know whether you recommend that the FDA lower the permissible level at the present time?

You state that, "If FDA lowers the current permissible level, virtually all species would be unmarketable and the Great Lakes commercial fishery would be dead," in your opinion.

Does that mean that you do favor the FDA lowering the current permissible level, or you are concerned if it does lower it, then the fishing industry, commercial and sports fishery, would suffer accordingly?

Mr. REED. I am fearful the lowering would cause the repercussions.

I am not an expert on FDA regulations and am unable to comment on the effectiveness of Canada's reduction to 2 compared to our 5 parts per million, except FDA is thinking very hard about it right now.

Mr. RUPPE. Are you not kind of on the horns of a dilemma? You indicated all levels of PCB's are bad in your opinion, and I presume should be banned, or substance, utilization of any substance with PCB should be banned. And yet you do indicate that if we were to carry out what I feel is your suggestion, you fear for the commercial and sports fishing industry.

I have to say then which do you put first, the suggestion you make for banning consumption of any product with PCB or perhaps the maintenance of a sports and comercial fishery industry with some level of PCB tolerated?

Mr. REED. The two go together, Mr. Ruppe. The sooner we ban, the sooner we get a reduction in total PCB's in the environment, the faster we will see a rebirth of the commercial and sports fishing interests around the lake.

At the moment, at 5 parts per million or less, one has to be conscious of how much fish one is going to eat out of the Great Lakes.

Mr. RUPPE. Would you recommend that the FDA lower the current——

Mr. REED. I am not competent to make that recomendation.

Mr. RUPPE. I see.

Is your agency or any other agency in Government doing anything in the way of research to find out if there is a possibility of neutralizing PCB's in the environment or perhaps neutralizing PCB's that may turn up not only in your fish and wildlife, but in humans as well?

Mr. REED. Yes, sir. We have done a great deal of head scratching on this point and at the moment we only know one thing, and that is to harvest the fish as rapidly as possible at the top of the food chain.

But what do you do with the fish you capture? Because what you capture at the top of the food chain is the most contaminated with PCB's.

Mr. RUPPE. I presume that there is—this perhaps is a little out of your level of expertise or authority, I presume as a result of people being in contact with this type of discharge or contaminated because of consuming contaminated fish and so forth, there are people with a fairly high parts per million count PCB's in their system. Would that be correct?

Mr. REED. Yes, sir, that is correct.

Mr. RUPPE. Is there any indication that you know of at what level PCB's in the system can be harmful?

Mr. REED. No, sir, I am not competent to answer that.

Mr. RUPPE. Would you recomend that we undertake research in two areas to determine at what levels PCB content would be harmful and injurious to humans and, second, would you not consider it advisable to conduct research to determine how to flush out literally PCB out of the individual human system?

Mr. REED. Yes, sir.

Mr. RUPPE. We have not made any effort in your mind, frankly, to the best of your opinion, in that direction?

Mr. REED. No, sir. I am unaware of any work on that.

I imagine that PCB's have shown up in the nationwide cadaver testing program that was initiated a few year sago when there was ongoing research as to the levels of various chemicals in human beings (67).

However, those figures are very, very difficult to obtain. Having attempted to obtain them while in office in the State of Florida, I know how extremely difficult it is to get those figures, but they certainly would make interesting reading on PCB's.

Mr. RUPPE. The reason I bring that up, I have done some work on PBB's and there is really no knowledge today on the part of FDA, although I suspect they sought that knowledge, but there is no current knowledge as to at what level a parts per million individual, PBB's——

Mr. LAGOMARSINO. If the gentleman will use initials, explain.

Mr. RUPPE. Polybrominated biphenyls.

I appreciate your asking and I feel very fortunate that I can respond.

[Laughter.]

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Anyway, there has been some real problems with PBB's in Michigan.

FDA does not know at what level—although at three parts per million, animals will wither away and die.

They also do not know, you bring up the point how to get or flush out, if you will, the PBB's out of the individual system, human system. I presume the same problem will occur in the case of PCB's; if they are not biodegradable, there is really no way of knowing if they will be flushed out of the human system and at what rate. So I think we need a lot of action.

I am very sympathetic with your fish and wildlife. I even get more concerned about individuals who have consumed PCB's or PBB's, have the PCB's in their system, and may be literally sitting on a keg of dynamite because you do not know at what level they are injurious to the individual. We do not know if they are injurious, what we can do to actually flush them out of the system or remove them from the system.

Mr. REED. Mr. Ruppe, we do not know a lot of things, but we are getting there quickly, all too quickly.

Two years in a row the Great Lakes Commission has puzzled over the loss of lake trout egg plants on offshore reefs in Lake Michigan. We have our suspicions why those eggs did not hatch; PCB is a concern to our scientists.

Mr. RUPPE. I appreciate your interest and your knowledge and simply want to say that while you are doing a lot of work on fish and wildlife research, I hope somebody else is doing a lot of work studying and thinking about the human side of the situation.

Thank you, Mr. Chairman.

Mr. LEGGETT. Thank you very much, Mr. Ruppe, it is very helpful.

Let me ask this, your scientists have not detected any PCB's in wildlife besides fish?

Mr. REED. Yes, sir.

Mr. LEGGETT. Have they detected PCB level in wildlife and is that correlated with the levels for the areas in which we find the high PCB levels in fish?

Mr. REED. Yes, sir, I am going to ask Mr. Walker to go very briefly over the Nation pesticide monitoring program. It is in some papers we sent up to you, but I would like him to summarize those in 2 or 3 minutes.

Mr. WALKER. I believe the committee has copies of the paper I presented to the Chicago Conference on Polychlorinated Biphenyls, (48) concerning the monitoring program. There I itemized, in table 5, the occurrence of PCB's in Mallard duck populations, by flyway, and by ambient concentrations. The same kind of information was made available to you on starlings, a bird species we have selected to monitor nationwide trends of PCB contamination [Table 6].

Mr. LEGGETT. How about coyotes?

Mr. REED. I have not done the coyote yet, Mr. Chairman. I suspect the levels are low though, because the coyote seems to be doing very well.

Mr. LEGGETT. It seems to me they are doing very well. It does not really affect their reproduction.

Mr. REED. Unfortunately, that would be the answer to all our problems, Mr. Leggett, if we could somehow selectively dose them. I think the Wyoming wool growers and you and I ought to get together on that one.

[Laughter.]

Mr. LEGGETT. Do we have any studies done on domestic animals that you know of, Doctor?

Mr. WALKER. There is quite an extensive body of information on both laboratory and domestic animals, chickens; in particular much of this information dates back into the 1930's. In another paper, which I presented at the national conference (49), I cite a great deal of work that was done prior to 1972, on both domestic livestock and laboratory animals. And, as a matter of fact, if you were to compare the effects, side by side, from fish to mallards to chickens, to rabbits, to monkeys, to rats, to mink many of the same types of pathology, the consequence of exposure, have definite correlation. (44, 49).

Mr. LEGGETT. And now can you present to the committee all of these working papers, Mr. Secretary?

Mr. REED. Yes sir, with great pleasure.

(See references 44, 48, 49, 52.)

Mr. LEGGETT. It is an extremely serious matter that you are presenting to the committee, and we are going to have to, in light of your strong stand which I do not take lightly, we are going to clearly evaluate technologically all of the material that your people have come up with, and hopefully we can get an office of technological assessment review of this, short of 6 months or a year, and I think it is something that we ought to have a thorough and effective comprehensive analysis of.

Mr. REED. I agree with you. When I came back from Chicago, discouraged as I was, I wrote a note to the head of the National Academy of Science and urged him to get deeply involved and to be responsive to the Congress. I knew that you were going to be deeply concerned, and I got a fine letter back from him saying they are applying their resources to this problem in order to be able to give you the kind of backup you need.

I have talked to the Secretary and called upon experts beyond the Fish and Wildlife Service to look over my shoulder, and over the shoulder of the Fish and Wildlife Service, to see if we had gone off into troubled waters. He came to the conclusion, after having the best scientific review, that we were on sound grounds and that we have a national problem of the greatest possible consequence to all of us.

Mr. LEGGETT. And just one final question before I let Mr. Studds ask questions. Do you find a correlation, Doctor, between the levels of PCB's you find in water and the fish you find in the same waters?

Mr. WALKER. We recognize that there are two routes of entry into fish: either through the diet or by contact with the water. We have shown PCB biomagnification and bioaccumulation definitely from the water and the diet. These are direct correlations: the magnitude exceeds 100,000 times the water concentration or 50,000 times the dietary level.

In case of fish, the rate of bioaccumulation appears to be related to its residence time in the contaminated water; its lipidor fat content; its position in the food chain and its association with the bottom sediment. Hence, carp are fat, long-lived, live close to the bottom, eat penthic organism, and have the highest residues.

In the case of bottom feeding fish in the Hudson River, we found an average residue in our 1974 sampling year, of 75 parts per million.

Mr. LEGGETT. Pretty good.

Mr. Studds.

Mr. STUDDS. Thank you, Mr. Chairman.

It has been such a good day so far, I should have known something like this was coming. It takes your breath away—it is sobering testimony.

I have to ask you, first of all, about a sparrow on Normans Land Island—I assume he is all right?

Mr. REED. We are determined to keep your sparrow in good order, just short of passing that bill.

[Laughter.]

Mr. STUDDS. Are we going to confine ourselves to bombing and strafing——

Mr. REED. Through a cooperative agreement we have some, but not complete control over the island.

I have not written a letter asking for that yet, but if you will remind me again——

Mr. STUDDS. I do every year at this time.

May I pursue a little bit the question of the sources of PCB's. As I understand it, laying aside for the moment the question of ongoing current industrial discharges, we suspect there is a significant amount already in the environment in a variety of ways; is that correct?

Mr. REED. That is correct.

Mr. STUDDS. Do we have any way of estimating roughly what percentage is already there as opposed to what we may be adding on a monthly or annual basis?

Mr. WALKER. Sir, I cannot answer that. My impression from consultation with others is that EPA may be in a better position to answer this question.

Mr. STUDDS. Could you elaborate a little bit, Mr. Secretary, on the nature of the sources of that which we already know to be in the environment? I know you mentioned things like solid landfills and others.

Mr. REED. This is the one that troubles us the most, Mr. Studds, where in the devil are these tons and tons of PCB coming from?

Since the Chicago conference, the EPA has sent out to their field representatives the strongest orders to try to come to terms with this question. I would be very interested to see what their testimony produces in this. But it is coming from a vast variety of sources.

It was a wonderful chemical or appeared to be, and it was involved in every kind of Americana. And it is in our dumps, it is in our cars, it is in our transformers and capacitors, and it is in our heat exchangers—it is everywhere.

Mr. STUDDS. For how many years has it been in widespread use?

Mr. REED. Since the late twenties. It became America's favorite and it accelerated in use on an annual basis—1930's, 1940's, reached a high in the 1950's and 1960's. We have got that terrible itchy feeling on the back of our neck which says it is going to be around for a long time.

Mr. STUDDS. So we were using something half a century, approximating half a century, before we knew with what harmful effects we have been depositing it in vast quantities.

Mr. REED. That is correct.

Mr. STUDDS. What effects are we going to have, if any, by prohibiting further discharges from this day on?

Mr. REED. I can only look to mercury and DDT, by saying we never know——

Mr. STUDDS. I understand.

Mr. REED [continuing]. Unless we call a halt, and then, thank God, we have seen in spite of our projections of long persistance or half life, that the DDT residues have gone to the bottom and are becoming increasingly fixed or degraded and they are being removed from the chain of life, and the only hope that I hold is that we can get over this great hump of PCB's in the environment.

Mr. STUDDS. All right, certainly. Some people have suggested it is inaccurate to simply use the generic term PCB. one must distinguish between various kinds of materials, all of which may qualify for the general categorization. Most particularly people have made reference to Aroclor 1016 as a product used in the production of small capacitors as more readily biodegradable than many other PCB's.

Is it possible to make distinctions between various kinds of PCB's?

Mr. REED. Let me ask Mr. Walker to answer that, sir.

Mr. WALKER. I would say most definitely, yes. It was well presented at the conference in Chicago, that PCB is certainly, if you want to use it in a singular form, a misnomer. Actually it is a mixture of chlorinated biphenyls, 209 isomers in all.

These mixtures, or isomers, are represented by various percentages in different formulations.

Certainly in our experience from a toxicological viewpoint, the PCB isomers with higher chlorine content are less acutely toxic to fish. On the other hand there are more toxic to many kinds of birds and mammals. The PCB formulations with the lower percentages of chlorine contain less chlorinated biphenyls and slightly more biogradable. They are nonetheless still quite serious in their toxicological implications. As I suggested in the paper (49) even very low concentrations, of the more biodegradable formulations have a very profound toxicological significance insofar as different forms of life are concerned.

Mr. STUDDS. So biodegradability is not necessarily a measure of toxicity in your opinion?

Mr. WALKER. Biodegradability can be an advantage; however we must keep in mind that it is only in comparative terms. PCB's in general are highly persistent and biodegradability in those terms is only slight in comparison to what we would call biodegradable

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pesticides. So toxicity, yes, biocumulations yes. If materal is accumulated, and deposited in fat, it may not harm the animal until those fat reserves are mobilized.

Mr. REED. Good point.

Mr. WALKER. Such as in a spawning run, starvation, disease or migration.

Mr. REED. Whenever you get into stress conditions this is where adverse effects show up. For example, in toxication DDT shows up. When the residues are mobilized and transported to the brain and vital organs.

It does not show up in us well-fed human beings very often; it depends on if we are on a crash diet. We very rarely call upon fat reserves.

If a bird is unable to feed for 3, 4, 5 days, bad weather, a pelican unable to get at a mullet—Paul Rogers is here and has got lots of pelicans as friendly constituents.

I watched a pelican this year unable to feed for 3 or 4 days during a heavy wind storm, during the Christmas holidays in Florida. That is when a wild animal calls upon fat reserves.

Women call upon fat reserves during pregnancy, but men do not call upon them frequently.

We should be aware that wildlife feed heavily at times when food is readily available and lay down fat stores in their bodies. At times of food scarcity and during periods of stress, they live off that body fat. That is when they are in trouble.

Mr. STUDDS. Thank you.

Mr. LEGGETT. Very good. Thank you very much. That is very helpful.

Mr. Lent.

Mr. LENT. Thank you, Mr. Chairman.

The New York Environmental Commissioner Ogden Reid has banned striped bass in the Hudson River because of the PCB contamination.

It is my understanding that striped bass from the Hudson and the Chesapeake Bay migrate in a northeasterly direction.

Now, the striped bass are important gamefish off the Coast of Long Island, which I represent, and although the latest information I have is that these striped bass have not been contaminated, do not indicate they are contaminated, my question is will the influx of PCB contaminated bass from the Hudson or the Chesapeake necessitate the reduction of striped bass harvesting off Long Island?

Mr. REED. Mr. Lent, that is the damnable position we are in. If there is a change made in the FDA limitation, which is for reasons of health, we may have problems with fish coming out of the Hudson.

We have samples right now of striped bass well in excess of 5 parts per million. I am sure Commissioner Reid will give you a broadscale look at the Hudson River situation. He is extremely worried and with good reason.

This has apparently been going on for years and was not picked up until Commissioner Reid came into office and was able to obtain this information from his staff.

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I would hope that this committee might hear from the distinguished Commissioner from New York State who has done so much to highlight the real problems of PCB's and our fishery resources, for you and your constituents, not only for your sport fishermen, but for the striped bass in the New York market. It is one of the highest valued fish on the market.

Mr. LENT. Thank you.

Mr. LEGGETT. Thank you, Mr. Lent.

Mr. Oberstar.

Mr. OBERSTAR. Thank you very much, Mr. Chairman.

I would like to inquire of the Chair whether the FDA will be called to testify?

Mr. LEGGETT. We are going to have everybody in Washington here, I am sure.

[Laughter.]

Mr. OBERSTAR. I just wanted to be sure we would have them here.

Yours is a very enlightening and straightforward presentation, Mr. Secretary, for which we thank you and recognize the very considerable effort you have made.

There are a number of areas I would like to look into. First of all, the impact of PCB's on the recycling industry. We have made a great effort in recent years to encourage recycling as a means of conservation, recycling of all kinds of materials, including paper, in which PCB's show up.

There is also the question here, and I would like to know to what extent you have looked into it: the migration of PCB's from waste paper recycled into paperboard, which is used for cereal boxes—the FDA alleged at one time that PCB's migrate into the cereal in those boxes.

Mr. REED. Mr. Oberstar, let me answer that question very directly; that is the responsibility of the Environmental Protection Agency. We have been very much involved in all areas of conservation in the last 5 years, including supporting recycling efforts in this country. But I would rather have Administrator Train address himself to that, because he is up to date on that specifically.

Mr. OBERSTAR. Do you have information about the levels of PCB in Lake Superior in contrast to Lake Michigan, which you cite as flushing rate of 50 years, Lake Superior has a flushing rate of 500 years?

Mr. REED. Yes, we have. We can give you that.

Mr. OBERSTAR. Are you working closely with the National Water Quality Laboratory, Duluth?

Mr. REED. Yes, sir.

Mr. OBERSTAR. They have done extensive work under the leadership of Don Mount, director of the lab?

Mr. REED. Yes, sir.

We have worked very closely with them and continue to work very closely with them, and the Great Lakes Fishery Committee is working closer and closer with them also.

Mr. OBERSTAR. What levels of PCB have you found and in what species of fish in Lake Superior?

Mr. REED. Give us a moment and we will give you those figures.

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Mr. LEGGETT. This is Lake Superior we are getting now?

Mr. OBERSTAR. Yes.

Mr. REED. This is on Superior.

Lake Superior, I have whitefish, lake trout——

Mr. LEGGETT. If you do not have that handy, you can provide that for our records.

Mr. REED. Yes, it would probably be easier.

Mr. WALKER. There is information on lake trout, lake whitefish, bloater, yellow perch, from the National Pesticide Monitoring Program Reference (48).

Mr. LEGGETT. Keep your voice up if you will.

Mr. WALKER. Wayne Wilfred, a biochemists from our Biological Laboratory in Ann Arbor, Mich., presented a paper at the Chicago conference that will be made available to the committee. Reference (52).

Mr. OBERSTAR. The main problem, though, from your research is Lake Michigan, which has the highest levels of PCB?

Mr. REED. Yes. Lake Michigan has the highest level.

Mr. OBERSTAR. And do you have information on the persistence of the PCB's in the food chain or is that something that EPA or FDA will present to us?

Mr. REED. Go ahead and take a crack at it.

Mr. WALKER. We have conducted a number of food chain studies, and we have conducted field surveys. A very recent one that might interest you was on the Mississippi River that involved Lake Pepin.

Mr. REED. Yes.

Mr. WALKER. We investigated the mayfly, an important fish food organism, and found that the PCB concentration in adult mayflys was directly correlated with the down river proximity to Lake Pepin. This is an important resting area for migrating canvasback ducks.

Mr. OBERSTAR. Yes.

Mr. LEGGETT. Mr. Oberstar, your time has expired.

I announce at this time it is necessary for us to vote on the conference report on S. 2174, the Railroad Reform Act, and I intend to come right back and I will recognize anybody who is here when I come back with questions. So it is going to be a race. And if nobody is here, we are going to be done with this witness, so—yes.

Mr. EMERY. Mr. Charman, since I will not be able to return after this vote, I would like to request permission to offer some questions in writing.

Mr. LEGGETT. Certainly; anybody who would want to offer questions in writing may do so and submit them and those answers will be incorporated in the report.

We will stand in recess until we get back.

[Whereupon, a short recess was taken.]

Mr. LEGGETT. The meeting of the subcommittee will resume.

Members who have not previously been recognized will be recognized for questions at this point.

Apparently, there are no members who have returned at this point. who have not asked questions and therefore I want to thank you very much. Mr. Secretary, for your testimony today.

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Undoubtedly, we will be recalling you on this subject matter. I would appreciate again your presenting to the committee all of your internal working documents that you do not consider beside the point, but particularly which are probative on this issue.

We are going to go over them with a fine-tooth comb and we hope mutually the results will be satisfactory to all parties concerned.

Mr. REED. We will give you anything we have and any person in the field working on this problem will be available to you and your staff.

Mr. LEGGETT. If you have any conflict, I would appreciate your servicing that conflict.

Mr. REED. If there is conflict I can honestly tell you that I will look into it and I can state that the service stands behind my statement today.

Mr. LEGGETT. Thank you very much.

At this point we are very privileged to have the distinguished Administrator of the Environmental Protection Agency, Mr. Russell Train, with us, and I want to welcome you, Mr. Train before the committee.

We have your statement which is of some volume, and I believe you have some charts.

We would like to include your statement as though you read it completely, and you can feel free to speak anyway you care to and if you wish to read it, you may do so.

STATEMENT OF HON. RUSSELL TRAIN, ADMINISTRATOR, ENVIRONMENTAL PROTECTION AGENCY; ACCOMPANIED BY DR. ANDREW BRIEDENBACH

Mr. TRAIN. Good afternoon, Mr. Chairman, and members of the subcommittee.

I am appearing today to discuss the problem created by the widespread presence of polychlorinated biphenyls, or PCB's, in the environment, and actions which the Environmental Protection Agency is taking to reduce or eliminate those problems.

Let me inject one general statement at this point, Mr. Chairman.

So far as I am concerned, there is absolutely no disagreement whatsoever that PVB's should be eliminated, all uses should be gotten rid of just as rapidly as we can.

This is not a matter really of debate, so far as I am concerned.

I think there are substantial problems as to just how we go about doing that, how we achieve that kind of goal.

Insofar as the goal is concerned, and our overall national policy, I do not think there should be any question about that whatsoever.

Mr. LEGGETT. To amplify your agreement, do you agree with all of these things that were stated by the previous witness and his supporting witness, so far as you are knowledgeable?

Are you knowledgeable of any disagreements?

Mr. TRAIN. I am not aware of any disagreements, though it is dangerous to say you agree with everything somebody else has said.

Mr. LEGGETT. I presume you heard everything he said.

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Mr. TRAIN. I did not get here until after he had started his statement.

So far as I know, I am in agreement with what he has said.

We all had a crack at each other's testimony in advance, as part of the OMB's clearance process.

You can be sure whatever was said represents the administration's position.

Mr. LEGGETT. I understand.

Mr. TRAIN. And the objective of banning all usage of PCB's is what I called for some while before publicly in a press conference in December and the statement coincides with that policy, and I think I probably will read a fair amount of this statement today, Mr. Chairman.

Mr. LEGGETT. Now, that statement you referred to that you announced about Christmas time, that probably reached the Chicago Conference, is that correct?

Mr. TRAIN. That is correct.

I followed an analysis we made of the testimony at the Chicago Conference.

Mr. LEGGETT. Now, do you feel you would need legislation to ban PCB utilization?

Mr. TRAIN. Absolutely.

There is no question about that. There is absolutely no authority whatsoever for any general ban on uses of PCB or any other chemical other than through pesticide legislation.

Mr. LEGGETT. You have not prepared a bill as yet, inhouse?

Mr. TRAIN. Mr. Chairman, we submitted the administration's Toxic Substances Control Act in February 1971, which was written in my office, and I was then chairman of the Council on Environmental Quality.

That bill and in all of the various forms in which it has since been considered would so far as I am aware, in each case, provide ample authority for dealing with the PCB problem.

That bill passed the Senate once as you may know, and passed the House in different Congresses.

It passed both Houses in one Congress and then spent 9 months in conference where it died.

It is now being considered in the Senate Commerce Committee and the House Interstate and Foreign Commerce Committee, and we are exceedingly hopeful that the Congress will act on that legislation in this session.

That really is the appropriate legislative mechanism in my view for dealing with this problem.

Mr. Chairman, I think it would be a mistake to legislate just on PCB because before you are through legislating on PCB's we will have another chemical problem.

I think it much better to deal with this generically, as a class of problems, and utilize the toxic substances legislation to fill the gaps between pesticides authority, Food and Drug Administration authority, and OSHA and all the various bits and pieces of regulatory authority which exists at the present time.

Mr. LEGGETT. But considering the fact that we apparently have a stalemate, what is your comment?

Mr. TRAIN. No. I would not say there is any stalemate, but I am hopeful that there will be more forward motion, perhaps.

I do not think there is necessarily a stalemate, Mr. Chairman.

Mr. LEGGETT. Have you presented testimony that you are about to give to me to the committee, and I suspect that would be what, the Interstate and Foreign Commerce Committee?

Mr. TRAIN. Interstate and Foreign Commerce, yes, sir.

Mr. LEGGETT. Have you presented this testimony to them?

Mr. TRAIN. EPA has testified on toxic substances before that subcommittee.

Mr. LEGGETT. How about the PCB's?

Mr. TRAIN. Not the House committee.

I testified on the Senate side.

PCB's have been referred to in that testimony, going back, I think, to 1071.

We have always considered PCB's as sort of a prime example of the need for toxic substances legislation, going back to the early 1970's.

I believe I am correct in saying that and I believe you will find references to PCB's in substantially all of the testimony which we have submitted to committee on toxic substances over the years.

Mr. OTTINGER. Would the gentleman yield with respect to that?

Mr. LEGGETT. Yes.

Mr. OTTINGER. I am very disturbed that EPA has taken that posture.

I think that it has been used as an excuse not to act.

Mr. TRAIN. I am not putting it forward as an excuse, Mr. Ottinger.

Mr. OTTINGER. Why was action not taken under the Refuse Act of 1890 when it was in effect and presently under section 504 of the Water Pollution Control Act which seems to give you clear authority to go to court to get an injunction to stop action which threatens health with respect to matters which are polluting the waters.

Mr. TRAIN. We are proceeding and all of this is in my testimony and we will get to it.

We are proceeding under the permit program to set a zero discharge limit for PCB's in every possible manufacturing case where we can do that.

Let me point out, however, that it is our best estimate that approximately 10,000 pounds of PCB's are entering the environment annually in the United States through what we might call direct discharges of that sort.

Some 35 million pounds a year are being manufactured, produced, and utilized every year in the United States and we would estimate roughly, although this is hard to get a handle on, that something like 10 million pounds are probably lost to the environment every year.

Of those 10 million pounds, some 9,900,000 pounds are not involved in the kinds of discharges which can be dealt with under the Federal Water Pollution Control Act.

That is not to excuse any lack of aggressiveness in dealing with those 10,000 pounds, but I think the committee should be aware that no matter what utilization we make of the Federal Water Pollution Act authority you are not dealing successfully with the total problem.

Mr. LEGGETT. Very good.

It might be well if you proceed with your case in chief, Mr. Train, and then we can proceed to examine you.

Mr. TRAIN. I think I will probably be touching on most of the points and we can explore them further in questions.

PCB's are a significant hazard to human health and the environment. Laboratory tests show they cause reproductive failures, gastric disorders, skin lesions, and tumors in mammals. Their destructive effects on fish and wildlife are well documented.

However, the PCB problem is but one dimension of a much larger picture of environmental degradation by toxic chemicals. The picture is a dismaying one, as the numbers of different chemicals, amounts manufactured, the uses, and the accumulation in the environment each increase. Incidents of adverse effects on health or the environment have in recent years brought home to us that our ever-increasing use of toxic chemicals poses an ever larger and more hazardous threat to the environment.

Further, the history of governmental response to these incidents reveals that, while our authority to act and ability to develop some form of remedies have both improved, we are still fighting a rearguard action, all too often in a position only to cure and not prevent. While one problem is being solved others are suddenly exploding, or incubating unknown to those who will have to deal with the unhappy results. In the meantime, those other factors—increased numbers, amounts, uses, and accumulation of chemicals—mean the environmental burden grows heavier and heavier.

Let me recall for you some of the warning signs of recent years.

Hexachlorobenzene is a chemical produced as a byproduct during the manufacture of several other chemicals. Relatively small amounts have been used as a seed dressing. EPA's concern was triggered with cattle grazing near a chemical wastes disposal dump in Louisiana were found to have levels of the chemical that exceeded the guidelines for meat.

The inadvertant mixing of polybrominated biphenyls, a fire retardant added to plastics with cattle feed has resulted in tens of millions of dollars in damages sought by farmers owning contaminated animals.

For many years we were unaware of the carcinogenic potential of the major industrial chemical vinyl chloride, and only now are we beginning to effectively contain that chemical.

Asbestos, which is used widely throughout our economy, is known to be a serious health hazard when inhaled. There remain many questions concerning the relative effect of several forms of asbestos fibers, as well as uncertainty as to the effects of ingestion. Finally, limited steps have been taken to reduce exposure to asbestos.

Gross population declines of several flesh-eating wild bird species in the United States have been caused by DDE residues resulting

from DDT use. In 1969–70, for example, 1,852 nesting attempts by brown pelicans on Anacapa Island off the coast of California produced but nine young.

Reproduction of grebes was halted on Lake St. Clair, near Detroit. This was traced to mercury from chlor-alkalie plants in the region.

Dozens of dead blue and snow geese were found in Missouri in April 1974 during the bird's northward migration. These birds contained lethal levels of dieldrin in the brain although ths compound was not used locally. It was hypothesized that exposure occurred 600 miles to the south in rice growing areas.

These examples have one thing in common—damage to fish and wildlife or man from chemicals in the environment—but they differ in that EPA has authority to deal with some problems but not others. Thus, DDT and dieldrin are both pesticides and have no other uses; we have therefore acted under the Federal Insecticide, Fungicide, and Rodenticide Act to eliminate most uses.

Thus, we have controlled their adverse environmental effects, although the full environmental benefits may not be realized for some time, as the amounts already in the environment only gradually degrade or are removed from active biological cycles. The uses of hexachlorobenzene and mercury include pesticides, but pesticide uses are only a small part of those substances entering the environment.

We have no authority to control other uses and must rely on the Federal Water Pollution Control Act and the Clean Air Act to achieve partial control.

In the case of mercury we have succeeded in reducing the flow into the aquatic environment, which we judge to be the critical element. On the other hand, reductions in hexachlorobenzene reaching the environment have been due largely to voluntary actions by industry coupled with State regulation.

Asbestos and PCB's are illustrative of substances where our authority is limited to regulating air and water emissions and ambient levels—a particularly awkward situation in that persistent chemicals are occurring in different media and having different uses. PCB's offer an excellent example of the need for more comprehensive authority.

We now estimate that over the past 45 years, some 1.4 billion pounds of PCB's have been produced in the United States. Of that amount more than half has already entered the environment through discharges to the air, water, and land. Although some of this has been chemically or biologically degraded, the vast majority is contained in landfills, contaminated soils, bottom sediments of rivers, lakes, and coastal waters. Unfortunately, there appears to be relatively little we can do to remove PCB's from the environment, and it may be many years before some of our waters will again be suitable for commercial or recreational fisheries.

At present there are over 700 million pounds of PCB's currently in use or inventory in electrical equipment such as transformers and capacitors, hydraulic equipment, paper products, and other commercial and industrial products. Without preventive measures, es-

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sentially all of these PCB's could ultimately enter the environment and add to the existing soil, sediment, air and water concentrations that I have just described. A large part of this amount can be kept from entering the environment if effective disposal and use practices are followed. The remainder may be virtually uncontrollable and will result in a continuing addition to the environmental burden.

We are producing domestically 35 million to 40 million pounds per year. We are importing about one-half million pounds as a chemical, and an unknown amount in PCB-containing products.

Having mentioned imports, I might also comment, Mr. Chairman, that under existing law EPA has no authority whatsoever to control or ban or otherwise restrict imports.

Mr. LEGGETT. How many companies produce that 35 million to 40 million pounds a year?

Mr. TRAIN. There is only one producer in the United States.

Mr. LEGGETT. What is the name of that company?

Mr. TRAIN. It is Monsanto.

Mr. LEGGETT. How many plants do they produce that at?

Mr. TRAIN. I believe only one.

Monsanto, Mr. Chairman, I believe is listed as a witness today and could answer that question for you.

Mr. LEGGETT. Very good.

Mr. TRAIN. In 1975 we found that although PCB levels in most foods have steadily declined, PCB's remain present in our environment to a far greater degree and at higher levels than we would have thought. PCB's are highly persistent—more so than DDT—and bioaccumulate in the food chain. PCB contamination is pervasive in the environment. We have found high PCB levels—levels greatly exceeding FDA guidelines of 5 p/m—in fish taken from the Great Lakes, the upper Mississippi River, off the southern California coast, streams entering the Gulf of Mexico, in the Hudson River and other waterways in New York State. Specifically, high concentrations of PCB's have been detected in recent months in fish in Lake Michigan—up to 165 p/m—Lake Pepin—up to 40 p/m—and in the Hudson River—up to 350 p/m—although the average levels are significantly lower.

The presence of PCB's in thees waters threatens to destroy commercial and sport fishing and associated industries, since contaminated fish are rendered unfit for human consumption and some fish become incapable of effective reproduction.

The evidence we have accumulated over the past 3 years has underscored our original concern over the toxicity of PCB's and over the potential health hazard posed by the presence of high PCB concentrations in water and in fish. It indicates that the most serious potential health problem from PCB's which we are able to identify today would come from eating fish which contain high levels of PCB's. Until environmental levels go down substantially, the human health threat from PCB's can only be controlled through not eating fish that exceed the limits prescribed by FDA.

With hindsight, EPA probably should have moved more aggressively to attack PCB discharges into the aquatic environment during the

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past several years. However, it is important to recognize that annual point source discharges from manufacturers of PCB's and electrical equipment containing PCB's—which represent the bulk of the discharges which we can effectively address existing authorities—probably total less than 10,000 pounds per year. At the same time we estimate that many millions of pounds of PCB's are probably entering the aquatic environment annually through other sources.

The PCB problem, and expected similar problems, can be effectively dealt with only through authority we do not yet have. Until the Congress passes toxic substances control legislation, we must rely to a large extent on voluntary actions by industry.

Let me explain.

In 1971, a Federal interagency task force was formed to address the question: What do we know and what should be done about PCB's in the environment?

At that time, PCB's had been in wide industrial use in the United States for about 40 years. Approximately 80 million pounds were being domestically produced annually.

Mr. LEGGETT. At what time was that?

Mr. TRAIN. This would have been 1971.

These PCB's were used in a great variety of commercial and industrial products. The task force concluded in 1972 that PCB's were highly persistent, could be found in all parts of the environment, could bioaccumulate to unacceptably high levels in fish, and could have serious adverse effects on human health.

The task force recommended—and the Federal Government adopted—a policy of urging private industry to confine PCB use to closed electrical systems, where there were no adequate and safe substitutes.

The Monsanto Co., the sole American producer of PCB's had already voluntarily restricted sales of PCB's to uses in closed electrical systems. The American National Standards Institute issued guidelines for industry on the use, disposal and labeling of PCB's. The Environmental Protection Agency announced that it would take steps to limit discharges of industrial effluents of PCB's into rivers and lakes.

The Food and Drug Administration established temporary tolerances for PCB's in several types of food and set limits on PCB contamination in food-packaging and in food-processing plants.

In addition, the General Services Administration stopped purchase of PCB-containing paper by the Federal Government and the Department of the Interior prohibited future use of PCB's in offshore oil operations. Other nations also took action.

I might say this was largely under issues put forward by representatives of the U.S. Government.

Under an Organization for Economic Cooperation and Development Council decision in 1973, member countries agreed to severely restrict uses of PCB's to certain closed systems; additionally, the OECD Council decision recommended that member countries further restrict PCB uses whenever possible.

At that time, we believed that these measures would take care of the PCB problem and enable us to continue to take advantage of the

unique properties of PCB's while protecting the public and the environment from exposure to hazardous levels of these chemicals.

Since 1971, annual U.S. sales of PCB's have been cut in half.

Today, however, we know much more needs to be done.

Despite the voluntary actions described, high levels of PCB's remain in and continue to enter the environment. Last November, EPA sponsored a National Conference on PCB's in Chicago to examine the latest scientific findings on PCB's environmental and health effects, and to identify needed control actions. As a result of new evidence indicating the urgency of the problem, I announced on December 23, 1975, these actions:

One: The immediate establishment of requirements to virtually eliminate PCB's from the process wastes of all manufacturers of PCB's and of capacitors and transformers that utilize PCB's. I instructed each of our regional offices to take steps to review and amend, if necessary, all waste water discharge permits for such installations, and this activity is currently underway. By March 1, onsite surveys of 50 facilities will have been conducted and by April 1, the process of revising discharge permits for each of these facilities will have been initiated.

Two: The issuance of proposed regulations to control the environmental damage that results from spills of hazardous substances, including PCB's. EPA will move as rapidly as possible to finalize these regulations after a public comment period.

Three: A request to all State Governors asking them to examine carefully and to apply their authorities to deal with the PCB problem. We are particularly concerned about solid waste disposal problems and effluent discharges into municipal systems, and believe that the States can be particularly helpful in these areas.

Four: A request to the heads of selected Federal agencies asking them to inventory their uses of PCB's and PCB-containing materials and to develop plans to assure adequate management and safe disposal of these materials. Followup meetings with those agencies have been held, and detailed activities are being worked out.

As an example, Mr. Chairman, there was some talk earlier and you may want to talk about this further, about the use of carbonless copy paper.

This is not a Xerox type of operation, but for several years, for example, the Internal Revenue tax forms were made so that by writing on the front sheet an imprint was put through on the second sheet, even though there was no black carbon on the back of the first sheet.

This kind of usage was stopped back in 1971 or 1972, but these papers remained in large quantities in storage in the Federal Government, and I presume still do since the statute of limitations may not have yet run on some of these tax returns.

Our concern is that as the time comes for the discard of these paper stocks, they not simply be put into the recycling system as used paper and perpetuate the PCB's in commercial usage in that way.

Mr. LEGGETT. How would you suggest we destroy them?

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Mr. TRAIN. I suppose this is part of the work we have underway by way of research at the present time.

High temperature incineration is one of the alternatives that we are testing this spring on PCB's both in terms of the efficacy and the destruction of PCB's and also in terms of identifying any by-products and the effects of by-products that might result.

We cannot immediately say that is the answer, but it would seem to me this is a very possible answer.

Mr. LEGGETT. How about burying them in the limepits that we have out in Kansas?

Mr. TRAIN. I am not a great one for burying.

We have had enough concern over radioactive materials in that respect.

On the other hand, secure landfills that are sealed presumably would provide one avenue of dealing with a problem of this sort.

I would think that high temperature incinerating is probably the best way.

Five: Initiation of a number of other programs to find ways to eliminate the environmental discharges from other sources of PCB's including paper recycling operations, the investment casting industry, uses in hydraulic systems, and the disposal of electrical consumer products which contain PCB's.

In addition, during the past several weeks, I have met with representatives of more than 25 companies and trade associations involved in the manufacture of transformers and capacitors containing PCB's and urged their cooperation in seeking alternative approaches to PCB's.

Also, I have met with representatives of a number of electrical utilities, transit authorities, and railways who are principal users of electrical equipment containing PCB's to begin to develop additional ways to prevent PCB's from being discharged into the environment.

These consultations will continue in the months ahead until we have these aspects of the problem under control.

I might add at that point that I made abundantly clear at both of these meetings our commitment to a goal of eliminating all uses of PCB's in the environment as doubtless will be mentioned to you and since that time—I think within the last couple of days—the Monsanto Co. has announced its policy of phasing out all manufacturing of PCB's as rapidly as safe and effective substitutes can be developed.

Undoubtedly, you will want to explore that with them, Mr. Chairman.

These actions are based on our conclusion that, in order to stop the growth of the PCB threat, the Nation must phase out production and importation of PCB's and products containing PCB's, and assure to the extent possible that PCB's presently in use do not enter the environment.

But the important question is, how do we get beyond cure to prevention of this kind of problem?

I wish to assure the committee and I am sorry Mr. Ottinger has left but I would assure him if he were present, that I am not making

this statement with any purpose of diverting attention from PCB's or any possible derelictions on the part of any Federal agencies in dealing with the existing problem, but having said that, I also do not want to be diverted from what I consider is a very high priority concern on our part in terms of legislation.

Over the 5 years since Toxic Substances legislation was first proposed, an estimated 1,000 chemical compounds have been introduced into the commercial market each year. This has happened without systematic advance assessment of their potential impact upon public health or the environment.

I stress the word "systematic" because I know a number of companies, and I presume most responsible companies have testing systems of some sort.

All of the toxic substance control bills now before the Congress set forth essential authorities which would greatly strengthen our hand in beginning to control the problem of toxic substances entering the environment. The bills would enable us to keep track of chemical substances being manufactured, processed, or imported. We could require the testing of chemicals which appear to pose a risk to health or the environment and are not covered adequately by other laws. We could take immediate action against particularly hazardous chemicals.

There are other important authorities common to all the bills as well, but the point is clear; the bills would plug the serious gap in Federal authority revealed by some of the cases I have described today. The administration has announced its support for H.R. 7664 with amendments and I understand that a formal communication on this bill will be forwarded to the Congress in near future, that communication which the administration considers would strengthen and perfect that particular bill.

In conclusion, Mr. Chairman. I believe that the PCB's and similar problems can be viewed as warning signs. In the face of the burgeoning role of chemicals in the world, we must be able to take all due action to prevent the sort of environmental contamination which PCB's have caused. We cannot rely on half-measures and spotty, limited authority. We cannot wait until a risk-posing chemical is out in the economy before beginning to address the problems it presents. And we should not use our citizens and the nation's fish and wildlife resources to learn what the problems are.

Mr. Chairman, that concludes my prepared remarks. I will answer any questions you may have.

Mr. LEGGETT. Accepting your conclusion that PCB's pose a greater threat to fish than anything else we have yet determined, recognizing also that you have an omnibus interest in the great number of matters as do many Members of Congress, but also recognizing the limited scope of the jurisdiction of this Committee and our responsibilities and further, the hiatus in enactment of adequate legislation and considering the fact that you are in total agreement with the prevous witness that PCB's should be totally banned, would you support a bill that could be jointly drafted by agencies and this Committee that would totally ban the manufacture and import and uti-

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lization in industrial products of PCB's, say in either 6 months or a 1-year time period?

You can answer that yes or no.

Mr. TRAIN. I would doubt very much that the committee would want to adopt a bill of that sort and I doubt whether the previous witness would support a bill of that sort.

Mr. LEGGETT. All right.

Why do you say that?

Mr. TRAIN. While I believe that broader toxic substances legislation is the proper vehicle, I certainly would have no basis for opposing legislation giving EPA a specific authority with respect to PCB's which it would otherwise have through the toxic substances legislation.

But I would not believe it would be wise for the Congress to specify a deadline of 6 months or 1 year for a total ban on all uses of PCB's.

The PCB's, for example, are used at the present time among other things in transformers, in engines on railroad trains, and on subway systems.

They were introduced because of the large number of fatal fires in tunnels and in subway systems due to the flammability of the substances such as mineral oil and others which had been used prior to PCB's.

I am not here as a defender of PCB's, but I think we must realize that there are very substantial health and safety tradeoffs if we suddenly eliminate them without being assured that there are effective and safe substitutes.

Mr. Chairman, that is the problem.

There may well be some uses—and I think we may have identified some of thees already—where safety considerations are probably not sufficiently significant as to warrant continued use of PCB's.

I have yet to hear from any utility operator and the utility operator would have no self-interest in continued use of PCB's.

But I have yet to hear anyone tell me there is an effective substitute for all uses in transformers and capacitors of PCB's.

They are only used in a small fraction at the present time.

Mr. LEGGETT. You have some 40 companies on this subject matter and also you have had your symposium in Chicago.

Outside of the transformers and vehicles that go through tunnels, have you isolated anything else that would be required or be perhaps subjected to a tradeoff?

Mr. TRAIN. All the capacitors in the country which are used in fluorescent lights and television sets and I believe in refrigerators and air-cooling systems are very, very widely used throughout American industry.

I would say at the present time an outright ban on PCB's would be tantamount to turning the electricity off in this country within a very short period of time and I do not think you are ready to do that, Mr. Chairman.

Mr. LEGGETT. Whatever the previous witness said to the contrary, you would not support it?

Mr. TRAIN. I did not hear him say anything to the contrary.

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He said it should be banned as rapidly as possible and I totally agree with that, but I think you have to realistically understand the nature of the problem involved.

The PCB's are a highly valuable material that has a very high degree of flame resistance which is one reason why they are so desirable.

It is not an economic issue so much as it is a human safety issue.

Mr. LEGGETT. Let me read to you, and this is Nat Reed talking, our previous witness, and he said:

> The insidious character of PCB's is now obvious and presents a serious problem to all of us.
>
> This pollutant affects the very core of State and Federal resource management programs throughout the United States.
>
> We urgently need an effective program to control rapidly eliminating the release of PCB's into our environment because of my deep concern with the problem. I support a national ban on all domestic and imported PCB's.

That is unqualified.

Now, I ask you, do you agree with that statement?

Mr. TRAIN. I certainly do as a goal, Mr. Chairman, but I know Mr. Reed does not support and could not support a national ban on PCB's within the kind of period you described.

If we have some kind of happy breakthrough, yes, because it would be possible to ban then.

Mr. LEGGETT. His next statement is, and I quote:

"We must have as our goal the elimination of PCB's from the environment of the United States as rapidly as possible."

Mr. TRAIN. And that is my position, Mr. Chairman.

Mr. LEGGETT. Now, the implication from that is that you achieve the goal, you know, of safeguarding the environment by the immediate national ban on all domestic and imported PCB's.

He goes on to state:

"I recommend that the critical or essential use of PCB's in transformers or capacitors be immediately and critically reviewed in light of current potential replacement products."

That hedges your previous statement.

Mr. TRAIN. That is my position, Mr. Chairman.

Mr. LEGGETT. All right.

So, if we pass a bill out of this committee, recognizing that there was an emergency, a national emergency, and we do not know when the toxic substances bill will get to the President or whether or not he will sign it and limit our ban to include limitations as described here, would it have the support of your agency?

Mr. TRAIN. Yes, I would want to see, obviously, the final language of the bill to assure myself essential uses are allowed, but in principle, I have no objection to it, and would support it.

I still urge you—and this was the reason we developed the toxic substances legislation in 1970, because the mercury scare attracted great public attention, and I recall getting my staff together and saying, look, we cannot deal with these toxic chemical problems on a case-by-case, ad hoc basis; we need some general authority.

That is still the case, Mr. Chairman, and I promise you before you get through passing a bill on PCB's, you are going to have another toxic substance problem arise.

We have had several vinyl chloride cases, a good many of them requiring toxic substances control legislation, but having said that I certainly cannot object to the PCB's authority you propose.

Mr. LEGGETT. Very good.

Mr. Studds, any questions?

Mr. TRAIN. The fluorocarbon problem is another ideal example posing serious questions about the ozone, the integrity of the ozone layer and the introduction of excess ultraviolet radiation on human populations, and the adverse health effects that would follow from that.

That is another problem that we have right now, Mr. Chairman.

Mr. LEGGETT. Does that affect fish?

Mr. TRAIN. The expert here says no.

Mr. LEGGETT. Very good.

Considering the fact there is a conflict we cannot act on that statement.

Mr. TRAIN. You have our balanced answer on the need for general toxic substances control authority.

Mr. LEGGETT. Mr. Forsythe?

Mr. FORSYTHE. Mr. Chairman, I would have to take issue with you on passing that kind of bill because we would be in real trouble before we got it passed.

Mr. LEGGETT. What we need is a good partisan scrap on this committee now and then.

Mr. FORSYTHE. Just once in a while, Mr. Chairman.

I thank you, Mr. Train, for your statement, and really I do not know that I have too much in the way of questions, except to explore one area with you.

I asked Mr. Reed about this area of coordination in research. I am a bit concerned that you may get two or three agencies that are going to have a piece of the action.

Are you working closely so that you are not duplicating efforts and are maximizing research efforts.

Mr. TRAIN. Yes.

In fact, I think we are probably overstretching, if anything, the limits of existing authority in order to find as much of an answer to this problem as we can.

We are working very closely with the Fish and Wildlife Service, the Food and Drug Administration, Health, Education and Welfare, generally, and GSA on government procurement policies and other agencies, including the States that have some role in this in terms of the health research that was referred to in questions earlier.

There is an interagency task force headed by the Food and Drug Administration on the health effects of PCB's and PBB's.

This includes a subgroup on chemistry, one on metabolism, one on chemical toxicity, one on animal toxicity, carcinogens and human exposure among others.

The task force is pulling together all the Federal agencies involved with this issue so that we in EPA have a very large number of research projects underway in this area.

I would say, Mr. Forsythe, there is a very high level of cooperation.

It might be late in coming, but as things stand right now it is very good.

MONS 091361

Mr. FORSYTHE. You mentioned the problem of the government holding the paper and what are we going to do with it, have you been able to stop the government from procuring other PCB contaminated materials?

Mr. TRAIN. To a very great extent.

Mr. Forsythe, the only now uses in the economy are these closed system transformers and capacitors.

The paper usage has stopped some time ago.

The use in hydraulic equipment is primarily in mining. I believe that is not a continuing use and is another example, Mr. Forsythe, of interagency cooperation with the Bureau of Mines.

It is being used to a limited extent.

I think it is primarily utilized by the Joy Manufacturing Co. in their mining equipment for safety reasons, below ground; this is an example of the use for PCB's for safety purposes.

There, the Bureau of Mines has the lead in working with the industry to try to see if substitutes can be developed, to have that use phased out.

Transformers and capacitors are, of course, found throughout the Federal Establishment. I would imagine they are found extensively in military equipment of various kinds, in the Navy and in the aircraft, but much more widely all through the government.

Let me introduce Dr. Briedenbach, our Assistant Administrator of the Environmental Protection Agency for Water and Hazardous Material.

I should have introduced him at the beginning.

My understanding is, we have been having meetings with other agencies on this aspect of the matter.

Mr. FORSYTHE. It is encouraging to know that the government may be out front in trying to eliminate the uses of PCB's.

Mr. TRAIN. You might be interested to know that in my discussions with the utility industry in which these transformers are extensively found, it is my impression that the industry works under very excellent housekeeping rules insofar as PCB's are concerned; that for example those people who work on changing the material within a transformer that contains PCB's wear special clothing.

Mr. Forsythe, if there is a spill it is wiped up.

Rags and clothes are collected and kept in a special sealed container.

Any used amounts of PCB's that are removed from the transformer are again stored and kept and not disposed of and then, finally, all of these used PCB's and waste PCB's are returned generally to the Monsanto Co. for reprocessing under contract.

Now, I will say I was really quite impressed with the housekeeping standards, which doubtlessly are not perfect, but in my opinion at least, a very good job was being done.

Mr. FORSYTHE. I understand there are many other reprocessors and there is the problem of some large amount of PCB's that may not be flowing through this chain of responsible usage.

Is that a correct assumption on my part?

Mr. TRAIN. Yes.

Our estimate is that there is about 500,000 pounds a year of PCB's as such, imported into the United States.

We have in EPA, working through the Bureau of Customs, endeavored to identify each of the importers of this material and then proceed to trace through channels of distribution those PCB's from the importer to the ultimate use, and in that fashion, try to get a fix on where these things are going and how they are entering the environment.

A major use of the imported PCB's is in the investment casting process.

That is mentioned in my statement and we are or will shortly be exploring this particuar use to see whether substitutes can be utilized for the small number of users.

Mr. FORSYTHE. Do imported PCB's include that which is already in the product or is it the raw material?

Mr. TRAIN. I would imagine some enters in capacitors.

We do not know.

The 500,000 pounds I mentioned is a raw PCB's product, as I mentioned.

To what extent it comes in, in other products, we have no other information.

There is no indication of PCB's being in the product and a customs inspector would have no way of knowing.

Mr. FORSYTHE. Do you have any idea whether that is a large element of the problem.

Mr. TRAIN. Well, foreign countries participating in the OECD joined with us in the adoption of national policies to use PCB's only in closed electrical systems.

I would hope that this is the major use in most foreign areas as well as here in the United States.

I cannot give any assurance of that, Mr. Forsythe.

Mr. FORSYTHE. Just one more question, Mr. Chairman.

An Ad Hoc Committee created by CEQ and the Federal Council on Science and Technology reviewed Federal ecological research in 1973 and found serious deficiencies and recommended the creation of a national ecological service, which would investigate responses of individual species to specific pollutants and integrate technological data, to design technological problems requiring such attention.

In your view, has creation of such an institute been useful in reducing the effect of toxic substances on the environment?

Mr. TRAIN. I was chairman of the CEQ at that time, Mr. Forsythe.

I would imagine I supported that study.

Mr. FORSYTHE. Thank you, Mr. Train.

Thank you very much, Mr. Chairman.

Mr. TRAIN. However, I do not think that proposal ever received the support of OMB.

Mr. LEGGETT. That would cost money.

Mr. Studds?

Mr. TRAIN. Do not overlook the importance, Mr. Chairman.

I am sure that you do not overlook the importance of the monetary considerations.

Mr. STUDDS. Mr. Train, at the end of long working days in Washington, especially when it has been raining, I generally reach the conclusion that we are all doomed and I take it you share that conclusion.

MONS 091363

It just occurred to me, and let me ask you sort of as an aside, are all noncarbon papers, is that the phrase, do they contain PCB's?

Mr. TRAIN. The answer is no, but I cannot expand on it, and maybe you would like to have an expert answer.

Mr. STUDDS. The reason I ask, all of our travel vouchers are that way, Mr. Chairman, from the House Finance Office.

Mr. LEGGETT. Just sign them.

Do not touch them.

Mr. TRAIN. Well, that suggests something to me, that is, we might include the Congress in our interagency exploration of procurement policies.

Mr. STUDDS. I thought you might suggest we stop traveling.

May I ask you, sir, if my mathematics are correct, only one-tenth of 1 percent of current discharges in the environment of PCB's constitute a direct identifiable point discharge, 10,000 out of 10 million?

Mr. TRAIN. That is roughly correct.

Mr. STUDDS. Can you elaborate a little bit on how the 99.9 percent gets in that is nontraceable to discharges?

Mr. TRAIN. Yes.

One of the major sources insofar as we are able to identify these, is landfills.

Mr. STUDDS. That is to say, dumps?

Mr. TRAIN. Dumps, even just mixed municipal waste, the disposal sites that have been a repository for both domestic and commercial wastes, and special landfills used, let us say, by a manufacturer.

For example, the landfill at the town where the General Electric plant is located on the Hudson River, is a municipal landfill, municipal dump, and we estimate it may have something like one million pounds of PCB's buried there.

Now, you have to take estimates of this sort with a pretty large grain of salt.

We are doing the best we can to arrive at intelligent estimates.

We are taking core samples of that dump to try to arrive at a better fix, but I do not know that that is so important.

The important thing is that there is no doubt that that is a very important location for dumping PCB's and when it rains you get leaching into the environment from that source.

Mr. STUDDS. And that has been going on for 45 years.

Mr. TRAIN. Undoubtedly been going on for 45 years. I would say that this is a kind of practice that we have some hope of getting a handle on.

Mr. STUDDS. You mentioned, Mr. Train, on page 6, effective disposal and use practices.

Do we have effective disposal and use practices which you prefer?

Mr. TRAIN. We do not, nor do we have the authority to require these.

We can develop guidelines in EPA for solid waste management and these guidelines are binding on other Federal agencies if we can enforce them.

As to the State and local governments and the private sector generally, they are only guidelines.

We are developing those guidelines as rapidly as we can to assist in dealing with this PCB problem.

MONS 091364

We are also working, and I believe I mentioned this in my statement, with the American National Standards Association, on procedures for disposal and general housekeeping procedures.

Knowing that organization, I would feel fairly confident that they will do a very good job at this and we are working closely with them.

Mr. Studds, we have had a number of meetings already and it would be my expectation that we develop these new standards, we will embody those standards in guidelines which we will issue, which will then, as I say, have binding force on the Federal establishment and some effect on the rest of the world.

Mr. STUDDS. One final question, Mr. Chairman.

Mr. Train, you were quoted some 2 months ago in the New York Times of November 20, saying that research conducted thus far by the EPA had uncovered PCB's in the drinking water of Illinois and Indiana, and it was suspected the chemicals were in the drinking water of Escondio, Calif., Bridgeport, Conn. and New Bedford, Mass.

Can you tell us anything with precision why those suspicions exist and is there any documentation for it?

Mr. TRAIN. Well, I assume it is more than a suspicion, Mr. Studds, if it is based upon actual water samples.

Mr. STUDDS. You made a distinction.

If you are quoted correctly, you said they have been uncovered in the first two instances and it was suspected in the latter three.

Mr. TRAIN. I cannot explain that.

I will be happy to find out why there is a suspicion of that.

The first two in Illinois and Indiana are based upon actual EPA measurements.

The last three we have been given industry measurements indicating levels of PCB's in this water.

We have not yet confirmed those ourselves.

I would say it is more than a suspicion of this being correct.

Mr. STUDDS. I understand you are in the process of attempting to confirm that suspicion, if you will.

I know we have communicated about that before.

Mr. TRAIN. That is correct, sir.

We are also, as you probably know, including PCB's in our nationwide sampling of some 112 communities for determining levels of organics in the drinking water.

Mr. STUDDS. What step do you take next, once in the first two instances, in the first two communities in Illinois and Indiana, you know there are PCB's in the water. Do you begin testing the animals that drink the water?

Just what do you do?

Mr. TRAIN. The main thing is to try to find out what the source is.

We also have other research going on trying to determine the dose/response levels of PCB's on humans.

This is doubtlessly going to be fairly lengthy. We do not really know what the risk levels are for human beings drinking the water.

We really have no data of this sort whatsoever, so I think it would be premature to require the installation of a treatment system at this point, until we know something more about it.

Mr. STUDDS. Thus, if we believe, as I understand you suggest, only one-tenth of 1 percent of it comes from site-specific sources anyway, is could be a very difficult task.

Mr. TRAIN. Dr. Breidenbach would add to that.

Dr. BREIDENBACH. You are touching on our drinking water authority and there are a number of things going on there which would be helpful to the community: The setting of standards for drinking water, research to develop adequate treatment protocols to remove organics from the water and the water treatment process.

Those things are going on in separate parts of the organization.

Mr. STUDDS. I would assume if we know there is this quantity in the environment, it is beginning to get into the drinking water, for all we know it may be much more widely spread in drinking water, then we might want to accelerate the research on the humans who drink that water.

Dr. BREIDENBACH. Exactly.

We are moving rapidly to come up with the systems for the removal of organics from drinking water and this is a requirement under the Safe Drinking Water Act.

Mr. STUDDS. Thank you, Mr. Chairman.

Mr. LEGGETT. Mr. Oberstar?

Mr. OBERSTAR. Thank you very much, Mr. Chairman, and Mr. Train, let me compliment you for a very fine and comprehensive statement, and for the very alert and early action of EPA on this very serious and far-reaching problem.

I would also like to take this opportunity to commend the National Water Quality Laboratory in Duluth, Minn., and their fine scientific staff under the direction of Don Mount for the splendid work they have done in providing the scientific basis for the testimony presented and the work EPA has done.

Mr. TRAIN. The laboratory has taken a leading role in all of this and Dr. Mount whom you mentioned earlier has done an outstanding job in directing that laboratory for the agency.

As you know I visited that laboratory and we are very proud of it.

It is an excellent facility and we are very pleased to have it.

We just wish the problems were not so difficult.

Mr. OBERSTAR. The Minnesota Pollution Control Agency has also been working on the problem of PCB's.

That agency has assembled an interagency task force on PCB's which for most of 1975 conducted continuing investigations and studies of PCB's located in Minnesota's waters, particularly Lake Pepin, on the Mississippi River, and its tributaries.

I would like to submit for the record a 2-page resolution adopted by the Minnesota PCA of July 1, 1975, including the resolved clauses that the Minnesota Pollution Control Board hereby supports a Federal ban on the sale and use of PCB's.

It supports your and Secretary Reed's testimony.

Mr. LEGGETT. That will be included in our record at this point.

[The document referred to follows:]

CERTIFICATE OF MINNESOTA POLLUTION CONTROL AGENCY'S AUTHORIZING RESOLUTION

I, Peter L. Gove, do hereby certify that I am Executive Director of the Minnesota Pollution Control Agency, and that the attached is a true, complete and correct copy of a resolution adopted at a meeting of the Board of the Minnesota Pollution Control Agency duly and properly called and held on the 24th day of June, 1975, that a quorum was present at said meeting, that those present unanimously voted for the resolution and that said resolution is set forth in the minutes of said meeting and has not been rescinded or modified.

In witness whereof, I have hereunto subscribed my name this 25th day of June, 1975:

PETER L. GOVE,
Executive Director.

STATE OF MINNESOTA, MINNESOTA POLLUTION CONTROL AGENCY, JUNE 24, 1975
RESOLUTION

Whereas, the Agency is charged with the administration and enforcement of all laws relating to the pollution of any waters of the state as given in Minnesota statutes of 1971, Chapter 115.03, and;

Whereas, no sewage, industrial waste or other wastes shall be discharged into any of the interstate or intrastate waters classified as fisheries and recreation so as to cause any material change in any other substances or characteristics which may impair the quality of interstate or intrastate waters or the aquatic biota in any manner render them unsuitable or objectionable for fishing, fish culture or recreational uses as per Minnesota Pollution Control Agency regulations WPC 14 and 15, (1973 Supplement), and;

Whereas, significant concentrations of persistent organic compounds known as polychlorinated biphenyls (PCBs) have been identified within the Mississippi River near the border areas of Minnesota-Wisconsin known as Lake Pepin, and;

Whereas, the United States Food and Drug Administration has enforced the "Action Limit" of five (5) parts per million total PCBs on several shipments of commercially caught rough fish from the Lake Pepin area resulting in voluntary disposal of the fish by the industry, and;

Whereas, as a result of the above, commercial fishing operations have temporarily been ceased in the Lake Pepin area, and;

Whereas, on May 27, 1975 Dr. Warren R. Lawson, Minnesota Commissioner of Health advised the public to limit consumption to no more than one meal per week of fish taken from the Mississippi River from the Minneapolis-St. Paul metropolitan area and lower Lake Pepin, and;

Whereas, a major study completed by Dr. J. R. Allen of the University of Wisconsin (1974) indicated short-term toxicity to a low-level exposure to PCBs in nonhuman primates, and this study and others suggests that there exists a significant potential for harmful effects to humans, and;

Whereas, and as a result of the above actions significant environmental effects on the aquatic life and economics of commercial and sports fisheries as well as tourism have occurred, and;

Whereas, the Great Lakes Environmental Contaminant Survey (GLECS) conducted yearly by Michigan's Departments of Natural Resources and Agriculture, the U.S. Food and Drug Administration—Detroit Region, and the Great Lakes Fishery Laboratory has determined that Lake Superior trout collected near Isle Royale are showing a pattern of elevated PCB residues similar to Lake Michigan; now therefore be it

Resolved, that the Minnesota Pollution Control Agency Board hereby supports a Federal ban on the sale and use of PCBs.

Mr. OBERSTAR. Thank you, Mr. Chairman.

Mr. Train, to your knowledge, is the PCB chemical biodegradable?

Mr. TRAIN. It is very long lasting and very persistent.

I would assume at some point, ultimately, it would break down.

Mr. OBERSTAR. Its half life would be very long?

Mr. TRAIN. It certainly would, far longer than DDT.

There are different PCB's and there has been some testimony earlier today that some tend to be somewhat more persistent than others.

I think it depends somewhat upon the chlorine structure of the molecule, but I do not know that there is any significant difference for the purposes of either the committee or ourselves.

If we could find a given PCB which is somewhat less persistent than another one and would provide the same benefits, I would say, you know, all things being equal, it should be substituted.

But I do not think you can look to the lesser persistent PCB's as a solution to the problem.

Mr. OBERSTAR. So far the testimony has dealt with the PCB's in animals, fish primarily.

Is there any evidence, given this long persistence, that plants absorb PCB's and that they, in turn, are eaten by fish and carried along the food chain?

Mr. TRAIN. The answer that we have is that they may be absorbed to some extent by plants, both aquatic and terrestrial, perhaps not to a very great extent.

Mr. OBERSTAR. That would be a remote concern because your primary interest is fish, which are directly eaten by humans and the more direct impact on the food chain there?

The reason I raised the question is, that at some point the PCB's settle into the water and get into the river bottom and the Corps of Engineers has an extensive dredging program in the Great Lakes, and in the Mississippi River.

When the dredge spoil is lifted out of the water presumably the PCB's are redistributed and reintroduced into the waterway and each time there is dredging, you have a reintroduction of the PCB's problem.

Would that be a fair statement?

Mr. TRAIN. That is correct.

We are very much aware of this problem, and we do not know what the answer is and here again, I think it very important that the committee be fully aware of this dimension of the problem.

I have no doubt that harbors and river mouths that would normally be the subject of dredging activity to maintain navigation depths have large amounts of PCB's in their sediment and the dredging is going to stir up and redistribute those PCB's in the aquatic environment.

Likewise, as those dredge spoils are taken off somewhere and disposed of by dumping either in water or on land, a certain amount of the PCB's are going to go with them and they will leach out from there.

We have extensive discussions—I do know that it has proceeded much beyond that, but they are going on—with the Corps of Engineers, on this very problem.

Mr. Oberstar, it is a shared problem. Our concern for water quality and their responsibility for dredging is a shared problem and what the answer is going to be, I do not know.

MONS 091368

Mr. OBERSTAR. Is there any effective means of filtering PCB's out of drinking water?

Mr. TRAIN. Carbon filtration, I believe, is reasonably effective, so far as I know, although we are continuing to do experimental work to verify that.

Mr. OBERSTAR. You would not use asbestos filters?

Mr. TRAIN. No, sir.

I do think that carbon filtration probably represents a way of inpipe control of PCB's.

How practical that is in terms of a large flow of water, I am just not sure.

Doctor, do you wish to comment?

Dr. BRIDENBACH. We do not have the exact data on this yet, but the type of the PCB's chemical structure, its degree of chlorination would suggest that its chances to be absorbed on carbon are rather strong.

It remains to be tested before we can recommend it.

Mr. OBERSTAR. It could be that critics bordering on Lake Michigan, would have to filter their drinking water drawn from Lake Michigan at some point if the presence of PCB's were significant.

Mr. TRAIN. That is conceivable.

I would not want to predict at this point, but PCB's do bioaccumulate not only in fish but in human beings.

There is an awful lot of stuff that bioaccumulates in us.

You and I have high levels of DDT, hexachlorobenzene and dieldrin, as well as other chemicals.

Mr. STUDDS. Mr. Chairman, the gentleman made reference to the Minnesota PCA.

Is that an earlier version of the PCB?

Mr. LEGGETT. What do those initials stand for, Mr. Oberstar?

Mr. OBERSTAR. Pollution Control Agency, Mr. Chairman.

Mr. LEGGETT. We would like initals explained in the committee.

Mr. TRAIN. Let me add, Mr. Chairman, but not on Mr. Oberstar's time.

Mr. LEGGETT. On whose time?

Mr. TRAIN. My own, if you will give it to me.

In view of the interest of this committee in marine problems and fishery problems, you might be interested to know that my information is that a few samples with respect to whales in the Pacific and specifically the sperm whales indicate levels of up to 10 parts per million of PCB's in the blubber, that is, the fatty tissue.

Now, that might be a interest to our Japanese friends who are exceedingly sensitive to PCB's.

Mr. STUDDS. Not in the scrimshaw, however.

Mr. LEGGETT. Very good.

Well, that is a very interesting observation.

I am sure it will help us.

Now, we will hear from the PCB's peninsula in Michigan, Mr. Ruppe.

Mr. RUPPE. Thank you very much. Mr. Chairman.

I regret, Mr. Train, that I was unable to be here due to a conflicting series of meetings.

I do have an opening statement that I would make at this point, Mr. Chairman.

STATEMENT OF HON. PHILIP E. RUPPE, A REPRESENTATIVE IN CONGRESS FROM THE STATE OF MICHIGAN

Mr. RUPPE. I am pleased that the subcommittee has taken the initiative to examine this complicated and difficult problem. The introduction of toxic chemicals into the environment has been a source of continuing concern to the people of northern Michigan and to the entire Great Lakes region. I certainly look forward to the testimony the subcommittee will be hearing on this extremely important question.

Polychlorinated biphenyls which, along with others such as DDT, PBB, and Dioxin possess a very interesting set of characteristics. First, they are fat soluble. In other words, if you are looking for concentrations of such chemicals, you do not look in the inorganic work, but in living organisms such as fish, poultry, and human beings.

Second, these compounds are very poisonous. The Food and Drug Administration currently indicates that PCB concentrations of 5 parts per million in food can be harmful to people.

Furthermore, concentration levels as low at 0.3 parts per million are set for similar chemicals by FDA with which we also have little known environmental experience.

Third, such chemicals are extremely persistent. Because living organisms have little experience with them, it takes a very long period of time to break them down.

In fact, some evidence has existed over the past few years to indicate the half-life of DDT and its relatives may be immortal. Fourth, such chemical compounds are very mobile

They move throughout the environment very quickly and can, as we found in Michigan, with polybrominated biphenyls, become widespread rather quickly.

Finally, to put the "topper" on it, these compounds tend to concentrate as they move up the food chain. This provides an important source of concern for all of us because human beings feed high off oceanic and fresh water food chains.

In my view, there is no more serious threat to our fishery resources and thereby to our citizens than that emanating from PCB's.

On the Great Lakes, the PCB problem is potentially the most devastating blow to sports and commercial fishing since the introduction of the lamprey eel.

The problem, as we will no doubt learn from the witnesses scheduled to appear, is not confined to the Great Lakes, but is present in a great number of streams and waterways in every section of the country.

This, in my view, is a serious definite health threat to extremely large numbers of our citizens. I hope the committee will insist on hard, clear answers from those who manufactured the chemical and those whose responsibility it is to regulate the introduction of chemicals into the environment.

For example, I will be very interested to learn from both the Environment Protection Agency and the Monsanto Co. why it took until only last month for these two concerns to take action against the harmful effects of PCB.

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MONS 091370

Yesterday, in a curious piece of timing, the Monsanto Co. announced it would phase out the production of PCB. Late last month, EPA announced an "emergency," and largely voluntary program to stem the introduction of PCB into the environment.

Yet, Mr. Chairman, PCB and one of its harmful effects was first identified in several water resource areas in 1970. In each succeeding year since, there have been recommendations for stopping PCB and its deleterious effects.

I will want to know, and hope the committee will insist on knowing what it took, until the committee called these hearings, for action on the part of both EPA and Monsanto.

Many members of the subcommittee may already be aware that in Michigan we have had a scare with PBB's, a chemical closely related to PCB's. In early 1974, large quantities of polybrominated biphenyls, a compound used as a fire retardant, was accidentally placed in the feed additives regularly provided to hundreds of farmers in the State.

Eventually, scores of dairy herds had to be quarantined and finally destroyed and the impact upon people who consumed large quantities of the contaminated dairy products is still not known.

I simply do not want what was an accident in Michigan with PBB to become a permanent phenomena with PCB's because of their continuing large-scale introduction into the Great Lakes environment.

I am also hopeful the committee will address itself to the question of how PCB was detected. Was it because there is an ongoing, cooperative effort among Federal agencies to test Great Lakes and other waters for toxic chemicals? Or was the presence of PCB discovered by accident?

If an effort is not underway to systematically and regularly test water supplies, such as the Great Lakes, and fishing resource areas for the presence of poisonous chemicals, then this committee should seriously consider establishing such a program.

Mr. Chairman, the committee could also be of great service to a large number of Americans who depend on their government for assistance in protecting them against threats to public health.

I am specifically suggesting that the committee ask the expert witnesses who come before it to look at ways of flushing PCB and other similar chemicals, like polybrominated biphenyl, from the human system.

Now that Americans know the problem of PCB ingestion by large numbers of citizens exists, our people will want to know what their government is doing to effectively advise them on its harmful effects.

Are there special diets which should be followed?

Are there special periods during human growth which are especially critical for PCB activity?

And, what can the Federal Government do to stop the spread of PCB and other toxic materials?

In my view, the people of this country will not treat us lightly, nor should they, if we fail to exhaust every avenue that could lead to a lessening of this and other chemical health threats.

Mr. Chairman, it is the paramount responsibility of government at every level—in Congress, in the executive branch and in the States, to protect the public health.

Finally, I would caution the members of the subcommittee that we ought not get involved in a highly technical and scientific debate over various aspects related to such chemicals.

It must be our purpose to examine the degree of adverse impact, assess the role of the responsible Federal agency involved, and thereby, insure that appropriate action is or will be taken to halt the buildup of these toxic compounds in the marine environment.

Mr. Train, I understand from your previous comments that you feel that EPA could not ban PCB's at the present time.

Do you have the authority, and if you do, have you chosen to implement your authority to either prohibit or control the discharge of PCB's in the environment or into waterways and the like?

Mr. TRAIN. To recapitulate some of what I have said and then to add to it, of the 35 million or 40 million pounds of PCB's that are introduced into use annually, we suspect that around a quarter of that, probably 10 million pounds or so escapes annually into the environment and of that about 10,000 pounds or one-tenth of 1 percent ends up in the form of a pipe discharge, a controllable pipe discharge.

Mr. RUPPE. Like perhaps the GE dischargers?

Mr. TRAIN. That is right.

We estimate on an annual basis their discharges at that plant at present time are probably around 1,000 pounds.

That, Mr. Ruppe, is a ball park figure. They are, of course, one of the largest manufacturers in the country.

We estimate on a national basis about 10,000 pounds is discharge of that sort. We are getting at that through our permit program at the present time and I directed our regional headquarters last December to send their surveillance and analysis teams out to all manufacturing and producing locations of PCB's which we identified, close to 50, and to make onsite inspections which they are to complete by the end of February and revise all permits as a result of those inspections, with the goal of achieving zero discharge.

Mr. RUPPE. How frequently can you revise the permits when they become due?

How often is that?

What about a permit that might be 5, 10, or indefinite?

What do you do in a situation like that?

Mr. TRAIN. I am informed that we can revise it at any time.

Mr. RUPPE. You can, no matter what the period of the permit?

Mr. TRAIN. Yes.

Mr. RUPPE. You intend to do that?

Mr. TRAIN. We certainly do.

Mr. RUPPE. Well, now, that takes care of part of this discharge.

Perhaps I am duplicating.

How about the bulk of the 10 million discharged into the environment?

Are there any ways of pinpointing where it does so the discharges can be identified and controlled in that sequence?

MONS 091372

Mr. LEGGETT. So that our record is straight, is it established it is 10 million pounds discharged into the environment?

Mr. TRAIN. I do not think I could prove that.

I believe that is our best estimate at the present time.

Mr. LEGGETT. That is by direct discharge?

Mr. RUPPE. That is all discharge, is it not?

Mr. LEGGETT. By all dischargers?

Mr. TRAIN. I am informed that that estimate of 10 million pounds represents our best estimate of the annual losses to the aquatic environment from leaching from landfill, direct discharges, air transport, and then getting into the water from the air.

But that is from all sources, Mr. Ruppe, and that is our best estimate.

Mr. RUPPE. Of that 10 million pounds of discharge, what percentage of that can you reach toward in any kind of a controlled program?

Can you stop General Electric from dumping in a river?

How much of the air and water dischargers can you really define?

How much can you really in a realistic fashion reach toward in terms of a controlled or a regulatory program?

Mr. TRAIN. The largest, I believe, single source would probably be landfills.

Mr. RUPPE. Existing landfills?

Mr. TRAIN. Yes, existing landfills, in the vicinity of manufacturing plants and also simply municipal landfills.

Now, we could, I think, over a period of time identify the highest concentrations of PCB's per landfill and develop a program of insulating them in a sense from the environment so they would not leach.

It would be an enormous task, but it is possible.

Mr. RUPPE. What about the PCB's that are currently discharged either, you know, not from a landfill, but are currently as the result of a chemical or other industrial processor?

How much of that is coming into the environment and are there any ways of controlling the new inputs of PCB's?

Mr. TRAIN. My impression is that this is a relatively small part of the problem.

They should be controlled as best they can.

There is no question about that, Mr. Ruppe, and I do not want to minimize any element of the problem, but I suspect that the normal industrial usages do not represent a large problem, other than the waste disposal aspects and landfills which are a significant part of the PCB's problem.

Mr. RUPPE. Can we control the new discharges that go into landfills, into the sewage systems?

Mr. TRAIN. PCB's apparently do get picked up by the air and I do not think we have a fix on amounts or control measures.

I have talked to a manufacturer who told me he had a completely closed cycle system of manufacturing.

He had PCB's on one side of the room with absolutely no connection to the other side of the room and PCB's were appearing in materials in the other side of the very large room.

MONS 091373

Obviously, it was transported by air.

Mr. RUPPE. Then we really have a problem.

If we do not prohibit the use of PCB's we can talk about eliminating a few of the point sources like the oft repeated General Electric situation, but basically we are not going to be able to do a great deal about the 10 million pounds going into the environment as long as we keep producing for better or worse the PCB's, and I have a feeling a discharge in the environment of the PCB product is virtually beyond our control.

Mr. TRAIN. That is correct.

That is why we believe we should eliminate all uses of PCB's.

Mr. RUPPE. One or two more questions.

Mr. TRAIN. Now, total elimination is going to give you the answer, ultimately, but it is so ultimate that I do not think any of us feel very happy with it.

I mean, it may be 100 or 200 years from now before you really eliminate PCB's from the environment even if you stop using them today.

Mr. RUPPE. I believe, Mr. Train, that you mentioned that the FDA had an interagency study on the effects of PCB's on humans and I believe the study also included PCB's, is that correct?

Has there been a study on the effect of PBB's on humans and has it included PCB's as well?

Mr. TRAIN. Whether one of the charges of this interagency group on human exposure was to include PBB's as well as the PCB's and any existing data, I do not know.

Mr. RUPPE. When we refer to a 5-year study, is that 5-year study ongoing for a period of time, or is this a 5-year study the initiation period?

Mr. TRAIN. I am not aware of the 5-year aspect.

Mr. RUPPE. There is a study on the effect of PCB, on the effect of human beings ongoing, is there not?

Mr. TRAIN. Yes, there is the Food and Drug Administration.

Mr. RUPPE. I would assume you would strongly support the proper level of funding for a study that would go into the effects of PBB's and PCB's on humans, the attempt to definitively find at what level PCB's and PBB's are of interest to individuals.

Mr. TRAIN. Absolutely.

Mr. RUPPE. Are we doing anything beyond that or do you support a research program beyond that, to find out if there is a way of flushing PCB's and PBB's out of humans?

As I understand at the present time, there is no way of eliminating from the human system through other than the 100-year period that you referred to, and what frightens me is as far as PBB's are concerned, three-tenths parts per million in cattle causes usually the death of the animal or nonproductivity, and we have seen humans with PBB's reach a level of 200 to 300 parts per million and we do not know what the effect of that is nor do we know if it does have a bad effect, and how to flush it out of the human system.

I have a feeling we have the same danger here as far as PCB's are concerned.

We do not know the effect, and if it is deleterious we do not know what to do.

Mr. TRAIN. I do not know of any work underway on the flushing aspect.

I do not know whether that has any scientific probability.

Mr. RUPPE. Does it have any merit?

Can your people register a comment on the meritorious promise?

Dr. BIEDENBACH. It would take a person skilled in medical research to comment on the appropriateness of a flushing action on the fatty tissues of the body.

We do not have such a person with us today.

Mr. TRAIN. You have some EPA scientific witnesses on tomorrow, Dr. Del-Wayne Nimmo, from our Gulf Breeze Laboratory in Florida.

I am not sure he would be an expert on this.

Mr. RUPPE. What I am referring to is three-tenths parts per million in animals and humans has turned out individuals that come up with 200 or 300 parts.

If you start out with five parts per million in fish and other products that humans eat and five parts of PCB's that might translate to the end of the Japanese experience, do you take the same mathematical correlation of 2,000 to 3,000 parts per million and then we could really have something on our hands.

Mr. TRAIN. Speaking as a layman, Mr. Ruppe, I have never heard of any kind of research or information on this flushing process.

You know, certainly, as I said earlier, we all have DDT and Dieldrin and hexachlorobenzene in our system and they are going to be there for a long time and if we could get rid of them, it would surely be a desirable thing.

Mr. RUPPE. But as a first step, you certainly highly endorse the concept of finding out what are the effects at various levels of PCB's and PBB's on the human system?

Mr. TRAIN. Yes, sir, but would emphasize we should not wait on the results of that kind of research before we try to take action.

It takes a long time to get good human health data but we do have mammal studies, such feeding of PCB's to primates.

These may not be fully adequate, but I do not know.

We do have this kind of data and I think we should make judgments on the basis of that.

PCB's are very adverse to human health. What we do not know is dose level relationships and we surely should try to develop that as rapidly as we can.

Mr. RUPPE. Thank you. Mr. Chairman.

Mr. LEGGETT. I just noticed on January 1 of this year there was an article in McGraw-Hill and they indicated the title of it was Substitute Found for PCB's in Capacitors and they called it the CDO, chlorophemal dioxide.

This has some toxic effect only infinitisemal to that of PCB's. They indicate this is not good for transformers and on the other hand they indicate the Japanese have had a transformer lubricant available in utilizations there for the past 5 years.

Do you know anything about that, Mr. Train?

Mr. TRAIN. Very little.

Dr. BRIEDENBACH. The industry we met with were aware of this article. They were hoping for a substitute but they were not really as optimistic as the article says.

Mr. LEGGETT. Apparently, the article was prepared to provide industry requirements for capacitors by July of this year.

Mr. TRAIN. McGraw-Edison, as I recall, was present at our meeting with all of the manufacturers and this statement was made by their representative to the industry.

I think we have to do some more looking at that aspect of the problem before I would say we are ready to move in that direction.

That certainly was the reaction, I would say, of the rest of the industry.

Certainly, as Dr. Briedenbach said, hopefully, this substitute would prove to be as good as McGraw-Edison was claiming, but we are cautious because we have gotten into these binds before of jumping to use another substance and finding it also has a range of environmental problems.

I did want to make this point, Mr. Chairman. The key to the problem is adequate substitutes. As I said earlier, there is a very serious flammability problem with respect to transformers and I presume capacitors.

This is a problem that has to be dealt with in our society and unless we are ready to do away with an awful lot of electrical uses—and I suspect we are not at that point yet—we must find safe, effective substitutes.

We likewise, I think, have to be awfully sure that we are not buying other kinds of environmental problems simply by substituting another chemical.

In other words, thorough technological assessment of substitutes is a lesson we are learning pretty rapidly, that we better be sure before promoting the use of a substitute for PCB's.

Now, that is not in any way to say we should drag our feet or anything of this sort.

Mr. Chairman, I am saying this is a very important element in the problem and we should be very thorough in the way we get at it.

Having said that, I think it is exceedingly important that we get after the substitutes as rapidly as we can.

Mr. LEGGETT. Mr. Spensley has a question.

Mr. SPENSLEY. I hope to ask a policy-type question.

Without wishing to make this a forum for the toxic substance legislation, I would note that none of the versions of the toxic substance bills which I have seen place the burden of showing the substance is safe on the industry who wishes to propose the introduction of a new substance.

I think there are a large number of people who feel that the production of chemicals is not a right but a privilege and thereby at least in terms of protecting the public's welfare, that stronger burdens of proof should be shifted perhaps to the proponents of toxic chemicals.

As Administrator of EPA, would it be your position to support such a proposal of that kind?

MONS 091376

Perhaps you might want to comment on the present adequacy of the toxic bills.

Mr. TRAIN. I believe you are correct.

I think you would want to be careful before you require a proof of safety prior to the introduction of any chemical into commercial use.

Proving a negative is exceedingly difficult, for one thing. It can be exceedingly long and I would think that putting the burden on the introducer to establish reasonable safety—and I think there has always been that kind of qualification—that it should only be with respect to classes of chemicals that had been determined to be inherently questionable.

Now, we have that authority under the pesticide legislation, the Federal Insecticide, Rodenticide Act.

We are in the process of reregistering all pesticides, 35,000 or 40,000 of them.

Mr. SPENSLEY. That is for pesticides.

That would not apply, however, to many of the chemicals that you have been referring to today.

Mr. TRAIN. No, it does not involve what we have been talking about today.

I am saying this is not an unusual thing that you are talking about. In our reregistration process, we are adopting a rebuttable presumption that for certain classes of pesticides the risk outweigh the benefits.

It is going to be incumbent upon the registrant, the manufacturer, to produce reasonable evidence that the benefits outweigh the risks in those cases, so the burden is placed upon the manufacturer in those cases.

This is not an unheard of procedure and it does exist at the present time.

I would not think you would want to expand that generally.

It could be a very inhibiting requirement in terms of innovation in industry.

Mr. SPENSLEY. So you are saying, in short, you would not support such a concept generally although you would support it in the pesticides area.

Mr. TRAIN. No.

You must have misunderstood me.

I would not support a requirement that all chemicals must be proved safe or relatively safe by the introducer prior to their being permitted to enter into the environment.

I do not think I want to have some unknown chemical coming into commercial use without some knowledge of its effects. I do not think it is practical for us to try to handle all chemicals but where we can determine that a new chemical falls into a high risk category because of its molecular structure or past experience with similar chemicals, something of that sort, I do not think that premarket testing would be an unreasonable requirement.

Mr. LEGGETT. Thank you very much, Mr. Spensley.

Mr. de la Garza, do you have questions of this witness?

Mr. DE LA GARZA. Thank you very much, Mr. Chairman.

I apologize, Mr. Train, for my absence but I had another very important matter and therefore, not having gone through your statement in detail, I would forego any question.

Mr. LEGGETT. I appreciate that and I thank you very much, Mr. Train.

We will be in further touch with you.

Mr. TRAIN. At the risk of being repetitive, let me make one more comment following up counsel's question.

I think that a very important element in the toxic substances legislation is notification of the commercial introduction of a chemcal so that even though we may not be requiring proof of no risk in advance of marketing, we at least know that something is going into the market; we know its general chemical characteristics.

We will know what testing has been done with respect to it, and are on notice and have an opportunity to blow a whistle if it is indicated before it gets into widespread use in the economy.

To illustrate the importance of such notice, PCB's are built so deeply into the economy now that no matter what you do it is a very wrenching process.

Mr. SPENSLEY. At least it is one small step for some men.

Mr. LEGGETT. Very good.

Thank you very much, Mr. Train.

Mr. Oberstar?

Mr. OBERSTAR. No questions.

Mr. LEGGETT. Mr. de la Garza.

Mr. DE LA GARZA. May I come back just for a question?

Mr. Train, when Secretary Reed testified he was asked about a plan and he alluded to the fact that he would leave that to your agency.

Could you go over that in your testimony?

Mr. LEGGETT. I think we have pretty thoroughly covered that.

Mr. DE LA GARZA. Then I would appreciate it, and I would redirect it.

Mr. TRAIN. If you have any further questions about it, do not hesitate to contact me.

Mr. LEGGETT. We will undoubtedly have you back here again.

Thank you again, Mr. Train.

Now, we have two industry members.

One is Mr. William B. Papageorge, Monsanto Industrial Chemicals and Mr. Clifford H. Tuttle, Jr., of Aerovox Industries.

Mr. Papageorge, how long would your testimony take?

STATEMENT OF WILLIAM B. PAPAGEORGE, MONSANTO INDUSTRIAL CHEMICALS CO., ST. LOUIS, MO.

Mr. PAPAGEORGE. I would say about 13 minutes, Mr. Chairman.

Mr. LEGGETT. How about you, Mr. Tuttle?

Mr. TUTTLE. I would say about the same or perhaps a little less, Mr. Chairman.

Mr. LEGGETT. Which of you has to leave the earliest?

Mr. PAPAGEORGE. I can stay overnight if it will help the committee any.

Mr. LEGGETT. Well, I would like to finish with both of you today. Do you have to go back tonight, Mr. Tuttle?

Mr. TUTTLE. I can stay or I can go at the pleasure of the committee.

Mr. LEGGETT. If you are both in the same situation, Mr. Papageorge, you are on first.

Mr. PAPAGEORGE. Thank you very much, Mr. Chairman.

My name is William Papageorge, and I am manager of product acceptability for the Montanto Industrial Chemicals Co., which is an operating unit of Monsanto Co.

Mr. LEGGETT. Very good.

And you are the very distinguished organization that has a cartel on the manufacture of PCB's.

Well, you do not have to answer that.

Mr. PAPAGEORGE. I like the distinguished part but I do not know about the cartel, Mr. Chairman.

Mr. LEGGETT. Your statement will be included in our record as though you read every bit of it.

Now you can highlight it or argue with the committee or suggest solutions or you can read it.

My staff has read the order of your analysis and you can do whatever you like at this point.

Mr. PAPAGEORGE. Well, that puts the burden on me, does it not?

Mr. LEGGETT. Yes; it does.

Mr. PAPAGEORGE. Then I would like to read it, sir, at your pleasure.

Mr. Chairman, the chemical structure of polychlorinated biphenyls—PCB's—has been known for nearly 100 years. Commercial production of the material was initiated in 1929 in response to the electrical industry's need for an improved dielectric insulating fluid which would also provide increased fire-resistant benefits when used in transformers and capacitors.

Mineral oil, the only known alternate material for these applications, had stability and flammability problems that made it potentially hazardous. Power surges in electrical equipment can cause arcs. A sustained, high-energy arc can vaporize mineral oil to the point where the material will ignite. The unique properties of PCB's—inertness, fire resistance, and their ability as dielectric insulators to act as nonconductors of direct electric current—made them ideally suited for those applications where high-voltage arcing could occur, and result in fires and/or explosions, damage to equipment and create hazards to people.

As the unique properties of this material became more fully understood, many additional uses were found. Their fire resistant nature made them an excellent choice for use in hydraulic and heat-transfer fluids. Their inertness imparted long-lasting qualities to lubricants. They also improved the waterproofing characteristics of surface coatings and offered similar and other benefits to the manufacturers of carbonless copy paper, printing inks, plasticizers and special adhesives.

PCB's, therefore, evolved as a truly unique class of chemicals which met important needs for both industry and society. It was within this framework that Monsanto and other producers developed a growing, worldwide business for these versatile products.

First signs of environmental concern:

In the late 1960's, some 40 years after PCB's were introduced, the first signs of potential environmental problems turned up in two separate events—one in Japan, the other in Sweden.

In 1968, about 1,000 people in Japan became ill from eating rice oil heavily contaminated with Japanese-produced PCB's as a result of an unfortunate industrial accident which has come to be known as the "Yoshu Incident." PCB's were being used as a heat-transfer fluid in equipment used to heat the rice oil. A leak developed in the equipment and went undetected, allowing the PCB to spill into the oil. Some news accounts have erroneously linked this incident with deaths, stillbirths, and miscarriages. While, in fact, no such cases were actually attributed to the incident, those exposed to PCB-contaminated rice oil did experience dizzyness, nausea, loss of appetite, weakness, and dermatological side effects. Infants, born to mothers who had been exposed during pregnancy, exhibited darkened skin at birth; however, in every case, this condition cleared within 3 months.

It should be pointed out that the levels of PCB contamination in the "Yoshu Incident" were in the 2-to-3 parts-per-thousand range—extremely high concentrations—while the levels being reported in fish and wildlife today are in the low parts-per-million and billion.

Mr. Leggett. That comes out to 2 or 3 parts per million?

Mr. Papageorge. Yes, sir.

It is also important to note that a similar industrial accident today, at least in the United States, is virtually impossible since PCB's are not used in heat-transfer applications.

The Japanese ban:

Primarily as a result of Yoshu, the Japanese Government announced, in 1971, a total ban on all PCB usage to become fully implemented by September of 1973. Monsanto and the U.S. electrical industry are often asked how Japan has been able to get along without PCB's in its electrical applications.

It should be pointed out that the major uses for PCB's in Japan were in "open applications," particularly for carbonless paper. The Japanese power distribution industry, less advanced than the United States technically, had never actually gotten around to taking advantage of fire resistant transformers to the extent they have been used in this country. Most of their transformers were either using mineral oil or were dry-type units. The Japanese capacitor industry on the other hand was only in the beginning stage of converting its equipment to the more reliable PCB dielectrics when the ban was announced.

Reliability standards for capacitors in the United States are much more stringent than they are in Japan or anywhere else in the world. So, the Japanese ban really did not materially impact that country's electrical power distribution industry.

THE SWEDISH FINDINGS

The other early sign of trouble was reported by a Swedish biologist, who, while using a new and totally unique technique, for the first time, identified PCB's in the bodies of fish. Montanto and others began immediately to study the Swedish work. But before these findings could be confirmed or duplicated in the United States, analytical methods had to be refined in order to separate PCB's from the other chlorinated hydrocarbons—like DDT—that were known to be present in the environment. Techniques also had to be developed to enable researchers to identify the chemicals in a very small parts-per-billion range.

MONSANTO'S RESTRICTED SALES PROGRAM

When these scientific investigations first confirmed the presence of PCB's in the environment in the United States in 1970, and long before information regarding the potential impact of this contamination was determined, Monsanto voluntarily began its program of terminating sales of PCB's to open applications—those which could likely result in losses to the environment.

Major applications affected by the company's unilateral withdrawal were in carbonless paper, fire resistant hydraulic fluids, heat transfer fluids and plasticizers. These restrictions resulted in a reduction in uses of PCB's, in applications where their loss to the environment was less controllable, of some 45 million pounds per year—cutting production in half.

At the same time, Monsanto made the conscious decision to continue supplying PCB's only to the electrical power distribution industry where they were marketed as dielectric fluids in closed or sealed systems such as transformers and capacitors.

In making this decision, Monsanto felt. (1) that entry of PCB's to the environment would be effectively limited and controllable as a result of this restricted sales program—which became fully implemented by late 1972, (2) that a more biodegradable, lower chlorinated homolog had been developed for use by the capacitor industry, and (3) that withdrawal from electrical applications would have brought to a halt production of equipment, essential to the safe and efficient distribution and use of electrical energy—there being no known, satisfactory replacement for PCB dielectrics available.

MONSANTO'S MANUFACTURING FACILITY

In the manufacturing area we took a number of significant steps to prevent loss of PCB's to the environment. Control, unique in the industrial chemicals industry, has been achieved. Measurable losses from the Sauget Village treatment plant to the environment are approximately 1 to 2 pounds per day, which equates to approximately 1 to 2 parts per trillion PCB's in the Mississippi River at average flow rates. [Two parts per trillion is the equivalent of two pennies out of $10 billion]. While there presently are no formal PCB discharge limits, proposals under consideration call for ambient water concentrations at levels not to exceed one part per trillion.

In our manufacturing area we have acted to prevent loss of PCB's in the environment by literally making the department a "concrete bathtub." Drainage is collected in an isolated PCB sewer system with setting basins to insure PCB containment in case of accidental spill or equipment failure with the capability of monitoring the effluent from the department.

Storage tanks are blanketed with nitrogen to eliminate tanks "breathing," and mist eliminators have been installed in vapor lines to eliminate the possibility of PCB's leaving the manufacturing area. The key to our continued success in controlling PCB's is in our maintaining a high housekeeping level.

A Monsanto chemical waste treatment facility, to be completed in late 1976, will be a further step in reducing PCB effluents.

STEPS TAKEN IN LABELING AND TRANSPORT PRACTICES

Monsanto ships PCB fluids in both bulk carriers and in drums. Bulk shipments are made in a Monsanto-owned fleet of tank cars which is used exclusively for that service, or in customer-owned tank trucks.

Drum shipments are made in special reinforced drums which we believe to be the best available.

A multilinqual warning label is affixed to each package giving a brief description of the nature of the material and appropriate actions to be taken in the event of a spill or leak. We also supply a label to be used on return shipments for incineration, which gives similar information.

THE MONSANTO INCINERATION SERVICE

An incinerator was built at our Sauget, Ill., plant for the specific purpose of destroying waste PCB-containing liquids, both from our own operations and from our customers.

Firebox temperatures above 2,000 degrees Fahrenheit are maintained to completely destroy the PCB compounds, and combustion products are removed in scrubbers. Routine sampling of both the stack and the scrubber effluent has confirmed the effectiveness of the system.

A fee for handling is charged for the information service, which does not fully cover the costs we have incurred to date in developing and operating the incineration system.

INDUSTRY GUIDELINES

In addition, representatives of the transformer and capacitor industries, utilities, and governmental agencies formed the American National Standards Institute Committee C-107 and promulgated guidelines for handling and disposing of dielectric fluids. The actions of this committee reflect the industry's understanding of the need for proper control.

FEDERAL TASK FORCE

In 1972, Monsanto's voluntary program was reviewed by a Federal interdepartmental task force—consisting of representatives

from the Office of Science and Technology, Council on Environmental Quality, Department of Agriculture, Department of Commerce, the EPA, HEW, and the Department of the Interior. The Federal Task Force Report, which is a matter of public record, supported and endorsed Monsanto's program.

CURRENT SITUATION—MONSANTO'S POSITION

Thus, the situation today is quite different from conditions which existed only a few years ago. Prior to 1971, Monsanto sold some 85 million pounds of PCB's per year to literally thousands of customers worldwide. At the present time, PCB's produced for U.S. consumption—about 27 million pounds per year—are used by fewer than 40 domestic customers and only in the manufacture of sealed electrical equipment.

All this notwithstanding, Monsanto is obviously aware of the mounting reports carried in the news media that would seem to suggest that the entry of PCB's into the environment has not been effectively curbed.

Monsanto simply cannot accept this hypothesis, given the following basic facts: (1) Production—reduced by over 50 percent; (2) open-system applications—totally eliminated; (3) manufacturing controls, unique in the industry—implemented; and (4) stringent electrical industry guidelines, for handling and disposal—established.

On the contrary, Monsanto sincerely believes that its current program, together with an increased level of awareness and concern on the part of the electrical industry, has had to have drastically reduced the amount of PCB's entering the environment. It is now known that certain of the PCB *isomers* will persist in the environment for a considerable period of time.

Monsanto is convinced, therefore, that the mounting reports of widespread contamination are not evidence that the restrictions are not working but, rather, substantiation of our theory that old PCB's have remained in the environment and are now being increasingly identified by a growing number of researchers, equipped with improved, highly sophisticated analytical tools and armed with advance knowledge of what to look for.

And, indeed, the findings of a task force involving agencies from Minnesota, Wisconsin, and the Federal Government, organized in the spring of 1975, tend to support this theory. Their report, issued in November 1975, said that industrial plants and sewage treatment facilities are not major sources of PCB contamination in the Mississippi River and its tributaries. Rather, the report suggested that the present source is quantities of PCB's that had been dumped into the river in past years.

The report explained that these PCB's settled to the bottom and became lodged in the sediment—only to be periodically stirred up by dredging operations.

PROGRESS ON ALTERNATE PRODUCTS

Monsanto has invested millions of dollars to implement and maintain its restrictive measures and controls and, despite the

company's strong belief that they are effective, it has invested additional millions in major ongoing research programs to develop acceptable replacement dielectric fluids that would be, in themselves, more environmentally compatible. Significant progress is being made.

It is important to discriminate between fluids designed for transformer cooling and those designed for capacitor impregnation. Because each application has requirements not shared by the other, Monsanto knows of no candidate replacement products which would be applicable to both.

For capacitors, we have studied several alternative technical approaches and have settled on a product, code named MCS 1238, which duplicates the electrical behavior of PCB's, yet contains no chlorine. The environmental and toxicological test data we have developed thus far encourages us to believe that MCS 1238 is better than PCB's—more biodegradable, not subject to biomagnification and relatively non-toxic. Additional studies currently underway include acute toxicity to wildlife, mutagenicity and teratogenicity—which are scheduled to be completed in early 1976, and 2-year animal feeding tests for carcinogenicity—which will be available by mid 1978.

We are confident, based on the results of all testing done to date and the chemistry involved, that no major problems will surface with those ongoing studies.

Our performance testing program has included accelerated life tests on capacitors impregnated with this material. While our own results are favorable, the ultimate acceptance must come from our customers. Sample quantities of this replacement candidate are currently being evaluated by customers.

Should we receive an early favorable verdict from enough of the industry to support an investment, we could get into interim production, at a volume sufficient to supply the industry, in a relatively short period of time.

Initially, the replacement product would be more expensive since the electrical industry would have to be supplied from an interim production facility. A fully dedicated plant could be constructed within 2 to 3 years.

In transformer fluids, we are not as far along. The same basic problems face anyone attempting to develop a replacement dielectric for transformers as for capacitors, but fire resistance is even more essential in many transformer applications for two fundamental reasons:

One: Transformers contain about 2,000 pounds of dielectric fluid compared to from 2 to 4 ounces in the typical ballast-type capacitor, and

Two: Many of these 2,000-pound units are installed in high-rise buildings, hospitals, schools and urban commuter trains, where a fire could well be catastrophic.

It is because of this that, despite the normal commercial incentives to replace them, PCB's have endured as the standard dielectric fluid for over 45 years, consistently performing their designed functions better and safer than any other product as yet conceived.

It is axiomatic that the chemistry which imparts high fire resistance tends also to produce stable molecules—those that tend to persist in the environment.

Our research efforts here are focused on developing replacement fluids that will provide performance reliability, acceptable fire resistance and environmental compatibility, as well.

Unfortunately, there is no accepted, quantitative definition of the degree of fire resistance needed in a fire resistant transformer fluid.

Another major objective of this program centers around the need to develop replacement fluids that will not only work in newly designed transformers but also in the thousands of existing "Askarel" type transformers—which, by definition, contain fire resistant dielectric fluids—currently required in high density population applications. Electrical, zoning and building codes, and indeed insurance rates have been traditionally predicated on the use of these Askarel units which, without exception, get their fire resistance ratings from the use of PCB fluids.

We feel we have a responsibility and a commitment, to the extent it is technically possible, to develop a fluid that can be used, interchangeably, in these Askarel transformers—thus avoiding the obvious economic burdens and serious power disruptions that would otherwise result from having to replace or retrofit them.

We have one promising candidate which is currently being readied for testing by transformer manufacturers. Preliminary environmental and toxicological screening has been completed on this new candidate fluid, and the test protocol for a comprehensive biological evaluation program, similar to the one used for our capacitor fluid, is currently being developed.

Monsanto's future plans/intentions:

While Monsanto made the conscious decision back in 1970 to begin restricting sales to closed-system dielectric uses, the main reason we elected to continue supplying the electric industry was that they had no viable alternates to turn to.

EPA also recognizes this, even today. At his December 1975 press conference, EPA Administrator Russell Train said he would not ask Monsanto to stop production because that would shut down the electrical power industry and the railroads in short order. He said we must find a way to proceed without shutting down the country.

This is precisely the position to which Monsanto has been committed since 1970.

While the PCB issue is a difficult one to handle, the difficulty does not now, nor will it in the future, stem from any lack of effort or cooperation on the part of Monsanto.

The problems that we face, collectively, are rooted in the unique fire resistant and dielectric characteristics of PCB's and the irreplaceable role they have played in electrical and industrial applications for the past 45 years.

The challenge is to replace them in an orderly manner without creating another hazard of equal or potentially greater consequences while, at the same time, avoiding serious power and transportation disruptions.

Monsanto has no desire to remain in the PCB manufacturing business any longer than is necessary. By this we mean as soon as we are able satisfied that the electrical power supply industry's needs for usable, acceptable alternate dielectric fluids have been met by whomever, Monsanto will voluntarily shut down its PCB manufacturing unit.

In the interim, we will continue to work with industry and Government to insure that the restrictive measures and controls we implemented in the early 1970's remain in force and are diligently pursued.

Thank you, Mr. Chairman.

Mr. LEGGETT. Thank you very much, Mr. Papageorge.

Now, you are currently selling it to 40 companies, half of which you were manufacturing in 1971, is that right?

Mr. PAPAGEORGE. That is correct, approximately correct.

Mr. LEGGETT. How much are you exporting?

Mr. PAPAGEORGE. The latest figure I saw, sir, about 17 million——

Mr. LEGGETT. To how many companies?

Mr. PAPAGEORGE. Export, I do not know that number.

Mr. LEGGETT. Would that not be important, too?

Mr. PAPAGEORGE. I do not know. I do not know who could use that information. They go to Southeast Asia, South America, Africa, Mexico, Canada.

Mr. LEGGETT. The way we get the evidence is that we are all in one ecosystem.

Mr. PAPAGEORGE. That is right.

Our policy that we follow in the United States we follow throughout the world, which is slightly different than our competitors throughout the world.

Mr. LEGGETT. How many people do you employ to manufacture this?

Mr. PAPAGEORGE. The individuals directly involved for a full working day, number at best about 20—a couple dozen people.

There are others who are involved sporadically such as the maintenance men who do repairs and then leave the operation.

Mr. LEGGETT. Now, the Japanese apparently went out of this business 3 years ago. They apparently do not have a transformer standard requirement like we do, but the question is, so what?

Mr. PAPAGEORGE. I can only speak of my personal experience, sir.

Mr. LEGGETT. Are you particularly knowledgeable as to what deficiencies they really suffer in their system because they failed to meet our high standards which we meet through the utilization of PCB's?

Mr. PAPAGEORGE. No, I am not. I suspect someone in the electrical equipment industry would be better qualified.

Mr. LEGGETT. But if your company does have informaion like that, it would be helpful.

Now, we have evidence—I guess it is an application before the Environmental Protection Agency and/or others, I think by General Electric, who discharged directly something like 10,000 to 14,000 pounds of PCB's per year.

Are you aware of that?

Mr. PAPAGEORGE. Yes, sir.

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Mr. LEGGETT. So that despite the fact we do have this closed system, it does open up in certain spots?

Mr. PAPAGEORGE. I do not know that anyone has ever tried to misinform anyone that this was totally a closed system to the point where not a molecule would ever escape.

Mr. LEGGETT. Let me ask you this then.

Do you have any estimate of the amount of PCB's that you sell is it on the order of 40 million to 45 million pounds per year?

Mr. PAPAGEORGE. Right.

Mr. LEGGETT. How much of that do you estimate escaped into the environment?

Mr. PAPAGEORGE. It is more in the order of 10,000 pounds per year, although I can understand from Mr. Train's testimony that we may have some differences of definition.

By escape, we are talking about the situation in which PCB's are made available to living creatures as distinguished from material buried in landfill.

Mr. LEGGETT. I understand. I would not counterattack that. If it is buried in a landfill and the landfill is a contained system, I would not count it as an escape.

Mr. PAPAGEORGE. That is the way we defined it; yes, sir.

Mr. LEGGETT. I think Mr. Train was talking about escapes from the landfill.

Mr. PAPAGEORGE. I have no measure of what is escaping from landfills. I am not aware of any programs that have monitored landfills.

So it has to be an estimate.

Mr. LEGGETT. OK.

You say 10,000 pounds out of the 45 million, that would be 1/45 hundredth, I guess, as escaping of what you are producing. OK.

Let me see. I have got to go.

Mr. de la Garza, can you Chair the committee for the balance of the questioning of this witness?

Would you like to proceed and answer questions tonight, or would you like to come back tomorrow?

Mr. PAPAGEORGE. It is up to the committee, sir.

I am available any time.

Mr. LEGGETT. Mr. Ruppe, do you have any preference?

Mr. RUPPE. I have to leave before noon tomorrow, so the chances with the witness' time would be appreciated.

Mr. LEGGETT. All right.

Because we are not coming back until 2 o'clock tomorrow, why do you not Chair the balance of the meeting, Mr. de la Garza, and—our last witness will be here tomorrow inasmuch he indicated it made no difference whether he stayed or went home. And we chose to have him testify tomorrow.

All right. The Chair would ask Mr. Tuttle if you would like to reconsider that. We frequently reconsider things, Mr. Tuttle.

Do you have any strong preference one way or the other?

Mr. TUTTLE. Well, I certainly would rather go back tonight, but, on the other hand, if it has to be postponed until tomorrow, I will make myself available.

Mr. LEGGETT. All right.

He has indicated he does not want to reconsider and you have got to make a stronger plea than that. Very good.

Proceed, Mr. de la Garza.

Mr. DE LA GARZA [presiding]. The question is you said your statement was 10 minutes or so, and if there is no great interest in questions afterwards and you would like to continue and make this statement, I think probably we can accommodate you here until about 6 o'clock or thereabouts.

Mr. TUTTLE. I would appreciate that.

Mr. DE LA GARZA. I do not think the chairman would have any preference unless you gentlemen are interested.

Mr. RUPPE. Can we have a few moments after the gentleman has testified to ask a few questions of both of them?

Mr. DE LA GARZA. We all have the time element problem, but I know being away from home and so on, if we can accommodate them, and all of you are agreeable, fine.

Mr. STUDDS. Fine.

Mr. DE LA GARZA. Any further questions of Mr. Papegeorge?

Mr. RUPPE. I have three questions.

Do you make any sales for use in open systems today?

You have indicated in your testimony you cut back the sales and have a program for elimination.

Has that program been completed and have you stopped all sales for open system use today?

Mr. PAPAGEORGE. The open system sales were terminated in early 1971.

Mr. RUPPE. You mentioned some possibility of PCB's being released in some type of breathing process.

Is that possible to take place in either—during the shipment or during storage by your customers, or even when the material is actually in the transformer itself?

Is there any chance for a release later on?

Mr. PAPAGEORGE. I cannot speak——

Mr. RUPPE. In the breathing process or any other process?

Mr. PAPAGEORGE. I cannot speak for the application in the electrical equipment. I would suggest that hopefully you can speak with someone who knows how a transformer functions while in service.

In the transporting, there is, of course, no breathing that occurs in the steel drums and in the tank car or bulk movements. The material is shipped at low temperatures so there are no high vapor losses and, in many instances, the use of inert gas like nitrogen is used. This is what we use.

Mr. RUPPE. You are satisfied that it gets from your plant to the customer's doorstop without the release of PCB's?

Mr. PAPAGEORGE. Yes; I am.

Mr. RUPPE. On page 9, you refer to the fact that—following up on your statement, you do not sell for open systems.

Is it not true that there is a certain amount of PCB reprocessing that does go into open-system utilization?

Mr. PAPAGEORGE. I have heard rumors to that effect, but this is not something we recommend or get involved in.

Mr. RUPPE. Do you know for a fact that perhaps it does get reprocessed for use in open systems?

Mr. PAPAGEORGE. I have been told by some people in EPA that they have some information in this area, but I have not been told the details.

Mr. RUPPE. Last question.

Do you know if PCB's are imported, and again, if they are imported, are those uses of imported PCB's most likely to be in open systems since it appears that Monsanto has a pretty good lock on the electrical utilities industry?

Mr. PAPAGEORGE. Again, I have to mention that my information came from EPA representatives who, in turn, got this from the Customs people, and the uses appear to be open type uses, those uses which we abandoned.

Mr. RUPPE. You mentioned that, on page 3, that the Japanese Yoshu incident was erroneously linked to deaths and stillbirths, miscarriages, and the like. And I understood there is an EPA study that indicates there were links to that effect.

I am not sure if you have been so advised.

Mr. PAPAGEORGE. I can only speak again from my personal observation. I have talked to Professor Kuratsame when he was here, and I believe we understood each other, and at no time did he say these were attributed to the exposure.

I have also spoken with representatives of the Food and Drug Administration who also have that impression, and we have in our medical department in Monsanto a letter from a professor who categorically says that the deaths were not attributed to the exposure.

Mr. RUPPE. Thank you very much.

Thank you, Mr. Chairman.

Mr. DE LA GARZA. Mr. Studds?

Mr. STUDDS. I will be extremely brief in recognition of the rule that thou shall not delay thy constituent.

Mr. Papageorge, I did not catch—I am not sure of your position with the company.

Mr. PAPAGEORGE. My position is that of manager, product acceptability.

Mr. STUDDS. Product acceptability.

I just really have one question. In today's Boston Globe, which is northeast of St. Louis, there is the following statement:

> Monsanto Co. has announced it intends to phase out the production of PCB's. In making the announcement in St. Louis the company spokesman said the phase out would take place in a planned and orderly manner.

Now, is that simply a rephrasing of your last paragraph, or is that an announcement of a new policy?

Mr. PAPAGEORGE. No; the intent was to rephrase. I hope it was done properly.

Mr. STUDDS. So that is not saying anything more or less than what you have said?

Mr. PAPAGEORGE. You are right.

Mr. STUDDS. Thank you.

Thank you, Mr. Chairman.

Mr. DE LA GARZA. Mr. Papergeorge, could you tell me, in a layman's term—are you a chemical engineer, a petroleum engineer, but can you tell us in a layman's term—can you explain to me in layman's term what is PCB?

Mr. PAPAGEORGE. I can try, sir. I have tried some time, and I think I have succeeded, and sometimes I do not do so well.

Mr. STUDDS. He really wants to know whether it comes from oil or gas.

Mr. PAPAGEORGE. He should.

We start with a high-purity benzene, and benzene is described by the chemists on paper with a diagram which represents a hexagon.

If you can visualize two hexagons, point to point, we have what we call the biphenyl group. Each of the points of the hexagons represents the position of a carbon atom.

To each carbon there is a hydrogen atom associated, so that give us—if I have my numbers correct, 12 carbon atoms, and 10 hydrogen, making the biphenyl group.

The biphenyl is then exposed to chlorine gas in its molten form. The chlorine displaces the hydrogen. The amount of exposure determines how many chlorine atoms affix themselves to the biphenyl group.

So we can have from 1 to 10 chlorines attaching themselves randomly on this double ring.

This is why this is called a commercial mixture, and it is a mixture of about 50 to 70—maybe 80 of these random mixtures of from 1 to possibly 10 chlorines.

The longer the chlorine is exposed to the biphenyl, the more chlorine attaches itself. Therefore, you will have PCB mixtures with chlorine content of 21 percent up to 68 percent. This is an indication of the amount of chlorine present.

There are, as was previously mentioned, 209 different chemical involved. So when we speak of PCB's, I think we should be very careful that we all understand what we are talking about. I find not only for PCB's, but for the precedent that it establishes, that we have got to be very careful that we do not attribute any characteristic to the whole family of 209, because it may not be factual.

Mr. DE LA GARZA. Where does the original benzene come from?

Mr. PAPAGEORGE. Benzene comes from petroleum sources.

Mr. RUPPE. Is that identified to one State, or just——

Mr. PAPAGEORGE. Well, yes. It does come out of Texas. Does that help any?

Mr. DE LA GARZA. I thought we ought to have that for the record, the process, and using the terms. it is a catalytic effect rather than a cracking or extracting effect. You take the benezene and then——

Mr. PAPAGEORGE. The benezine is cracked.

Mr. DE LA GARZA. You crack the benzene from the crude, and then in the process of making other matters from crude, but you add the chlorine.

Mr. PAPAGEORGE. Right. It is a chemical addition, right.

Mr. DE LA GARZA. Thank you very much, sir.

Are there any other further questions?

Counsel?

We appreciate very much your contribution, and without any further questions, you are dismissed.

Now, our next witness is Mr. Clifford H. Tuttle, Jr., Aerovox Industries.

Before you start, I might tell Mr. Papageorge, if you are looking for sites or sources for your product, we welcome you in South Texas.

You already are near Corpus Christi, but we wish you would come further south.

Mr. PAPAGEORGE. All right, sir. I will carry the message back.

Mr. DE LA GARZA. The same way with Aerovox.

Mr. STUDDS. A bad precedent has already been established.

Mr. DE LA GARZA. We will be happy to hear from you at this time, Mr. Tuttle.

STATEMENT OF CLIFFORD H. TUTTLE, JR., AEROVOX INDUSTRIES, NEW BEDFORD, MASS.

Mr. TUTTLE. Mr. Chairman and gentlemen, my name is Clifford Tuttle; I am not going to read this. Instead, I will highlight it and cover a few of the points on which I think there may be some confusion from previous testimony.

Firstly, you are just beginning to appreciate the magnitude of the problem.

Mr. Studds read a press clipping about the drinking water in five cities. I venture to say it is in every city water in the United States of America.

In New Bedford we reported the PCB content of incoming water to EPA. We also reported to the EPA that Boston was considerably worse than New Bedford. For New Bedford, it is not difficult to identify the source, because if you go back 10 years, we were paid for our scrap PCB's by the city, which used them to oil the roads.

Obviously, this was before the time we knew we were dealing with this ecological problem. What the source would be for Boston City, I cannot say, but PCB's are there.

Today there are three uses of PCB's. We have talked about them in general, and I am sure you gentlemen do not have to be told how to distinguish between them.

My company, Aerovox, manufactures what is known as small capacitors. A small capacitor is the type you have in fluorescent lighting, in street lighting, in television sets, microwave ovens, air conditioners, and virtually every AC motor in any plant, elevator, and so on.

It is used for one reason. It reduces the amount of energy required, and today the demand for this application is now up, because I am sure you are aware of the President's mandate on energy consumption decrease to appliance manufacturers of refrigerators, freezers, washing machines, and driers; none of these are now power factor corrected directly.

If appliances do not have this type of capacitor, by adding it will cut the amount of energy used. This is going to mean more capacitors, not less needed.

So to some extent we are fighting ourselves—not that I am arguing—but we are trying to cut our energy consumption, which is a function of this capacitor, and yet it only operates well with a PCB in it.

The small capacitor constitutes about half of Monsanto's sales or 20 million pounds.

A second use is the large capacitor. This is the type that is used in very large buildings, on the side of the building, or inside it. It is also used by utilities. This constitutes about another 7 million pounds.

The chairman left, bnt he cited an article in Electric World, relative to McGraw saying it has a non PCB fluid for capacitors. That article specifically states the fluid is for large capacitors. It is not for small capacitors.

The manufacturer of that fluid is Dow Chemical, and the first time material was put in the hands of small capacitor manufacturers was in December. We have had it on order since last spring. We are just starting to test it. Whether it will be a good alternative fluid to PCB in small capacitors I do not think that anyone can state yet. Obviously I have to agree with Mr. Train—without the PCB capacitor—you would virtually stop the construction industry, and we would also probably double the amount of energy used. We could go back to incandescent lights. Incandescent lights are exactly one-quarter as efficient as fluorescent.

In the past we have used PCB's for four reasons. The first one was flammability, and I think that has been well documented. There is no fluid that we are going to get that is as good as PCB in flammability, because it will not burn as used in our application. We are going to have to make a compromise there.

Another factor was reliability. When we used mineral oil—that was before my time—users had to change fixtures every 2 or 3 years, which is as often as you change a bulb in a fluorescent. Obviously, we hope whatever we use instead of PCB will not require the changing of the fixture every 2 or 3 years, because it will be prohibitive in terms of today's service costs.

And the last—the cost is very attractive in a PCB unit, compared to anything else.

In my statement I cite very strongly the fact that we should talk about PCB's by their specific formulation rather than the generic term PCB.

I have been told that I took a remark by Dr. Risebrough out of context. I am very anxious to see the record of the Chicago Conference, because I am sure I quoted him correctly.

The fact is that there are only three fluids really in demand that Monsanto makes now. One is Aroclor 1016. This is used in capacitors and is exceptionally biodegradable.

We have talked about the number of chlorine atoms in a molecule. Pentas and above—molecules with five and six chlorine atoms in it—have a half life of maybe 50 years. Aroclor has only 0.1 percent of the pentas.

There is another formulation called 1242; this has 7 percent of the pentas and above.

Now, beyond this I am not going to get into an argument; EPA has not agreed on what is biodegradable, and how quickly even Monsanto cannot tell this specifically.

Everyone agrees the one chlorine degrades quickly and two or three pretty well, but we are a little hung up on the four.

I am going to touch briefly on some of the things that have been done by industry. In some cases this must be limited to our company. Still I know that everyone in the capacitor industry switched voluntarily 5 years ago when 1,016 became available, even though the cost went up about 40 percent. We were aware enough of the ecological problem to say, "Let us spend more money to get material that is more biodegradable."

There has been a lot done in the area of discharge. Everyone today in the industry is paying a cost of about 10 cents a pound for hundreds of thousands of pounds a year to be incinerated at a high temperature. This is the only way we can totally breakdown a PCB.

Because of this and other practices, I would take very strong issue with Mr. Train's statement that 10,000 pounds are going to the environment via direct discharge. I am part of an industry committee that has determined that right now we are discharging 7 pounds a day as an industry. That is the total direct discharge, and that includes both municipal and navigable water. My company has gone from 5 to 10 pounds in 1970, to about a half a pound to 2 ounces a day right now. On the fifth of January this year our discharge was six-tenths of an ounce.

Other companies have made similar efforts, and we are working very closely, subject to the antitrust restrictions, to share our knowledge of how we can help the environment.

Although Bill Papageorge covered the Yoshu incident very well, I would like to add some comments. The fact is this is the only documented evidence we have of the effect on man of PCB's. There are some studies being done now. NIOSH has contacted four or five plants. They are going to spend considerable time at one of these plants, because each represents the only known populations that has been working with PCB for a long time; they will try to study the resulting effects. It looks like Aerovox is going to be one of the winners, if you can call it a winner, and GE may also have the lucky task of having all these people running around through our records and talking to our employees.

Two things that have not been pointed out to date, although you will get on them tomorrow.

First: In Chicago at least two panels reported on studies of the food chain that indicated that in the last 3 years the food chain has significantly improved with the exception of certain species of fish, which you are concerned with. They cited stripers, obviously, and a couple of species in the Great Lakes area.

Second: Other papers cited the fact that every body of water has improved, with one exception, and that was Lake Michigan. All other bodies of water have shown a drop in PCB, as we expected they would.

An alternative fluid is the solution to the problem. The lack of one presently is the reason that Mr. Train said he would not want to put a time schedule on a PCB phaseout. By now, he appreciates the need to have a viable alternative to which to go.

There are two potential fluids. We expect that the fluid that the McGraw-Hill article covered will probably raise the price of our product 100 percent, which would have a major economic impact on the Nation. We have a little more hope for the fluid that Monsanto is coming along with. Unfortunately, both were only available to us late in the fourth quarter. Tests are underway at our plant on these, and I am sure they have started at every other plant that could use them.

Whatever happens, we are going to definitely have to have some modification in our personnel safety requirements. Our industry is hoping to get Mr. Train or others in the Government to help us on this. UL is our specifier—they write the Bible—and right now they have not recognized the problem. Still we have told them there is no choice—changes in the requirements for flammability must be made.

We would estimate that testing these alternative fluids, if successful, could give us enough data under our belts by late in the spring of next year to say let us go. At present, I don't know if the successful candidate will be Monsanto or Dow Chemical or someone else. After the approval, it will probably take another year to gear up to produce 20 million pounds needed annually by our industry.

The switch from PCB probably cannot be made without a large gamble in product reliability, before July 1978, but I do think that this is a reasonable date to try to hit.

I would like to emphasize one section in my statement. I point out that our discharges go into Buzzards Bay, a body of water that I fish in, as do a lot of others. The tests we have had conducted by outside laboratories indicate that that body of water now meets the proposed water criteria which has been established by EPA for all waters; this is one part per trillion. Many testing labs say that they cannot measure and even EPA has admitted it has trouble measuring one part per trillion. Still that is the requirement.

I further point out that this is being achieved despite the fact that Aerovox and others in the area were not particularly mindful of the environment in the past—we did not know that what we were doing was wrong. Still the fact is we did not try to minimize our discharge into the environment. We used scrap material to oil the roads, and keep the dust down. Our practices were not good, and we used a much less biodegradable material at that time.

And last, one of the things that has not been previously mentioned is that one of the best uses of PCB was for bottom paint on boats. Practically every vessel in New Bedford, which has many boats, was painted with PCB up through 1971—a high chlorine content PCB, 10 to 15 percent and therefore nonbiodegradable. If you scrape those hulls you will find the PCB is still there, but Buzzards Bay has been cleared up.

I am sure there are other ways in which PCB have gotten into my local environment. As a matter of fact, EPA pointed out that

a recent bridge across the New Bedford Harbor, carrying I-95 across, was done with a lot of landfill and that PCB was found in the earth.

You are groping with a very big task. There is no doubt that we have got to stop using PCB as quickly as possible. I hope, and suspect that we can do that in the timespan I just suggested but that is still 2 years plus. The bigger problem is what we do to rectify the harm done to the environment over the past 45 years; I do not have that answer, and I have spent virtually half of my time over the last 6 months dealing with the PCB problem.

Thank you.

Mr. DE LA GARZA. Thank you very much.

Mr. Studds?

Mr. STUDDS. Thank you, Mr. Chairman.

Mr. Tuttle, I appreciate your patience with our time schedule, and hope you make the airplane.

Do not pay any attention to Mr. de la Garza when he is talking about luring you to Texas.

You said that at one point, I think, with reference to EPA, that they refused to talk with you. You said they hold the Bible, and would not talk with you, or something like that.

Did I misunderstand you?

Mr. TUTTLE. I do not know. No, I did not mean to say that, at all. EPA has been very cooperative, very cooperative.

Mr. STUDDS. Then I beg your pardon.

Mr. TUTTLE. That was Underwriters Laboratory.

Mr. STUDDS. There has been, in your experience, no instance of lack of cooperation from Federal agencies?

Mr. TUTTLE. Absolutely none. None, no.

Mr. STUDDS. Did I understand you correctly to say that you are most optimistic in your estimate of July 1978 in terms of complete cessation of use of PCB, and a transfer to some other——

Mr. TUTTLE. That would assume that one of these two, or some small modification, or something that pops up very quickly with a fluid that was acceptable.

Mr. STUDDS. I gather from listening to you that your own company, and the industry in general, is doing every thing they can to further this research to accelerate that process?

Mr. TUTTLE. They are. About a dozen of us have attorneys now determining whether we can do this on a developmental joint effort.

Mr. STUDDS. Are you aware of any way in which you think the Government might, or ought to be of assistance in this problem that it has not been so far, or you do not care to see the Government involved?

Mr. TUTTLE. Let me say I would not want the Government mandating the industry on what fluid to use, unless it wants to pick up the responsibility for the product.

I would say that there are two things; and perhaps NBS, or some other group, could assist in making a legal vehicle to assist in the evaluation of alternative materials, rather than having 15 companies going in 15 directions. That is the American way, but it does not bring the product necessarily to the market first. The Japanese

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are working through MITI via such means, and getting things done quickly.

The other thing—and I should have mentioned it earlier. We made a very passionate plea when we met with Mr. Train 2 weeks ago that perhaps some legislation could be passed giving some kind of assistance on fire insurance, this would be helpful.

There is going to be a big problem with the insurance underwriters, and in the end I am afraid of a lot of instances will come to pass in which a person will say, "let us try a lawsuit." All of us in the industry are going to be faced with product liability insurance bills that are going to be very, very substantial—very substantial.

I do not profess to really know how this could be worked out. Mr. Train was not too optimistic, either.

Mr. STUDDS. Thank you, sir.

Thank you for your time, and thank you, Mr. Chairman, for being accommodating.

Mr. DE LA GARZA. Thank you, Mr. Studds.

Let the record show that I am a friend of the New Bedford fleet. I just do not want to afford them any real protection that would injure the Texas fleet.

Mr. Ruppe?

Mr. RUPPE. Thank you very much. It may wipe out the Massachusetts fleet.

Thank you for a very, very interesting, very informative statement.

You mention the work your company has done, and the work that Monsanto has done to eliminate the sale of open system use of PCB.

Do you, in your own company, and from your own knowledge, and experience, know whether there is a great deal of import of this product, or reprocessing of the product for open systems use in the United States?

Mr. TUTTLE. I cannot imagine anybody in business being foolhardy enough to play with the liability we have.

Monsanto required 4 years ago that each of us, in order to be a customer, personally indemnify the Board of Directors of Monsanto.

Mr. RUPPE. How about the guy who reprocesses the waste?

Mr. TUTTLE. I pay a huge $10 million insurance policy on each director, and to sell a little scrap oil for a few dollars would not be too intelligent.

Mr. RUPPE. You have no knowledge of import through open system, or recycling or reprocessing?

Mr. TUTTLE. We process all fluid that comes into our plant from Monsanto. It is not clean enough to use; we filter it ourselves. We do our own filtering, but——

Mr. RUPPE. But yours is an open system use, the end product?

Mr. TUTTLE. The end product is closed, yes. The only place that I can think of it would not be in small capacitors, which you must remember are non-repairable items.

There are repair stations for your larger transformers and your capacitors.

Yes, these repair stations are generally a part of one of the big three or four who make that end product: Westinghouse, General Electric, McGraw, and so on. To the best of my knowledge, they are operating under the same care and practice that is dictated by management of the other plants.

They take a transformer in, and perhaps drain fluids; if it is deemed broken down, they barrel it and ship it back to the home plant which has an incineration process. The repair station then refills the transformer with new fluid.

I think generally all of the normal safeguards are being practiced there. Admittedly I have heard the rumor about recycling, and black market, and so on, but I just do not know that it exists. I really do not. I have no way of believing it, other than via imports, and it is very possible that the amount of imports may be unstated.

We have identified one user of imports of the type that are under investigation, also a constituent.

Mr. STUDDS. I hope that that is not the distinction that it sounds like.

Mr. TUTTLE. It is.

This is not a good use, but I have to say that it happens to turn out a beautiful gear, very inexpensively. Unfortunately, it requires that PCB wax being burned off and this gets into the environment. I am sure there are people who are still trying to buy PCB for hydraulic equipment and other things, because it is better.

I know of one guy who had a whole bunch of booster pumps. Without PCB as a cooling fluid, he had to wipe out about $200,000 worth of pumps. He queried me on the sale of PCB, I said, "no", although I could have made a buck on it. It just was not worth it.

Believe me, I really do not know of any black market selling, and I would be surprised if there is any, unless there is something insignificant which has not been identified, and that is very possible.

Mr. RUPPE. A number of people on this committee and in Congress have introduced a variety of toxic substance control pieces of legislation.

Do you think there is any merit to any type of pretesting, or preanalysis of the effects of such products in this area, and I must confess I do not know anything about it, to be more specific, but would there be any value in this kind of pretesting, which I think EPA referred to even earlier, as one of the things that would be within their realm of authority should the Toxic Substance Control Act pass in any form?

Mr. TUTTLE. I must say, that had you asked me this 2 years ago, I would have said a Toxic Substance Control Act was not necessary. But now I think it is a good idea, even though it is going to further control business.

I will be honest; at least two of the fluids that we are looking to as alternatives may not be ecologically and environmentally any better than PCB. I mean that. My people tell me they are not sure that alternatives will buy a thing, except a more costly product that is less reliable; the environment may be no better off than it is with 1016.

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We might as well face up to potential problems before we bring out a new product—such as the cure all for the PCB that we are now using.

It is not impossible that via such legislation, and we do hear such arguments, that 1016 could be judged a PCB formula which should be continued for a long time. In this example, unfortunately, because Monsanto has gotten so much negative publicity, that even at triple the price, they would not continue PCB production.

I think that what Mr. Train suggested was a responsible way of eliminating the possibility of introducing harmful chemicals. He did not necessarily advocate pretesting except on certain formulations of chemicals—certain combinations of chemicals, that past experience indicated posed problems. I know that environment studies are going on right now by Dow Chemical on their fluids, and Monsanto on their fluids, and Dow Corning on their fluids, because they are coming into an area—replacing PCB—in which we, their customers, are saying there is no point in jumping from one fire and ending up in another fire the next day. EPA will be right down our necks all over again on a different chemical if it is hazardous.

So I think really toxic substances legislation, although it may not be this committee's responsibility, is in order for consideration. I must state though that I have not read the proposed bill.

Mr. RUPPE. Are you suggesting pretesting or, I think perhaps you said more identifying the chemical composition, or chemical pieces of the product?

Mr. TUTTLE. I am suggesting that some pretesting is necessary on certain more potentially harmful chemicals. I am suggesting—well, I am suggesting what Mr. Train recommended—that the legislation call for prenotification of any new chemical on those that were improvements of prior materials or new applications of chemicals used without harm in the past, nothing further need be done. But on those of known risk, pretesting I think would be in order—and obviously pretesting is being done right now.

Mr. RUPPE. Thank you, Mr. Chairman.

Mr. DE LA GARZA. Thank you very much.

Counsel?

Mr. MANNINA. Mr. Tuttle, you seem to indicate Aroclor 1016 should be continued in use, and that the environmental impact may not be as severe as other PCB's. You indicate that Dr. Risebrough at the University of California stresses in his study that he has yet to find that particular component of PCB in environmental or animal life.

I would hope you and Dr. Risebrough could get together.

I took the liberty of talking with him yesterday, and it was his feeling that your statement did not reflect his position accurately, that 1016 had been found in the environment and in animal life.

He further contended that 1016 is toxic. Given your statement, could you explain the difference between 1016 and 1242, if 1016 has 41 percent chlorine and Aroclor.

Why is 1016 a better compound than 1242?

Mr. TUTTLE. I am not a chemist or a toxicologist. It is not so much the amount of chlorine, but how many chlorine atoms are in the benzine molecule. Therefore, how much will biodegrade instantaneously.

Those with two atoms will go very quickly. Three quite quickly. The biodegradability of molecules with four atoms, as I said, is up in the air. So it is really what is inside the structure, not the percent of chlorine by weight.

Now, 1242 has got 7 percent of its molecules that contain 5, 6 or 7 chlorine atoms and do not degrade. 1016 has got 0.5 percent. That is the difference really; it has less of the 5, 6 and 7 atom molecules, and 1016 has got more one's and two's.

Mr. MANNINA. Thank you.

Mr. TUTTLE. That is the difference. I do think when the Chicago record is published, and I wish it were out now, that that quote will be correct.

Mr. MANNINA. Perhaps you can get together and verify, amongst yourselves.

Mr. TUTTLE. One individual from EPA did indicate my quote was correct, but let's drop the subject.

Mr. DE LA GARZA. Thank you very much.

We appreciate your contribution. I am sure there will be more questions, and with that, the committee will stand in recess until 2 p.m. tomorrow.

[Whereupon, at 6:16 p.m., the subcommittee recessed, to reconvene at 2 p.m., Thursday, January 29, 1976.]

MONS 091399

POLYCHLORINATED BIPHENYLS (PCB)

THURSDAY, JANUARY 29, 1976

HOUSE OF REPRESENTATIVES,
COMMITTEE ON MERCHANT MARINE AND FISHERIES,
SUBCOMMITTEE ON FISHERIES AND WILDLIFE
CONSERVATION AND THE ENVIRONMENT,
Washington, D.C.

The subcommittee met at 2:50 p.m., pursuant to recess, in room 1334, Longworth House Office Building, Hon. Robert L. Leggett, chairman of the subcommittee, presiding.

Mr. LEGGETT. The meeting of the Subcommittee on Fisheries and Wildlife Conservation and the Environment will please come to order.

This is the time regularly scheduled for the second day of hearings on the oversight problem with respect to polychlorinated biphenyls, also known as PCB's, being introduced into the environment in spite of the fact that we have taken certain voluntary precautions.

In testimony that we have received yesterday, the committee was apprised of the overall national problem, particularly as respects fire in the high concentration of PCB's found in the fish environment in the Great Lakes area, such parts of the Atlantic Coast, to a lesser degree in other parts of the country, including the Yukon.

Today, we have a total of six witnesses, and counsel has suggested that we have all six witnesses testify as a panel, and the members be allowed to perhaps question them, not necessarily in rotation, but as the demand may require.

Today we have Mr. Tom Carver, National Marine Fisheries Service, U.S. Department of Commerce; Mr. Karim Ahmed, Natural Resources Defense Council: Mr. Lee Wedding, executive director, National Fisheries Institute; Dr. Del Wayne Nimmo, Environmental Reserch Lab, Environmental Protection Agency; Mr. Bob Pond, Stripers Unlimited: and Prof. Donald Parejko, Department of Biology, Northern Michigan University.

Very good, gentlemen.

Mr. Carver, your job with the National Marine Fisheries Service is what?

MONS 091400

STATEMENT OF TOM CARVER, NATIONAL MARINE FISHERIES SERVICE, U.S. DEPARTMENT OF COMMERCE

Mr. CARVER. Pesticide Specialist in Environmental Investigations.

Mr. LEGGETT. Very well.

Counsel, at this point, wants to complete our record in that he wants to present some documents to the committee and they include what, Mr. Spensley?

Mr. SPENSLEY. Mr. Chairman, on January 22, the letter was sent to you from Dr. McKelvey at the U.S. Geological Survey, requesting certain information with respect to PCB's in the environment.

Similarly, a letter was also sent to Hon. Alexander Schmidt, Commissioner of the Food and Drug Administration, on the same date, asking confirmation as to their research on PCB's, and we have submitted for the record responses from both of those gentlemen as well.

Mr. LEGGETT. Do they confirm, in fact, they do have PCB's in the environment?

Mr. SPENSLEY. Yes, they do confirm that and outline the research they are doing with PCB's.

In addition to that, the McGraw-Edison Co. has presented a study.

Mr. LEGGETT. A study of alternatives for PCB's and capacitors, and they point up some utilization of foods by the Japanese.

Let me ask this, counsel.

What are the conclusions that we draw from throughout the presentation?

Mr. SPENSLEY. I have not had a chance to digest the entire documents.

Mr. LEGGETT. Very good.

We will not ask you then to present a preliminary perusal.

Have you digested what Interior said?

Mr. SPENSLEY. This is from the U.S. Geological Survey.

Mr. LEGGETT. The Department of Interior has not responded.

All right. We find that PCB's are mobile. It is difficult to assess.

All right. All those documents will be inserted in the record at this point.

[The documents referred to follow:]

MONS 091401

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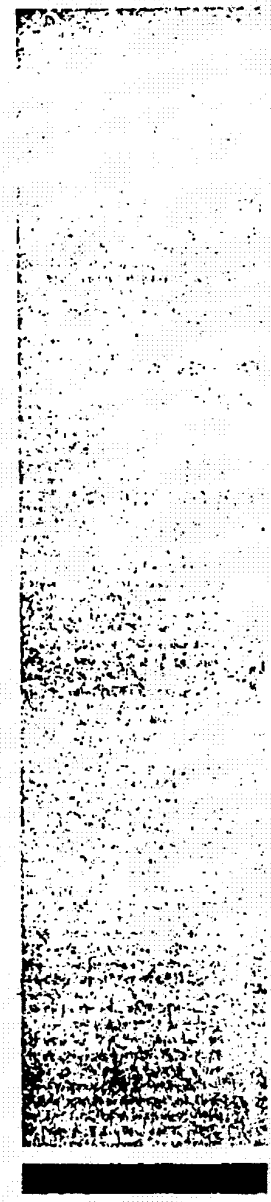


McGRAW-EDISON COMPANY
Power Systems Division

Canonsburg, Pennsylvania 15317

A Replacement for
PCB's in High Voltage
Power Capacitors

80-700 O - 76 - 7

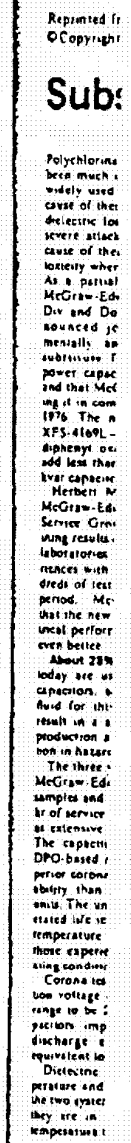
MONS 091402

Section A: Reprint of article from January 1, 1976 issue of Electrical World.

Section B: Text of bulletin now being prepared for publication.

Section C: Technical paper prepared jointly by McGraw-Edison Company and Dow Chemical Company.

MONS 091403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Section C

Reprinted from January 1, 1976 issue of Electrical World.
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Substitute found for PCBs in capacitors

ntly

Polychlorinated biphenyls (PCBs) have been much in the news of late. Though widely used in electrical apparatus because of their nonflammability and low dielectric loss, PCBs have been under severe attack by environmentalists because of their extreme persistence and toxicity when they enter the food chain. As a partial answer to this problem, McGraw-Edison Co's Power Systems Div and Dow Chemical Co have announced jointly that an environmentally and electrically acceptable substitute for PCB in high-voltage power capacitors has been developed, and that McGraw-Edison will begin using it in commercial quantities by mid-1976. The new fluid—designated Dow XFS-4169L—has an alkylated chlorodiphenyl oxide (DPO) base, and will add less than $20 to the cost of a 200-kvar capacitor.

Herbert M. Appleton, president of McGraw-Edison's Electrical Systems & Service Group, says that, after examining results of tests performed at Dow's laboratories as well as evaluating experiences with its own equipment in hundreds of test samples over a three-year period, McGraw-Edison determined that the new fluid offers the same electrical performance as PCBs, or perhaps even better.

About 25% of all PCBs manufactured only are used in high-voltage power capacitors, so acceptance of the new fluid for this application alone would result in a significant cutback of PCB production and a corresponding reduction in hazard to the environment.

The three years of electrical testing by McGraw-Edison involved hundreds of samples and more than 18-million kvar-h of service for full-sized units, as well as extensive testing of miniature units. The capacitors impregnated with the DPO-based dielectric demonstrated superior corona behavior and greater reliability than similar PCB-impregnated units. The units were subjected to accelerated life tests, with voltage stress and temperature ranges greatly in excess of those experienced under normal operating conditions.

Corona tests showed discharge inception voltage over the normal operating range to be 20-25% higher than for capacitors impregnated with PCB, and discharge extinction voltages were equivalent to those of PCB systems.

Dielectric loss as a function of temperature and stress also is equivalent in the two systems. The losses are as low as they are in PCB systems, from room temperature to about 90C.

The new dielectric fluid introduced by McGraw-Edison and Dow is technically a flammable liquid, using a standard flammability test. However, a comparison of flash and fire points shows that the new fluid has substantial advantages over mineral oil (see table).

Unlike distribution transformers in which the flash and fire points are often approached, capacitors are hermetically sealed, and the dielectric fluid normally

Flammability of insulants

	Flash deg. C	Fire deg. C
Mineral oil	154	167
PCB	166	316
XFS-4169L	174	199

attains maximum temperatures that are well below both the flash and fire points. Therefore, substantial energy is required from an arc to produce a fire.

The National Electrical Code allows installation of electrical devices in or on buildings without a vault if they contain less than 3 gal of a flammable liquid. The commonest-sized power capacitor—a 200-kvar unit—contains less than 3 gal of fluid—and is usually installed out-of-doors. Therefore, the flammability classification does not pose a serious drawback to use of the fluid in capacitors.

As a flammable liquid, the DPO-based dielectric offers at least one major advantage over the PCB it replaces. PCBs require incineration at temperatures in excess of 2,000F and under highly controlled conditions for environmentally acceptable disposal (EW, Sept 13, 1970, p 76). The new insulating fluid requires no special incineration, and no toxic residue is expelled or deposited in the stack.

The problem of disposal of PCB was called to the world's attention in 1966 when its residues were detected during studies of the retention of DDT in animal tissues. Pressure against use of PCBs built up so rapidly that, in 1971, Monsanto Industrial Chemicals Co, principal producer of the chemical in the US, announced that it would, thereafter, restrict sales to use in so-called "closed-cycle" systems, such as capacitors and transformers.

The US Food & Drug Administration allows up to 5 ppm of PCBs in fish, but the US Fish & Wildlife Service considers anything over 0.3 ppm in a fish egg as unacceptable. Despite current tight control of PCBs in aquatic life, readings of these values have been found in fish in extensive sections of waterways throughout the country.

The low toxicity of DPO has been demonstrated in a test on fathead minnows. Comparatively, the DPD-based fluid proved to be 20 times less toxic to fish after 96 hr than were PCBs. A concentration of only 0.7 mg/liter of a capacitor-grade PCB was lethal to 50% of the minnows, compared to 15.4 mg/liter of the DPD-based fluid. Further tests in the same series indicated an even greater difference in toxicity for longer exposures.

In tests for toxicity to mammals the highest practical dosage of the DPO-based fluid did not kill rats. During a 90-day dietary feeding study, no significant differences resulted in control rats and rats fed up to 15 mg/kg/day. In a 140-lb person, this dose would be equivalent to 750 mg/day or 1,500 ppm if consumed in a daily portion of meat or fish.

Relative biodegradability of chemicals in the DPO-based fluid and in capacitor-grade PCB also shows a marked difference, according to the developers of the new fluid. Generally, DPO-based fluid chemicals biodegrade significantly faster than the chemicals in capacitor-grade PCB, at a rate comparable to many nonpersistent industrial chemicals.

Chlorodiphenyl oxide, the most-water-soluble component in the new dielectric fluid, biodegrades fast enough to be classified as "bioticizable" in wastewater-treatment plants, although the developers caution against using this kind of disposal as a recommended practice. Disposal of the DPO-based fluid should be performed as with any other low-hazard chemical.

The new fluid is intended for use in capacitors and is not directly applicable to transformers. Dow, however, has a polydimethyl siloxane liquid under test for this purpose. The Japanese National Railway System has used it for almost five years and ongoing field evaluation is under way in France, Scandinavia, and Great Britain.

Dow has assured the electrical industry that it will have the manufacturing capability to produce XFS-4169L at a 1-million-lb/yr rate during the first quarter of 1976. Should the fluid prove acceptable to the industry, Dow is willing to make a commitment to produce it in multimillion-lb/yr quantities by the end of 1978. ■

MONS 091404

Section A

(Text of bulletin now being prepared for publication.)

AN ENVIRONMENTALLY ACCEPTABLE LIQUID DIELECTRIC FOR POWER CAPACITORS

By

McGraw-Edison Company
Power Systems Division
Greenwood, South Carolina

MONS 091405

ıblication.)

ıIELECTRIC

United States Department of the Interior

GEOLOGICAL SURVEY
RESTON, VIRGINIA 22092

JAN 2 8 1976

Honorable Robert L. Leggett, Chairman
Subcommittee on Fisheries and Wildlife
Conservation and the Environment
Committee on Merchant Marine and Fisheries
U.S. House of Representatives
Room 1334, Longworth House Office Bldg.
Washington, D.C. 20515

Dear Mr. Leggett:

In response to your request of January 22, 1976, for a letter detailing several aspects of the Geological Survey's water resources investigations, I submit the enclosed information. The enclosure was prepared by Dr. R. J. Pickering, Chief of the Quality of Water Branch in our Water Resources Division, after consultation with Ms. Nancy Matthews of Congressman Ottinger's staff. Dr. Pickering's replies are numbered according to the questions enumerated in your January 22 letter. I hope this will be of some help to you in the hearings that you will be holding later this week.

In addition to the replias to your specific questions, I also have enclosed literature describing the Geological Survey's Water Data Storage and Retrieval System (WATSTORE), our fledgling National Water Data Exchange (NAWDEX), and the program of our Office of Water Data Coordination (OWDC) which is a function assigned to the Department of the Interior by OMB Circular A-67.

Because of the time required to make retrievals and statistical summaries of the many thousands of water-quality analyses in our data storage system, we are able to provide at this time only a computer printout of individual determinations for six selected constituents on a station-by-station basis, but we will be pleased to provide a statistical summary of the data for insertion into the Congressional Record as Dr. Pickering has arranged with Ms. Matthews.

Sincerely yours,

V. E. McKelvey

Director

MONS 091406

Enclosures:
Computer printout of analyses
for 6 toxic substances
WATSTORE Phamphlet
USGS Circular 460-E
USGS Circular 643
NAWDEX design pamphlet (OWDC)
Brochure on OWDC functions (OWDC)
Digest of 1972 Catalog of Info on
Water Data (OWDC)

MONS 091407

ATTACHMENT
R. J. Pickering
1/27/76

1. The bulk of the Geological Survey's information on PCBs in the biological environment is with reference to fresh-water aquatic environments--that is, streams and lakes. Data obtained to date make it clear that PCBs are very widespread in their occurrence, that they travel largely in solids suspended in the water, and that they reside in significant concentrations in bottom sediments of rivers and lakes.

The Geological Survey has no systematic continuing program for sampling and analyzing PCBs in biological materials. Our data consist of the results of studies of known problem areas, and are not representative of the fresh-water aquatic biological community as a whole. The data do show, however, that PCBs are readily taken up by aquatic organisms when they are introduced into the aquatic environment.

2. The Geological Survey's program of water resources investigations is nationwide in geographic extent and addresses a broad range of physical, chemical, and biological characteristics of water quality. It can be divided into three types of programs: (1) the Federal program, which is designed to develop information about large geographic areas and an understanding of general hydrologic principles, and which is funded wholly through our annual appropriation from Congress; (2) the programs with other Federal agencies, which are usually funded by the agency requesting the work and are in response to specific needs of those agencies; (3) and the Federal-State cooperative program, which responds to the needs of State and local agencies for water data in which the Federal government also has an interest, and which usually is funded on a 50-50 basis with the cooperating agency providing half the funds and the Geological Survey providing the other half.

Our water-quality program has grown so rapidly in the past few years that we have found it necessary to centralize and automate our water-quality laboratories. Our three large laboratories now perform an average of 7,000 individual determinations per day, and the demand continues to rise. The variety of determinations has changed in recent years, also. We are making many more determinations of toxic metals, pesticides and other toxic organic chemicals, and biological characteristics than in previous years. The mix of water and sediment fractions and chemical characteristics to be measured results in a very large number of measurements that can be made. Our Central Laboratories System offers a total of about 400 standard determinations at the present time, and provides many more on a custom-analysis basis.

One or more water-quality characteristics were measured at more than 5,600 sites on surface streams and at about 350 sites on lakes or reservoirs in 1975, and water-quality data are available for about 80,000 ground-water wells. Sites selected for sampling range from ground-water wells and remote surface water sites unaffected by man to highly polluted locations such as streams draining urban-industrial complexes or wells sampling ground water below surface waste-disposal sites.

3. The accompanying data printout lists the sites at which PCBs in the several water fractions have been measured. Many of these are in known problem areas, so the range of concentrations cannot be considered to represent a balanced assessment of conditions nationwide. However, we hope that such a balanced assessment for the Nation's major rivers will be provided eventually through the National Pesticide Water Monitoring Program, which we have recently initiated in cooperation with the Environmental Protection Agency.

Some feeling for the mobile nature of PCBs can be obtained from the fact that they have been detected in water and bottom sediments at stations in our Hydrologic Bench Mark Network. Stations selected for this network are believed to be essentially free of man's influence in terms of known flow regulation and waste inputs. It is suspected that a significant part of the PCBs found at these sites was transported by air.

The National Interim Primary Drinking Water Regulations, published in the Federal Register for December 24, 1975, lists no maximum contaminant levels for PCBs because of insufficient information on their occurrence, their health effects, and methods for their analysis. However, the National Academy of Sciences' "Water Quality Criteria, 1972" recommends a maximum concentration of PCBs of 0.002 micrograms per liter (ug/l) in water-suspended sediment mixtures for fresh water aquatic life and wildlife. Because this concentration is below the sensitivity of the Geological Survey's analytical method, any positive numbers in the data printout can be considered as representing excessive levels of concentration of PCBs.

4 and 5. As noted under 2 above, our central laboratories are capable of providing a very large number of determinations on request. These include essentially all the toxic and nontoxic inorganic substances of current interest, many of the persistent pesticides, and selected organic compounds of special interest, such as PCBs, PCNs, TNT, RDX, and Kepone.

The accompanying data printout shows the levels of concentration in our Nation's waters of PCBs and five other toxic substances that you have indicated are of interest to your subcommittee. A statistical summary of these data will be provided within the next few days. As

MONS 091409

a basis for comparison with sites relatively unaffected by man, the summary will include a separate listing of the ranges of concentrations observed at our Benchmark Network sites during a three-year period. For your further information, a copy of USGS Circular 460-E, which describes the quality of water at our Hydrologic Benchmark sites, is enclosed. Also enclosed is a copy of USGS Circular 643, which describes the results of a 1970 reconnaissance of seven minor elements in surface waters of the United States.

6. The Geological Survey disseminates the information gained through its water-resources investigations widely in order to make it of benefit to the maximum number of potential users. The availability of water-quality data for stations or water wells sampled on a continuing basis is announced in the Catalog of Information on Water Data (digest enclosed) that is issued regularly by the Office of Water Data Coordination. Basic data are stored in our computerized data bank (WATSTORE) from which the enclosed printout was obtained, and are also published in a series of annual basic data reports organized on a state-boundary basis. Large masses of one-time-only data that are not stored in our data bank or published in our basic data reports are published as raw data and/or in summary form in our several series of interpretive reports, or in reports issued by cooperating agencies.

The availability of Geological Survey reports is announced in our monthly List of Publications of the Geological Survey, in the catalogs of the Department of the Interior's Water Resources Scientific Information Center, and in lists of publications available from several other organizations such as the National Technical Information Service and the Government Printing Office. In addition, copies of basic data and completed reports are provided to organizations and individuals whom we may know have a particular interest in them, either through their direct involvement in the data-collection program or their expressed interest.

Our field offices have instructions to inform appropriate state and Federal officials of potentially dangerous situations such as observed concentrations of toxic substances exceeding public health standards in raw sources of public water supplies. All basic water-quality data stored in our WATSTORE system are transferred to EPA's STORET system on a weekly basis, and streamflow data are provided on request.

For the past several years we have provided the Council on Environmental-Quality with input to their annual report, and we are now discussing with them ways in which we can provide CEQ with basic data on an even more timely basis. The Geological Survey endeavors to apprise other Federal agencies of the availability of our data

MONS 091410

through regular meetings of a number of Federal interagency coordinating committees. Close contact is maintained with all appropriate Federal agencies on such matters as standardization of methods for field and laboratory measurements, and future plans for water-data acquisition.

7. The type of cooperative arrangements that the Survey makes with Federal, State, and local agencies vary considerably. As noted above, cooperative programs with State and local agencies usually are funded on a 50-50 basis. Occasionally, a State or local cooperator may provide all the project funds. Formal documentation normally consists of a simple cooperative agreement between the two agencies.

Cooperative programs with other Federal agencies also are normally by interagency agreement, with transfer of funds either at the field office level or at the Washington level. The programs may be long-term, such as our water-data gathering agreements with the Corps of Engineers or the National Weather Service, or one-year-only projects, such as our agreement with EPA in 1970 to mount a major effort to analyze surface-water samples for mercury.

8. It is difficult to assess the extent to which our water data are put to use by agencies receiving the information. We do know that many of the states have used our data as a basis for setting state water-quality standards and identifying water-quality limited reaches of state streams in accordance with the provisions of PL 92-500. The Corps of Engineers and National Weather Service use our streamflow data in managing the flows of some of the Nation's larger streams. Our salinity data for the Colorado River constitutes an important part of the information used by the Bureau of Reclamation in selecting salinity control measures to assure U.S. compliance with our treaty with Mexico. The Council on Environmental Quality intends to use data from our National Stream Quality Accounting Network (NASQAN) as input to its monthly report to the President on environmental conditions in the United States. Our own Conservation Division has used our advice and the data we are gathering in the oil shale and coal-mining areas of the West as a basis for writing monitoring requirements for lessees of Federal lands for production of energy raw materials. These are just a few examples of known uses to which our water data have been put by agencies receiving the data.

MONS 091411

INTRODUCTION

The history of developments in the power capacitor industry has been quite dramatic over the last 30 years. Through material and design improvements, power capacitors have had size reductions from 80 to 10 cubic inches per KVAR and prices have dropped from $5.00 per KVAR to the current low of $1.50 per KVAR, which has made capacitors one of the best buys in the electrical industry.

A major contributor to this dramatic product improvement has been the liquid dielectric Aroclor,* a capacitor-grade askarel containing polychlorinated biphenyl (PCB). But today, capacitor users and manufacturers are now faced with a major problem.

Table I is a brief account of industry and governmental activities regarding PCB liquid over the past 10 years.

TABLE I

Industry and Government Activities on PCB's

1966	- PCB detected in the environment
1971	- Federal Government establishes task force to coordinate government efforts investigating PCB liquids; FDA sets temporary PCB tolerance levels
1972	- Monsanto voluntarily restricts use of PCB liquid to electrical applications
1972-3	- EPA initiates new approach to toxic pollutant effluent standards
1974	- EPA develops criteria document (Clean water standard ... 1 part per trillion maximum)
1975	- Government task force reconvenes to consider EPA document

It is quite apparent from these actions that there is a real possibility that there will be a total ban on the use of PCB's in the United States in the very near future and it is of major concern to us as a manufacturer of power capacitors and to you as a major user of these electrical devices. It is for this reason that we have come to you to discuss alternative actions and present our recommendation.

PCB ALTERNATIVES

Mineral oil was used in capacitors 30 to 40 years ago and, therefore is a qualified capacitor dielectric. However, use of mineral oil would have detrimental effects on the power capacitor market.

*Monsanto trade name

First of all, the physical size of capacitor units would more than triple. This means that the 100-KVAR capacitor unit that we know today would be at least 3 times larger physically if made with mineral oil.

Second, material requirements would be triple that being used for equivalent KVAR sizes today. Serious raw material shortages would limit output - - especially paper dielectric and mineral oil. This would lead to inadequate supply to satisfy the KVAR needs of the industry.

Third, a 100-KVAR capacitor unit would be the largest size unit that could effectively be manufactured. This is opposed to the major usage today of 150-, 200- and 300-KVAR size units.

Fourth, with the tripling of unit physical sizes, capacitor equipments would increase in size to a point where they would be incompatible with existing facilities.

Last, but not least, cost per KVAR would increase by at least three times.

Obviously, mineral oil is an unacceptable alternate.

McGRAW-EDISON RECOMMENDATION

Over the past several years, McGraw-Edison has been engaged in a number of testing activities with various liquids aimed at the development of a replacement dielectric fluid for power capacitors. One of these fluids, a diphenyl oxide (DPO) based fluid developed by Dow Chemical Company, has been found to possess the required electrical, physical and environmental properties as specified in the testing program goals. The remainder of this presentation discusses the major aspects and results of this testing program.

Health and Environmental Evaluation

Dow Chemical Company has conducted an extensive and comprehensive evaluation of the DPO based fluid's impact on the environment. Their evaluation was based on:

- Persistance in the environment (biodegradability).
- Toxicity in mammals.
- Toxicity in fish.
- Bioconcentration in fish.

Persistance in the Environment (Biodegradability)

The biodegradability of the DPO based fluid has been observed to be much faster than capacitor grade PCB's. Figure 1 shows that the rate of biodegradability for the lower chlorinated fractions of PCB is known. The extremely slow or nondetectable rate is attributed to the higher degree of chlorination of PCB. The rates of biodegradability of the DPO based fluid are comparable to those of common industrial chemicals. Examples of these would be napthalene moth balls and dichlorobenzene used to deodorize lavatories. Neither of these industrial chemicals is known to present significant environmental problems.

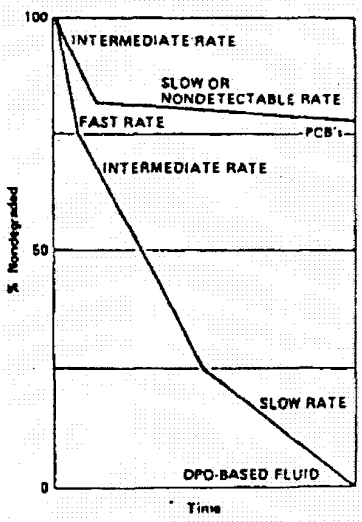

Figure 1.

There was a time when disposal of waste chemicals or capacitors was treated as standard refuse. Today, it is unlawful to dispose of materials in ways that will adversely affect man or his environment. Guidelines available from the EPA recommend that more hazardous types of waste require more extensive types of disposal. For PCB's this means special high temperature incinerators designed for chlorinated hydrocarbons - the most costly type of disposal. It is Dow Chemical Company's opinion that a supervised dry landfill is acceptable for the disposal of capacitors and adsorbents that contain the DPO based fluid.

Toxicity in Mammals

An evaluation of tests performed on animals shows that the DPO based fluid is less toxic than capacitor grade PCB's. These tests included toxicity from oral feeding, skin adsorption and vapor inhalation, plus irritation to eyes and skin. Based on this information, minimal protection measures for workers handling chemicals are recommended in accordance with the Occupational Safety and Health Act of 1970. This recommendation applies to chemicals with the least potential handling hazards. Oral administration tests were performed on rats to determine the maximum doses of the DPO based fluid and capacitor grade PCB which could be tolerated and yet sustain a 100% survival rate. These test results are shown in Table II. The DPO based fluid produced no fatalities among the rats after oral administrations of up to 10 grams/kilogram, the maximum practical dose level in this test, whereas the maximum dose of capacitor grade PCB was only 1 gram/kilogram. Preliminary results of a dietary study in rats has shown that the DPO based fluid has much less toxicity than PCB's after prolonged feedings. Also the accumulation factor (concentration of chemical in fat per concentration in diet) for the DPO based fluid was 0.1 as compared to 2.2 for capacitor grade PCB's.

TABLE II

TOXICITY IN MAMMALS

	Dosage (gm/kg)	
Acute oral, rats	DPO Based Fluid	Capacitor Grade PCB
100% survival	greater than 10	1.0

Toxicity in Fish

The toxicity of the DPO based fluid to fish is significantly less than the toxicity of capacitor grade PCB's. Table III shows the concentration of several common samples that is lethal to 50 percent of the fish (LC_{50}).

TABLE III

TOXICITY CLASSIFICATION FOR FISH

Toxicity	Example	LC_{50} ppm
Low	ethyl alcohol	100
Moderate	dry cleaning solvent	10-100
Toxic	naphthalene (moth balls)	1-10
Extreme	DDT	1

MONS 091415

Table IV shows the results of the conventional static water test on fathead minnows used to compare the toxicity of DPO based fluid with capacitor grade PCB. It can be seen that the DPO based fluid is moderately toxic to the fish while PCB is extremely toxic.

TABLE IV

TOXICITY IN FATHEAD MINNOWS

Test	LC_{50} (mg/liter; ppm)	
	DPO Based Fluid	PCB
96-hour static water (EPA recommended procedure	15	0.76

To give you a volumetric perspective of this contamination, the 0.76 milligrams/liter is equivalent to approximately 45 drops of PCB (from an eye dropper) in 1,000 gallons of water. Recognize that this is the amount that will kill 50 percent of the fish in 96 hours. In order to kill no fish in this period of time, the contaminated water would have to be diluted to 10,000 gallons. Water quality criteria of PCB is one part per trillion.

Bioconcentration in Fish

Tests to evaluate chemical bioconcentration in rainbow trout have shown that the DPO based fluid has a low bioconcentration potential as opposed to a very high potential for capacitor grade PCB's. It was this bioconcentration of PCB's in fish that was one of the most detrimental environmental properties and gave rise to the FDA limit of 5 parts per million in fish. For example, comparison of the environmentally significant components of DPO and PCB capacitor grade fluids shows that the PCB bioconcentration potential is 30 times greater than that of the DPO based fluid. Organic chemicals that have low water solubility are easily picked up and stored by fish, especially in the fat. This happens whether the chemicals are present in their food or the water.

Environmental Evaluation Summary

To summarize the four environmental evaluation points, refer to Table V. Capacitor grade PCB, mineral oil and the DPO based fluid are listed in a forced ranking based in their degree of environmental hazardousness.

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TABLE V

RELATIVE ENVIRONMENTAL HAZARDS

Forced Ranking (1 to 5)

Chemical	Biodegradability	Toxicity		Bioconcentration	Total
		Mammal	Fish		
PCB	5	3	5	5	18
Mineral Oil	4	1	1	4	10
DPO based Fluid	3	1	2	2	8

Note: A total of 20 is the most hazardous ranking possible and 5 is least hazardous ranking.

Electrical Test Program

Since 1971 McGraw-Edison has been conducting an active research program on various liquids to replace capacitor grade PCB's. Over 1000 small capacitor units have been tested and over 400 of these were impregnated with the new DPO based fluid.

Results of the extensive test program on small capacitors are outlined in Table VI.

TABLE VI

McGRAW-EDISON TEST PROGRAM

Type of Test	Conditions	Failures
Voltage Stress	Stress: 150% Time: 2 years Stress: 200% Time: 1000 hours	None
Low Temperature	Stress: 150% Temp. : -30°C Time : Over 200 hours	None
High Temperature	Stress: 175% Temp. : 75°C Time : Over 1000 hours	None
Switching Surge	Stress: 125% Time : 7000 hours 65,000 switching operations at 250% rated stress	None

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Full size 100- and 200-kvar capacitor units were used during the reliability tests. These units were tested at stresses ranging from rated voltage to 160% of rated voltage and temperatures ranging from from -30 C. to +40 C. To date, over 18 million kvar-hours of operation have been logged during which time no failures have been experianced.

The DPO based fluid works satisfactorily in both paper-film and all-film capacitors. However, since it was developed primarily for use with an all-film dielectric as opposed to a paper-film dielectric, it is necessary to review the major electrical features of McGraw-Edison's all-film capacitor which are directly affected by the use of this new fluid.

*Average dielectric losses under operating conditions were reduced from 0.5 (paper-film) to 0.2 (all-film) watts per KVAR.

*Low temperature rises during operation provide for greater kilovar stability.

*Operating costs are reduced since less total system capacity is required plus a savings of kilowatt hours during operation.

*Higher level of reliability due to the greater ratio of discharge inception voltage (DIV) to operating voltage, thereby reducing the possibility of corona damage to the dielectric.

*Greatly reduced tank rupture hazard due to the absence of paper in the dielectric.

Therefore, the DPO based fluid will allow the capacitor industry to maintain or improve on present capacitor designs using PCB's.

In the following several paragraphs, a comparison is made between specific tests of identical all-film dielectric capacitors impregnated with PCB and the DPO based fluid.

FIGURE B

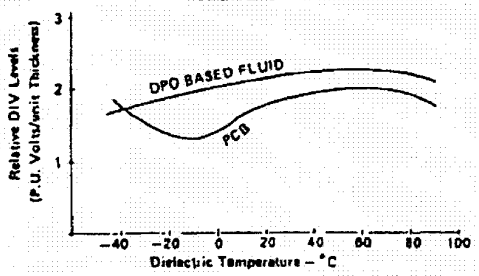

Figure B presents a comparison of discharge inception voltage (DIV) versus temperature. Capacitor units impregnated with the DPO based fluid shows an appreciable advantage over those impregnated with PCB.

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Note that with DPO based fluid, only slight changes in DIV occur over the normal temperature operating range. This means that the capacitor units with the DPO based fluid would have a greater margin of safety between their operating stress and the DIV and have better low-temperature over-voltage characteristics.

The results of this data show that through the use of the DPO based fluid as a dielectric, users can be assured of having capacitor units that will maintain or improve on the present available electrical ratings and physical sizes.

Up to now, capacitors impregnated with PCB's have been very desirable because of the non-flammable characteristic of PCB. Table VII shows a comparison of the DPO based fluid as compared to PCB and mineral oil.

Note that the DPO based fluid is definitely less flammable than mineral oil even though it is classified as a flammable liquid, whereas PCB is a non-flammable liquid. By definition (Underwriter's Laboratories) a non-flammable liquid has a fire point which exceeds its boiling point.

TABLE VII

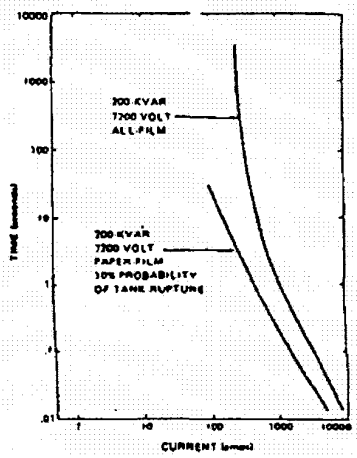
FLAMMABILITY CHARACTERISTICS

Dielectric Liquid	Flash Point (°C)	Fire Point (°C)
PCB	165	None to 315*
DPO-based fluid	175	200
Mineral oil	155	170

*Boiled at 300°C.

Although the flammability rating of the DPO based fluid is a disadvantage, it is offset by the improved tank rupture characteristics of all-film capacitor designs. This important feature allows users to more safely protect capacitor equipments and prevent the possibility of tank rupture which could result in a fire hazard and environmental damage.

FIGURE C



Comparison of all-film vs. paper-film capacitor tank-rupture curves.

Figure C shows the comparison of the all-film Type S capacitor tank rupture characteristic with that of the Type R paper-film design. There is a definite improvement in the safe zone of fusing that can be obtained by using all-film capacitors and also allows application of capacitors in higher fault current areas. McGraw-Edison has found through extensive testing that no internal gases are generated during an all-film capacitor failure mode. This is because of the absence of paper in the active all-film dielectric, and is in contrast to the gases which are generated during a paper-film capacitor failure mode - gases which would in turn rupture the tank.

CONCLUSION

Upon completion of careful cost studies, it has been concluded that the cost of a capacitor unit impregnated with the DPO based fluid will be approximately 25 percent higher than a comparable PCB unit.

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But consider:

*The cost in terms of the alternative, mineral oil, and what its use will cost in terms of compatability, dollars, space and beeutility.

*The dollars involved in cleaning up after a PCB accident or disposal of PCB capacitors.

With the DPO based fluid, McGraw-Edison can offer all capacitor users:

1. An adequate KVAR supply in the near future.

2. Compatible physical sizes with present equipments.

3. The superior electrical characteristics of today's capacitors.

4. Capacitors at a reasonable cost.

We have now reached the point where field trial experience is necessary to fully qualify the DPO based fluid as a dielectric liquid for power capacitors. May we count on your participation in this field trial program?

Section B

AN ENVIRONMENTALLY ACCEPTABLE FLUID FOR POWER CAPACITORS

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Dean Bergene
Dow Chemical Company
Midland, Michigan

ABSTRACT

A new and environmentally acceptable dielectric fluid has been developed for power-factor-correction capacitors. The fluid is based on alkyl chlorodiphenyl oxide and has excellent dielectric properties when used in an all-film capacitor. The dielectric losses are very low, the partial discharge inception voltages are high, and the system is reliable.

The health and environmental properties of new fluid compared to capacitor-grade polychlorinated biphenyl show low toxicity to fish and mammals, less accumulation in fish and mammals, and faster rates of biodegradability.

INTRODUCTION

Power-factor-correction capacitors have for many years used polychlorinated biphenyl (PCB) as the liquid impregnant. Capacitor grade PCB is a very good dielectric fluid which has contributed significantly to the improvements in performance of power-factor-correction capacitors. In the last 30 years or so, the volume per kVAR has been reduced by a factor of about 4, the dielectric losses have been reduced by a factor of over 10, and the cost per kvar has been reduced by a factor of about 5. In short, capacitors have become more economical which is due, in part, to the use of PCB.

In the past few years, the use of PCB has been questioned on the grounds of its potential hazard to health and the environment. A suitable alternative to capacitor grade PCB is necessary because of the vital function served by capacitors.

CRITERIA OF A NEW CAPACITOR FLUID

The suitability of candidate fluids in all-film capacitors was judged using the following criteria:

1. The dielectric losses were to remain as low as with PCB.
2. The partial discharge inception voltage of the new system was to be equivalent to that with PCB.
3. The new capacitor design was to exhibit equivalent reliability to a PCB capacitor system.
4. There should be no increase in volume per kvar.
5. The new capacitor system should not present any greater explosion and fire hazards than is realized with the PCB system.
6. The new fluid had to be environmentally acceptable.

It was also desired that candidate fluids be available in large quantities, at a reasonable price, and lend themselves to capacitor manufacturing.

FLUID EVALUATION APPROACH

The project started with a literature search resulting in a list of hundreds of possible candidates. Over 50 fluids with desired physical and dielectric properties were obtained and evaluated.

The evaluations began by determining material compatibility. Fluids which would have dissolved polypropylene film or reacted with aluminum foil would obviously be rejected. The main evaluation, however, involved the performances of the liquid in miniature capacitors.[1]

The miniature capacitors were constructed and processed with the fluids and were subjected to various tests. The following performance was typical of the replacement fluid in the miniature capacitors:

1. The samples using the test fluid were to last as long as similar samples processed with capacitor PCB.
2. The samples had to exhibit reasonably high partial discharge inception voltages (PDIV's). In particular, the PDIV had to be well above the operating stress over the entire operating temperature range (from about -40°C to +90°C).
3. The dissipation factor of the replacement liquid had to have reasonably low values over the ordinary operating temperature range of the dielectric. In particular, from about 20°C up to about 70°C, very low values were required, thereby resulting in low losses per kvar and assuring against thermal overheating and failure of the capacitor.
4. The dissipation factor was required not to increase with time of operation under electrical stress. At the same time, the PDIV was not permitted to decrease with time. If either of the above test requirements were not met, the system was considered unsuitable and was rejected.
5. The samples using the new fluid had to last under conditions of switching surges.
6. The new fluid samples had to perform properly on life tests conducted under a wide range of temperature changes.

Most of the fluids evaluated using the above criteria were rejected. With additional work involving processing, additives, etc., some fluids did perform reasonably well.

THE NEW DIELECTRIC FLUID

In the latter half of the 1960's, it became unfortunately apparent that there were health and environmental problems associated with PCB's. In 1971, a joint research program was established. During the course of the program, the family of aryl chlorodiphenyl oxide was identified as the type of materials that has the best overall electrical, physical, and environmental properties.[2] For example,

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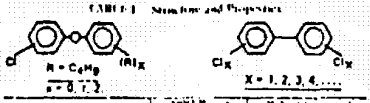
TABLE I Structure and Properties



Property	DPO Based Fluid	Polychlorinated Biphenyl (PCB)
Dielectric constant (25°C)	4.3 – 4.5	5.7 – 5.9
Dielectric strength	33	35
Dissipation factor	0.01	0.01 – 0.06
Volume resistivity (ohm-cm)	8.2×10^{10}	5.0×10^{11}
Solubility in water (25°C, mg/liter)	0.14 – 3.3	0.05 – 2.9
Viscosity (cSt, centistokes)	10.5	35.4
Vapor pressure (mm Hg, 25°C)	1.4×10^{-4}	2.0×10^{-4}
Pour point, °C	< –45	< –14

a. Range of values for components in dielectric fluids.

b. Values listed for a capacitor grade PCB with the following weight percent composition: 1.5% $C_{12}H_8Cl_2$, 21% $C_{12}H_7Cl_3$, 36% $C_{12}H_6Cl_4$, 21% $C_{12}H_5Cl_5$, and 0.5% $C_{12}H_4Cl_6$.

butylated chlorodiphenyl oxide optimizes the good electrical properties while maintaining the adverse health and environmental characteristics. Table I shows the chemical structure of alkyl chlorodiphenyl oxide (DPO-based fluid) and PCB's.

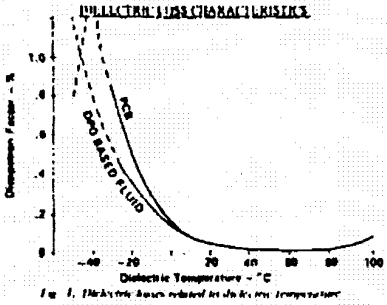


Fig. 1. Dielectric losses related to dielectric temperature.

Figure 1 compares the dielectric losses of capacitors impregnated with capacitor PCB and the alkylated oxide (DPO-based fluid). Both of the systems need an epoxide additive on the liquid impregnant. The losses as a function of temperature are virtually identical on the two systems from 20°C to about 110°C. At very low temperatures, the two systems exhibit a difference. The PCB system peaks out at about –40°C because of the physical change in the fluid. The replacement system continues to have increases in dissipation factor and, at –60°C, the lowest temperature at which a reading was taken, the dissipation factor was about 2.0%.

Figure 2 exhibits the dielectric losses of the two systems as a function of the dielectric stress. The readings for Figure 2 were obtained at room temperature. The shapes of the two curves are quite similar with somewhat lower losses having been obtained on the new system. Additional data of dielectric loss as a function of

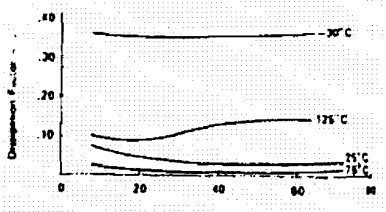


Fig. 2. Dielectric losses as a function of electrical stress.

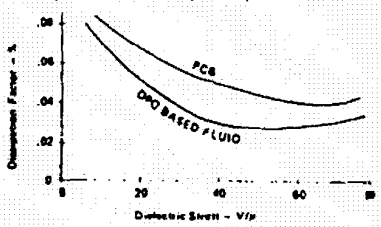


Fig. 3. Dielectric losses related to electrical stress at various temperatures.

dielectric stress for miniature capacitors impregnated with the DPO-based fluid is presented in Figure 3. These, depending on the stress chosen, the dielectric losses tend to be low from about 20°C to well above 75°C. The losses are somewhat higher at very high temperatures and considerably higher at very low temperatures. Thus, one of the requirements of the new liquid is met. It exhibits low losses from room temperature to about 90°C. The high losses at very low temperatures are generally felt to be desirable. The reliability of many dielectric systems have been found to be poor at very cold temperatures. The high losses at low temperatures tend to cause heating of the dielectric and ensure operation in temperature regions where reliability is known to be very good.

PARTIAL DISCHARGE INCEPTION VOLTAGE

The discharge inception voltage (DIV) was required to be reasonably high above the design stress over the entire temperature range. Figure 4 is a presentation of the DIV as a function of temperature for PCB and the new liquid alkylate systems. The solid dielectric was the same thickness in both cases. Except at very low tempera-

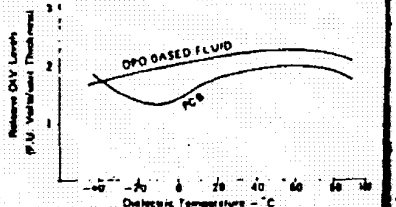


Fig. 4. Partial discharge inception voltages related to dielectric temperatures.

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—30°C

—125°C

25°C
75°C

60 90

V/μ

of electrical stress

D

60 80

V/μ

electrical stress of various

are impregnated with the
5. Thus, depending on the
o be low from about 20°C to
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ure impedance). Thus, one
is met. It exhibits low losses
The high losses at very low
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PERATION VOLTAGE:

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s over the entire temperature
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n systems. The solid dielectric
l waxes at very low tempera-

10

10 40 60 80 100

erature – °C

reasures related to dielectric

uses the new system has higher DIV values than does the PCB system. Particularly important is the fact that the characteristic dip of the PCB systems at about 10° to –20°C is not present for the DPO-based fluid system. In this respect the new dielectric system is more ideal in that the DIV changes only slightly over the normal operating temperature range.

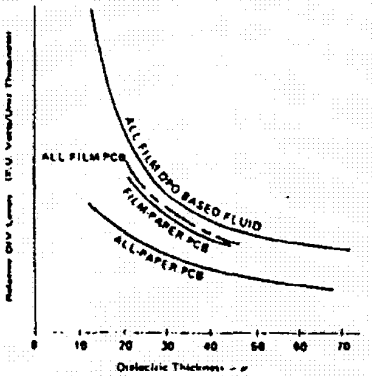

Fig. 5. Partial discharge inception voltages related to dielectric thickness.

Figure 5 shows the DIV as a function of the dielectric thickness for several capacitor systems. With the improvement in materials, the DIV has also improved.

The all-paper PCB system was an improvement over the all-film material system. The use of polypropylene film led to additional improvements. The introduction of the new fluid has raised the DIV still higher.

LIFE TESTING OF THE SYSTEM

Long-term testing under electrical stress had to be conducted on the system for the purpose of determining changes in DIV and dielectric losses as a function of time. The miniature capacitors impregnated with the new fluid were life tested at both high and low temperatures and under conditions of both long and short duty cycles. Although the tests are not complete, the replacement system appears to be very stable. As an example of one of the tests, consider Figure 6. The

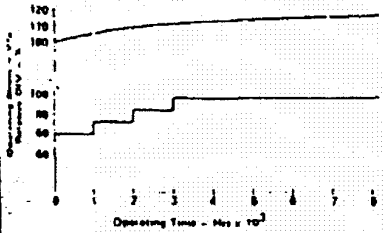

Fig. 6. Partial discharge inception voltage related to operation under electrical stress.

dielectric thickness of 1 mil. The capacitors were life tested at room temperature. Initially, the electrical stress was raised every 1000 hours; however, at what was felt to be a sufficiently high stress the units were periodically tested to failure and operated at that stress. The DIV remained during the time that the units were on test. Additionally, the dielectric losses also decreased with time of operation.

Thus, under life test conditions, the all-film new fluid system not only exceeded all of the dielectric characteristics considered desirable.

TESTS INVOLVING FULL SIZE CAPACITORS

An in-depth evaluation of the all-film DPO-based fluid system was performed utilizing miniature capacitor samples. The results had to be duplicated and verified on full-size capacitors. Numerous prototype capacitors were constructed and tested. The results as described above on the miniature samples have been verified. In particular, the dielectric losses are, in fact, as described in Figure 1. Additionally, the capacitors were operated at stresses well above rated voltage for thousands of hours with excellent results. Some prototype capacitors were in use for over four years at stresses above the rated design stress.

RELATIVE DIELECTRIC CONSTANT

The relative dielectric constant of capacitor-grade PCB is about 5.9 which compares to about 4.4 for the DPO-based fluid. Thus, capacitor-grade PCB has a 33% higher relative dielectric constant. It would be anticipated that this would influence capacitor design. In particular, it would be expected that the use of the new fluid in a capacitor would require additional active area and, therefore, a larger volume/kvar if the electrical stress is kept the same. This is probably true for all-paper capacitors where the fluid is a substantial contributor to the overall relative dielectric constant and, therefore, the capacitance. However, in the case of polypropylene film that is not the case. Polypropylene film, when impregnated with either capacitor PCB or the new fluid, exhibits an increase in the relative dielectric constant. As nearly as can be determined, the relative dielectric constant of polypropylene film is actually slightly higher when the new fluid is used as the impregnant instead of capacitor PCB. Thus, only the volume ordinarily occupied by the impregnant alone is directly influenced by the relative dielectric constant of the fluid. The results to date have indicated a reduction in capacitance of about 4 to 5% by changing from capacitor PCB to the DPO-based fluid. Neither the electrical stress nor the voltage will have to be changed to keep the kvar per unit volume the same.

FLAMMABILITY

It is desirable that capacitors, even when they fail, will not present a fire hazard to the surroundings. With the use of PCB, only a few tests have resulted. The liquid is extinguishable and, only when a unit is ruptured, will it present an electric arc chamber of a few inch PCB. The replacement fluid is declared as a flammable liquid using a standard flammability test. There is also no flash over of the additional chlorine which is present in capacitor-grade PCB.

TABLE II. Flash and Fire Points of Dielectric Fluids

Dielectric Liquid	Flash Point (°C)	Fire Point (°C)
PCB	165	None to 315*
DPO-based fluid	155	200
Mineral oil	155	170

* Tested at 315°C

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Table II lists the flammability of these dielectric fluids. Thus, the new dielectric fluid is flammable, but not as great a fire hazard as hydrocarbon-type materials.

Prior to the use of PCB in capacitors, mineral oil was the commonly used dielectric liquid. The change to PCB was made because of superior dielectric properties, primarily a higher relative dielectric constant; the non-flammability was a desired by-product. Over the past 40 years, capacitors were developed into very efficient and safe machines. With the introduction of polypropylene film and the elimination of paper completely from the active dielectric, the risk of tank rupture and explosions were reduced substantially. The absence of the paper from the active dielectric has eliminated gassing almost entirely under conditions of ordinary failures. As a consequence, considerably longer times are required to cause bulging of tanks and tank ruptures. This means that fusing is much more effective in eliminating tank ruptures and explosions.

Capacitors operate with the dielectric fluid at temperatures well below either the flash or the fire point. In the case of distribution transformers, for example, the flash and fire points are very often approached. An arc of any kind will produce a fire if a fluid is above the fire point. In contrast, a rather large amount of energy is required from an arc to produce a fire if the fluid is well below the flash or fire point as it is on a capacitor. As a result, with the use of the new fluid, a rather safe capacitor is realized. The fire hazard of the all-film DPO-based fluid is probably less than it is with the all-paper and paper-film PCB capacitor.

ENVIRONMENTAL CONSIDERATIONS

An environmentally acceptable alternative to a PCB fluid was defined as a material that was significantly:

Less toxic to fish and mammals,
Less accumulative in fish and mammals,
More biodegradable.

Table III summarizes the results of the toxicity and accumulation tests with fathead minnows and rats. Data from the 96-hour static

TABLE III Toxicity and Accumulation

Fathead Minnows	DPO-based Fluid	PCB	Less DPO-based Fluid than PCB
Toxicity			
96-hour static water			
Impliers, TL$_{50}$	15	[illegible]	20x
15-day flow-through water test, TL$_{50}$	1.2	[illegible]	16x
Accumulation[1]			
From whole fish [illegible]	0.21	7.1	33x**
Rat			
Toxicity, acute oral			
LD$_{50}$, mg/kg	>10	1.0	
LD$_{50}$, mineral oil, g/kg	>10	10	>10x
90-day diet, no effect (mg/kg/day)		no response	
Accumulation[1]			
% in GI tract diet at 90 days @ 5 mg/kg/day	0.026	5.3	200x**

*Major component
**Less accumulative = PCB stored by DPO-based fluid

water test[2] is important for regulating the discharge of chemicals into public waters. The concentration of the DPO-based fluid that was lethal to 50% of the fathead minnows (LC$_{50}$), the most accurately measured value, was 15.4 mg/liter[a] compared to 0.76 mg/liter[b] for a capacitor-grade PCB. The data shows the DPO-based fluid to be 20 times less toxic than PCB's to fathead minnows in 96 hours.

Data from the 15-day flow-thru water test[3] is important in determining the long-term exposure levels that are "safe" for fish. The test was stopped after 15 days because most of the fathead minnows from the DPO-based fluid accented earlier. The LC$_{50}$ of the DPO-based fluid was 1.82 mg/liter[c] compared to 0.050 mg/liter[d] for the PCB. Thus using the DPO-based fluid was 36 times less toxic to fathead minnows after 15 days exposure. The trend of the data the indicated an even greater difference in toxicity for longer exposures.

The potential to accumulate in fathead minnows was determined by analyzing the concentration of chemicals in whole fish and exposure water. The samples were taken from the 15-day toxicity test[4] and extracts were analyzed by gas chromatography. The average concentration of butylchlorodiphenyl oxide in whole fathead minnows exposed to 1.66 ppm for 15 days was 380 ppm for trichlorodiphenyl, the concentration in whole fathead minnows exposed to 0.061 ppm for 15 days was 470 ppm. The ratio of the concentration in fish to the concentration in water was an indication of the potential of these compounds to accumulate in fish. The ratio for butylchlorodiphenyl oxide was 230 compared to 7,700 for trichlorodiphenyl as shown in Table III. These data indicate that butylchlorodiphenyl oxide was about 30 times less accumulative than trichlorodiphenyl.

The data regarding acute oral toxicity to mammals, shown in Table III, indicate that the DPO-based fluid did not kill rats even at the highest practical dosage. This test was part of the acute toxicology which included an evaluation of rabbit skin irritation, rabbit eye irritation, toxicity from absorption through rabbit skin and toxicity to rats by inhalation of vapors. Based on the results of these tests, appropriate care and cleanliness will prevent hazards from inadvertent exposure during handling. The DPO-based fluid was free from accidental and incidental exposures of several workers. In other words, butylchlorodiphenyl oxides[1] have not resulted in handling hazards.

Capacitor-grade PCB was also evaluated for acute toxicology. One noticeable difference between the DPO-based fluid and PCB was that the PCB was more than 10 times as toxic as the mineral oil and the PCB was moderately irritating to the skin of rabbits.

The DPO-based fluid was evaluated in a 90-day dietary feeding study in rats. The toxicological parameters measured were body and organ weights, gross and microscopic pathology, clinical chemistry, hematology, and concentrations of the capacitor fluid in tissues. Data after 90 days showed that rats fed doses up to 45 mg/kg/day actually weighed just slightly more than control animals. In other tests. The toxicological significance of an apparent depressed body weight have not been evaluated at this time. The 45 mg/kg/day dose is equivalent to 3150 mg/day in a 70-kg person or 13,000 ppm in the diet of 5-kg daily portions of meat or fish.

a The range of 95% confidence was 11.8-24.2 mg/liter.
b The range of 95% confidence was 0.58-1.02 mg/liter.
c The range of 95% confidence was 1.45-2.03 mg/liter.
d The range of 95% confidence was 0.029-0.064 mg/liter.
e Samples were taken from these aquaria with chemical concentrations nearest the LC$_{50}$ concentration.
f Intermediates to other products.

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discharge of chemicals
PD-based fluid that wo
gl, the most accurately
1 to 0.76 mg/liter[b] for a
D-based fluid to be 30
n 96 hours.

test[2] is important but
but are "safe" for fish
e most of the lethality
ce. The LC_{50} of the
d in 0.050 mg/liter[c] for
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did not kill fish even at
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PD-based capacitor fluid
ental workers in other
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of the acute toxicology
PD-based fluid and PCB
an injury in the acute and
f the skin of rabbits.

a 90-day dietary feeding
ed-stunted were body and
ridneys, chemical chemistry,
ipation fluid in diets
ones up to 15 mg/gm/day
t parameters, no outward
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The 15 mg/kg/day dose
mum of 1,500 ppm in the

11 ft-24.2 mg/liter.
0.58-1.03 mg/liter.
1.45-2.03 mg/liter.
0.029-0.0n6 mg/liter.
uantity with chemical
oncentration.

Some of us[3] evaluated capacitor-grade PCB as a coolant dielectric oils. The capacitor-grade PCB accumulated in the mussel tissue 5.27 as that in the diet after 60 days. Almost 0.02% of the butylchlorodiphenyl oxide in the DPO-based fluid accumulated in the mussel fat in the same tests from about the same dose rate (5 mg/kg/day). This indicated that butylchlorodiphenyl oxide accumulates at least 200 times less in animal fat than a capacitor-grade PCB.

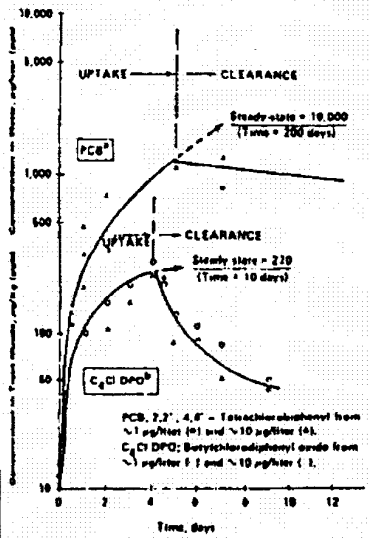

Fig. 7. Bioconcentration principle in trout muscle.

Figure 7 compares the potential of two compounds to bioconcentrate in trout muscle. 2,2',4,4'-tetrachlorobiphenyl was a significant component in capacitor-grade PCB and butylchlorodiphenyl oxide was a significant component in the DPO-based fluid. Its bioconcentration factor for each compound was generated by combining the bioconcentration data from trout exposed to 1 and 10 µg/liter. The bioconcentration level[4] in trout is an estimate of the uptake and elimination rate constants of the chemicals in trout muscle. Based on the rate constants, the bioconcentration factor of 2,2',4,4'-tetrachlorobiphenyl at steady state was 107,000 and would be reached after 200 days of continuous exposure. The time to reach one to clear half the concentration of 2,2',4,4'-tetrachlorobiphenyl from the trout muscle was 28 days. Similarly, the bioconcentration factor of butylchlorodiphenyl oxide at steady state was 70 and would be reached after 10 days of continuous exposure. The time in fresh water to clear half the concentration of butylchlorodiphenyl oxide was about one day. Therefore, butylchlorodiphenyl oxide was 34 times less bioconcentratable and cleared about 28 times faster after the trout were transferred to fresh water compared to 2,2',4,4'-tetrachlorobiphenyl.

Figure 8 illustrates the relative biodegradability of the chemicals in capacitor-grade PCB and the DPO-based fluid according to the following three tests, biochemical oxygen demand, activated sludge

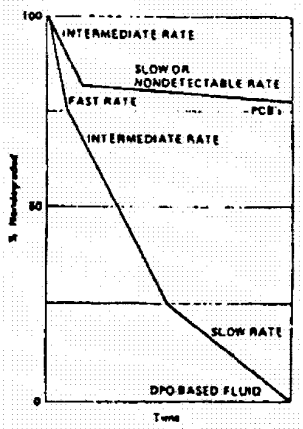

Fig. 8. Relative biodegradability.

oxygen demand, and $^{14}C(1)_2$ formation from ^{14}C compounds. Generally, the data showed that the chemicals in the DPO-based fluid biodegrade significantly faster than the chemicals in capacitor-grade PCB. For example ^{14}C-butylchlorodiphenyl oxide was biodegraded to $^{14}CO_2$ at a rate 44 times faster than ^{14}C-2,3,5'-trichlorobiphenyl.

The recommended disposal of the DPO-based fluid is by conventional incineration or a properly designed landfill. This recommendation is based on the overall interpretation of the health and environmental properties. Although disposal in a wastewater sewer is not a recommended disposal practice, it is of interest that chlorodiphenyl oxide, the most water-soluble component of the DPO-based fluid, biodegraded sufficiently fast to be classified as "nonrefractable" in wastewater treatment plants. The other chemicals in the DPO-based fluid would bind to the biomass and would ultimately biodegrade according to the studies with activated sludge.

CONCLUSION

The DPO-based fluid is a dielectrically suitable alternative to capacitor-grade PCB and is environmentally acceptable. Dielectrically, the new fluid has all of the electrical characteristics and, in some instances, is superior to capacitor-grade PCB. The new fluid has improved partial discharge inception characteristics and the dielectric losses are as low as with PCB. The lower relative dielectric constant of the DPO-based fluid has virtually no influence on the capacitance of the finished product. The volume size will remain the same with the new fluid without an increase in the electrical stress.

The use of the DPO-based fluid in an all-film capacitor results in a system that is probably no greater a fire hazard than all-paper and paper-film PCB capacitors. This is due to the greatly reduced chances of capacitor tank ruptures brought about with the elimination of paper from the active dielectric.

Environmentally, the DPO-based fluid is an acceptable alternative to capacitor PCB because it is significantly less toxic and

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accumulative in fish, less toxic and accumulative in mammals and more biodegradable.

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Mr. LEGGETT. Now, let me see. Some of you gentlemen have prepared statements and some of you do not.

As I understand it, Tom, you do not have a prepared statement at the outset.

Would you want to lead off, or some of you with the prepared statements would like to lead off?

Tom, you are No. 1 and you get the first option.

Mr. CARVER. Mr. Chairman, I do not have a prepared statement.

Mr. LEGGETT. Switch the microphone around, Tom.

Mr. CARVER. I do not have a prepared statement, but I do have some notes that outline the activities of our agency related to PCB's.

Mr. LEGGETT. All right.

Why not give us a brief overview of what you are doing?

Of course, we have had you here before. You are with Commerce, and I presume that you interrelate pretty well with your counterparts over in the Fish and Wildlife Service.

Mr. CARVER. Yes; with both the Fish and Wildlife Service and EPA.

Mr. LEGGETT. All right.

And we have had presentations yesterday by Nat Reed, who purported to speak for all of his associates, and gave us rather impressive assessment of what he considered his problem.

You can present your assessment.

Mr. CARVER. First, I would like to report some nonincriminating results from our Seattle laboratory.

We have recently completed a study in which we investigated the effects of PCB's via ingestion on juvenile coho salmon.

Some important results indicated that PCB's were not lethal when fed at levels considerably above concentrations in water that are lethal to fish.

No mortalities from PCB's occurred when levels up to 12 parts per million were fed for 5½ months.

The growth of salmon fed 1, 2, and 12 parts per million PCB's was statistically greater than the controlled fry.

This is contrary to the results reported by the Fish and Wildlife Service on lake trout, which is a freshwater species.

Mr. LEGGETT. That is a rather interesting statement you made.

Mr. CARVER. There is a species difference.

Mr. LEGGETT. I see.

And one species you can conclude responds negatively to PCB's rather dramatically.

Mr. CARVER. You have to bear in mind that this was a very carefully controlled experiment. They were subjected to PCB's only in the diet.

Mr. Chairman, this could not possibly be duplicated in nature because of the amount of PCB's that they would acquire through the normal process of respiration.

Mr. LEGGETT. Now, where did the PCB's in this test that you describe come from that they ingested and assimilated?

Mr. CARVER. The material was incorporated into a pellet.

Mr. LEGGETT. Well, all right.

Mr. CARVER. And is actually fed.

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Mr. LEGGETT. It was digested but was it actually assimilated into their system?

Mr. CARVER. The next point I was going to make is that the PCB's in the diet-induced activity of live enzymes that break down biphenyls, which implies that the compounds were metabolized and excreted.

Mr. LEGGETT. Was there any deleterious effect on the livers as discovered?

Mr. CARVER. You are one step ahead of me.

On the other side of the coin, work in progress as Seattle seems to indicate that environmental levels of PCB's in Puget Sound have a degenerative effect on fish livers.

Pathological examination of starry flounder in the Puget Sound showed almost all fish exhibited enlarged and abnormally colored livers.

These characteristics are similar to those described for livers of mammals exposed to high levels of PCB's.

In answer to your question, Mr. Chairman, yes.

We have also studies underway concerning the distribution and magnitude of PCB residues in marine species. Efforts have focused on specific fish, and the menhaden fisheries of the Atlantic and Gulf Coasts.

All samples from Alaska, Washington, and Oregon contain less than three-tenths of 1 part per million PCB's in the edible portion of the flesh.

The species include halibut, striped bass, sable fish, oysters, and mussels.

The largest fishery in the United States, based on the number of fish landed, is a nonfood species, the menhaden, which ranges from Maine to Texas.

The PCB levels in whole fish have decreased from 3.7 parts per million in 1971 to 1.0 parts per million in 1974. However, this still leaves a residue level in the oil of over 7 parts per million.

Of our samples, 70 percent exceeded the two parts per million level guideline that was established by the Food and Drug Administration.

Menhaden oil is also an export commodity for use in the manufacture of margarine. The PCB's in the oil do not represent a health hazard because they are removed by normal processing methods.

No menhaden meal from any area had as much as eight-tenths of 1 part per million PCB's.

Our ocean fish pesticide monitoring program is a joint venture with the EPA, and represents one element of the national pesticide monitoring program.

During 1973 and 1974, 175 samples of 20 fish each were analyzed, but the analyses were only of the liver.

The station locations ranged from Georges Bank—300 miles off the coast of New England—to South Carolina, the north central Gulf of Mexico, and from the Bering Sea in Alaska south to Los Angeles, Calif.

Bottom depths ranged down to near 1,000 feet. For the most part, residues were confined to DDT and PCB's in the low parts per million range.

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Notable exceptions were in the area west of Los Angeles, the mouth of the Columbia River area, and George's Bank.

In some samples from these areas, particularly sharks, the DDT complex and the PCB residues were in the 1 to 10 parts per million range.

Interpretation of these large residues was complicated by the absence of information on the age of the fish.

Repeat collections were made in the summer of 1975 in both inshore and offshore waters of the northwestern Atlantic. Only juvenile specimens were analyzed, Mr. Chairman. We subsequently analyfied shark embryos that were surgically removed. The results analyzed shark embryos that were surgically removed. The results are that the total body burden is a function of age.

That is the end of the summary of the work that we are doing.

If you have any additional questions, I will be happy to respond.

Mr. LEGGETT. Let me ask you this: Did you find any fish with 2 parts per million or above of PCB's that did not have liver damage or do you know?

Mr. CARVER. No; this would apply particularly to the menhaden. This is a nonfood resource.

Mr. LEGGETT. I did not understand that.

Mr. CARVER. We did not find that condition, no, sir.

Mr. LEGGETT. OK.

The areas that you indicated, the mouth of the Columbia River, Los Angeles, and George's Bank, that do have the PCB problem, what magnitude is that?

Mr. CARVER. Generally speaking it is less than 1 part per million, which does include liver damage.

We are discussing two different programs.

Mr. LEGGETT. What program are you discussing?

Mr. CARVER. Right now I am on the ocean fish monitoring program.

The environmental levels which are in the Sound are somewhere in the neighborhood of three-tenths to five-tenths part per million in adult fish, and you find liver damage.

Mr. LEGGETT. You find liver damage?

Mr. CARVER. Yes, sir.

Mr. LEGGETT. Now, have you found any evidence of deterioration in reproductive capacity?

Mr. CARVER. We have had no studies directed toward that. There is some information in the literature which would indicate this is the case.

Mr. LEGGETT. Now, you indicated that PCB's had gone down from 1972 to 1975.

Mr. CARVER. That was in the South Atlantic in one fishery.

Mr. LEGGETT. One fishery in the South Atlantic?

Mr. CARVER. Yes.

Mr. LEGGETT. Was that just one fish or a representative sample of fish?

Mr. CARVER. This was based on the analyses of hundreds of fish.

Mr. LEGGETT. Did you draw any reasons as to why that had occurred?

Mr. CARVER. No, sir.

Mr. LEGGETT. OK.

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Mr. CARVER. This is an offshore fishery.

Mr. LEGGETT. How far offshore was the fishery?

Mr. CARVER. Up to 100, 150 miles.

Mr. LEGGETT. Normally do you find, let us say, at the mouth of the Columbia River, if you are 150 miles off the mouth of the Columbia River, would that affect——

Mr. CARVER. I do not think our ships went that far off the Columbia. We were sampling within 25, 30 miles of the mouth of the river system. I do not think they went out as far as you have mentioned.

Mr. LEGGETT. Well, Mr. Reed indicated yesterday that it is his position that considering the threat to fish and wildlife by PCB's that he would support a summary ban on all manufacture and import of PCB's for thrift.

Mr. Train indicated he would support that ban provided it were tied to a program to replace PCB's as soon as possible.

If I asked you do you have a position, would you be able to give it to me?

Mr. CARVER. I think we can support Mr. Train's position on that; to ban PCB's as soon as there is suitable replacement.

Mr. LEGGETT. Very good.

Our next witness is Dr. A. Karim Ahmed, Natural Resources Defense Council.

Your statement will be included in the record as though you completely read it. Your statement here is 4 pages.

You can go ahead.

You have some 15 conclusions.

STATEMENT OF DR. A. KARIM AHMED, NATURAL RESOURCES DEFENSE COUNCIL, INC.

Dr. AHMED. Mr. Chairman, what I have done here is try to summarize the information we have concerning the environmental contamination of PCB's.

Mr. LEGGETT. Why not go ahead and summarize each of those points for us.

Dr. AHMED. OK.

PCB residues are generally found in areas associated with high industrial and urban activity. Wildlife sampled in remote, non-populated areas generally show little or no detectable levels of PCB's.

High concentrations of PCB's have been observed in several predatory birds, including heron, white-tailed eagle, peregrine falcon, cormorants, et cetera. Tissue or whole body weight PCB values ranged in these species between 30 and several hundred parts per million.

Many fish species sampled in the Great Lakes region and in the Eastern seaboard have PCB concentration values well above the present FDA tolerance limit of 5 parts per million. In Lake Michigan this would include species such as chinook salmon, coho salmon, brown trout, tiger trout, lake trout, whitefish and carp.

Similar levels of PCB's have been shown to occur in walleye, white bass and carp in the northern reaches of the Mississippi River.

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particularly Minnesota. Certain varieties of lake trout in Lake Superior have PCB residues ranging up to 12.7 parts per million.

Nearly all the fish species sampled in Massachusetts rivers show PCB concentration values above 5 parts per million. Recent sampling by the federal EPA of fish caught in the Housatonic River at stations below Pittsfield, Mass., were the General Electric transformer manufacturing plant is located, show PCB concentration levels up to seven times above the present FDA standards.

Fish sampled in the Hudson River, north of Albany and in a region south of the two GE plants manufacturing electrical capacitors, show the highest PCB contamination thus far recorded in the United States. Recent monitoring data indicate extensive contamination of nearly all fish species in the upper reaches of the river, with values ranging upto 500 parts per million. Striped bass and shad caught in the lower Hudson River also show levels frequently above 5 parts per million.

The bottom sediments of the Hudson River appear to be a sink for the bulk of the non-degradable PCB's. Near the GE plants, sediment PCB levels ranged between 540 and 2,980 parts per million. Lower reaches of the Hudson River also contained PCB in the sediments, often in the order of 1 to 18 parts per million.

Dredging of river bottoms appears to be one of most certain routes by which the nonwater soluble PCB's can get resuspended into the river. It is clear that sufficient studies and careful abatement procedures will be required to mininize this potential problem. In the meantime, we strongly urge a complete mortatorium on all proposed river bottom dredging in the Hudson River.

PCB's, as a class of compounds, as you know, are extremely persistent and nonbiodegradable substances, and tend to bioaccumulate in the aquatic environment by factors of a few thousand to several hundred thousand fold. For example, fathead minnows may bioaccumulate as much as 200,000 fold.

PCB's have been shown to interfere with the reproductive process and hatchability of fish eggs, in concentration levels as low as 0.5 parts per million with certain species.

Similarly, PCB's have been demonstrated to effect the reproduction of several animal species, at dietary levels of 20 to 100 parts per million in experimental rats, and at less than 1 parts per million in minks. Several domestic bird species, such as pheasants and chickens, show marked thinning of eggshells and reduction of egg production when fed PCB as little as 10 parts per million.

Recent studies indicate that dietary levels as low as 2.5 parts per million show clear effect on the reproductive ability of female rhesus monkeys. It is important to note that many of the known human toxicity symptoms observed in acute ingestion of PCB's the so-called "Yusho" disease, were also seen with the primates studied in the above experiments.

Experimental rats fed PCB's at 100 parts per million for 21 months were recently shown to have an abnormally large number of malignant liver tumors. PCB's are also known to drastically increase the microsomal enzyme activity in mammalian species, indicating that its presence in the liver may help trigger the formation

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of potentially injurious or carcinogenic chemical metabolites in animals.

The effect of PCB contamination of commercial and sport fisheries in this country appears to be large. We estimate that about 22 million pounds of Hudson River striped bass are consumed each year, if we combine both commercial and sport catch figures. It has been estimated that between 50 and 90 percent of the North Atlantic striped bass are spawned in the Hudson River. Being a migratory fish, there is no way of distinguishing the origin of striped bass in the North Atlantic coastal areas, and thus it is possible that its entire stock may be contaminated.

A similar problem may also exist in the Great Lakes region. Commercially important fish in Lake Michigan, such as chubs, appear to be contaminated with PCB's. They accounted for 32 and 54 percent of the total commercial fisheries in Lake Michigan and Lake Superior, respectively.

I have also with me a copy of the paper I recently submitted at the National Conference on PCB's.

Mr. LEGGETT. You were in Chicago?

Dr. AHMED. In Chicago, right.

It has most of the points in my testimony expanded and fully documented.

Mr. LEGGETT. Your full statement will be received and if it is not too complicated or too long it will be incorporated in our record or else it will be digested by counsel.

[The statement follows:]

STATEMENT OF DR. A. KARIM AHMED, NATURAL RESOURCES DEFENSE COUNCIL, INC., NEW YORK, N.Y.

Polychlorinated biphenyl (PCB) residues were first detected in fish and wildlife samples accidentally by the Swedish scientist, S. Jensen, in 1966. This chemical substance, which is commercially available as a mixture of chlorinated compounds, has been used as a highly desirable fluid in a variety of industrial products and processes. Because of its abundant and widespread use, which reached a production peak of approximately 72 million pounds in 1970 in the U.S., PCB residues have now been detected in numerous aquatic and animal species, in river bottom sediments and in foods, such as poultry, fish and dairy products.

In this testimony, we wish to summarize briefly the extent of the environmental contamination of PCBs, its potential effect on animal and human health and its impact on fisheries in the United States:

(1) PCB residues and generally found in areas associated with high industrial and urban activity. Wildlife sampled in remote, non-populated areas generally show little or no detectable levels of PCBs.

(2) High concentrations of PCBs have been observed in several predatory birds, including heron, white-tailed eagle, peregrine falcon, cormorants, etc. Tissue or whole body weight PCB values ranged in these species between 30 and several hundred parts per million.

(3) Many fish species sampled in the Great Lakes region and in the Eastern seaboard have PCB concentration values well above the present FDA tolerance limit of 5 ppm. In Lake Michigan this would include species such as the chinook salmon, coho salmon, brown trout, tiger trout, lake trout, white fish and carp.

(4) Similar levels of PCBs have been shown to occur in walleye, white bass and carp in the northern reaches of the Mississippi River. Certain varieties of lake trout in Lake Superior have PCB residues ranging up to 12.7 ppm.

(5) Nearly all the fish species sampled in Massachusetts rivers show PCB concentration values above 5 ppm. Recent sampling by the federal EPA of

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fish caught in the Housatonic River at stations below Pittsfield, Mass., where the G. E. transformer manufacturing plant is located, show PCB concentration levels up to seven times above the present FDA standards.

(6) Fish sampled in the Hudson River, north of Albany and in a region south of the two G. E. Plants manufacturing electrical capacitors, show the highest PCB contamination thus far recorded in the United States. Recent monitoring data indicate extensive contamination of nearly all fish species in the upper reaches of the river, with values ranging up to 500 ppm. Striped bass and shad caught in the lower Hudson River also show levels frequently above 5 ppm.

(7) The bottom sediments of the Hudson River appear to be a sink for the bulk of the non-degradable PCBs. Near the G.E. plants, sediment PCB levels ranged between 540 and 2,980 ppm. Lower reaches of the Hudson River also contained PCB in the sediments, often in the order of 1 to 18 ppm.

(8) Dredging of river bottoms appears to be one of most certain routes by which the non-water soluble PCBs can get resuspended into the river. It is clear that sufficient studies and careful abatement procedures will be required to minimize this potential problem. In the meantime, we strongly urge *a complete moratorium on all proposed river bottom dredging* in the Hudson River.

(9) PCBs, as a class of compounds, are extremely persistent and non-biodegradable substances, and ten to bio-accumulate in the aquatic environment by factors of a few thousand to several hundred thousand fold. For example, fathead minnows may bioaccumulate as much as 200,000 fold.

(10) PCBs have been shown to interfere with the reproductive process and hatchability of fish eggs, in concentration levels as low as 0.5 ppb with certain species.

(11) Similarly, PCBs have been demonstrated to effect the reproduction of several animal species, at dietary levels of 20 to 100 ppm in experimental rats, and at less 1 ppm in minks. Several domestic bird species, such as pheasants and chickens, show marked thinning of eggshells and reduction of egg production when fed PCB as little as 10 ppm.

(12) Recent studies indicate that dietary levels as low as 2.5 ppm show clear effect on the reproductive ability of female rhesus monkeys. It is important to note that many of the known human toxicity symptoms observed in acute ingestion of PCBs ("Yusho" disease) were also seen with the primates studies in the above experiments.

(13) Experimental rats fed PCBs at 100 ppm for 21 months were recently shown to have an abnormally large number of malignant liver tumors. PCBs are also known to drastically increase the microsomal enzyme activity in mammalian species, indicating that its presence in the liver may help trigger the formation of potentially injurious or carcinogenic chemical metabolites in animals.

(14) The effect of PCB contamination of commercial and sport fisheries in this country appears to be large. We estimate that about 22,000,000 pounds of Hudson River striped bass are consumed each year, if we combine both commercial and sport catch figures. It has been estimated that between 50 and 90 percent of the North Atlantic striped bass are spawned in the Hudson River. Being a migratory fish, there is no way of distinguishing the origin of striped bass in the North Atlantic coastal areas, and thus it is possible that its entire stock may be contamiuated.

(15) A similar problem may also exist in the Great Lakes region. Commercially important fish in Lake Michigan, such as chubs, appear to be contaminated with PCBs. They accounted for 32 and 54 percent of the total commercial fisheries in Lake Michigan and Lake Superior, respectively.

Dr. AHRENS. Thank you.

PCB residues are generally found in areas associated with high industrial and urban activity. Wildlife sampled in remote, non-populated areas generally show little or no detectable levels of PCB's.

High concentrations of PCB's have been observed in several predatory birds, including heron, white-tailed eagle, peregrine falcon, cormorants, et cetera. Tissue or whole body weight PCB values

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ranged in these species between 30 and several hundred parts per million.

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Similar levels of PCB's have been shown to occur in walleye, white bass and carp in the northern reaches of the Mississippi River, particularly in Minnesota. Certain varieties of lake trout in Lake Superior have PCB residues ranging up to 12.7 parts per million.

Nearly all the fish species sampled in Massachusetts rivers show PCB concentration values above 5 parts per million. Recent sampling by the Federal EPA of fish caught in the Housatonic River at received at hearings, for example, at the present administrative hearings in New York State. This is a summary of all that information. levels up to seven times above the present FDA standards.

Mr. LEGGETT. Let me ask you this: You have gone through a number of different places here and you have more particular testimony that is incorporated in our record. We would like to know if you have sampled these areas more than once in various time frames.

Dr. AHMED. I am stating the information we have received from various government documents and reports. Also, materials we have received at hearings, for example, at the present administrative hearings in New York State. This is a summary of all that information. We did not sample ourselves.

Mr. LEGGETT. I understand.

Then in your particular testimony do you site the documents and the time and place?

Dr. AHMED. Exactly. All the figures, tables, and the documents are cited.

Mr. LEGGETT. In any of these areas where you found these high concentrations, have you noticed any difference between 1970, as an example, or do the reports show any difference between 1970 and 1975?

Dr. AHMED. The best study comes from Lake Michigan. That was done by the Michigan Department of Natural Resources.

I have a figure in my paper here that shows that between 1969 and 1974 DDT levels in Lake Michigan of coho salmon and chubs have been systematically decreasing, in some cases below the FDA's allowed concentration.

On the other hand, PCB levels between 1972 and 1974 in Lake Michigan have been increasing.

Mr. LEGGETT. That report is from where?

Dr. AHMED. From the Michigan Department of Natural Resources.

Mr. LEGGETT. OK. Very good.

I did not mean to interrupt you.

Dr. AHMED. Fish sampled in the Hudson River, north of Albany and in a region south of the two G.E. plants manufacturing electrical capacitors, show the highest PCB contamination thus far recorded in the United States. Recent monitoring data indicate extensive con-

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tamination of nearly all fish species in the upper reaches of the river, with values ranging up to 500 parts per million. Striped bass and shad caught in the lower Hudson River also show levels frequently above 5 parts per million.

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appear to be contaminated with PCB's. They accounted for 32 and 54 percent of the total commercial fisheries in Lake Michigan and Lake Superior, respectively.

In conclusion, I would like to mention briefly that recently our organization, along with the environmental defense fund, petitioned the Food and Drug Administration to revise the present 5 parts per million limit to a lower level in view of recent studies that show PCB's affect animal species at far lower levels than had been originally assumed. If this tolerance level were to be lowered, you can imagine the impact it might have on the fisheries, particularly on those fish below or at 5 parts per million.

Mr. LEGGETT. It is your position that all dredging ought to be stopped in the Hudson River?

Dr. AHMED. Well, I think it should be stopped until they can find the proper measure by which they can properly contain PCB in the shipping channels.

It turns out the PCB's tend to accumulate most on very fine silt particles. These silt particles tend to be settle in the very shipping channels where dredging has ben proposd.

We have asked the Corps of Engineers to hold a public hearing to consider the possibility of a temporary moratorium on dredging until they have decided how best to deal with the problem of dredging.

Mr. LEGGETT. Of course, you mentioned the Hudson River, but I would suspect that you would include all rivers where dredging occurs where noticeable or substantial PCB levels exist.

Dr. AHMED. This would obviously be the case.

Right now we are faced with a very eminent proposal by the Corps of Engineers in the Hudson River.

Mr. LEGGETT. Now, considering what you have said about the Great Lakes and the problems they are having there and the high concentrations, the inability to differentiate, would you also recommend that all fishing stop in the Great Lakes?

Dr. AHMED. Do you mean in terms of PCB concentration found in some of the species mentioned?

Mr. LEGGETT. Yes.

Dr. AHMED. Well, it seems to me that you could do it two ways. Some of the States have done it by warning the public not to consume more than a certain number of sports fish over a given period of time. In cases wehere large amounts of PCB contamination are found, well above 5 parts per million, and these are commercially important fish, then I think the FDA should seize shipments of these fish. They have in many instances done so already.

Mr. LEGGETT. Are there shipments from the Great Lakes today in excess of 5 parts?

Dr. AHMED. Last fall when we were in contact with the FDA, there were shipments of fish in both the Great Lakes area and in the Mississippi River that were above 5 parts per million and where shipments of fish had been seized.

Mr. LEGGETT. Considering Canada has adopted the 2 parts or 2½ parts, should we also adopt that standard?

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Dr. AHMED. Well, our position with the FDA is we have not suggested a level, but I think 2 parts per million is hardly the level that we should have. I think it should be at least one-tenth lower.

Mr. LEGGETT. You think it should be one-tenth lower?

Dr. AHMED. At least tenfold lower or less.

Mr. LEGGETT. Tenfold?

Dr. AHMED. Or lower.

Mr. LEGGETT. Instead of 5 parts, five-tenths parts per million, or 5 parts per million?

Dr. AHMED. Well, we have made the point that since PCB has now been shown to cause cancer in experiment animals, one cannot really establish a threshold or safe level for it. It is a difficult question of how you go about setting an acceptable level or reasonably acceptable level of a carcinogen in food. This issue has to be resolved, I think.

Mr. LEGGETT. Now, is this covered by the Delaney amendment?

Dr. AHMED. It is not very clear whether PCB comes under the Delaney amendment. If it were a pesticide, it may have come under the Delaney clause, being, in fact, an indirect food additive.

We do not really have a clear interpretation of whether PCB would be interpreted as the indirect food additive. But, the same concept of the Delaney clause should still apply here.

Mr. LEGGETT. Have you found any proof of malignancy at levels at less than 100 parts?

Dr. AHMED. In experimental animals?

Mr. LEGGETT. Yes.

Dr. AHMED. No.

The only experiment we have is Dr. Kimbrough's experiments from the Center for Disease Control where the experimental animals, female rats, had been given a diet of 100 parts per million of PCB's.

Mr. LEGGETT. Do you question any of the evidence presented by the previous witness?

Dr. AHMED. I have not examined his data. I only listened to his testimony. I do not have any basis to either accept or disagree.

Mr. SPENSLEY. Mr. Chairman, I would want to raise for the record that evidently the testimony of Dr. Albert Colby, Associate Director of Sciences, Bureau of Food and Drug Administration, part of the testimony referred to earlier that was submitted for the record indicated that temporary tolerances have been set for PCB's and they range anywhere from two-tenths of a part per million to 5 parts per million.

Mr. LEGGETT. That is set by FDA.

Dr. AHMED. That is the limit I mentioned earlier. The FDA has a series of different tolerance levels.

Mr. LEGGETT. Do you agree with that?

Dr. AHMED. I obviously do not because we petitioned the Food and Drug Administration to lower the tolerance levels in fish and other foods.

Mr. LEGGETT. OK.

Mr. Oberstar.

Mr. OBERSTAR. Thank you, Mr. Chairman.

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Reviewing your testimony, your comments on dredging, is it possible to have dredging where the dredge spoil is pumped directly from the lake or river bottom rather than mechanically moved up through the water and would that avoid the problem of reinfecting the water with PCB?

Dr. AHMED. I do not really know the answer to that question.

There have been a lot of ingenious proposals being made now on how to contain the dredging operation itself so that you do not churn up all the fine silt material.

I do not think there is an easy answer. Perhaps your suggestion may be something to examine. But, obviously it is a difficult thing to figure out mechanically, how to maintain PCB in river bottoms, and once you do contain it, how you plan to store it.

The same problem arises with disposal. That is a whole different issue. Will you be willing to take it to some kind of a sewage treatment facility or do you take it to the ocean? That is the next question that arises.

So, you really have a whole host of problems here.

Mr. OBERSTAR. You are not going to take dredge spoils from the Great Lakes interconnecting channels 2,000 miles to the ocean.

Mr. LEGGETT. If the gentleman will yield, we also have determined that many times you get 1,000 times as much debris circulating in the water due to turbulence than you do from a normal annual dredge operation.

Dr. AHMED. That is possible, too.

Mr. OBERSTAR. So, there are those problems as well.

Dr. AHMED. But, the PCB concentration, if you look, is not only on the surface of the bottom sediment, but also resides at the lower depths in the bottom of the river.

Mr. OBERSTAR. In response to the chairman's question about banning fish in all the Great Lakes, do you not differentiate or would you not differentiate between the various Great Lakes?

The levels of PCB are different in Lake Superior than in Lake Michigan.

Dr. AHMED. Different species have different levels, that is correct.

Mr. OBERSTAR. There are varying levels of PCB.

Dr. AHMED. I thought that is what I said when I said they were above the present limitation.

The Government obviously has the legal power to seize shipments of fish and the States may have their own powers.

Mr. LEGGETT. If the gentleman will yield. Wait a second.

We have to be consistent.

You are petitioning the lowering of the standards.

Dr. AHMED. To lower it, yes.

Mr. LEGGETT. What standard do you support for fish?

Dr. AHMED. My personal point of view, in terms of what——

Mr. LEGGETT. No.

In the petition that you filed to have the FDA reduce the standards, your organization files, reduce it to what level?

Dr. AHMED. We have not suggested a level. We have asked the FDA to examine that whole question scientifically and arrive at a standard.

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Mr. LEGGETT. How about 4.09?

Dr. AHMED. Obviously not, no.

Mr. OBERSTAR. I cannot understand how you can ask the FDA to reexamine the question. It is under a continuing review.

Why would you ask them to reexamine it unless you would have some good scientific evidence to come in and ask for a lower standard?

Dr. AHMED. Because, as I mentioned earlier, it is a very difficult thing to set a standard for a carcinogenic substance.

It is not scientifically correct to talk about a threshold for a carcinogen. You have to make a judgment, in effect, of how much substance you are going to tolerate in a food supply, or what you consider to be a risk level.

These are not easy answers to arrive at.

Mr. OBERSTAR. Do you have any quarrel with what the FDA has done in their procedural work in arriving at 5 parts per million?

Dr. AHMED. This level was arrived at from experiments and data that go back at least 5 years. We are talking about some new data that have been just published.

Mr. OBERSTAR. Are you asserting that FDA has not updated their information?

Dr. AHMED. No, I would not be stating that.

I think the FDA, within its own agency, has been looking at this question themselves. We have merely petitioned them to take the legal steps to gather the information, and based on new evidence to establish a lower tolerance limit.

Mr. LEGGETT. If I may, I will interrupt again.

As I understand the letter you put in from FDA, they are reviewing the tolerance of 5 parts per million for fish in light of the data that has been presented, and they indicate that the Environmental Defense Fund, your group, has petitioned FDA to gradually reduce all the temporary tolerances for PCB's, including zero, and that they will continuously be reviewing this matter.

Dr. AHMED. That is right.

The zero level is the concept of the Delaney clause.

Mr. LEGGETT. That is the concept?

Dr. AHMED. That is the concept.

Mr. LEGGETT. It is your time.

Mr. OBERSTAR. Well, the purpose of my questioning is to determine whether you have some solid scientific data to go on or whether you are just ringing alarm bells.

Dr. AHMED. No, we have recent experimental data.

Mr. OBERSTAR. Just a minute.

People want to have solid information on which to make judgments, you know. Concerns about levels of foreign substances and the food we eat are matters that affect the daily lives of people.

If we are going to have people ringing alarm bells, well, they had better be well informed. It is not only a matter of public responsibility, but it is also a matter of economics.

Some years ago, the FDA rang the alarm bell on fish from the Great Lakes that had botulism. They clamped the lid on all fish and

particularly smoked fish from the Great Lakes. We found out later that the seven deaths that occurred from botulism were traced to fish that were taken from Lake Michigan, and the botulism entered the food chain several days after the fish had been processed, shipped, and not properly refrigerated.

So when you make a blanket, sweeping statement that would stop all economic activity in the Great Lakes, you are scaring some people. You are not making a statement that is based on scientific fact and your statement will have an economic effect as well.

Dr. AHMED. Let me try to respond to that.

The evidence we have presented in our petition could also be gone into in some detail with Dr. Joe Highland, who will be here tomorrow, a witness from the Environmental Defense Fund.

Let me mention the basis on which the FDA usually sets these tolerance standards which are based on experimental data, both in humans and animals.

They try to establish a "no effect" level. They extrapolate that by dividing by a factor of 100, when experimental animal data is used.

In the present petition, we have to examine the experimental data of Dr. James Allen of the University of Wisconsin Medical School, who still finds an effect on reproductibility at levels as low as 2.5 parts per million.

If you were to accept that data, and I have no reason to believe too many people would challenge that particulr experiment, you then have to extrapolate that information down to a lower level of PCB's that should be tolerated by human beings who may ingest PCB's.

Thus, we still have not established a "no effect" level as low as 2.5 parts per million.

Mr. OBERSTAR. Now, you provided some scientific information.

Dr. AHMED. I have details of this experiment in my paper which I submitted for the committee's record. I did not have time to go into detail in my presentation.

Mr. OBERSTAR. Have you looked at the Canadian basis for setting a level of 2 parts per million?

What scientific measurement did the Canadian Government use in arriving at the levels it established for PCB's in fish?

Dr. AHMED. I have not examined the Canadian Government's standard.

Mr. OBERSTAR. Thank you, Mr. Chairman.

Mr. LEGGETT. Thank you, Mr. Oberstar.

Mr. Forsythe.

Mr. FORSYTHE. I have no questions.

Mr. LEGGETT. Very good.

You are still part of the panel, Doctor.

We will now move on to the next witness, who is Mr. Leo Weddig, executive director, National Fisheries Institute.

Your statement will be incorporated in our record.

[The statement referred to follows:]

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STATEMENT OF LEE WEDDIG, EXECUTIVE DIRECTOR, NATIONAL FISHERIES INSTITUTE

There is no need to review background information on the use of polychlorinated biphenyls in our economy or how they found their way into our environment. I am sure the various theories on potential health hazards of PCBs are also known to the committee.

As of this time, the effect of this environmental problem on the commercial fish industry is relatively modest. To our knowledge, the industry has lost usage of rough fish in some parts of Lake Michigan, the resource of the Hudson River, and several other modest sized resources. Certain other Great Lakes resources are in a borderline state under the present FDA 5 ppm tolerance.

The FDA is considering the need to lower the present tolerance. If this tolerance is reduced, it will cause much more severe effects on the commercial industry, most specifically eliminating the remaining activity in Lake Michigan and severely hampering other Great Lakes production. Depending on the exact level and details of a new tolerance, we would expect negative impact on some of our coastal resources as well.

We are not in a position to scientifically comment on the various theories regarding ill effects of long term exposure to PCBs. We can only indicate to the committee that exposure to PCBs through normal fish consumption patterns is exceedingly low.

Commercial product from the rivers and lakes in industrial areas makes up but 2 percent of the total mix.

None of the products can be considered to be daily, or even weekly dietary items.

The only possibility of consistent exposure that we can see would be to the sports fisherman who may fish one body of water and load his freezer with the same species.

While we have severe misgivings over the theories of potential harm through commercially marketed fish, we must come to the conclusion that if the Government determines that presence of PCBs in fish is a health hazard, then the Government must also take whatever steps are necessary to prevent that presence.

We believe then the following measures must be adopted to react to the present situation, and to prevent further problems:

The Government should immediately ban further sale, production, importation, or recycling of PCBs in any form whereby the chemical can be expected to enter the environment. Efforts should be made to achieve international agreement to the same goal.

A national system should be established to provide for safe disposal of PCBs already in use.

The Toxic Substances Control Act should be passed to help avoid future problems with other chemicals.

The present FDA tolerance of 5 PPM in fish should be retained pending further research on the toxic effects on humans of PCBs. Any reduction in the tolerance should be selective, based on the role of the specific affected food in the diet.

Compensation should be made to commercial fishermen whose livelihood is destroyed by prohibition of sale of the species of fish in which presence of PCB exceeds the FDA tolerance.

Effluent standards for PCBs, and other toxic substances, should be implemented immediately by the EPA.

We wish to elaborate on several of these points.

First, regarding a ban on further usage. It may seem to be unreasonable to ask for an immediate ban, and, perhaps it is. Yet, our fishermen are put out of business immediately. We would have to be convinced that a long term phase-out is proper for the polluter, but improper for the victim.

Second, on the matter of the FDA tolerance, we believe that modification of the Food, Drug and Cosmetic Act is in order.

In our mind, the present law is confusing in that toxic substances in the environment at times are considered to be unauthorized additives. Some may be considered pesticides for which a tolerance in fish is not registered; or they may be considered a toxic substance whose presence cannot be avoided.

In our opinion, all such substances that are present in the waters should be considered as unavoidable microconstituents. Tolerances should be promulgated

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to profect the public health under ordinary circumstances. We do not believe the presence of such environmental microconstituents can be considered to be food additives nor unregistered pesticides.

Further, we believe the development of tolerances for these unavoidable substances should take into account consumption patterns of the product involved. Fish consumption is low. Very often, it's seasonal. The product from a given source is distributed to a widespread market. The likelihood of consistent exposure to any individual is extremely rare.

Further, we propose such tolerances should be applied only to specific stocks of fish from specific bodies of water. If the trout, over a certain size in Lake Michigan generally contain more PCB than the tolerance, then remove that entire stock from the market. If on the other hand, the fish generally contain less than the tolerance, then allow all of them to be marketed.

There is no way the commercial industry can test fish on an individual, or even lot sampling basis, for contaminant presence. The tests are too expensive and too slow. In addition, such procedures are meaningless in protecting public health, in that any potential health hazard is not the result of an occasional exposure, but rather the result of long term continuous exposure.

We realize that these basic concepts in relating the FDC Act, and its enforcement to environmental contaminant problems, are not in this committee's jurisdiction. However, this is a most important concern we have with PCBs and similar substances.

Finally, we would like to comment on the matter of compensation.

We mentioned earlier that the effect to date of PCBs on the entire fish industry has been minimal. But to those fishermen involved, it's been catastrophic. There is no mechanism to compensate these people who are entirely blameless for this problem of our society.

We have noted before to this committee that beekeepers and dairy farmers are compensated if their product is contaminated by pesticides. I believe the proposed fiscal 1977 budget includes almost $4 million for this purpose.

The need is present for a rapid response system to aid commercial fishermen and dealers during times when their products are declared unfit. The system should provide assistance to recover losses from condemned product and income lost through inability to fish. It should provide a means to refit vessels if movement to a new fishery is required.

Mr. Chairman, we thank you for this opportunity to comment, and would be pleased to respond to questions.

STATEMENT OF LEE WEDDIG, EXECUTIVE DIRECTOR, NATIONAL FISHERIES INSTITUTE

Mr. WEDDIG. I will just summarize what we pointed out in our statement.

Mr. LEGGETT. Your statement will appear in the record. You may summarize.

Mr. WEDDIG. I would like to talk just about the effects of PCB on the commercial side of the industry as we see it as of this point as opposed to the effects on the reproductive capabilities of fish and the basic resource.

As of now, we have lost not too many fish from the commercial viewpoint. As Dr. Ahmed has mentioned, we have had some seizures. Those were rough fish out of Lake Michigan, mainly carp, which is a tremendously large resource for the individual fishermen involved with it. It represents the only resource for them.

So the PCB problem has become rather catastrophic and has put them out of business entirely.

However, if the byline of tolerance is lowered to something in the order of 2 parts per million, or beyond that, we would expect to have significant problems with other resources around the country;

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namely, in the coastal resources, and some of the other river and lake resources.

Many of the fish that have been cited with the higher levels of PCB are mainly sports fish and, as a result, they have not affected commercial industry quite as much as they would have otherwise.

In terms of the ill effects of long-term exposure to PCB's, we are not toxicologists or scientists but we can report that at the Chicago conference, which we attended also, at the time Dr. Kimbrough presented her paper about the possible carcinogenic effects of PCB after the exposure of 100 parts per million for quite a few months, the following paper that was presented disputed the carcinogenic finding stated by Dr. Kimbrough.

So I think we are running into another situation similar to what occurred, say, in cyclamates, where there is a concern if something is carcinogenic or not.

Another scientist said he looked at the same slides as Dr. Kimbrough, and they did not look carcinogenic to him.

To call PCB's carcinogenic at this time, I think, is a little advanced. I would like to say potentially they may be carcinogenic as opposed to saying they are.

Mr. LEGGETT. Now, that is a contradiction from what the doctor just stated.

The doctor was talking about hearsay that he had read rather than the experiments.

Dr. AHMED. Dr. Kimbrough's experiments.

Mr. LEGGETT. It was Dr. Kimbrough's experiments?

Dr. AHMED. Yes.

Mr. LEGGETT. That was 100 parts?

Dr. AHMED. On rats.

Mr. WEDDIG. So you have two opinions on the scientific part.

Mr. LEGGETT. You say another doctor saw the same slides of Dr. Kimbrough?

Mr. WEDDIG. That is what he reported.

I guess you would have to say my statement here is hearsay, but it is what I heard at the Chicago conference on PCB.

One doctor reported that his experiments were unable to produce any carcinogenic effects in rats also.

Mr. LEGGETT. Did anybody else here at the table hear anything at the Chicago conference?

Mr. WEDDIG. I will send you the paper if you would like.

Nonetheless, I do not want to minimize the potential problem that exists because we do recognize that it is a very serious problem and it will be very bad on our Great Lakes fishermen if the guideline is lowered any extent whatsoever.

We feel that the only real problem that exists right now from our point of view is with the person who might load up his freezer with a lot of sports fish. In terms of exposure over a continued period of time, the fish-eating habits of this country usually do not concentrate on a given fish from a given body of water unless they are sports-caught fish. This is a possibility where someone could go and catch a mess of fish and put them in his freezer. They would be eating them week after week after week, especially if they are using them for subsistence or because they like them so well.

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From a commercial viewpoint, you would not find our product on the market in a continuing fashion. Just the purchase habits would provide a measure of protection against the continued exposure that is really the heart of the problem with these contaminants.

In terms of steps to be taken, we have outlined a number of them here.

We agree that further sale production, et cetera, of PCB's really should be halted. In one respect to say immediate is not very reasonable, but for our fishermen who are put out of business, the effect is immediate. They think what is good for the goose is good for the gander in this case, and that if the polluters are able to go on for an indefinite basis, then those fishermen catching fish may be should not be put out of business either.

It has to work both ways.

Second: We are concerned with the safe disposal of PCB's. This is a problem that will take us a long time. I am especially concerned about the disposal of things like capacitors, which are going to end up in landfill eventually, and over a period of time those metal cases are going to rust and the material eventually is going to get into the environment.

So that is a long-term problem that we see.

We think the Toxic Substance Control Act should be passed because prior testing of chemicals has to take place if we are going to avoid similar situations over the next generations.

We would like to see the tolerance remain as it is. We do not think that the evidence presented warrants a lowering of the tolerance, even though this is in the hands of the Food and Drug Administration, and I am sure they will come up with an answer as they analyze the present data.

We would think any reduction should be selective based on the role of the specific food in the diet. When you look at the different fish species, the total available is very small and spread over a large market, so you are not talking about extended exposure which is really the key to any potential harm.

There is no level of PCB in fish that is on the market that has any kind of immediate toxic effects. It just is not high enough. The concern is over a long-term exposure, and for that you really have to look at dietary habits and the amount of fish that is available to be spread out over many people.

We think any reduction in the tolerance should be based on the role of the particular fish in the diet.

Then we have a matter of compensation. This is a long-term problem with us and we have gone through this with DDT, with dieldrin, with mercury, and now with PCB, and who knows what is coming up next.

Commercial fishermen are really the ones that get it in the neck on this thing, and there is no form of helping them out other than going on welfare, as somebody told them they should do down in Virginia with Kepone. It just does not seem to be right that there is not a system to provide some means for them to either relocate their fishing vessel or to tide them over until the hazard disappears.

We noted that in the agricultural sector, for example, beekeepers and dairy farmers have a regular program. They re compensated if their production is contaminated by pesticides.

So we do not see any reason why something like that could not be established for fishery producers who get into the same bind through no fault of the fishermen.

Mr. LEGGETT. On the other hand, when the wool growers came to Congress and wanted compensation, the bill passed the committee but bombed on the floor.

The cyclamate bill bombed. The eucalyptus compensation bill bombed.

Of course, the Florida fishermen recently asked for special compensation and that has not received action by this committee.

Mr. WEDDIG. That is correct.

At one time there was a problem in the Department of Interior where commercial fisheries had a disaster aid program. The unfortunate part of it was while, in theory, it was good, it was never financed properly, and also there was a real discussion over what constituted a disaster. It usually took more paperwork and time to try to get any results from it than would actually happen.

I think the whole program is gone right now.

Nevertheless, it is a problem for us.

We think also the effluent standards for PCB must be implemented immediately by the EPA. The Water Quality Act of 1972 or 1973, as I recall, called for implementation of effluent standards for toxic substances. The law called for these standards to be implemented within a period, as I remember, of 1½ years.

Now, we are somewhat beyond that, and we still do not have toxic substance effluent standards in practice, so that plants that use PCB's can continue to let them go into the waterways.

I believe the EPA has just published these proposals in the last month.

Finally, I would just like to comment on one other item, and Dr. Ahmed mentioned this. It concerns the Food and Drug Cosmetic Act and its definitions as to toxic substances, adulteration and so forth.

Dr. Ahmed said there is some confusion over just what part of the act applies.

Mr. LEGGETT. Your position is this should not be considered as an additive?

Mr. WEDDIG. That is correct.

It should be looked on as an unavoidable contaminant. Tolerance should be based on the need to protect public health.

Right now we could have our product seized by the mere presence of some of these things. It is part of our nature now.

I think anyone who looks at it as being something foreign from the present nature of 1975 is just wrong. It is part of the natural environment that we have in this country.

It may be that the Food, Drug and Cosmetic Act should be modified to recognize this type of a contaminant and to set up a very special way of handling tolerances and the means of protecting public health.

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Mr. LEGGETT. Very good.

Thank you very much.

Maybe before further questions, unless there is a reasonable objection, we will hear from Dr. Nimmo now, Research Ecologist, Environmental Research Laboratory, Sabine Island, Gulf Breeze, Fla., Office of Research and Development, U.S. Environmental Protection Agency.

Your statement of January 29, 1976, will be included in our record in total at this ponit, including the charts and graphs which you have appended to the end of your statement.

You may proceed to highlight your statement, if you will.

[The statement referred to follows:]

STATEMENT OF DR. DELWAYNE R. NIMMO, RESEARCH ECOLOGIST, ENVIRONMENTAL RESEARCH LABORATORY, SABINE ISLAND, GULF BREEZE, FLA., OFFICE OF RESEARCH AND DEVELOPMENT, U.S. ENVIRONMENTAL PROTECTION AGENCY

My name is Dr. DelWayne R. Nimmo. I am a Research Ecologist at the Environmental Protection Agency's Gulf Breeze Environmental Research Laboratory at Gulf Breeze, Florida. I have conducted research on the effects of pollution on marine organisms at this laboratory since 1968. The mission of the Gulf Breeze Laboratory is to study the effects of toxic materials on marine organisms and ecosystems.

My education background is as follows: I received my B.S. degree in Biology from Evangel College, Springfield, Missouri in 1959; my M.S. degree in Zoology from Wichita State University in 1964, and my Ph.D. in Limnology from Colorado State University in 1968.

Data produced at our laboratory are used by officials in EPA to establish criteria and in enforcement activities. I have not personally been involved in policy decisions concerning PCB's, but I would like to present research findings developed at the Gulf Breeze Laboratory on the effects of these chemicals on marine organisms. With your permission, I submit a collection of scientific papers from which my testimony is taken.

Our laboratory has conducted field experiments to determine the routes and reservoirs of PCB's and has completed many experiments in the laboratory to determine effects of these chemicals on marine organisms.

FIELD STUDY

We detected the polychlorinated biphenyl, Aroclor® 1254, in the water, sediment and biota of Escambia Bay, Florida in 1969 and we are continuing to study some aspects of the movement and accumulation of this chemical within the bay system. Only one source of the chemical, the Monsanto Chemical plant on the Escambia River, was located at that time. To date, we have not documented other sources. In our studies on various components of Escambia Bay and contiguous waters we have come to the following conclusions:

(1) Much of the chemical in Escambia River and upper reaches of the Bay is associated with the particulate or suspended matter in water.

(2) Of the components (sediment, water, plants and animals) sampled, the greatest concentrations of the PCB are contained in the sediments and biota of the Bay.

(3) Although quantities of the PCB have been reduced in the sediments and biota, two beds (reefs) of oysters located approximately 8 miles from the original source of the chemical still have detectable PCB in their tissues, and I would like for you to refer to Attachment 1 and notice that we have sampled for seven years.

(4) It has been documented that this PCB can be accumulated by estuarine and marine crustaceans directly from contaminated sediments, and

(5) Although the specific routes are unknown, we have evidence that the chemical is dispersed or transported to adjacent waters by physical or biological transport.

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Now as far as the laboratory studies, following the discovery of PCB's in Escambia Bay, Florida in 1969, our Laboratory at Gulf Breeze, Florida began studies with PCB's to determine their effects on and bioaccumulation by estuarine organisms. Estuarine organisms studied included bacteria, protozoans, oysters, shrimp, fishes and communities of benthic organisms. The following discussion is confined to research on Aroclor 1016, 1242 and 1254 because these PCB's are presently produced in the greatest quantities.

Aroclors 1016, 1242 and 1254 are acutely toxic to certain estuarine organisms. The 48- or 96-hour concentrations that kill 50% of the test organisms (LC_{50}) are in parts-per-billion range from 9 to 32 for penneid shrimp, 12 to 16 for grass shrimp, over 100 for pinfish. From 10 to 32 parts-per-billion of the chemical reduces shell growth in oysters.

Laboratory bioassays lasting longer than two weeks demonstrate that acute bioassays underestimate the toxicities of Aroclors 1016 and 1254. Aroclor 1254 is toxic to commercially valuable shrimps, and I will dispense with the reading of the scientific terms, and grass shrimp at concentrations of 1 parts-per-billion. Exposed shrimp are particularly sensitive to salinity stress and possibly to viral disease. Aroclor 1254 decreases growth rates of oysters at 4 parts-per-billion. At concentrations of about 5 parts-per-billion, Aroclor 1254 is lethal to juvenile fishes: spot pinfish and sheepshead minnow. At Aroclor 1254 concentrations of 0.1 parts-per-billion, some sheepshead minnow fry die. Aroclor 1016, at 15 parts-per-billion was lethal to pinfish and sheepshead minnows; susceptibilities of fry, juvenile and adult sheepshead minnows were similar.

Aroclor 1254 affects reproduction of the sheepshead minnow, an estuarine fish. Adult fish exposed for four weeks to 0.1 parts-per-billion appeared to be unaffected, but when eggs from these fish were fertilized and placed in PCB-free water, the survival of fry was diminished. Mortality was observed also in fry from eggs that contained greater than 5 parts-per-million per gram of the PCB and increased as PCB content of the eggs increased. Reproductive success of Atlantic salmon and striped bass may also be affected by PCB's in their eggs. Adult sheepshead minnows that had been exposed for four weeks to from 0.3 to 3 parts-per-billion of Aroclor 1016 produced eggs that contained from 3 to 77 parts-per-million of this PCB, yet fry that hatched from these eggs were apparently unaffected.

Estuarine organisms accumulate PCB's from water. Maximum concentration factors (concentration in animals divided by concentration in water) in laboratory exposures of various species to Aroclor 1254 were: oysters, 101,000 to 165,000; shrimp, 20,000; and fishes, 37,000. The maximum concentration factor determined from exposures of fishes to Aroclor 1016 was 34,000. Fishes exposed continuously to Aroclors 1016 and 1254 accumulated both Aroclors in increasing concentrations for about four weeks; thereafter, the quantity stabilized. Maximum concentrations were found in the liver, gills and skin of the fish, but the lowest concentration found in fishes and shrimps was in the muscle. Bioconcentration factors calculated from data from Escambia Bay were greater than 230,000 for shrimp, 670,000 for fishes and greater than 100,000 for oysters, indicating that laboratory data underestimate bioconcentration potentials of Aroclor 1254.

At this point in the testimony, I would like to introduce some comparisons of toxic effects of Aroclors 1016, 1242 and 1254 to various marine species. This data is summarized in Attachment 2a. Included are data illustrating rates of accumulation and loss of these PCB's from fishes, summarized in Attachment 2b, and a comparison of bioaccumulation of Aroclor 1254 in animals held in the laboratory with those from Escambia Bay, Florida (Attachment 2c).

In summary, our research in the field has shown that polychlorinated biphenyls: (1) occur in the marine environment, (2) are readily dispersed from point sources, (3) are relatively persistent, and (4) are concentrated in animals, plants and sediments. Controlled experiments conducted in the laboratory indicate: (1) various PCB's are toxic (at the parts-per-billion level in water) to shrimp, fish and other organisms, (2) animals can obtain PCB's from water, sediment or food organisms, and (3) these chemicals are bioaccumulated.

Mr. Chairman, that concludes my prepared remarks. I will answer any questions you may have.

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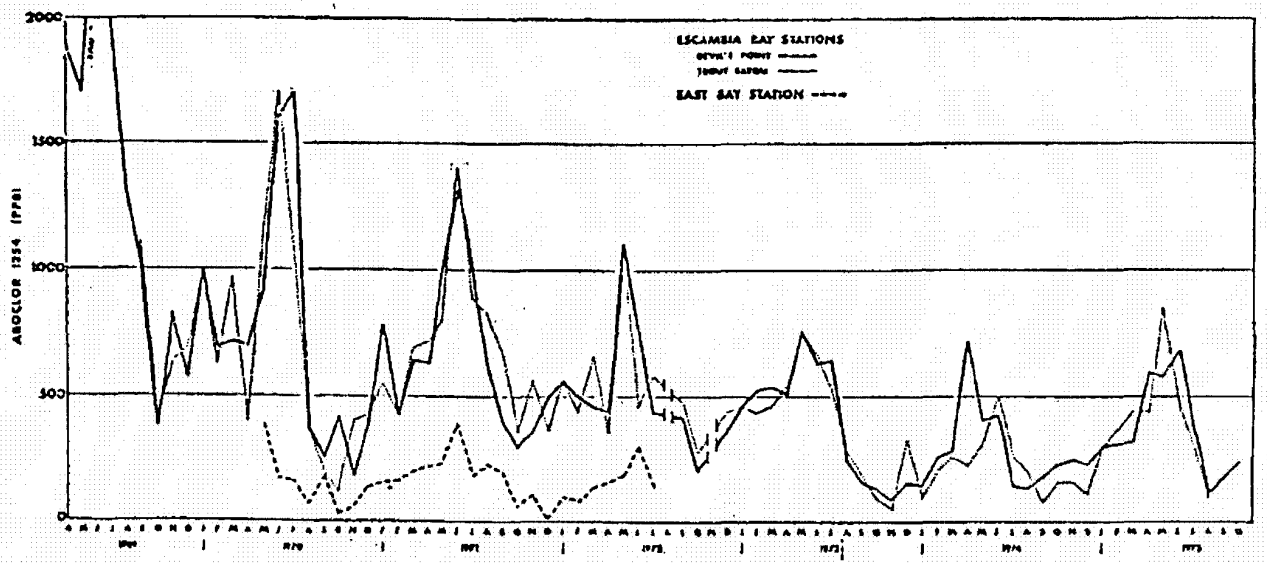
RESIDUES OF AROCLOR 1254 IN OYSTERS



Attachment 1

Attachment 1

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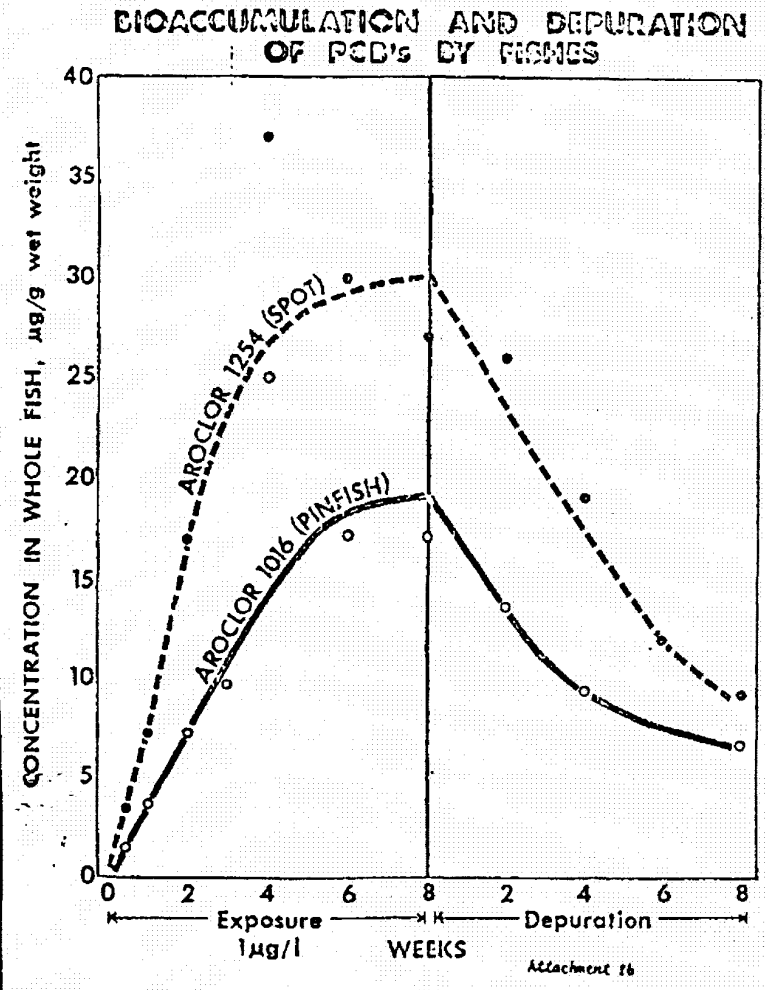
CONCENTRATION IN WHOLE FISH, µg/g wet weight

ACUTE TOXICITY OF AROCLORS 1016, 1242, AND 1254 TO SELECTED ESTUARINE ORGANISMS IN FLOW-THROUGH BIOASSAYS

Organism	96-hour LC50 or EC50, microgram per liter		
	1016	1242	1254
Penaeid shrimp	10	9	1 32
Grass shrimp	12	16	>12
Oysters	10	32	1 14
Pinfish	>100	>100	>100

1 48-hr tests.



Attachment 1b

Attachment 1

68-706—76——10

BIOACCUMULATION OF AROCLOR 1254 IN ESTUARINE ORGANISMS

Organism	Concentration factors	
	Laboratory	Escambia Bay
Oyster	165,000	>100,000
Shrimp	26,000	>470,000
Crabs	4,600	>230,000
Fishes	37,000	>670,000

STATEMENT OF DR. DelWAYNE R. NIMMO, RESEARCH ECOLOGIST, ENVIRONMENT RESEARCH LABORATORY, SABINE ISLAND, GULF BREEZE, FLA.

Mr. NIMMO. In order to shorten this, with your permission, may I start at the bottom of the first page?

Mr. LEGGETT. Go ahead. Start anyplace you want.

Mr. NIMMO. Our laboratory has conducted field experiments to determine the routes and reservoirs of PCB's and has completed many experiments in the laboratory to determine effects of these chemicals on marine organisms.

Mr. LEGGETT. Have you performed any of the experiments that Dr. Ahmed referred to?

Mr. NIMMO. I do not believe so.

Mr. LEGGETT. All right.

Go ahead.

Mr. NIMMO. I would like to highlight two aspects of our studies. One, a historical background as to the occurrence of PCB in the Escambia Bay, a basic system that has been exposed to Aroclor 1254 specifically, and then highlight and document for your evidence the toxic effects at extremely low levels for many species of fishes crustaceans and mollusks, many of which are commercially important.

We detected the polychlorinated biphenyl, Aroclor 1254, in the water, sediment and biota of Escambia Bay, Fla. in 1969 and we are continuing to study some aspects of the movement and accumulation of this chemical within the bay system. Only one source of the chemical, the Monsanto chemical plant on the Escambia River, was located at that time. To date, we hve not documented other sources. In our studies on various components of Escambia Bay and contiguous waters we have come to the following conclusions: (1) Much of the chemical in Escambia River and upper reaches of the bay is associated with the particulate or suspended matter in water. (2) of the components—sediment, water, plants, and animals—sampled, the greatest concentrations of the PCB are contained in the sediments and biota of the bay, (3) although quantities of the PCB have been reduced in the sediments and biota, two beds—reefs—of oysterns located approximately 8 miles from the original source of the chemical still have detectable PCB in their tissues, and I would like for you to refer to attachment I, and notice that we have sampled for 7 years, (4) it has been documented that this PCB can be accumulated by estuarine and marine crustaceans directly from contaminated sediments, and, (5) although the specific routes are

unknown, we have evidence that the chemical is dispersed or transported to adjacent waters by physical or biological transport.

Now as far as the laboratory studies, following the discovery of PCB's in Escambia Bay, Fla. in 1969, our Laboratory at Gulf Breeze, Fla. began studies with PCB's to determine their effects on and bioaccumulation by estuarine organisms. Estuarine organisms studied included bacteria, protozoans, oysters, shrimp, fishes, and communities of benthic organisms. The following discussion is confined to research on Aroclor 1016, 1242, and 1254 because these PCB's are presently produced in the greatest quantities.

Aroclors 1016, 1242, and 1254 are acutely toxic to certain estuarine organisms. The 48- or 96-hour concentrations that kill 50 percent of the test organisms [LC_{50}] are in parts-per-billion range from 9 to 32 for penacid shrimp, 12 to 16 for grass shrimp, over 100 for pinfish. From 10 to 32 parts per billion of the chemical reduces shell growth in oysters.

Laboratory bioassays lasting longer than 2 weeks demonstrate that acute bionssays underestimte the toxicities of Aroclors 1016 and 1254. Aroclor 1254 is toxic to commercially valuable shrimps, and I will dispense with the reading of the scientific terms, and grass shrimp at concentrations of 1 parts per billion. Exposed shrimp are particularly sensitive to salinity stress an dpossibly to viral disease. Aroclor 1254 decreases growth rates of oysters at 4 parts per billion. At concentrations of about 5 parts per billion Aroclor 1254 is lethal to juvenile fishes; spot, pinfish, and sheepshead minnow. At Aroclor 1254 concentrations of 0.1 parts per billion, some sheepshead minnow fry die. Aroclor 1016, at 15 parts per billion was lethal to pinfish and sheepshead minnows; susceptibilities of fry, juvenile and adult sheepshead minnows were similar.

Aroclor 1254 affects reproduction of the sheepshead minnow, an estuarine fish. Adult fish exposed for 4 weeks to 0.1 parts per billion appeared to be unaffected. but when eggs from these fish were fertilized and placed in PCB-free water. the survival of fry was diminished. Mortality was observed also in fry from eggs that contained greater than 5 parts per million per gram of the PCB and increased as PCB content of the eggs increased. Reproductive success of Atlantic salmon and striped bass may also be affected by PCB's in their eggs. Adult sheepshead minnows that had been exposed for 4 weeks to from 0.3 to 3 parts per billion of Aroclor 1016 produced eggs that contained from 3 to 77 parts per million of this PCB, yet fr ythat hatched from these eggs were apparently unaffected.

Estuarine organisms accumulate PCB's from water. Maximum concentration factors—concentration in animals divided by concentration in water—in laboratory exposures of various species to Aroclor 1254 were: oysters, 101,000 to 165,000; shrimp, 26,000; and fishes 37,000. The maximum concentration factor determined from exposures of fishes to Aroclor 1016 was 34,000. Fishes exposed continuously to Aroclors 1016 and 1254 accumulated both Aroclors in increasing concentrations for about 4 weeks; thereafter, the quantity stabilized. Maximum concentrations were found in the liver, gills, and skin of the fish, but the lowest concentration found in fishes and

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shrimps was in the muscle. Bioconcentration factors calculated from data from Escambia Bay were greater than 230,000 for shrimp, 670,000 for fishes and greater than 100,000 for oysters, indicating that laboratory data underestimate bioconcentration potentials of Aroclor 1254.

At this point in the testimony, I would like to introduce some comparisons of toxic effects of Aroclors 1016, 1242, and 1254 to various marine species. This data are summarized in attachment 2a. Included are data illustrating rates of accumulation and loss of these PCB's from fishes, summarized in attachment 2b, and a comparison of bioaccumulation of Aroclor 1254 in animals held in the laboratory with those from Escambia Bay, Fla. (attachment 2c).

In summary, our research in the field has shown that polychlorinated biphenyls: (1) Occur in the marine environment; (2) are readily dispersed from point sources; (3) are relatively persistent; and (4) are concentrated in animals, plants, and sediments. Controlled experiments conducted in the laboratory indicate: (1) Various PCB's are toxic—at the parts-per-billion level in water—to shrimp, fish, and other organisms; (2) animals can obtain PCB's from water, sediment or food organisms; and (3) these chemicals are bioaccumulated.

Mr. Chairman, that concludes my prepared remarks. I will answer any questions you may have.

Mr. LEGGETT. Very good.

Thank you very much for your testimony.

You confirm what has been stated previously, that PCB's are a problem. So I understand your testimony when you state that laboratory exposures of various species of Aroclor 1254 maximum concentration factors, like for oysters, were 100,000 or 165,000.

By that you mean it was that multiple times the levels found in water.

Mr. NIMMO. That is correct.

Mr. LEGGETT. So it is much higher in some of these shellfish than it is in fish!

Mr. NIMMO. Yes.

Mr. LEGGETT. Now, you also have a chart here, and your first chart, your attachment, shows residues of Aroclor 1254, at least in Devil's Point, where there appears to be a downward slope as the years progress.

Mr. NIMMO. That is true.

Mr. LEGGETT. Since 1969.

Have you determined why that has occurred?

Mr. NIMMO. Well, for one thing, I believe that the inputs into the bay system have essentially been stopped. This occurred in 1969, early 1969.

I cannot really explain though why the levels dropped for 5 years, and then seemingly have plateaued, except that in the last year we have had tremendous hydrological problems, about double the annual rainfall that we normally have, and we believe that probably there is some resuspension of PCB contaminated sediment in the upper reaches of the bay, and they are now being brought down to where these beds of oysters are.

So what we are seeing is a reflection of some hydrological disturbance.

Mr. LEGGETT. Now, on your second chart you describe 1016, 1242, and 1254. Those are three types of biphenyls.

Mr. NIMMO. That is true. Three different mixtures.

Mr. LEGGETT. Anywhere from 10 parts to 100 parts for the first type of 1016.

Those are what you call acute doses?

Mr. NIMMO. Yes. Acute is a correct term.

Mr. LEGGETT. Is that a lethal dose?

Mr. NIMMO. In the cases of the penaeid shrimp, grass shrimp and pinfish, yes, but in the case of the oysters it is considered to be the concentration that will reduce oyster shell growth by 50 percent.

Mr. LEGGETT. I think we understand that.

Very good.

If we hold our questions, it might be well now if we heard from Mr. Pond of Stipers Unlimited.

STATEMENT OF BOB POND, STRIPERS UNLIMITED

Mr. POND. Mr. Chairman, it is a pleasure to be here.

We have been working with striped bass for 5 years and this is the first time anybody has listened to us.

We started out at the Edenton National Fish Hatchery trying to hatch striped bass eggs from Maryland. They had eggs from South Carolina. The striped bass eggs from South Carolina and the striped bass eggs from Maryland exhibited different mortalities. There was very high mortality in the striped bass eggs from Maryland and very little mortality in the striped bass eggs from South Carolina.

We felt, at that time, it was due to the buoyancy of the egg. The Maryland egg was buoyant, the South Carolina egg was heavy.

We thought there was something mechanically wrong with the way we were hatching. We devised a new system of handling the eggs, and went up to the Nanticoke River in Maryland and set up a hatchery. There we also noted a very large die off.

The first year we did not understand what was happening, but we did notice a weakening in the tissue of the eggs. At the time when the North and South Carolina fish larvae would still be living within the corion, safe from damage, the Maryland fish would be exposed to the surrounding water, because the corion would break very early. You had a tiny animal drifting around with no protection. It was not able to swim.

The fry would start to swim and then become paralyzed. They ceased to develop. They were not normal.

Mr. LEGGETT. What levels of PCB's?

Mr. POND. The chart, I guess, is on page 12. This is a Fish and Wildlife chart.

Now, this chart was developed by the Fish and Wildlife Service from ripe roe fish taken from Florida up to Maryland.

You can see the PCB contamination in Maryland fish is much higher than the contamination of Florida, Georgia, South Carolina, and North Carolina fish.

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We were working in levels of sometimes 30 and 40 parts per million combined PCB's, but along with this was DDT and other things.

When we ran into this problem we did not know what it was. Bruce Rogers from the University of Rhode Island who was working with us, said we should look for chlorinated hydrocarbons.

With the evidence we had, and the work that had been done in Lake George around 1955, it indicated these were the kinds of things you would see if chlorinated hydrocarbons were present.

So the University of Rhode Island did some analyses for us, and found we had high levels, above the 5 parts per million, which had been found to be fatal to Lake George lake trout eggs and larvae.

So we were beginning to notice that we were in some sort of trouble, but being just fishermen, and interested in the fish—I manufacture fishing lures for striped bass primarily—I was very interested in what was happening to striped bass, and I felt some work should be done since we had observed these things.

We found out there was no money available for work on fish reproduction anywhere that we could find. In fact, since the Lake George work in 1955, when it was discovered that eggs were dying in the hatchery, there had not been a single piece of work done up to this time.

In fact, the Great Lakes had lost their fish, and to this day they have not identified the chemicals or the pollutant. They said pollutants killed the fish in Lake Michigan, but the actual chemicals that did the killing have never been specifically identified.

Here we are 20 years later without a series of figures. I asked Mr. Rogers, what are the lethal levels for striped bass?

He said I do not know. We do not know what the levels for any fish are, with the exception of Lake George lake trout.

This is the only work that was done. We felt this was a great oversight, because we just wanted somebody to look at what we were finding.

In addition, we found some things that no one else noticed. We did notice the thin walls, the thin tissue.

We also noticed that the fish did not form gas in their swim bladders when they were ready to feed.

Now, in the South Carolina fish, they would almost all form this gas in the swim bladder, but in the Maryland fish only 1 in 100 would. This is a gross mutation, if you can call it that, because this is a natural thing to happen to a fish.

The danger was obvious. We hatched 3 million eggs and we got maybe 200,000 fry. Of these, 200 were raised to fingerling size. The fish were so high strung, and so different from the South Carolina fish, which we also had in tanks, that we began to see there was really damage occurring.

We felt somebody should really look at this. We went to the State of Maryland to get some support, and they started tagging fish.

I thought, my God, why are they doing that at a time like this when we are finding this gross damage. We were not alone in this. There were several other groups looking at the same things all around the area, all along the Chesapeake Bay system. All were looking at striped bass eggs, and all were seeing the same things.

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These were scientific people from various institutions, and we thought, well, someone ought to come down and have a look at this. Nobody did. They just tagged fish, measured the fish, and kept on the same old way.

We have been at it now for 5 years, just begging somebody to come down and look at what we are seeing, and really put some real work into it.

We have been to EPA twice, and each time they said we are not going to do anything about it because the stuff is in the environment, and what are you going to do about it.

We found there are 250,000 tons of this material in dumps now not yet leeched into the environment. This is from the prior PCB conference report, and dumps are still leeching this material out into the environment.

We are probably going to have to live with the levels we have now for 100 years, and somehow we have to learn to cope with it.

The only way we can cope with it is to put hatcheries in.

Texas has started to put in hatcheries, because their fish are so damaged in Texas they are not reproducing.

Bob Stevens, with whom we worked in the beginning at the Moncks Corner hatchery, is now in Texas developing salt water hatcheries.

We think we will have to take these striped bass out of the environment, feed them a clean diet, and then strip them of eggs. That is the only way to save the fish.

We did contact the Department of Commerce, petitioning for a threatened species status for striped bass and sent over all the information about the eggs. They turned it down, saying, there are plenty of striped bass around. They never mentioned the chlorinated hydrocarbon problem.

You are not going to solve it by not looking at it. Of course, it is getting into the human population. They figure that 75 percent of the human population have up to 3 parts per million PCB's in their tissue. This is very bad.

Mr. LEGGETT. Would you say that humans are a little high strung?

Mr. POND. I would say that any child being born today is in tough shape.

This is my feeling from what I have read from a report from Science and Technology, U.S. House of Representatives, "The Effects of Chronic Exposure of Low Level Pollutants in the Environment."

We do not know if all fish are as high strung and nervous as we see them, but fish behave like humans. We are seeing really the third generation of stripers. That is what we are looking at now, and this will increase with each generation.

We are losing the homing instincts of our fish. They are not coming back to the Chesapeake Bay to spawn the way they used to. There are big gaps in the population. What the population was back in 1936, 1937, 1938, does not exist any more.

So we feel that to not look at this, and not to look at the Chesapeake Bay just as seriously as they looked at Escambia Bay is just absolutely foolhardy.

We asked EPA to do something about it. They gave the University of Rhode Island some $314 million for a study on the environment. They are studying oil and heavy metals.

I called Dr. John Knauss to see what they were doing.

I said:

You know these chlorinated hydrocarbons are disastrous in the environment. They are doing a lot of harm. Why are you spending three and a half million dollars on oil and heavy metals, when they have not been identified as harmful?

He said:

You know more about PCB's than I do. EPA has said we should not work on them. So we are going to have to work on what they told us to work on, which is heavy metals and oil.

You, Congress, are spending the money, and you are not getting results.

In the Detroit area they spent $750 million over 10 years to bring back the Detroit River, and they still do not know what they are treating it for.

All this waste treatment and PCB's and DDT are the things that knock off the fish in the Great Lakes, but which they have not yet proven.

But you cannot treat for PCB. You cannot treat for DDT. Here they are taking all this money to take things out, which really are not the toxicants.

So I do not know why they do not identify what is causing the trouble, and go after the target things. They certainly ought to stop dumping anything that is leeching PCB's into the environment, and dumps should be capped or blacktopped.

Long Island has a dump which is the subject of an NBC documentary. They found this dump was leeching PCB's. Every dump that has stuff that is leeching PCB's should be closed. All PCB in television sets, and in florescent light fixtures should be identified so they are not taken to dumps and so keep this thing going for another 100 years.

It is a very serious situation. We have to attack it. We just cannot keep burying it and hope it will go away.

That is what we have run into. Most people are not interested in the project. They think everything is fine and it will go away.

Mr. LEGGETT. Very good.

We are interested in the project. It is our second day of hearings on this, so we are really not up to speed on this point.

We have your research paper of Stripers Unlimited, which has some excellent work in it. We will see that appropriate portions of that newspaper are extracted for our record and put in it.

[The information was placed in the files of the subcommittee.]

Mr. LEGGETT. Are rock fish the same as striped bass?

Mr. POND. Yes. The same fish.

In fact, the Kepone incident was quite interesting in the James River because that area is the Rock Fish Gap area and that was named after the rock fish of the James River. Now here it is contaminated with another chemical. The poor rock fish are hit from all directions.

Mr. LEGGETT. I am pleased to see that the PCB's in the Sacramento River are less than 1 part. That is pretty good.

Mr. OBERSTAR. Mr. Chairman, could we include in the record the very fine article in this morning's Washington Post on the effect of PCB's on striped bass or rock fish in the Chesapeake Bay?

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Mr. LEGGETT. Very good.

That article will be included at Mr. Oberstar's suggestion at this point in the record.

[The article follows:]

(From The Washington Post, Thursday, Jan. 29, 1976)

"STRIPERS" BLAME CHEMICAL

(By C. Boyd Pfeiffer)

Industrial chemicals, not unlike some agricultural pesticides that have been banned in recent years, are blamed by Stripers Unlimited for the sharp decline of rockfish in the Chesapeake Bay.

Bob Pond, manufacturer of the Adam series of saltwater plugs and the guardian angel for the nonprifit Stripers Unlimited, recently appealed to then-Commerce Secretary Rogers C. B. Morton to place striped bass on the endangered-species list.

Pond cited decreased commercial landings of the fish, increased prices (indicating a scarcity), and the apparent lack of recruitment (reproduction) of rock since 1970.

"Our extensive striped-bass research has brought us to the realization that stripers are much more threatened by long-term persistent chlorinated hydrocarbons such as PCB and DDT than had ever been suggested," Pond said.

PCB—Polychlorinated biphenyls—have been around since 1930, and are widely used in the electronics industry for transformers and capacitors, heat transfer units and hydraulic fluids. Some are used in printers' ink, paints, sealants, plasticizers and adhesives.

The substances are hydrocarbons, industrial equivalents of the agricultural pesticides, herbicides and insecticides such as DDT, recognized earlier as a danger in Rachel Carson's 1962 classic, "Silent Spring."

But it wasn't until 1966 that PCB was recognized as a dangerous food contaminant and, subsequently, as a dangerous pollutant.

While PCB does not seem to be as toxic as DDT to fish eggs and fry, they have, according to Pond, similar effects in apparently causing sterility in the fish and mortality in the fry.

Pond notes that PCB and DDT have been found in striper eggs and fry during 1971 rearing studies that were begun initially to restore high populations of striped bass to some areas of the East Coast.

Research for Stripers Unlimited subsequently found concentrations of the chemical increasing with the age of the spawning fish. The Nanticoke River was also found to be devoid of small rock, indicating to Stripers Unlimited that survival rates might be too low for rock to return to spawn.

And while not initiated on striped bass, one study at EPA's Gulf Breeze (Fla.) Pesticide Laboratory disclosed that levels of seven parts per million of PCB on sheep's-head minnows caused total mortality in the fry. Pond's studies indicate levels as high as 9 ppm in 1974 populations of rock.

Other studies on rockfish in the bays, Choptank and Nanticoke rivers show PCB levels of from 2.8 to 20 ppm.

Nor is the problem solely related to the Chesapeake Bay or striped bass. In August, Ogden Reid, commissioner of the New York Department of Environmental Conservation, warned residents against eating striped bass from the Hudson River or salmon from Lake Ontario because of the presence of excessive amounts of PCB in the flesh of the fish. Most governmental agencies recognize 5 ppm as the danger level for humans, but little research has been done on toxicity levels for the fish themselves.

Thus, PCB in all waterways, in fact throughout the environment, are becoming recognized as a more dangerous, more persistent, more lethal and more costly pollutant than DDT.

But the question remains whether or not PCB is the principal cause of the scarcity of rockfish as Stripers Unlimited claims, or if there are other explanations for the past few seasons of poor fishing.

Mr. LEGGETT. Now, our last witness here is Prof. Donald Parejko, Department of Biology, Northern Michigan University.

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Doctor, you have a statement of 5 pages and that will be included in our record at this point.

[The statement follows:]

STATEMENT OF RONALD A. PAREJKO, PH. D., ASSOCIATE PROFESSOR DEPARTMENT OF BIOLOGY, NORTHERN MICHIGAN UNIVERSITY, MARQUETTE, MICH.

In 1971, some two years after PCBs were initially reported to be contaminants in Swedish marine waters and animals, we became interested in the possible presence of these compounds and other organochlorines in the Lake Superior Watershed. Using facilities available at Northern Michigan University and taking advantage of the geographical location of that University it was believed possible to obtain data on the presence of organochlorines in the Lake's ecosystem. Research on the analysis of environmental samples taken from North America's largest oligotrophic lake was intended with the anticipation of obtaining data which could be used for comparative purposes with those determined in other geographical areas (principally with those data from analyses of specimens taken from other of the Great Lakes) and with that which might be obtained at a different time. Also, to our knowledge, at that time, no data was available on the organochlorine (PCB) concentrations of specimens taken from Lake Superior.

So, in 1972 research on the organochlorine analysis of Lake Superior lake trout was initiated in our laboratory. Lake trout were selected for analysis because these fish are near the top of the ecological food chain in the lake and if organochlorines, that is (PCBs) are accumulated as they ascend to higher trophic eschelons, they could be expected to be found at relatively higher concentrations in lake trout than in forage fish. Also, lake trout are important in the Lake's commercial and sports fishery and data on the organochlorine content in these fish might be found significant.

The lake trout used were netted in Michigan waters of Lake Superior during the summer of 1971. Netting locations were: (1) About 2 miles east of Rock Harbor Light, Isle Royale in the northwestern portion of the Lake, and (2) about 15 miles south-southwest of Caribou Island in the east central portion of the Lake. These two locations are approximately 140 miles apart. The trout were provided by the Michigan Department of Natural Resources, Marquette, Michigan. A total of 20 lake trout were used.

Ventral abdominal tissue, muscle and adipose, taken from an area between the pelvic and pectoral fins was used for analysis. This tissue was selected for analysis because it is relatively lipid and rich and the organochlorines (PCB's) are lipid soluble. The tissue was analyzed for organochlorines by standard analytical technique, which used the United States Department of Health, Education and Welfare, *Pesticide Analytical Manual*, Vol. 1, and the PCB's were separated from the organochlorine pesticides by the method of Armour and Burke. Electron capture gas-liquid chromatography was used for organochlorine (PCB) detection and quantitation.

The lake trout analyzed were generally of a size with an average length some 23 inches and average weight about 5.7 lbs considered to be desirable by sports and commercial fishermen. Fish tissue analyzed contained an average of about 31 percent extractable fish oil.

Several organochlorine insecticides were detected in these fish including lindane, heptachlor, aldrin and DDT and its analogs. Total DDT and analogs were found in 18 (90 percent) of the fish analyzed in a concentration range of from 0.88 to 9.78 parts per mil, and averaging 3.25 parts per million (based on wet tissue weight). These concentrations of DDT and analogs were generally less than those detected in Lake Michigan lake trout and Cayuga Lake, N.Y. lake trout, as reported by other researchers. This result may be expected as Lake Superior waters receive relatively little run off from agricultural land.

In regard to PCBs, every fish analyzed contained compounds identified as PCB's that is Aroclor, with total PCB concentrations found ranging from 2.7 to 13.8 parts per million, with a mean of 7.0 parts per million (based on wet tissue weight).

Statistical analyses were made in an attempt to correlate Lake Superior lake trout age, location of capture, sex or fish oil content with total PCB or total DDT analogs concentrations. For each attempted correlation no statistically significant difference in comparative parameter could be determined. Caution

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should be take in the interpretation of these statistical studies because the small sample size may be a limiting factor contributing to potential error.

Subsequent to this study and for comparative purposes, organochlorine analyses were made of 15 lake trout taken from the Michigan Department of Natural Resources, Marquette Fish Hatchery propagation pools, in 1973. These lake trout were not exposed to the waters of Lake Superior and were fed an artificial diet of fish feed pellets. The fish hatchery lake trout were analyzed for organochlorines (PCBs) using the same technique used for Lake Superior lake trout.

Although some DDT and analogs and PCBs were detected in the hatchery fish, statistical analyses indicate that there is a statistically significant difference of total DDT analog concentrations and total PCB concentrations between fish hatchery lake trout and the Lake Superior lake trout used in the previous study, with the Lake Superior fish having a higher concentration.

Currently, we are engaged in the continued monitoring of Lake Superior fish for organochlorine (PCB) contents and are copiling data on specimens more recently taken from that lake. Unfortunately this data has not been analyzed to a degree that will permit me to indicate trends. But, it was surprising to note that the concentrations of PCB in a Lake reputedly containing the purest water of the Great Lakes system and in the least industrialized part of this whole region were of the order of one-third to one-half of the concentrations identified in Lake Michigan lake trout. I would appreciate an opportunity to submit our latest comparative analysis to your Committee when it is produced this spring.

This statement is a summary of studies I collaborated in during the period 1971–73 which was reported in a recent issue of the Bulletin of Environmental Contamination and Toxicology. I have copies with me for your consideration.

Thank you for your attention to my work. I will be pleased to try to answer any questions you may have.

STATEMENT OF RONALD A. PAREJKO, PH. D., DEPARTMENT OF BIOLOGY, NORTHERN MICHIGAN UNIVERSITY

Mr. PAREJKO. Mr. Chairman and members of the subcommittee, I would appreciate the time to at least be able to read portions of my statement.

In 1971, some 2 years after PCB's were initially reported to be contaminants in Swedish marine waters and animals, we became interested in the possible presence of these compounds and other organochlorines in the Lake Superior Watershed. Using facilities available at Northern Michigan University and taking advantage of the geographical location of that university it was believed possible to obtain data on the presence of organochlorines in the lake's ecosystem.

Research on the analysis of environmental samples taken from North America's largest oligotrophic lake was intended with the anticipation of obtaining data which could be used for comparative purposes with those determined in other geographical areas—principally with those data from analyses of specimens taken from other of the Great Lakes—and with that which might be obtained at a different time. Also, to our knowledge, at that time, no data was available on the organochlorine (PCB) concentrations of specimens taken from Lake Superior.

So, in 1972 research on the organochlorine analysis of Lake Superior lake trout was initiated in our laboratory. Lake trout were selected for analysis because these fish are near the top of the ecological food chain in the lake and if organochlorines, that is PCB's, are accumulated as they ascend to higher trophic eschelons, they could be expected to be found at relatively higher concentrations in lake trout than in forage fish. Also, lake trout are important in the lake's com-

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mercial and sports fishery and data on the organochlorine content in these fish might be found significant.

The lake trout used were netted in Michigan waters of Lake Superior during the summer of 1971. Netting locations were: (1) About 2 miles east of Rock Harbor Light, Isle Royale in the northwestern portion of the lake; and (2) about 15 miles south-southwest of Caribou Island in the east central portion of the lake.

These two locations are approximately 140 miles apart. The trout were provided by the Michigan Department of Natural Resources, Marquette, Mich. A total of 20 lake trout were used.

Ventral abdominal tissue, muscle and adipose, taken from an area between the pelvic and pectoral fins was used for analysis. This tissue was selected for analysis because it is relatively lipid and rich and the organochlorines—PCB's—are lipid soluble.

The tissue was analyzed for organochlorines by standard analytical technique, which used the U.S. Department of Health, Education, and Welfare, Pesticide Analytical Manual, vol. 1, and the PCB's were separated from the organochlorine pesticides by the method of Armour and Burke. Electron capture gas-liquid chromatography was used for organochlorine—PCB—detection and quantitation.

The lake trout analyzed were generally of a size with an average length some 23 inches and average weight about 5.7 pounds considered to be desirable by sports and commercial fishermen. Fish tissue analyzed contained an average of about 31 percent extractable fish oil.

Several organochlorine insecticides were detected in these fish including lindane, heptachlor, aldrin, and DDT and its analogs. Total DDT and analogs were found in 18–90 percent—of the fish analyzed in a concentration range of from 0.68 to 9.78 parts per million, and averaging 3.25 parts per million—based on wet tissue weight.

These concentrations of DDT and analogs were generally less than those detected in Lake Michigan lake trout and Cayuga Lake, N.Y. lake trout, as reported by other researchers. This result may be expected as Lake Superior waters receive relatively little run off from agricultural land.

In regard to PCB's, every fish analyzed contained compounds identified as PCB's, that is Aroclor, with total PCB concentrations found ranging from 2.7 to 13.8 parts per million, with a mean of 7.0 parts per million, based on wet tissue weight.

Statistical analyses were made in an attempt to correlate Lake Superior lake trout age, location of capture, sex, or fish-oil content with total PCB or total DDT analogs concentrations. For each attempted correlation no statistically significant difference in comparative parameter could be determined. Caution should be taken in the interpretation of these statistical studies because the small sample size may be a limiting factor contributing to potential error.

Subsequent to this study and for comparative purposes, organochlorine analyses were made of 15 lake trout taken from the Michigan Department of Natural Resources, Marquette fish hatchery propagation pools, in 1973. These lake trout were not exposed to the waters of Lake Superior and were fed an artificial diet of fish feed pellets. The fish hatchery lake trout were analyzed for organochlorines—PCB's—using the same technique used for Lake Superior lake trout.

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Although some DDT and analogs and PCB's were detected in the hatchery fish, statistical analyses indicate that there is a statistically significant difference of total DDT analog concentrations and total PCB concentrations between fish hatchery lake trout and the Lake Superior lake trout used in the previous study, with the Lake Superior fish having a higher concentration.

Currently, we are engaged in the continued monitoring of Lake Superior fish for organochlorine—PCB—contents and are compiling data on specimens more recently taken from that lake. Unfortunately this data has not been analyzed to a degree that will permit me to indicate trends. But, it was surprising to note that the concentrations of PCB in lake trout taken from a lake reputedly containing the purest water of the Great Lakes system and in the least industrialized part of this whole region were of the order of one-third to one-half of the concentrations identified in Lake Michigan lake trout.

I would appreciate an opportunity to submit our latest comparative analysis to your committee when it is produced this spring.

This statement is a summary of studies I collaborated in during the period 1971–73 which was reported in a recent issue of the Bulletin of Environmental Contamination and Toxicology. I have copies with me for your consideration.

Thank you for your attention to my work. I will be pleased to try to answer any questions you may have.

Mr. LEGGETT. Very good.

Is that one copy you have there?

Mr. PARAJKO. I have probably about 50 copies.

Mr. LEGGETT. 50 copies. Very good.

We will have counsel peruse one copy and determine how much of it we can put in our record annd we look forward to doing that.

When you finish your other study, we will review that to determine if that can be put in our record.

[The material was placed in the files of the subcommittee.]

Mr. LEGGETT. Mr. Oberstar undoubtedly has questions about Lake Superior.

Mr. OBERSTAR. First I would like to come back to Dr. Nimmo.

What has been the extent or level of cooperation between your Gulfbreeze lab and the laboratory at Duluth, the National Water Quality Laboratory?

Mr. NIMMO. With regard to what?

Mr. OBERSTAR. On this issue of PCB.

Mr. NIMMO. Very close cooperation.

Mr. OBERSTAR. How does your work differ from the work that they are doing at the Duluth laboratory?

Mr. NIMMO. I believe that initially we put more effort into field investigations and for obvious reasons.

The PCB problem in Escambia was essentially at our back door, so we spent quite a bit of effort in that area. However, our laboratory research probably emphasizes the mollusks and crustaceans, whereas theirs emphasizes the work on fish and fish food items.

Mr. OBERSTAR. Is there any difference in concentration of PCB's in shellfish, mollusks, from those of freshwater fish, finfish?

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Mr. NIMMO. I would have to suggest that if you really needed to know an answer that John Eaton from the Duluth laboratory has discussed the matter with us for the past several years.

I will just put it this way. The levels that he has found in the fish from the Great Lakes are comparable to what we found in the fish from the Escambia Bay immediately after the release of the material.

Mr. OBERSTAR. Any difference in the concentration of PCB's in fish or shellfish in freshwater and those in salt water?

Mr. NIMMO. Up until the Hudson Bay incident, I would say they have been very similar, but we had nothing in the marine environment that I know of that equals the problem in terms of how I understand it. The concentrations in the fish are there. That, to me, is just about a record.

Mr. OBERSTAR. The medium does not really make much difference, then. If the chemical is present in varying degrees of concentration, it would be absorbed by the aquatic life in proportion to the amount that is present in the environment; is that right?

Mr. NIMMO. Yes; I believe this is true. Immediately after the PCB was found in the oysters of the Escambia Bay, we obviously went to samplings of fish. For three or four species we found a range of somewhere between 12 and 20 parts per million and for a number of years this was considered to be very high until we found levels in the Great Lakes in fish that exceeded that.

Mr. OBERSTAR. Now, do you find, as with the bald eagle and DDT, that PCB is transmitted through the food chain to predator animals?

Mr. NIMMO. It is surprising that to me in looking at the literature the greatest magnification—will you agree with that term?

Mr. OBERSTAR. Yes.

Mr. NIMMO. Occurs at the first trophic level, that is, the grazer fish or the grazer organism takes up much of the material or most of the material at that fish's initial trophic level.

From that point on up the magnification may be lessened, but that still does not negate the impact that it has on the top predator.

So, to give you an example, the *Menidia*—Atlantic silver side—occurs in our area and in one survey this particular species, which is a grazer, had more PCB than some of the top carnivores, such as the bass, the striped bass. This was surprising to us.

Mr. OBERSTAR. From that would you postulate that humans would tend to accumulate PCB in their systems from eating fish which have high concentrations of PCB?

Mr. NIMMO. Having never really looked at the data that would influence residues in humans, I could not say, but I would suspect that based on what we know with other animals.

Mr. OBERSTAR. The only evidence we have then of effect on people is the Japanese?

Mr. NIMMO. Yes; the Japanese.

Mr. OBERSTAR. It was very direct. It was not a food chain situation. It was an accident.

Mr. NIMMO. Yes.

Mr. LEGGETT. We have two bells. In 5 minutes, two more bells are going to ring and we have to vote, so it might be wise at this point

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if we yielded to Mr. Forsythe and let him ask some questions. And if we feel we have questions after that, we can come back.

Mr. OBERSTAR. I have a number of questions, so I would like to proceed later.

Mr. LEGGETT. Very good.

Mr. Forsythe.

Mr. FORSYTHE. I thank the panel for some very technical information that is very helpful.

I have only one question, Dr. Parejko; did you find any evidence of similar research having been undertaken in Lake Superior particularly?

What I would like to know is what coordination is there in the research field so that we are getting the most out of the talent available and the research dollars available to make sure we are not duplicating each other's work and so on.

Mr. PAREJKO. Well, in addition to simply going straightforward to the literature yourself and, for example, using various abstract services that are available, chemical abstracts, pollution, and biological abstracts, there are also a couple of sources that you can, as a researcher, utilize for the purposes of research, actually a search into the information that is available.

One of these that I know is available is the Smithsonian Institute Science Information Exchange.

I believe there is also another one available from the publishers of Current Contents.

I cannot exactly recall. There is possibly another one of the panel members who could help me out on this, but there is also type of literature search that you can request them to do for you.

So there are a couple of possibilities.

Mr. LEGGETT. Does anyone else want to comment?

Dr. AHMED. I think perhaps what you mean is the computer search where you request information on toxic material.

Mr. PAREJKO. Right.

Mr. FORSYTHE. I gather, Dr. Parejko, from your response that these are available.

Are they being used and are we getting the best advantage?

It is fine to have all these things, but if somebody is not using them, we really are not doing as well as we might.

Are they generally available?

Dr. AHMED. Can I try to answer that?

They are very expensive, by the way. For an organization like ourselves to take advantage of these computer searches, it would cost several hundreds of dollars each time to find out some information on one given chemical compound. However, I understand some of the Government laboratories find it easier. Well, they have the money. I am sure the National Cancer Institute, and all the various research institutions, do take advantage of it.

I have conversed with scientists at these institutes and they have generally been familiar with these particular services, and they take advantage of it.

Mr. FORSYTHE. It just seems to me it is an area that we are weak in. Maybe EPA could assume the lead in coordinating an expanded research effort.

Mr. POND. We were quite interested in this because we felt there was an awful lot of work being done which was very short term, 18 months. It was the sort of thing you do in college when you want to get a degree.

There was no long-term planning. For instance, we saw nobody overseeing the research. There was nobody saying, well, let us look at what is happening and then do the research which will answer the question. Rather, the research started at the bottom. Somebody said this is my particular bag. This is what I teach, so I will do this kind of research, whether it is needed or not.

We needed applied science throughout. We could not find this being done. There was just a lot of pure research and not applied research.

We thought this was ridiculous. I earn a living out of this fishery and nobody was doing the kind of work I could get something out of. I was really upset.

You know, being an amateur and being a man who is practical I knew that if you want to make a fishing lure you do this, this and this, but here there was nobody overseeing this research.

In Maryland, the management people do not do the research. The university does the research. The management people cannot even suggest areas of research. This is true of most fisheries.

Mr. LEGGETT. We have to vote. We will come back in 5 minutes. At that time, Mr. Oberstar will be in charge, and we will finish up with his questions.

I want to thank the panel on behalf of the Chair for their contribution. It will help us in our deliberations.

[Short recess.]

Mr. OBERSTAR [presiding]. The subcommittee will reconvene.

If I may, I will come back to Dr. Nimmo.

Yesterday we received testimony from Mr. Clifford Tuttle, President of Aerovox Industries, a manufacturer of alternating current capacitors, whose testimony stated the following:

> Unfortunately, because of the media and, to some extent, the EPA, we all tend to talk in the generic term—PCB. There are many formulations that fall into this category, and we would be much better advised to refer to them individually; Dr. R. Risebrough, Ph.D., Bodega Marine Laboratory stated at the Chicago Conference on PCB's that we should do exactly this. He stressed the fact that, in all his studies, he had yet to identify Aroclor 1016 in either the environment or the animal life which he has examined. For your information, both the high voltage and the small capacitors are made exclusively with Aroclor 1016. The advantage of this material is that only one-half of 1 percent of it is made up of homologs that are not readily biodegradable; in contrast, other formulations are considerably more persistent.

Would you agree with that statement about biodegradability and could you react to Dr. Risebrough's statement that Aroclor 1016 has not been identified in the environment or in animal life?

Mr. NIMMO. As to 1016 biodegradability, I cannot really comment one way or another on that.

I will say that the evidence does support that environmental samples and samples that we have or specimens that we have exposed to the chemical in a laboratory, some of the earlier homologs, as it is used there, are depressed or suppressed.

That is about all I can say about it.

As to any evidence of their degradation, I cannot attest to that.

Now, may I respond to the second part?

It is my understanding that 1016 has been documented in various samples.

Mr. OBERSTAR. I am sorry. I did not hear the last part.

Mr. NIMMO. It is my understanding that 1016 has been documented in various samples as being contaminants in the Hudson River.

Dr. AHMED. May I respond to that, because I am familiar with the Hudson River situation?

Let me first try to explain to you the difference.

The capacitors used to use Aroclor 1242 before they substituted Aroclor 1016. However, Aroclor 1016 has 41 percent chlorine content. No one to this day knows why they decided to name an Aroclor mixture containing 41 percent content 1016. That is still a puzzle.

This is confusing to a lot of people because the nomenclature originally was that the last two digits denotes the chlorine content.

Second, if you look at the gas chromatographic technique used to detect the various mixtures, the "fingerprint" or whatever you have in these charts, it is very difficult to distinguish between an Aroclor 1242 and an Aroclor 1016 mixture. They are essentially identical.

So when the State and the EPA report the presence of PCB as a certain Aroclor mixture, 1242 and 1016 are considered equivalent. There may be some minor differences in one or two peaks, but they are so small that you cannot identify one from the other.

All the samples that have been analyzed from the upper Hudson River have shown high concentration of Aroclor 1242 and 1016.

The substitution of 1016 from 1242 and from the higher chlorinated homolog mixture that was used years ago has only occurred in the last few years, in the early 1970's. So you have a question of transport and dispersion, and you will necessarily find the higher homolog samples in wildlife samples. It will take some time before these 1016 samples and 1242 will have migrated far enough into other parts of the environment.

I want to caution you when someone makes a statement like that, to take it in the proper perspective.

Mr. OBERSTAR. That is why I am asking you.

Dr. AHMED. That is why I tried to impress upon you the best evidence we have is the place where the greatest discharge of PCB is occurring today, and that discharge is Aroclor 1016.

Mr. OBERSTAR. Do you contest the assertion of biodegradability of 1016?

Dr. AHMED. Well, what we are talking about here, I imagine, is the relative biodegradability between 1016 and high homolog mixtures.

I have seen some figures. They have never been published by the manufacturer in the scientific literature. These diffrences are not very large.

If you would like to know the biodegradability between the high homolog mixtures and 1016, there may be a certain amount of significant difference in biodegradability, but these may, in turn, be not because of the total mixture, but each homolog compound may have different biodegradability and different toxicity.

When we talk about 1016, we talk about having a mixture of a number of biphenyles with a lesser amount of chlorine attached to the

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biphenyl molecules than, for example, 1260, which has a mixture of homologs with higher number of chlorine atoms.

You cannot make a statement that one Aroclor mixture is less biodegradable.

One, the mixture is discharged from a discharge point, say an industrial source, and each of these homolog compounds go their separate ways and then they recombine. You cannot talk about an Aroclor 1016 being there unless you have such a discharge of pure Aroclor 1016 occurring over a period of years.

Let us suppose you have hypothetically a discharge point with Aroclor 1260, 1248, 1221's, and the other homolog mixture being discharged into a river. When you analyze the water sample, it is impossible for you to tell where each of the homologs came from unless you have a radioactive tag on them.

So what we are talking about is the individual biodegradability of each of these homolog compounds, not a mixture as such.

Mr. OBERSTAR. So, it is your judgment that none of the PCB formulations would be biodegradable, that they are all essentially persistent, and you would specifically contest the statement in Mr. Tuttle's remarks which asserts that 1016 is readily biodegradable?

Dr. AHMED. Well, there is very little information in the published literature that points in this direction; that one type of mixture is significantly more biodegradable. There is some information in the literature that a given individual homolog may or may not be significantly more persistent. Sometimes a lower chlorinated homolog may be more persistent than, say, a high homolog and sometime the opposite may be true. So, I do not think one can make that kind of a statement one way or the other.

Mr. OBERSTAR. Mr. Weddig, I think you had indicated you wanted to say something.

Mr. WEDDIG. Dr. Ahmed said what I was going to say.

The point I was going to make is 1016 is a relatively new PCB compound on the market. I do not think it has had a chance really to work its way into the fish and other wildlife as have the earlier compounds because there was a basic change in the early seventies as to the type of material that was going to be produced and there was a basic change in usages.

So that, I think it is only a matter of time before we will see 1016, if you can find it, in concentrations in various items.

Mr. OBERSTAR. Are there any synergistic effects that you have identified—anyone of you on the panel that wish, may respond to that—between PCB's and other chemicals or materials of any kind in the water or land environment?

Dr. Nimmo.

Mr. NIMMO. We conducted some experiments with the shrimp in which we added a mixture, methoxychlor, which is an insecticide, Aroclor 1254, and cadmium. The combined effects were additive.

Dr. AHMED. I would like to point out an interesting study done by Dr. Jaeger and Dr. Rubin, Harvard School of Public Health, where they find that when you feed rats PCB you will induce the liver toxicity of vinyl chloride. In the absence of PCB, the levels of vinyl chloride fed these animals indicated no effect.

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This is a very interesting observation. The same effect could also be demonstrated with phenobarbital.

What occurs here is PCB activates the liver. It activates the microsomal enzyme system that hydroxylates drug compounds which makes them water soluble so they can be excreted in the urine. With the same system that hydroxylates drugs, other compounds can be hydroxylated, vinyl chloride, for example. Often you can produce what are known as intermediate metabolites, which are potential toxic or carcinogenic. Trichlorethylene can be hydroxylated to form a molecule which is known to be a carcinogen.

The problem with PCB is now recognized to be more serious than before because it has the synergistic effect on other substances, like vinyl chloride.

Mr. OBERSTAR. This, I think, is extremely significant for our work here. It is not just that the element itself may have adverse effects, but its combination with other minerals and other chemicals in the environment which we have so little knowledge about. There is so much floating around in the water that although any one of these in itself may not be carcinogenic, it could be dangerous by combining with other chemicals to produce a third, carcinogenic, effect.

Dr. Nimmo, could you comment, if you have this scientific information, on the quantities of water that humans will have to ingest in order to build up levels of PCB in body tissue, whether fatty or muscle tissue?

Mr. NIMMO. I would not have any idea.

Mr. OBERSTAR. Is there any information available on this issue? Is any study under way on ingestion through food or drink by humans?

Mr. NIMMO. I know of none.

Mr. OBERSTAR. Yes, Mr. Pond.

Mr. POND. The pesticide monitoring service did go into this. They did mention that water was one of the things that did not seem to hurt the human. A human can drink a lot of water without it being magnified at all. It was food that seemed to be the magnifier.

You can find this in the pesticide monitoring journal. They actually did point out that water was not necessarily a magnifier.

Mr. OBERSTAR. Thank you.

Dr. Ahmed.

Dr. AHMED. That is an interesting observation. I am just trying to think what could possibly account for that observation.

I think in order to ingest a fat-soluble or nonwater soluble material like PCB you have to pick a fat in your diet in order to transfer it across the gut wall. Water when it is drank without food perhaps may not allow the PCB's to be easily ingested.

I am just speculating on that possibility.

I want to point out that one could make a theoretical estimate of the amount of water you might ingest, assuming a certain absorption in the gut, and find out what the build up of PCB may be.

Dr. Highland may be able to answer those questions tomorrow, since my understanding is that the Environmental Defense Fund is looking at this question and has come up with some interesting figures.

Mr. OBERSTAR. I think that would be very significant; if PCB's are present in our water environment. They are surely coming into drinking waters because we do not have ultra filtration that would remove, as a matter of normal course, this kind of material from drinking water and if it is there we ought to know what are the concentrations that would become significant for human ingestion.

What device is used to detect PCB?

You mentioned, Dr. Ahmed, the gaschromatograph.

Is this detectable with electron microscopy or by X-ray diffraction?

Dr. AHMED. It is a computerized mass spectragas chromatograph system. It is a computerized system that allows for the identification of the various peaks and allows the identification of whether it is given a spectrum of peaks, i.e., belonging to one type of Aroclor mixture.

Mr. OBERSTAR. Mr. Pond, I wanted to ask, in your judgment, is the FDA 5 part per million ruling on PCB's adequate for fish or should that be lowered?

Mr. POND. My feeling is that for a woman who is going to have a child, that she has to be free of this material. We have seem so much damage in our fish. We are not talking about relatively low levels. We are talking about 30 parts per million. We see such gross damage. We see such nerve damage in the Maryland fish we keep in our tanks compared with the Carolina fish who are much less contaminated.

There are definite signs of trouble and I would certainly want someone to look at this. We have spoken of putting a NASA team together to look into this thing. We need that kind of expertise. We need neurologists. We need biochemists. We need so many people in a team to go in and look this whole problem over.

EPA has suggested this to us. There was no one with the expertise to do the work on the PCB problem. It just did not exist. There was no college that had the expertise and there was not anybody in the country or no group in the country that was put together to do the work. That is why it was not being done.

There was a reluctance to work on it. There was just a lack of talent to go over all the facets and, again, you are speaking about a no-harm level. You are talking about 5 parts per million. You are talking about a lethal level to a fish and fish and men are related.

So, you are talking about a lethal level at least in the environment to a particular fish.

So, therefore, I think it is really a serious situation. I think we cannot ignore it any longer.

Mr. OBERSTAR. Your position would be there is no threshold and there should be a zero tolerance?

Mr. POND. For a woman having a child. For the rest of us it is probably not going to give us cancer at these levels. The level now in the environment is probably not going to hurt the person living except the new born child. It is in the reproductive process it seems to be doing its damage.

That is where I would target my work. I would look toward this and I would have to find out where we had to build hatcheries, I would be very seriously interested in knowing.

In the recent rhesus monkey experiment Dr. Allen said that the monkey had the highest concentration of PCB's in the ovaries and it is the same with fish. Fish have the highest concentration in their eggs. It gravitates toward the birth cycle. Seals have the same problem. So, it transfers over into the birth process.

Mr. OBERSTAR. What is the break even point for fish?

At which point does the damage become noticeable?

How many parts per million?

Mr. POND. Of course we have such a mixture of chemicals. You are going into the wild. It is not like a laboratory. You are picking up fish with all kinds of contamination. There is DDT and all kinds of chemicals, some more, some less.

Mr. OBERSTAR. There have been laboratory studies; have there not?

Mr. POND. I think just 7 parts per million was found to be fatal in an experiment done in Gulfbreeze. That was the level.

The one in Lake George, the lake trout, was done 20 years ago.

Other than that, I do not know of any experiments that have set levels. They are only working on one chemical at a time. We are working on every chemical in the environment. I can find everything in that fish that is in the environment.

Mr. OBERSTAR. Dr. Nimmo, has the Gulf Breeze staff been reduced along with the general cutback in EPA and R. & D. staffing at regional laboratories?

Mr. NIMMO. No, it has not.

Mr. OBERSTAR. Is your budget adequate for the work you are doing?

Mr. NIMMO. I would rather you direct that question to our chief. But as far as my personal facilities and assistants, it is fine. It is adequate.

Mr. OBERSTAR. I expressed some concern for the record about the general cutback in funding for EPA, R. & D. facilities, and not directly at any one laboratory, but the spread across the board.

It just disturbs me that, in OMB's charge to reduce Federal expenditures, the first place they look to pick on for cuts is the R. & D. function of any Federal agency, and EPA has suffered more than its share over many years.

Finally, my question is about the availability of PCB's in the environment.

Even if we were to eliminate, as of today, the production, the sale, and distribution of those chemicals not yet manufactured into some end product, there are still enough materials in the environment, in commerce, in home use, to find their way into landfills and into streams and lakes.

How do we prevent them from becoming contaminants?

Has anybody given that some thought?

Mr. POND. That is why I suggested we cap the dumps. We should really look at the dumps, and see which ones are leeching this material.

There are dumps all along our Atlantic Coast as you go down 95. Every single marshland has a huge dump on it. I think we should see what kind of leeching is going on.

NBC is doing a documentary on PCB's and they located it coming out of a dump in Long Island. They photographed the dump, and they will air it on the 23rd. They found it and I am sure it could be found

in others that are leeching into the environment, and it should be just capped with blacktop.

This should be an engineering process to find out how you stop a dump from leeching this out. There should be no more dumps or landfills near the water.

If I knew that PCB's were in my television set, I certainly would not take my television set to the local dump.

We have to know where it is. If it is in the fluorescent light, I have to know it is there, so I will not take that to the local dump.

It is criminal on the part of government and the industry in not telling us where it is.

I know electricians who to this day, do not know they should not take that transformer fluid and bring it to a farmer for him to spray on his crop. He still thinks it is a great thing for controlling bugs.

This was used, according to what I hear, as an original sort of pesticide, and was sprayed on apple orchards, and things like that.

This is just what I hear from electricians.

Mr. OBERSTAR. That is astonishing. I never heard that before.

Mr. POND. I heard this last night.

Mr. OBERSTAR. What we need is a massive program of public education to inform people of things like fluorescent ballast which are dangerous to the environment.

Mr. POND. They do not know. The average electrician has not the slightest idea, and even the people handling the material do not think it is dangerous. It has never been reported as being harmful.

I called GE's environmental scientist. He said that that stuff never hurt anybody. They got a few sores. He was angry about me calling 4 or 5 years ago when I first found these things in the eggs.

For the first time, recently, this electrician I know had to put in an installation where he actually sealed the transformer in a room, in a vault, and had to put a tank under it to catch the material. He said he never did this before. He had seen transformers where kids had opened the valves, and all the fluid went into the ground.

There are a lot of spills. If you talk to the electrical industry, the man that works in the industry, he will tell you some horrible stories.

Mr. OBERSTAR. Counsel has some questions.

Mr. SPENSLEY. Mr. Pond, I have one question I want to ask you.

Has any Federal agency helped you with any research money in your efforts?

Mr. POND. We have not found any agency offering any money at all.

Bruce Rogers collected a lot of data. He went to his EPA coordinator and said he really thought this should be looked into. He has been on this thing 4 years, and never had any money.

EPA scientists agreed this should be done, but from the highest level of Government they said no, we are not going to touch it.

I believe it is not just being open and aboveboard about the problem. You have to face it, and we have to do something about it.

We do need money, not ourselves, but the universities, at least, directly for this problem.

Mr. SPENSLEY. I also wanted to ask Mr. Carver and Dr. Nimmo whether you are satisfied that your agencies are coordinating your

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research efforts in this area, and whether you are obtaining the type of information that is helpful in the projects you are working on.

Is there interagency agreement for coordinated research efforts, or exchange of information?

Mr. CARVER. There is a coordinating mechanism for all Federal pesticide research, and most PCB work comes under this.

Mr. SPENSLEY. What is the mechanism?

Mr. CARVER. The mechanism is the Federal Working Group on Pest Management. It consists of five or six panels, one of which is a research panel. I think about 20 different agencies are represented on this.

Mr. SPENSLEY. Are you satisfied that they are doing an adequate job?

Mr. CARVER. I think they are doing a splendid job.

Mr. SPENSLEY. Dr. Nimmo?

Mr. NIMMO. I agree. I am not familiar with what exactly Mr. Carver is talking about, but in terms of the information and the work of the programs, certainly this information is shared between the agencies.

Mr. SPENSLEY. Well, EPA does participate in this panel that Mr. Carver is referring to?

Mr. CARVER. Yes.

Mr. SPENSLEY. One last question, to whoever wants to respond to it. Evidently one of the principal objections to substituting the PCB's in the industry is the question of flammability. Perhaps Dr. Ahmed or somebody else may have considered this question. Has there been a consideration of this question in evaluating substitutes?

Dr. AHMED. Well, there is an underwriters code with respect to transformers on flammability. There is no corresponding code for capacitors.

My understanding is even in capacitators there may be certain occasions where you might have problems of flammability.

Mr. SPENSLEY. I guess the question I am asking is, has someone examined these substitutes and verified the industry's claims that flammability is, in fact, a significant problem?

Dr. AHMED. With the substitutes you said, like mineral oil, and some of the other possibilities?

Mr. SPENSLEY. Yes.

Dr. AHMED. The only agency that has been looking at this thing seriously is the National Bureau of Standards. They are apparently expected to report their findings on this question soon.

A professor at Purdue University, in the engineering department, chaired this particular study group. If you would care to inquire of them, I think that they would have the best available information on this study.

Mr. OBERSTAR. Well, the National Water Quality Laboratory at DuLuth has developed some information that indicated substitutes are being developed by industry. Dow Chemical is manufacturing a fire-retardant fluid suitable for use in capacitators called butyldiphenol oxide, and Dow Corning is manufacturing material for use in transformers called a silicone oil.

Are you familiar, either of you, with either of these two materials, Dr. Nimmo, or Dr. Ahmed?

Mr. NIMMO. No; Dr. Gil Veith at the laboratory has told us on several occasions about these. As far as I know, the information is not generally known, any information concerning these, in terms of the physical chemical properties, and certainly no research that I know of in the agencies is going on as far as that is concerned.

Dr. AHMED. I have talked to both Dow Chemical and Dow Corning about these products. My impression is that the Dow Chemical product has undergone, at least within the industry, a certain amount of testing. They believe that they have the right kind of fluid in terms of physical properties. They still are concerned about the potential environmental impact.

The information I have gotten from them directly, which is not published in the literature, is that they seem to be considerably less toxic, both chronically and acutely.

The biphenyloxide material is a compound with the oxygen atom in between the two benzene rings. They apparently appear to be more biodegradable, and so on. This is the information I have.

They have apparently given this information directly to the EPA. But we have not been able to get exactly the technical information from the companies in writing. All I can tell you is that I talked with the technical staff, and they assure us that they are on the threshold of coming out with a very good substitute.

I think GE has used phthalate esters in countries where PCB's have been banned. They, in fact, have a promotional brochure on this particular material. It does have a bit of a flammability problem compared to the PCB. It is certainly not nonflammable.

Mr. OBERSTAR. Did you say that GE is doing this in other countries, using esters?

Mr. NIMMO. Yes; they are selling this product in other countries.

Mr. OBERSTAR. But they are not doing it in this country?

Mr. NIMMO. As far as I know, they are not. This matter was brought up at the hearings in Albany.

Mr. OBERSTAR. It is a little matter of patents they have, and the $6 million royalties they realize a year from the patents they have on systems of impregnating capacitators with PCB's.

Dr. AHMED. Well, this particular compound is called econol, and that is all we know.

Mr. OBERSTAR. Is it possible to develop a scientific protocol for testing of the butyldiphenyl oxide or the oil over a sufficient period of time so we could have some scientific evidence on whether that would be environmentally acceptable?

Dr. AHMED. Yes; I think it can be done. From my conversation with the technical staff at Dow Chemical, I was impressed with what they told me. They are studying the material on several species of animals at low levels.

In this kind of study, as it turned out to be true, it can be done by industry on other substances, like common toxic substances, and I think we will go a long way in preventing the kinds of problems we have been discussing today.

Mr. OBERSTAR. Mr. Tuttle, in his testimony yesterday, indicated that the best we could do in switching over from Aroclor or other PCB's would be July 1, 1978, quoting him, "Assuming the new fluids prove to be satisfactory."

That indicates that we would have to do a good deal of testing, both as to the environmental effects, biological effects, and the technological efficiency of new materials in the work that they are expected to do in the capacitors and transformers.

Is that a reasonable time frame?

Is that something that is achievable?

Dr. AHMED. Personally, I think it is. It is achievable.

But the other problems without the PCB already present in the environment, the bottom sediments and landfills and all, are still some issues that we still have to deal with.

There is no mechanism under the Federal Government to undertake that testing. This will have to be done by private industry and there is no means within the Federal regulatory framework to approve or disapprove the entry of a new chemical compound into industrial use and its introduction ultimately into the environment.

Dr. AHMED. You are right. There is nothing in the statutes.

Mr. WEDDIG. There is nothing in the statutes now, but it is one reason why we would like to see the Toxic Substances Control Act passed, because that would provide the mechanism.

Second, there is nothing to prevent, in terms of statutory authority, issuing very stringent effluent standards so that current manufacturing practices which are involved with Aroclor would cut off entirely further leakage through their plant outfalls.

Finally, there is nothing that would prevent this Congress or someone setting up a disposal system that would try to prevent further dissipation of the used material. Why not?

We are talking about recovering tin cans or aluminum cans from soda pop and beer, so why can we not set up a system to recover used capacitators. We used to pay bounties on wools and other creditors, so why can we not pay bounty on transactors?

Mr. OBERSTAR. You mean we should take each product that is sold, just like we do cigarette packages, and say, "Warning: the Environmental Protection Agency has determined that disposal of this material may be hazardous to health and other things in the environment"?

That is about the only way that you are going to be able to do it.

Mr. WEDDIG. I think if there is a system that is involved where you will get 50 cents back every time you bring one of these in, it would encourage a little bit of action in that way from junk dealers and from other people who can handle it.

They are bringing back newspapers at a far less cost than that.

Mr. OBERSTAR. Counsel has a question.

Mr. MANNINA. In 1971, the Government research with respect to PCB's was so diffused that an Interagency Task Force was created.

In response to Mr. Spensley's questions, you indicated this problem was largely solved because of the pesticide monitoring program.

What about things that are not pesticides, such as PCB's?

Are those covered under this monitoring program you have discussed?

Mr. CARVER. I think it was largely due to the efforts of pesticide researchers that the PCB problem was uncovered, and it is through their subsequent efforts that those problems have been identified.

Mr. MANNINA. All right.

PCB's were found, I believe, with DDT.

Is that accurate?

Mr. CARVER. Yes.

Mr. MANNINA. What about pure chemicals that are not found in association with a pesticide?

Are you coordinating in that research effort or, again, are the substances falling between the cracks?

Mr. CARVER. I am afraid, I cannot answer that or the answer would be no.

Mr. MANNINA. You are not coordinating your efforts.

Mr. CARVER. There is no coordinating mechanism, to my knowledge.

Mr. NIMMO. I think there are two planning cycles.

There was some money in the PCB problem specifically for that and now we no longer have that in our program.

As Mr. Carver has stated, the PCB awareness sort of came by just analyzing samples for the other chlorinated materials. This is where most of our knowledge came from.

As far as I know, there is no coordination in either of the agencies with regard to the PCB monitoring, as such, but residues are reported. Whenever you see most reports in such journals, as the Pesticide Monitoring Journal, PCB's are reported.

Mr. MANNINA. It just seems to me there could be a major gap in the program here.

One last question.

We have been focusing exclusively on PCB's.

Are there other substances that have similar potential for environmental harm that you feel this committee should be aware of?

You can respond now or for the record.

Mr. NIMMO. Two compounds come to mind that we, as a laboratory, are concerned with to the extent that we are doing literature searches as to their appearance and effects, if they are known, and these are the halowaxes. I think those are chlorinated napthalenes and the PBB's, the polybrominated biphenyls.

So we do not have an effort in this regard now, but it does not mean we are not going to. As far as I know, they occur in tremendous quantities, or if there are any hints to acute effects, I am sure somewhere the work will be started.

Mr. MANNINA. When you say you do not have a program now, is that because of lack of resources?

Mr. NIMMO. No, just the high priority of other problems that we face right now, such as Kepone.

Mr. MANNINA. Does anybody else have any comment on that?

Mr. CARVER. We can furnish information for the record on that.

Mr. MANNINA. I would appreciate that.

[The following was received for the record.]

CHEMICALS OTHER THAN PESTICIDES

To address the issue of chemicals other than pesticides in the marine environment, particularly the halowaxes, we are concerned about any stable, toxic compound that is used in sufficient quantities for residues to be detected in the marine environment. We believe that the use of these compounds must be controlled to prevent a recurrence of widespread contamination such as we have experienced with PCB's. We further believe that an adequate legislative base is the first step towards controlling the widespread use of harmful compounds.

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There are several legislative proposals before the Congress providing for the control of toxic substances. Of these, we believe that HR 7664 with the amendments proposed by the Administration on January 29, 1976, would provide the legislative base needed to control these toxic substances.

To clarify the issue of Federal coordinating mechanisms for research and monitoring of newly-developed toxic compounds, a coordinating mechanism is being planned as outlined in the National Pesticide Monitoring Plan being prepared by EPA as required by the 1972 Amendments to FIFRA (PL 92-156). Additionally new chemicals are not usually widespread in the environment. The following paper from the *Proceedings of the International Conference on Environmental Sensing and Assessment* describes the structure, coordinating function, capabilities and programs of the existing Monitoring Panel of the Federal Working Group on Pest Management.

A National Pesticide Monitoring Program Overview

(By Thomas C. Carver, Jr.[1] National Marine Fisheries Service, National Oceanic and Atmospheric Administration, Washington, D.C.)

Introduction

The National Pesticide Monitoring Program is sponsored by the Monitoring Panel of the Federal Working Group on Pest Management. Membership in the Monitoring Panel is drawn from components of the Departments of Agriculture, Defense; Commerce; Interior; Health, Education and Welfare; Environmental Protection Agency; Tennessee Valley Authority and the National Science Foundation.

In addition to sponsoring the National Pesticide Monitoring Program, the Panel encourages the development and use of uniform samplings and analytical methodologies. The Panel has recently published guidelines for both. The Panel also sponsors *The Pesticides Monitoring Journal*, now in its eighth year, which serves as the primary outlet for reports resulting from the National Pesticide Monitoring Program (NPMP).

The Monitoring Panel has defined monitoring as the repeated sampling and analysis of components of the environment to produce reliable estimates of the pesticide levels in the components and the change of these levels in time.

The National Program was described in Vol 1, No. 1 of the *Pesticides Monitoring Journal* in 1967. The program was initially designed on the basis of the minimum monitoring needed to meet program objectives of establishing baselines, detecting trends in time and identifying potential problems.

Several component parts of the NPMP have been funded by direct appropriation, while others have been accommodated within existing agency programs with no specific appropriations. Irrespective of the specific fiscal support, substantial accomplishments have resulted from modifications of existing programs or new programs having objectives other than monitoring as a primary goal.

The National Program was updated in Vol 5, No. 1 of the *Pesticides Monitoring Journal*. Changes resulting from advances in analytical and sampling techniques, changing use patterns of pesticides, introduction of new compounds and from variations in Departmental missions, are a continuing process which will necessitate periodic revision.

There are other aspects common to all elements of the National Program. Problems certainly must be included as well as objectives and meaningful analytical sensitivity. We have recently addressed the analytical sensitivity issue and have concluded that some semblance of order is desirable. Practical limitations have a tendency to outweigh the biologist's need for lower limits of biological significance. We believe that an adequate compromise should and can be reached.

Problems were mentioned earlier as being common to all elements of the National Program. In order to identify and, hopefully, resolve the problems associated with the fragmentation of agency priorities, the Environmental Protection Agency funded a contract with a private group for an assessment of the National Pesticide Monitoring Program. The final report was recently made available to members of the Panel and its recommendations are currently being studied.

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[1] Designated Representative: Pesticide Monitoring Panel, Federal Working Group on Pest Management.

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The National Human Monitoring Program functions to determine the levels and incidences of pesticide residues and metabolites in the general population of the United States. Adipose tissue is collected and analyzed for chlorinated insecticides and PCB's. Collection sites are selected according to a stratified probability sample of population centers; data are expected to be representative of the general population of the United States.

All laboratories participating in the program are required to maintain acceptable standards in an externally-moderated quality assurance network. Data including age, sex, race, geographic location, diagnostic information and residue profile, are managed electronically.

In addition to the ongoing ambient human program, the National Human Monitoring Program engages in several short activities directly related to the regulatory responsibilities of the Environmental Protection Agency.

National water pesticides monitoring program

The first National Monitoring Program for the continuous surveillance of pesticide residues in surface waters was designed in 1965. The initial design called for 50 sampling sites located near the mouths of major rivers and intermediate points on several of the largest rivers. The original plan was partially implemented and remained in operation until 1973 when a revised program was established between the Environmental Protection Agency and the Geological Survey.

The current design is based on a random selection of sampling sites representing drainage from the major river basins of the United States and Puerto Rico. Sampling frequency was based on earlier experience and now includes semi-annual bottom sediment sample collection as well as quarterly water sample collection at 153 stations. The residues that are monitored include the common chlorinated hydrocarbons, PCB's and certain herbicides, and organophosphate insecticides, and PCN's.

Results of the analyses are entered into the data storage and retrieval systems of both agencies.

The National Soils Monitoring Program was one of the earliest operational components of the National Pesticide Monitoring Program and was designed and initiated by the U.S. Department of Agriculture. The program was transferred to the Environmental Protection Agency in December 1970.

The system is designed to determine ambient levels of pesticides and other major pollutants in soil and in raw agricultural crops and, through periodic sampling, to determine changes in these levels.

In the original design, two land-use categories, cropland and non-cropland, were recognized. Cropland was to be sampled at the rate of one four-hectare block for every 16,194 hectares, while non-cropland was to be sampled at the rate of one four-hectare block for every 161,943 hectares, or one-tenth the rate for cropland. One-quarter of the allocated sites in each state were to be sampled each year.

At each cropland site, a composite soil sample and a crop sample are taken. Sample collection is generally timed to coincide with harvest of the crop. In addition, the following information is collected for each site: crops grown on site, irrigation, pesticides used, crop each pesticide is applied to, pounds active ingredient applied, formulation and method of application.

All soil samples are analyzed for arsenic, chlorinated hydrocarbons, organophosphates, and triazines. Samples are also analyzed for phenoxy herbicides when use records indicate application. Crop samples are routinely analyzed for chlorinated hydrocarbons and organophosphates, while triazines and phenoxy herbicides are analyzed for if applied.

Monitoring of urban soils has been conducted each year since 1969 in selected cities and their surrounding suburban areas. The selection of sites for the Urban Program is based on one site per 2.50 km^2 within the city limits and one site per 51.8 km^2 outside the city limits. Urban samples are analyzed for chlorinated hydrocarbons, organophosphates and arsenic. Since 1972, the samples have also been analyzed for mercury, cadmium and lead.

Results of the cropland and urban programs have indicated that agricultural soils are contaminated with low levels of pesticides residues and that urban soils carry a higher pesticide burden than agricultural soils.

The primary problem which the National Soils Monitoring Program has encountered is the lack of multi-residue chemical methodologies for many of the widely-used, newer generation pesticides. While these newer pesticides can be

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investigated by short-term special studies with a small number of samples, chemical methodologies amenable to large numbers of samples are necessary if routine analysis on all samples is desired.

EPA NATIONAL ESTUARINE MONITORING PROGRAM

Objectives

The Environmental Protection Agency determines the extent to which man-made substances are directly toxic to the biota, or indirectly harmful as a result of environmental degradation.

Secondly, EPA must determine whether its regulatory measures and other legal restrictions are effective in controlling the introduction of toxic substances to the environment at acceptable levels. Persistent residues must be not only tolerable from the point of view of man's health but also conducive to the welfare of man's health but also conducive to the welfare of ecosystems in general.

Initial attempts to assess the pesticide pollution in the marine environment were based on the concept that estuaries act as sinks for water-borne persistent substances and on the knowledge that molluscs serve as efficient collectors of materials present in only trace amounts in their environment.

In 1965, the former Bureau of Commercial Fisheries established a pesticide monitoring program using estuarine molluscs. Samples of oysters, clams, or mussels were collected monthly at about 180 fixed stations in most of the coastal states. By 1972, more than 8,000 samples had been screened for the most common organochlorine pesticides. In the final years of this program, the decline in number and magnitude of detectable residues made obvious the need for other indicator organisms that could be sampled less frequently and thus reduce the considerable physical and financial burden.

The molluse program, under the aegis of EPA since 1970, undertook an entirely different approach in July, 1972. Although fish were know to accumulate pesticides, they posed a problem in that it was difficult to determine when or where the residues were acquired, and whether they represented the total accumulation. For it was known that pesticide residues are mobilized and lost to some extent in the production of spawn.

These difficulties have been largely overcome by sampling juvenile fish on a 6-month basis. At least two species of fish with different food habits are sampled in each estuary to broaden our knowledge of pesticide kinetics in different food webs. Each sample consists of two groups of 25 pooled fish, which are analyzed in replicate to minimize the effects of individual variations.

In addition to the organochlorine pesticides, samples are now screened for organophosphate and carbamate pesticides, phenoxy herbicides, and inorganic cadmium, lead, and mercury.

In the first 30 months of the estuarine fish program, data from 1,052 samples confirmed the general decline in *sDDT residues observed in molluscs*. Localized estuaries with high residues identified in the molluscan program continue to present a picture of pollution problems. There is evidence in some areas that restrictions on the use of DDT have led to increased frequency and magnitude of some other pesticide residues.

Mercury residues occur over a broad geographic area. About 65% of the analyses were positive, but residues were usually small as is to be expected in juvenile specimens. There are still too few data for cadmium and lead residues to draw any conclusions.

A recent review of the data indicates that samples of yearling fish collected prior to their first spawning provide the most consistent picture. Future collections will be made on this basis. The annual sample collection dates will vary with the geographical region.

It is proposed to reactivate the molluscan monitoring program in the spring of 1976. One collection will be made at each of the original stations to determine whether significant changes in residues have taken place since 1972.

EPA-NOAA OCEAN FISH MONITORING PROGRAM

The identification of unacceptable residues in some commercially important marine fish indicated the need for a "problem seeking" effort rather than a randomized monitoring program. The potential costs of sample collection made it obligatory that such a project be combined with some on-going program already funded for the operation of vessels and collection of fish on the high seas. In 1971, an Agreement of Understanding was reached between NOAA and EPA

which recognized their mutual interests in identifying pollution problems in commercially important marine fish and their food supply.

The Fishery Centers of NOAA's National Marine Fisheries Service engage in annual surveys of bottom fish resources on the continental shelf. In 1973, arrangements were completed to freeze surplus fish from these trawling operations and use them in the sampling program.

Fish were frozen when caught and stored at the Fishery Centers. Livers were removed from the fish and aliquots of 20 pooled samples were dry-processed and shipped to the EPA Pesticides Monitoring Laboratory in Mississippi for analysis.

During 1973 and 1974, about 8,500 fish were distributed to 175 samples and analyzed in replicate. Station locations ranged from Georges Bank, 300 miles off the New England coast, to South Carolina; the north-central Gulf of Mexico; and from the Bering Sea in Alaska south to Los Angeles, California. Bottom depths ranged down to about 1,000 feet.

For the most part, residues were confined to DDT and PCB and were in the low ppb range. Notable exceptions were the area west of Los Angeles, the mouth of the Columbia River area, and inexplicably, Georges Bank. In some samples from these areas, sDDT and PCB residues were in the 1–10 ppm range. Interpretation of these large residues is complicated by the absence of information on the age of the fish. Repeat collections are now underway (1975) in both inshore and offshore areas; only juvenile specimens will be analyzed. These data should indicate whether residues are being accumulated currently and whether they represent new inputs from terrestrial sources or a recycling of persistent chemicals in the deeper offshore waters.

The magnitude of sDDT and PCB residues found in these surveys demonstrate a need for continued surveillance of commercial fish populations and the organisms they prey on in order to safeguard this important segment of man's food supply.

SUMMARY OF THE FOOD AND DRUG ADMINISTRATION'S PESTICIDE SURVEILLANCE ACTIVITIES

The pesticide surveillance activities of the Food and Drug Administration are geared towards FDA's statutory responsibility of enforcing pesticide tolerances for food established by the Environmental Protection Agency. This is accomplished by sampling and testing individual shipments of food for pesticide residues. In addition, FDA gathers information on levels of pesticide residues and other contaminants in the U.S. diet in order to detect emerging problems and trends and to obtain a national overview of pesticide residue levels in food.

The pesticide surveillance activities of FDA have been in effect since the early 1900's. These activities have been refined over the years by expanding coverage of chemical contaminants, improved statistical design of the sampling, and improved analytical techniques and sensitivity.

National Food and Feed Surveillance Program: This activity determines pesticide residue levels of individuals food commodities on a geographical basis using a statistical sampling plan for food at point of origin. Each FDA field office samples and examines major food items to determine levels of pesticide residues. All samples are examined by FDA's multiresidue methodology which can simultaneously determine over 100 chlorinated and organophosphate pesticide residues. Additionally, selected samples are examined for other chemical residues.

Total Diet Study: This activity involves examination of foods as they are prepared and ready for consumption. A total of 117 items are included in each total diet sample. Samples are collected from 4 geographic regions of the United States and sampling sites are chosen from different cities representing Standard Metropolitan Statistical Areas. Thirty total diet samples are collected annually. The food items collected are composited into various food classes, e.g., meat, fish and poultry; dairy products; leafy vegetables, etc. All total diet composites are examined for chlorinated organophosphate and carbamate pesticides, PCB's and various heavy metals.

General findings

Over the years, chlorinated compounds have been the most frequently found residues. DDT, dieldrin and PCB's represent the most frequently found compounds in those foods susceptible to environmental contamination, e.g., fish, foods

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produced by animals. Except for dieldrin, all compounds detected have been shown to be well below the WHO/FAO acceptable daily intake. More recent data indicated some decline in the level and instance of DDT compounds and PCB's.

Assessment of the program with reference to problems of technology or interpretation

The main problem with FDA pesticide surveillance activities is lack of resources and lack of multi-residue methods for chemical classes other than chlorinated and organophosphate pesticides.

Identified future trends or modifications

FDA will try to gear its programs towards environmental chemical contaminants that may present future food contamination problems and, where necessary, expand its routine sampling activities to cover new contaminants.

THE NATIONAL MEAT AND POULTRY MONITORING PROGRAM

Managed by the U.S. Department of Agriculture and is largely regulatory in nature and has as a major objective the removal of products containing violative residues form the Nation's markets. This program involves about 7,200 Federally inspected slaughtering and processing plants and in 1972 about 25,000 tissue samples were taken for chemical analysis.

THE NATIONAL FISH AND WILDLIFE MONITORING PROGRAM

Freshwater fish program

The original program of sampling fish from 50 stations in the continental United States was started in 1967. In 1970 this was expanded to 100 stations. Certain rivers and areas have been identified as "hot spots" with unusually high residues or the occurrence of specific pesticides, metals or other organic contaminants such as phthalate esters, PCB's, etc. These findings have promoted research studies or investigative monitoring of concern to fishery resource management and also stimulated laboratory research on toxicological significance of specific pesticides and development of better analytical methodology. Some trends in residue levels are indicated but the degree and significance is under evaluation.

Mallard and black duck program

Duck wings from all parts of the United States are available for monitoring purposes as a byproduct of a nationwide survey of waterfowl productivity in which cooperating hunters mail thousands of wings to central points for biological examination. Of the array of species whose wings are available for monitoring, those of the mallard and black duck were selected because their combined range covers the United States and they are relatively abundant.

In a special study made for the purpose of determining the relationship of pesticide residues in wings to other parts of the body, highly significant correlations were shown between DDT residues in wings and those in skin, muscle, kidney, pancreas, brain, gonads and liver. On the strength of these findings and a pilot study, duck wings were considered appropriate for monitoring and a full-scale effort was started in the winter of 1966–66.

A sample for analysis consists of a pool of 25 wings collected in a given State and the number of pools is roughly proportional to the State's harvest. The flight feathers are discarded and the 25 wings are chopped and blended. In the monitoring program to date, DDE proved to be the predominant residue throughout the survey; dieldrin was detected in wings from most states; heptachlor epoxide was reported in trace levels from one-third of the States; a decline in residues has been observed in DDE, dieldrin and PCB's in certain flyways in recent samples. This study is repeated every third year.

Starling program

Starlings are collected especially for use in the monitoring program. Their abundance and general distribution make it possible to sample them according to a specially designed plan. Basically the sampling design consists of 5 degree latitude/longitude blocks covering the contiguous 48 States with up to four randomly selected collecting sites within each block. In actual practice this has resulted in a pool of ten starlings collected in the fall of even years at approximately 125 to 180 sites. Birds are trapped or shot and immediately frozen. Beaks,

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feet, wings and skin are removed and the remaining ten carcasses are ground together. Aliquots are taken for analysis of chlorinated hydrocarbon pesticides and PCB's. In odd years about half the stations are resampled for metal analysis.

DEPARTMENT OF THE ARMY MONITORING PROGRAM

Limited environmental sampling was initiated in 1972 and 1973. A preliminary analysis of the early data demonstrated the need for a stratified sampling program which was initiated in 1975 when soils, sediments, fish and birds were designated for scheduled sampling from 34 installations.

The soil environment has been stratified into three broad subsets of highly specialized uses. The first group is further subdivided into four further subsets designated as sewage treatment, sanitary landfills, pesticide shops and pesticide storage areas. The second group involves rather high intensity human occupancy areas, such as shops, offices, classrooms, etc.; recreational areas, and golf courses. Golf courses have been specifically separated from other recreational areas in view of the specialized maintenance operations requiring both intensive and extensive pesticide use. The third land use area is generally further subdivided into military range and training areas; agricultural areas; and grazing areas.

Stratification of sediment sampling is related to the bodies of water, i.e., streams traversing the installations, streams originating on the installation, and impounded bodies of water.

Fish sampling is restricted to two categories broadly designated as either bottom feeders or top feeders. These samples are collected from the same bodies of water designated for sediment sampling.

Generally the starling is designated as the terrestrial vertebrate indicator of pesticides in the environment.

Provisions are made for special environmental sampling where pesticide involvement is suspected or other circumstances warrant such action.

Preliminary evaluation of limited data demonstrate the high probability that the stratified sampling design and the acquisition of all samples from one location will produce a realistic pesticide profile of that location.

THE MIREX MONITORING PROGRAM

Is also managed by the U.S. Department of Agriculture and was designed to evaluate environmental residues resulting from aerial application of Mirex to control the imported fire ant. Environmental components from the monitoring sites include soil, vegetation, water sediment, fish, crayfish, birds and small mammals. The program is limited to the 9 southeastern States in which control efforts are concentrated.

Mr. MANNINA. Thank you, Mr. Chairman.

Mr. OBERSTAR. The subcommittee will be adjourned to reconvene at 10 a.m., tomorrow morning.

[Whereupon, at 5:20 p.m., the subcommittee recessed, to reconvene at 10:00 a.m., Friday, Jan. 30, 1976.]

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POLYCHLORINATED BIPHENYLS (PCB)

FRIDAY, JANUARY 30, 1976

HOUSE OF REPRESENTATIVES,
COMMITTEE ON MERCHANT MARINE AND FISHERIES,
SUBCOMMITTEE ON FISHERIES AND WILDLIFE
CONSERVATION AND THE ENVIRONMENT,
Washington, D.C.

The subcommittee reconvened at 10:15 a.m., in room 1334 Longworth House Office Building, Hon. Robert L. Leggett, chairman of the subcommittee, presiding.

Mr. LEGGETT. The meeting of the Subcommittee on Fisheries and Wildlife Conservation and the Environment will please come to order.

This is the time regularly set for continuing our hearings on polychlorinated biphenyls also known as PBC's, and their effect on the environment, and the effect of our attempts to harness those particular complex chemicals.

We are pleased to have before us today one of the parties who has inspired these hearings, and has been very much helpful to the Congress and the environmental communities, and who has pointed up the problems of PCB's, and while we ought to take perhaps remedial action separate from the Toxic Substances Act, to wit, Mr. Richard Ottinger of New York.

Dick, it is very nice to have you here. We have your statement, which we shall incorporate in our record at this point, and you may proceed to read it, summarize it, or proceed as you wish.

STATEMENT OF HON. RICHARD L. OTTINGER, A REPRESENTATIVE IN CONGRESS FROM THE STATE OF NEW YORK

Mr. OTTINGER. With your permission, I will both read and improvise, Mr. Chairman.

Mr. Chairman, I want to thank you very much for holding these hearings. I have a particular affection for this subcommittee. We worked together on many occasions a few years back. You were instrumental in getting action on stopping ConEdison from massive fish kills on the Hudson River, helping us to get the Hudson River protection legislation through the Congress.

Your continuing concern, and your taking of really meaningful action on the threat to the environment has caused a hope to all of us concerned in the country and the Congress.

I think you do a fantastic job. I am tremendously appreciative, and I think the country should be appreciative, for the fine work that you and this subcommittee do in this area.

Mr. LEGGETT. Very good. As long as we get the hard work input of you and your staff and associates it is helpful to us.

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Mr. OTTINGER. I want to thank you for the privilege of allowing me to sit with you for parts of these important hearings on PBC's and other toxic chemicals in the environment.

I raised a question the other day with Mr. Train, and I would like to raise it again. Why, with so much knowledge about PCB's, their presence in the environment, and their adverse effect on fish, wildlife, and people, has the Government so consistently failed to act?

Mr. Train spoke on Wednesday about the 1971 Federal Interdepartmental Task Force on PCB's which was set up at the time jointly by the Council on Environmental Quality—which Mr. Train then headed—and the President's Office of Science and Technology. Mr. Train stated that the "task force recommended—and the Federal Government adopted—a policy of urging private industry to confine PCB use to closed electrical systems, where there were no adequate and safe substitutes."

As others will testify this morning, General Electric, under the scheme of the "closed system" was, until very recently, discharging on the order of 30 to 50 pounds per day of PCB's into the Hudson River at the company's Hudson Falls and Fort Edward plants. That was over 10,000 pounds per year, the figure Mr. Train alleges is now the total national discharge annually from all point sources.

In the past few months, G.E. has decreased its discharge to an average of less than 5 pounds per day, which resulted not from any actions of EPA, but from strong action by the State of New York's Department of Environmental Conservation, now headed by our former colleague in the House, Ogden Reid.

Unfortunately, I have to report to you that yesterday another former colleague, Governor Carey of New York, overruled Mr. Reid. He said the standards Mr. Reid set for discharge by December would have great economic consequences for New York, and might cause the General Electric plant to close, and that therefore, he was opting for a less stringent standard.

This was at the strong urging of the head of the Department of Commerce in New York, John Dyson.

Mr. Chairman, I find this very distressing. An aide to Commissioner Dyson was quoted in the New York Times as saying, "After all those years of discharging of 30 pounds a day, no one can tell me there is one bit of difference between zero and 3.5 ounces. It is another totally phony symbolic issue."

This kind of attitude on the part of business and business representatives in government, I think, is totally deplorable.

I am a strong believer in the free enterprise system, but I just cannot conceive that anybody should argue that free enterprise gives anybody the license to kill or to poison our people, or to poison the natural resources on which life on this planet depends.

The picture of industry insisting that it has to continue to pour a known cancer-producing agent into our environment, and that it has the freedom to do that, is just absolutely incredible.

We have the red-dye industry now challenging in the courts the decision of the Environmental Protection Agency to stop the use of red-dye No. 2 and the decision of the Food and Drug Administration to stop the use of this known poison in our food and drug supplies.

It seems to me that if business wonders why there is a negative attitude on the part of the American public toward its operation, it is

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just examples like this that not only damage the attitude of the public toward business as a whole, but I think poses a greater threat to the free enterprise system than anything else.

Furthermore, this kind of decision makes no commercial sense, Mr. Chairman. It totally ignores the value of the commercial fisheries in the Hudson River, and the tremendous recreational industry that is built around the sport fisheries that spawn there.

Indeed, in our hearings on the damage being done to fish by ConEd before this subcommittee a number of years ago it was the Long Island Chamber of Commerce, the Long Island experts, the fishing associations that came in here and made strong representations to us that this is the largest industry on Long Island. The boating, fishing, and fishing tackle industries represent better than $100 million per year and there is no counterbalancing in the presentation to the public by the Department of Commerce of New York of these important considerations. There are counterbalancing commercial considerations, Mr. Chairman. The very argument made by the Department of Commerce that we might close down the General Electric plant in New York, and they might move somewhere else so they might freely dump their PCB's under State law into some other State's waters is the best argument in the world why EPA ought to be acting on this.

Mr. Chairman, there ought to be a national standard. That kind of argument—that the plant is going to close down because it cannot continue to pollute our waters, and is going to go to some other State—should not be available to the Governor of any State.

What Mr. Train did not say about the task force was that its March 2, 1972 report also stated:

> • • • In this connection, the Environmental Protection Agency will restrict industrial liquid discharges of PCB's and PCB users.

And in an appendix of the task force report a staff member of the Council on Environmental Quality wrote:

> Another legal authority for controlling water pollution is Section 13 of the 1899 Refuse Act which forbids discharge of any wastes [other than municipal waste] into navigable waters without a permit, issued by the Army Corps of Engineers, which can limit the discharge of substances into water.

General Electric never received such a permit from the corps.

Terry Davies, the author of the appendix—"Regulatory Action on PCB's,"—also stated:

> • • • EPA and the Justice Department are prepared to use the Refuse Act to prevent PCB discharges.

And a few pages later, this intention was stated yet again:

> • • • EPA recently has opposed regulation which would prohibit all intentional discharges of PCB into the water, and would limit PCB levels in the water to 0.01 parts per billion. *These regulations probably would be enforced through use of the Refuse Act.* (Emphasis added.)

Mr. Chairman, let me just re-emphasize that these regulations probably would be enforced through the Refuse Act.

This report was, as I indicated, written and printed in the spring of 1972, 5 or 6 months before the final passage and veto override of the Federal Water Pollution Act Amendments of 1972. But no action was ever taken by EPA under the Refuse Act.

The task force was treated with much fanfare, both during and following the completion of its report, which was released publicly.

If the committee thinks, as it might be inclined to do, that the task force report probably ended up as a dustgathering tome in obscure agency libraries, allow me to release to you a memorandum on the subject of PCB's and the task force report, which for some reason has never been released before.

On April 24, 1972, Assistant Administrator for Enforcement John Quarles sent a memorandum to all regional administrators on policy on PCB's.

At the end of his memorandum, Mr. Quarles stated that the interagency task force report "will be provided to you as soon as it becomes available—it is now at the printers."

I would like the committee to know a couple of the key phrases in Mr. Quarles' memorandum, and with the permission of the chairman, I would like to insert the entire memo and its attachments into the record.

Mr. LEGGETT. It will be so included.

[The following was received for the record.]

APRIL 24, 1972.

MEMORANDUM

To: All regional administrators.
From: Assistant Administrator for Enforcement and General Counsel.
Subject: Policy on PCB's.

Until further notice, the following policy should be followed by the Permit Program with respect to processing of permits for sources of Polychlorinated Biphenyl discharges. It is understood, of course, that by reason of the District Court injunction in *Kalur v. Resor*, no permit may be actually issued at the present time.

It is the policy of the Environmental Protection Agency that all discharges to the aquatic environment involving Polychlorinated Biphenyls (PCB's) be restricted to the lowest possible level. The goal of the policy is to achieve levels in the environment sufficiently low that fish and other aquatic organisms will not be damaged, that accumulations in edible fish will not exceed the FDA guidelines of 5 parts per million in the edible portion. To implement this policy, we will restrict knowing discharges to the lowest achievable level by placing all present dischargers on an implementation schedule which will seek to bring about no discharge from known sources of contamination as rapidly as possible. It must be recognized that there are reservoirs of PCB's in sewer systems and in waterways as a consequence of previous use. We should anticipate a decline over the next several months of PCB discharges from these sources as the sources are gradually cleaned out.

At the present time, the Monsanto Company is the sole U.S. manufacturer and the manufacturers of capacitors and transformers are the only users. Monsanto sells to no one else. We believe that there are less than 50 individual plants involved in these uses. In addition to these sources, there are known residues in paper that is recycled, therefore, some residue in waste from pulpmills can be anticipated. These, too, should decline over the next several months. PCB's were used in heat transfer systems, as hydraulic fluids, in cutting oils, etc., in the past, but Monsanto has stopped sales for these purposes and has reclaimed as much as possible from these users. It is anticipated that by the end of 1972 amounts reaching the environment from former users should be greatly reduced or near zero.

The desired limit in water is 0.01 parts per billion. Our best indicator of PCB contamination in various waters, however, will be residues in fish or in other aquatic organisms.

Excerpts from two briefing memoranda prepared by the Office of Research are attached. The interagency task force report will be provided to you as soon as it becomes available (it is now at the printers).

JOHN R. QUARLES, Jr.

Attachments.

Mr. OTTINGER. Mr. Quarles wrote:

Until further notice, the following policy should be followed by the Permit Program with respect to processing of permits for sources of polychlorinated biphenyl discharges . . .

> It is the policy of the Environmental Protection Agency that all discharges to the aquatic environment involving polychlorinated biphenyls (PCB's) be restricted to the lowest possible level * * * To implement this policy, we will restrict knowing discharges to the lowest achievable level by placing all present dischargers on an implementation schedule which will seek to bring about no discharge from known sources of contamination as rapidly as possible.

No forceful action was taken, even then, and certainly not in region II, which affects the Hudson River and the GE plants that were dumping at that point 30 to 50 pounds per day of PCB's in the Hudson River.

Attached to the Quarles memorandum was a paper entitled, "Recommendation on PCB Policy," dated March 27, 1972, prepared by the Office of Research, EPA. Among other things, the paper suggested that "monitoring data from fish, shellfish, and water will be examined to reveal locations with high PCB content. These areas can then be subjected to followup studies to determine sources, and enforcement actions under the Refuse Act initiated where warranted."

No such followup studies or enforcement actions were pursued.

Now, as the committee knows full well, some 6 months after Mr. Quarles wrote his memo, the Water Pollution Control Act Amendments of 1972 were made law. In those amendments, the Congress gave the EPA Administrator some emergency powers in section 504, which gives the Administrator the power to go into court to stop pollution which poses an imminent health hazard or endangers peoples' livelihoods—for example, the ability to market shellfish.

Section 504 became effective more than 4 years ago, and yet the Environmental Protection Agency has never used it to force a polluter to stop discharging a dangerous chemical into the Nation's waterways. Nor, to my knowledge, has the EPA ever come to Congress to suggest that section 504 is unworkable.

Again, regarding the Hudson River and EPA's region II, suggestions to utilize this emergency section were made at least as long ago as Mr. Harris Cronin will later spell out in detail for the committee.

In May of 1974, the Natural Resources Defense Council, which is being represented here this morning by Mr. Speth, sent the Administrator a letter last August 29 which was so detailed as to nearly constitute a brief in favor of utilizing section 504.

I will leave additional testimony on section 504, its history and its lack of use to the other witnesses here today.

But I would like to call the attention of the committee to one other issue I consider significant.

As Mr. Train stated on Wednesday, the EPA is beginning testing on water, to ascertain whether significant—and possibly harmful—levels of PCB's are being found in drinking water, or in such levels in our waterways as to make it likely that levels in fish might come to exceed the allowed 5-parts-per-million standard set by the FDA in 1970.

I might state that the EPA's current water testing would appear to be a rather foolhardy duplication of effort, since the U.S. Geological Survey has been testing waters for most of this century. They have been testing for PCB's among other chemicals since the mid-1960's.

Further, all USGS test results are routinely forwarded to the EPA's computer, in addition to their being stored at the Survey.

Just to demonstrate the superbly forceful Government action to get after PCB's these past 5 or 6 years, let me talk for a minute about water. In the interdepartmental task force report—and in the Quarles

memorandum, it was stated that levels of PCB's in water should be low enough so as to avoid fish becoming contaminated at levels higher than the FDA standard of five parts per million. As Mr. Quarles wrote, in April of 1972:

> EPA should establish guidelines for PCB's in water of 0.01 ppb (parts per billion) which will be sufficiently low that concentrations in fish should not exceed five parts per million. 0.01 parts per billion is 1/500,000 of five parts per million, and thus this concentration should not result in PCB levels in fish as high as five parts per million guideline of FDA. The 0.01 parts per billion level is sufficiently low that fish and other aquatic organisms should not be damaged.

Tragically, New York State suffers levels substantially over that recommended standard, even now. The New York State Department of Health recently sent me results of some recent water tests.

On August 25, 1975, a sample of the Poughkeepsie, N.Y. drinking water—which comes from the Hudson River—contained 0.10 parts per billion in raw water, or 10 times the recommended standard. And the drinking water, after treatment, contained 0.02 parts per billion.

In fact, for raw water—which is the stuff fish swim in—all of the State's samples in the Hudson and Mohawk exceeded the 0.01 parts per billion recommended level.

With your permission, I would like to enter the letter from New York State as a part of my testimony in the record.

Mr. LEGGETT. Without objection.

[The document referred to follows:]

STATE OF NEW YORK.
DEPARTMENT OF HEALTH,
Albany, December 24, 1975.

MS. NANCY MATHEWS,
c/o Congressman RICHARD L. OTTINGER,
Cannon Building,
Washington, D.C.

DEAR MS. MATHEWS: With respect to your telephone call of December 23 to Mr. John C. Bumstead, Director, Bureau of Public Water Supply, requesting polychlorinated biphenyl (PCB) data on Hudson River drinking water system, the following latest available data including that for the Mohawk River may be helpful:

Community water system	Population served	Sampling date (1975)	River-water source	PCB lots (μg/l)
Latham Water District	70,000	September 4	Mohawk	[1] 0.015 [2] .010
Cohoes (city)	20,000	August 25	do	[1] .02 [2] .06
Waterford (village)	7,000	do	Hudson	[1] .02 [2] .03
Rhinebeck (village)	3,000	do	do	(3) [2] .02
Poughkeepsie (city)	40,500	do	do	[1] .10 [2] .02
Highland Water District	4,000	do	do	[1] .04 [2] .01
Port Ewen Water District	4,000	do	do	[1] .03 [2] .12

μg/l—micrograms per liter (parts per billion).
[1] Raw water.
[2] Filtered water.
[3] Not run.

If you have additional questions, please write me.

Sincerely yours,

EDWARD D. COATES, M.D.,
First Deputy Commissioner.

Mr. OTTINGER. Translating those levels in the water to their effect on fish, EPA's own scientists discovered in testing in the summer and fall of 1974 levels such as 78 parts per million in minnows, and even 350 parts per million in rock bass.

In recent months, New York State's Department of Conservation andn Naturalization has found levels from 20 to 300 parts per million with one all-time record sample which showed 658 parts per million discovered by General Electric itself in a common sucker.

People do eat these fish, and they continue to eat them today. The hazard to human life there, it seems to me, does not need further reiteration.

These levels obviously translate into direct harm to the fish resources of the Hudson, a subject this committee knows well.

Striped bass, shad, and sturgeon are all found in abundance in the Hudson even now, and to a certain extent, they are commercially taken. But as we know, the commissioner of environmental conservation in New York has recommended against eating Hudson River fish.

This disturbes me deeply—and it would be far more serious if the FDA decides to lower the allowable levels of PCB's in fish—because we have been hoping to reestablish even greater commercial and recreational fishing in the Hudson.

When you consider that only 75 or 80 years ago Romanoff Caviar was exporting several hundred thousand pounds a year of sturgeon caviar, you have to become concerned and saddened.

We have a biologist at work at the Boyce-Thompson Institute in New York studying sturgeon in the River now, and in 4 months he has, with the aid of commercial fishermen, looked at some 1,100 samples. Preliminary tests, the results of which may not be accurate entirely, show levels of 6 to 15 parts per million of PCB's in the sturgeon.

Members of the committee, I suppose I could go on and on about this subject. Partly because PCB's have been so thoroughly studied, and partly because so many agencies have been involved, we have a case study here that may just demonstrate a complete inability on the part of the Federal Government to act effectively.

In this regard I would like to urge that the committee reconsider establishing a provision of the 1899 Refuse Act that was eliminated in the Federal Water Pollution Act that would allow citizens to bring suits, and get a bounty for doing so in enforcement of these laws.

I think it has just been demonstrated time and time again that the industrial sector, that part of industry that insists on its right to pour its poisons and other pollutants into the environment, has too much influence with the Federal, State and local regulatory agencies.

It is only if you get site sensibilities to enforce these laws that you are going to get effective enforcement.

I should say in closing, that I strongly favor enactment of the strongest possible Toxic Substances Control Act, including requirements for pretesting of all new toxic chemicals to be introduced into the environment or food and water supplies.

I say look at Mr. Train and his strong support of such a law, Mr. Chairman.

But in no way does this excuse the EPA or other agencies of Government for their total failure to act under authorities available to them to stop—or even control— the introduction into our waterways of toxic substances known to be health hazards, including PCB's.

Mr. Train's attempt to justify lack of action against PCB's, continuing to this day, on the grounds that the Toxic Substances Control Act has not been passed, is misleading and deplorable.

At a minimum, I would have hoped we could expect that the EPA would vigorously pursue the elimination of PCB discharges where

it did have the authority, with followup action as new authorities are granted by the Congress.

Again, the PCB saga is one of the most dismal I have ever seen, with perhaps the most egregious governmental failure ever.

I certainly hope that the committee will continue to pursue the ways in which fish and wildlife are being adversely affected because of bureaucratic ineptitude, and I am sure you will.

I thank the committee for giving me this time today.

Mr. LEGGETT. Very good.

Thank you very much, Dick.

Your charges are succinct, and we do have people from EPA here, who we shall confront with these various provisions.

I know we have already gone through some of them with Mr. Train, and we have his views, and we have the General Counsel here of EPA, and some other experts from their Water Enforcement Division, and we shall, through the course of the day, give proper response opportunity to them.

I have no questions.

Mr. Anderson?

Mr. ANDERSON. No questions, Mr. Chairman.

Mr. LEGGETT. Mr. Forsythe?

Mr. FORSYTHE. I have no questions.

Mr. LEGGETT. Counsel?

Mr. SPENSLEY. I just have a couple of letters that I wish to be inserted in the record.

[The following was received for the record.]

U.S. DEPARTMENT OF THE INTERIOR,
GEOLOGICAL SURVEY,
Reston, Va., January 28, 1976.

HON. ROBERT L. LEGGETT,
Chairman, Subcommittee on Fisheries and Wildlife Conservation and the Environment, Committee on Merchant Marine and Fisheries, U.S. House of Representatives, Longworth House Office Building, Washington, D.C.

DEAR MR. LEGGETT: In response to your request of January 22, 1976, for a letter detailing several aspects of the Geological Survey's water resources investigations, I submit the enclosed information. The enclosure was prepared by Dr. R. J. Pickering, Chief of the Quality of Water Branch in our Water Resources Division, after consultation with Ms. Nancy Matthews of Congressman Ottinger's staff. Dr. Pickering's replies are numbered according to the questions enumerated in your January 22 letter. I hope this will be of some help to you in the hearings that you will be holding later this week.

In addition to the replies to your specific questions, I also have enclosed literature describing the Geological Survey's Water Data Storage and Retrieval System (WATSTORE), our fledgling National Water Data Exchange (NAWDEX, and the program of our Office of Water Data Coordination (OWDC) which is a function assigned to the Department of the Interior by OMB Circular A-67.

Because of the time required to make retrievals and statistical summaries of the many thousands of water-quality analyses in our data storage system, we are able to provide at this time only a computer printout of individual determinations for six selected constituents on a station-by-station basis, but we will be pleased to provide a statistical summary of the data for insertion into the Congressional Record as Dr. Pickering has arranged with Ms. Matthews.

Sincerely yours,

VINCENT E. MCKELVEY,
Director.

[ATTACHMENT, R. J. PICKERING, JANUARY 27, 1976]

(1) The bulk of the Geological Survey's information on PCBs in the biological environment is with reference to fresh-water aquatic environments—that is, streams and lakes. Data obtained to date make it clear that PCBs are very widespread in their occurrence, that they travel largely in solids suspended in the

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water, and that they reside in significant concentrations in bottom sediments of rivers and lakes.

The Geological Survey has no systematic continuing program for sampling and analyzing PCBs in biological materials. Our data consist of the results of studies of known problem areas, and are not representative of the fresh-water aquatic biological community as a whole. The data do show, however, that PCBs are readily taken up by aquatic organisms when they are introduced into the aquatic environment.

(2) The Geological Survey's program of water resources investigations is nationwide in geographic extent and addresses a broad range of physical, chemical, and biological characteristics of water quality. It can be divided into three types of programs: (1) the Federal program, which is designed to develop information about large geographic areas and an understanding of general hydrologic principles, and which is funded wholly through our annual appropriation from Congress; (2) the programs with other Federal agencies, which are usually funded by the agency requesting the work and are in response to specific needs of those agencies; (3) and the Federal-State cooperative program, which responds to the needs of State and local agencies for water data in which the Federal government also has an interest, and which usually is funded on a 50–50 basis with the cooperating agency providing half the funds and the Geological Survey providing the other half.

Our water-quality program has grown so rapidly in the past few years that we have found it necessary to centralize and automate our water-quality laboratories. Our three large laboratories now perform an average of 7,000 individual determinations per day, and the demand continues to rise. The variety of determinations has changed in recent years, also. We are making many more determinations of toxic metals, pesticides and other toxic organic chemicals, and biological characteristics than in previous years. The mix of water and sediment fractions and chemical characteristics to be measured results in a very large number of measurements that can be made. Our Central Laboratories System offers a total of about 400 standard determinations at the present time, and provides many more on a custom-analysis basis.

One or more water-quality characteristics were measured at more than 5,600 sites on surface streams and at about 350 sites on lakes or reservoirs in 1975, and water quality data are available for about 80,000 ground-water wells. Sites selected for sampling range from ground-water wells and remote surface water sites unaffected by man to highly polluted locations such as streams draining urban-industrial complexes or wells sampling ground water below surface waste-disposal sites.

(3) The accompanying data printout lists the sites at which PCBs in the several water fractions have been measured. Many of these are in known problem areas, so the range of concentrations cannot be considered to represent a balanced assessment of conditions nationwide. However, we hope that such a balanced assessment for the Nation's major rivers will be provided eventually through the National Pesticide Water Monitoring Program, which we have recently initiated in cooperation with the Environmental Protection Agency.

Some feeling for the mobile nature of PCBs can be obtained from the fact that they have been detected in water and bottom sediments at stations in our Hydrologic Bench Mark Network. Stations selected for this network are believed to be essentially free of man' influence in terms of known flow regulation and waste inputs. It is suspected that a significant part of the PCBs found at these sites was transported by air.

The National Interim Primary Drinking Water Regulations, published in the Federal Register for December 24, 1975, lists no maximum contaminant levels for PCBs because of insufficient information on their occurrence, their health effects, and methods for their analysis. However, the National Academy of Sciences' "Water Quality Criteria, 1972" recommends a maximum concentration of PCBs of 0.002 micrograms per liter (ug/1) in water-suspended sediment mixtures for fresh water aquatic life and wildlife. Because this concentration is below the sensitivity of the Geological Survey's analytical method, any positive numbers in the data printout can be considered as representing excessive levels of concentration of PCBs.

(4 and 5) As noted under 2 above, our central laboratories are capable of providing a very large number of determinations on request. These include essentially all the toxic and nontoxic inorganic substances of current interest, many of the persistent pesticides, and selected organic compounds of special interest, such as PCBs, PCNs, TNT, RDX, and Kepone.

The accompanying data printout shows the levels of concentration in our Nation's waters of PCBs and five other toxic substances that you have indicated

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are of interest to your subcommittee. A statistical summary of these data will be provided within the next few days. As a basis for comparison with sites relatively unaffected by man, the summary will include a separate listing of the ranges of concentrations observed at our Benchmark Network sites during a three-year period. For your further information, a copy of USGS Circular 460-E, which describes the quality of water at our Hydrologic Benchmark sites, is enclosed. Also enclosed is a copy of USGS Circular 643, which describes the results of a 1970 reconnaissance of seven minor elements in surface waters of the United States.

(6) The Geological Survey disseminates the information gained through its water-resources investigations widely in order to make it of benefit to the maximum number of potential users. The availability of water-quality data for stations or water wells sampled on a continuing basis is announced in the Catalog of Information on Water Data (digest enclosed) that is issued regularly by the Office of Water Data Coordination. Basic data are stored in our computerized data bank (WATSTORE) from which the enclosed printout was obtained, and are also published in a series of annual basic data reports organized on a state-boundary basis. Large masses of one-time-only data that are not stored in our data bank or published in our basic data reports are published as raw data and/or in summary form in our several series of interpretive reports, or in reports issued by cooperating agencies.

The availability of Geological Survey reports is announced in our monthly List of Publications of the Geological Survey, in the catalogs of the Department of the Interior's Water Resources Scientific Information Center, and in lists of publications available from several other organizations such as the National Technical Information Service and the Government Printing Office. In addition, copies of basic data and completed reports are provided to organizations and individuals whom we may know have a particular interest in them, either through their direct involvement in the data-collection program or their expressed interest.

Our field offices have instructions to inform appropriate state and Federal officials of potentially dangerous situations such as observed concentrations of toxic substances exceeding public health standards in raw sources of public water supplies. All basic water-quality data stored in our WATSTORE system are transferred to EPA's STORET system on a weekly basis, and streamflow data are provided on request.

For the past several years we have provided the Council on Environmental Quality with input to their annual report, and we are now discussing with them ways in which we can provide CEQ with basic data on an even more timely basis. The Geological Survey endeavors to apprise other Federal agencies of the availability of our data through regular meetings of a number of Federal interagency coordinating committees. Close contact is maintained with all appropriate Federal agencies on such matters as standardization of methods for field and laboratory measurements, and future plans for water-data acquisition.

(7) The type of cooperative arrangements that the Survey makes with Federal, State, and local agencies vary considerably. As noted above, cooperative programs with State and local agencies usually are funded on a 50-50 basis. Occasionally, a State or local cooperator may provide all the project funds. Formal documentation normally consists of a simple cooperative agreement between the two agencies.

Cooperative programs with other Federal agencies also are normally by interagency agreement, with transfer of funds either at the field office level or at the Washington level. The programs may be long-term, such as our water-data gathering agreements with the Corps of Engineers or the National Weather Service, or one-year-only projects, such as our agreement with EPA in 1970 to mount a major effort to analyze surface-water samples for mercury.

(8) It is difficult to assess the extent to which our water data are put to use by agencies receiving the information. We do know that many of the states have used our data as a basis for setting state water-quality standards and identifying water-quality limited reaches of state streams in accordance with the provisions of PL 92-500. The Corps of Engineers and National Weather Service use our streamflow data in managing the flows of some of the Nation's larger streams. Our salinity data for the Colorado River constitutes an important part of the information used by the Bureau of Reclamation in selecting salinity control measures to assure U.S. compliance with our treaty with Mexico. The Council on Environmental Quality intends to use data from our National Stream Quality Accounting Network (NASQAN) as input to its monthly report to the President on environmental conditions in the United States. Our own Conservation Division has used our advice and the data we are gathering in the oil shale and

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coal-mining areas of the West as a basis for writing monitoring requirements for lessees of Federal lands for production of energy raw materials. These are just a few examples of known uses to which our water data have been put by agencies receiving the data.

U.S. DEPARTMENT OF THE INTERIOR,
GEOLOGICAL SURVEY,
Reston, Virginia, March 3, 1976.

Hon. ROBERT L. LEGGETT, *Chairman,*
Subcommittee on Fisheries and Wildlife Conservation and the Environment, Committee on Merchant Marine and Fisheries, U.S. House of Representatives, Longworth House Office Building, Washington, D.C.

DEAR MR. LEGGETT: In response to your request in your letter of January 22, 1976. I transmitted by my memorandum of January 28, 1976, the answers to several questions posed by you and a computer print-out listing analyses in the Geological Survey's computerized data bank for six toxic substances in water and stream sediments. In my transmittal letter I promised to develop a summary of the analytical data and submit it to you for possible insertion into the record of the recent Subcommittee hearings.

The enclosed set of tables constitutes that summary. The tables were prepared under the direction of Dr. R. J. Pickering, Chief of our Quality of Water Branch, and any technical questions concerning them should be directed to him. The analytical data for each substance have been summarized, by state, in terms of (1) number of sites samples, (2) number of sites with positive results, (3) where appropriate, number of sites with concentrations exceeding recommended water-quality criteria or standards, and (4) maximum concentration observed. The summary represents all the data that were in our computer storage up to mid-January 1976.

It has been a pleasure to assist the Subcommittee in its important deliberations on the need for additional legislation for protection of the environment. Please let me know if we can be of further service.

Sincerely yours,

W. A. RADLINSKI,
Acting Director.

Enclosure.

SUMMARY OF TOXIC SUBSTANCES IN WATER AND STREAM SEDIMENTS

The attached data summary for each toxic substance presents for the United States and for each state (1) the number of sites sampled, (2) the number of sites with positive results (3) where appropriate, the number of sites with concentrations exceeding recommended water-quality criteria or standards, and (4) the maximum concentration observed.

Concentrations of the six toxic substances in water (dissolved phase) and in water containing suspended sediment (total phase) are expressed in micrograms per litre (ug/l), which are approximately equivalent to parts per billion. Concentrations of PCB's, Silvex, and Toxaphene in bottom material are reported in micrograms per kilogram (ug/kg), which also are equivalent to parts per billion. Concentrations of cadmium, lead, and mercury in bottom material are reported in micrograms per gram (ug/g), which are equivalent to parts per million.

It should be noted that no criteria or standards have been recommended for concentrations of toxic substances in stream sediments, either suspended or as bottom material. Therefore, comparisons are available only for the dissolved (water samples passed through a 0.45 micrometer filter) and total (unfiltered water samples containing suspended sediment) phases. Comparisons for the "dissolved" values are based on the maximum contaminant levels expressed in the "National Interim Primary Drinking Water Regulations," Federal Register, Vol. 40, No. 248, Wednesday, December 24, 1975. No standard for PCBs is given in the drinking water regulations, but the National Academy of Sciences' "Water Quality Criteria 1972" gives a suggested but not recommended value for PCBs in drinking water of 1 microgram per liter. This value was selected for purposes of the comparison. For "total" values, comparisons are based on the criteria recommended in "Water Quality Criteria 1972" for freshwater aquatic life and wildlife. Where a criterion or standard refers to a range of concentrations, the highest concentration in the range was used for the comparison. In a few cases, the standards or criteria fall below the lower limits of concentration detected by the analytical methods commonly used for analysis of water samples.

MONS 091492

SUMMARY OF SELECTED TOXIC SUBSTANCES IN WATER AND STREAM SEDIMENTS OF UNITED STATES

Toxic substance	Data source	Dissolved					Suspended			
		Number of States sampled	Number of sites sampled	Number of sites values >0	Number of sites values >X[1]	Maximum value reported micrograms per liter	Number of States sampled	Number of sites sampled	Number of sites values >0	Maximum value reported micrograms per liter
Cadmium	Surface water[1]	50	3,755	2,423	430	1,400	47	709	573	650
	Ground water[1]	36	2,431	940	150	1,400	8	72	42	750
	Other[1]	13	105	64	15	2,500	2	5	5	18
Lead	Surface water	50	4,356	3,781	145	1,900	47	743	722	3,500
	Ground water	40	3,266	2,145	94	40,000	8	127	102	4,000
	Other	12	164	136	8	850	3	45	33	600
Mercury	Surface water	49	2,515	1,918	193	196	47	669	355	32
	Ground water	32	1,603	837	34	13	6	56	12	5.4
	Other	10	91	50	0	1.2	3	38	18	.3
PCB's	Surface water	19	59	7	7	1,300	17	34	2	.2
	Ground water	(2)								
	Other	(2)								
Silver	Surface water	18	52	3	0	.14	17	34	0	0
	Ground water	(2)								
	Other	(2)								
Toxaphene	Surface water	(2)								
	Ground water	(2)								
	Other	(2)								

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	Other	(1)									
Silvex	Surface water	18	52	7	0	14	17	34	9	9	
	Ground water	(1)									
	Other	(1)									
Toxaphene	Surface water	(1)									
	Ground water	(1)									
	Other	(1)									

		Total					Bottom material			
		Number of States sampled	Number of sites sampled	Number of sites values >0	Number of sites values >X [2]	Maximum value reported micrograms per liter	Number of States sampled	Number of sites sampled	Number of sites results >0	Maximum value reported [3]
Cadmium	Surface water	49	2,283	1,869	168	960	35	591	485	300
	Ground water	25	859	448	18	750	(4)			
	Other	8	68	45	2	20	3	47	37	19
Lead	Surface water	49	2,787	2,709	1,546	7,800	38	669	659	4,500
	Ground water	28	1,089	992	417	4,000	(4)			
	Other	8	89	89	35	2,700	3	48	48	440
Mercury	Surface water	49	3,396	2,830	2,472	2,800	38	620	559	270
	Ground water	25	1,021	715	544	31	(4)			
	Other	8	105	76	61	7.3	3	47	47	1.5
PCB's	Surface water	46	1,106	97	97	21	42	958	463	1,300,000
	Ground water	15	382	5	5	.4	(4)			
	Other	8	63	8	8	2.1	4	36	29	540
Silvex	Surface water	48	1,384	442	12	120	22	419	99	310
	Ground water	15	383	12	0	.05	(4)			
	Other	7	44	5	0	.06	3	38	0	0
Toxaphene	Surface water	45	1,116	39	38	330	38	836	52	6,000
	Ground water	14	306	0	0	0	(4)			
	Other	8	60	0	0	0	4	36	0	0

[1] Values of x for each dissolved toxic substance are: Cadmium 10 µg/l, lead 50 µg/l, mercury 2 µg/l, PCB 1 µg/l, silvex 10 µg/l, toxaphene 5 µg/l.
[2] Values of x for each total toxic substance are: Cadmium 30 µg/l, lead 30 µg/l, mercury 0.2 µg/l, PCB 0.002 µg/l, silvex 2.5 µg/l, toxaphene 0.01 µg/l.
[3] Values for cadmium, lead, and mercury are reported in microgram per gram, for PCB, silvex, and toxaphene in microgram per kilogram.
[4] Includes streams, lakes, and reservoirs.
[5] Includes wells and springs.
[6] Includes estuaries, municipal waste, industrial waste, mines, public water supplies.
[7] No analytical data available.

MONS 091494

SUBSTANCE: CADMIUM

State	Dissolved				Suspended			Total				Bottom material		
	N[1]	N > 0[2]	N > 10 µg/l[3]	Maximum[4] micrograms per liter	N	N > 0	Maximum micrograms per liter	N	N > 0	N > 30 µg/l	Maximum micrograms per liter	N	N > 0	Maximum micrograms per gram
Alabama	97	90	14	90	4	4	2	34	32	0	10	5	4	10
Alaska	69	28	1	140	13	8	320	51	34	2	360	0	0	----
Arizona	21	15	0	10	11	11	20	12	12	0	20	1	1	1
Arkansas	37	23	1	14	11	11	16	128	118	3	111	13	12	10
California	154	78	3	340	43	43	39	118	83	20	80	26	22	10
Colorado	495	221	47	910	92	52	29	197	190	53	960	0	0	----
Connecticut	63	58	32	78	2	0	0	2	2	0	10	38	22	9
Delaware	10	10	0	2	0	0	----	0	0	0	----	0	0	----
Florida	280	105	2	13	55	38	7	293	210	1	35	52	52	20
Georgia	136	66	0	5	7	5	5	9	7	0	5	11	11	20
Hawaii	9	5	0	2	9	9	10	48	12	0	10	3	1	1
Idaho	78	57	11	1,400	7	7	20	39	39	5	440	1	0	0
Illinois	26	16	4	16	9	7	18	13	8	0	20	6	4	4
Indiana	45	23	0	10	17	9	3	19	13	0	10	14	10	10
Iowa	33	22	6	40	4	2	19	5	4	0	20	0	0	----
Kansas	24	15	0	8	8	8	20	9	9	0	20	1	0	0
Kentucky	103	79	6	18	28	22	7	72	63	0	23	39	39	20
Louisiana	271	157	11	25	53	52	60	71	69	1	60	169	143	10
Maine	14	10	5	<2,000	6	1	1	9	4	0	1	2	1	2
Maryland	21	21	0	6	2	0	0	13	4	0	1	1	0	0
Massachusetts	25	15	0	6	2	1	1	9	9	1	550	7	7	300
Michigan	125	88	3	20	17	16	5	34	31	0	10	0	0	----
Minnesota	41	29	0	8	11	10	20	29	26	0	20	20	20	10
Mississippi	20	12	1	11	6	6	23	66	41	0	25	51	50	17
Missouri	72	51	10	80	5	5	10	14	14	3	60	2	0	0
Montana	101	65	5	44	34	22								

MONS 091495

[illegible]	21	21	0	0	0	0	0	0	0	1	550	7	7	200
Maryland	[illegible]	15	0	6	2	1	1	9	9	0	10	0	0	[illegible]
Massachusetts	[illegible]	[illegible]	3	20	17	16	5	38	31	0	20	20	20	10
Michigan	[illegible]	[illegible]	0	8	11	10	20	29	26	0				
Minnesota	41	28												
[illegible]	72	61	10	40	6	5	23	64	41	0	25	51	50	11
					5	5	10	14	14	1	60	2	0	0
Montana	101	65	5	55	20	19	20	74	72	3	30	5	5	10
Nebraska	98	78	6	89	9	9	38	16	16	2	211	0	0	[illegible]
Nevada	11	6	1	28	6	6	20	18	18	0	20	0	0	[illegible]
New Hampshire	5	5	0	2	1	1	4	19	15	0	16	2	2	2
New Jersey	82	48	27	4,400	11	7	2	38	31	0	12	10	2	1
New Mexico	53	38	19	714	21	21	40	26	26	3	40	1	1	1
New York	185	179	137	220	10	6	74	122	57	7	230	6	3	3
North Carolina	67	56	6	58	18	11	10	44	41	32	80	18	17	20
North Dakota	78	63	5	26	14	14	38	65	62	2	30	3	2	10
Ohio	44	34	10	180	10	10	2	33	15	1	78	1	1	1
Oklahoma	52	36	2	38	12	12	27	60	58	6	100	7	6	8
Oregon	24	20	0	5	11	11	10	13	13	0	10	4	4	3
Pennsylvania	216	175	20	100	8	3	1	188	184	14	420	35	27	10
Rhode Island	8	8	4	10	0	[illegible]	[illegible]	4	4	4	210	0	0	[illegible]
South Carolina	11	11	0	7	7	4	15	11	10	0	16	5	4	10
South Dakota	47	37	3	14	8	8	30	15	15	2	30	0	0	[illegible]
Tennessee	21	18	1	190	7	6	650	47	35	1	840	1	0	0
Texas	162	135	3	30	0	[illegible]	[illegible]	29	29	1	50	3	2	1
Utah	43	28	8	270	14	14	20	15	15	0	20	0	0	[illegible]
Vermont	4	4	0	6	1	1	1	1	1	0	1	0	0	[illegible]
Virginia	17	15	7	50	3	0	0	4	4	0	2	0	[illegible]	[illegible]
Washington	21	15	1	10	9	9	20	17	17	2	40	0	0	[illegible]
West Virginia	53	38	5	25	48	24	5	51	38	0	22	15	10	0
Wisconsin	38	18	0	10	9	7	2	14	10	0	3	13	10	10
Wyoming	64	28	3	38	26	23	10	59	55	1	30	0	0	[illegible]
United States	3,755	2,423	430	1,400	709	573	650	2,283	1,860	168	960	591	485	300

[1] N = Number of stations for which data are available.
[2] N > 0 = Number of stations that have an analysis result greater than zero.
[3] N > 10 µg/l = Number of stations that have an analysis result greater than amount specified.
[4] Maximum = Maximum value found.

Source: Surface waters (streams, lakes, reservoirs).

MONS 091496

SUBSTANCE: LEAD

State	Dissolved				Suspended			Total				Bottom material		
	N [1]	N>0 [2]	N > 30 µg/l [3]	Maximum [4] micrograms per liter	N	N>0	Maximum micrograms per liter	N	N>0	N>30 µg/l	Maximum micrograms per liter	N	N>0	Maximum micrograms per gram
Alabama	97	93	2	100	5	5	38	33	33	18	100	5	5	30
Alaska	113	95	4	130	8	8	109	72	67	53	6,500	0		
Arizona	21	19	1	100	11	11	300	12	12	12	300	1	1	10
Arkansas	41	41	0	50	11	11	108	148	146	104	750	13	13	150
California	156	115	8	270	43	43	508	125	110	85	3,200	26	26	200
Colorado	517	431	10	1,900	92	92	400	212	212	206	1,900	47	47	350
Connecticut	64	55	2	70	2	2	75	2	2	1	75	38	38	4,500
Delaware	10	10	0	8	0			0				0		
Florida	458	397	17	780	179	171	140	326	315	77	800	70	70	1,500
Georgia	170	106	1	50	7	7	220	10	10	5	230	16	16	180
Hawaii	9	9	1	180	9	9	190	67	65	16	200	3	3	80
Idaho	87	78	3	181	9	9	200	49	49	46	2,500	1	1	20
Illinois	26	26	1	340	9	9	99	13	11	4	100	6	6	29
Indiana	45	42	0	38	17	14	190	19	18	3	200	14	14	65
Iowa	33	23	4	150	4	4	98	5	5	4	100	0		
Kansas	24	18	0	14	8	8	100	9	9	9	100	1	1	5
Kentucky	103	97	3	80	27	26	72	74	69	32	1,700	39	39	300
Louisiana	273	233	0	40	53	53	3,500	72	72	30	3,500	170	164	250
Maine	14	14	4	440	6	6	93	9	9	7	100	2	2	390
Maryland	21	21	0	40	2	2	8	13	12	2	100	1	1	30
Massachusetts	30	29	2	126	2	2	12	9	9	3	1,000	7	7	1,400
Michigan	129	118	2	120	17	16	83	39	38	6	90	0		
Minnesota	41	33	1	50	11	10	190	30	29	27	900	21	20	4,000

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Maine	21	21	-	126	2	2	12	9	9	3	1,000	0	-	-
Maryland			2	120	17	16	89	29	28	6	90	21	20	4,000
Massachusetts	30	29	2	50	11	10	190	30	28	27	900			
Michigan	125	118	1											
Minnesota	61	33												
Mississippi	22	15	0	46	6	6	51	68	68	10	110	51	51	40
Missouri	74	70	10	1,000	5	5	100	19	19	12	550	2	2	5
Montana	102	84	0	35	29	28	400	86	84	71	1,000	5	5	79
Nebraska	80	63	1	88	9	9	700	16	16	16	700	0	-	-
Nevada	13	12	0	13	6	6	100	10	10	10	200	0	-	-
New Hampshire	6	6	0	35	1	1	3	19	19	0	21	2	2	30
New Jersey	67	66	3	240	11	9	26	40	40	8	100	10	10	150
New Mexico	51	42	5	<2,142	26	26	800	63	63	63	1,600	1	1	5
New York	203	193	2	160	10	10	37	248	242	60	7,800	6	6	350
North Carolina	75	59	4	103	22	22	500	47	47	40	500	19	19	620
North Dakota	80	72	1	100	14	14	570	65	65	58	500	3	3	25
Ohio	49	43	9	340	10	10	46	185	171	10	240	1	1	20
Oklahoma	55	50	1	200	13	13	100	61	61	61	1,200	7	6	60
Oregon	25	25	1	60	11	11	100	13	13	13	100	4	4	30
Pennsylvania	245	213	4	<21,000	8	8	38	207	203	179	<41,000	36	36	660
Rhode Island	11	11	0	34	0	0	-	4	4	4	500	0	-	-
South Carolina	34	33	2	73	7	7	110	11	11	5	110	6	5	100
South Dakota	45	40	0	40	8	8	600	17	17	11	600	0	-	-
Tennessee	21	19	1	50	7	7	300	47	45	14	300	1	1	5
Texas	170	155	9	150	0	-	-	29	29	29	500	3	3	90
Utah	122	110	2	85	14	14	300	19	19	19	300	0	-	-
Vermont	4	4	1	50	1	1	3	1	1	0	4	0	-	-
Virginia	17	12	0	20	3	3	13	4	4	1	40	0	-	-
Washington	154	148	21	1,100	9	9	100	30	30	23	1,100	0	-	-
West Virginia	57	53	2	370	48	46	67	56	56	8	91	15	15	15
Wisconsin	38	35	0	30	9	8	37	14	11	2	37	13	12	100
Wyoming	66	45	0	15	27	26	600	60	59	56	600	3	3	100
United States	4,356	3,781	105	1,900	743	722	3,500	2,787	2,709	1,546	7,800	669	659	4,500

[1] N = Number of stations for which data are available.
[2] N > 0 = Number of stations that have an analysis result greater than zero.
[3] N > 50 µg/l = Number of stations that have an analysis result greater than amount specified.
[4] Maximum = Maximum value found.

Source: Surface waters (streams, lakes, reservoirs).

MONS 091498

SUBSTANCE: MERCURY

State	Dissolved				Suspended			Total				Bottom material		
	N [1]	N > 0 [2]	N > 2 µg/l [3]	Maximum micrograms per liter	N	N > 0	Maximum micrograms per liter	N	N > 0	N > 2 µg/l	Maximum micrograms per liter	N	N > 0	Maximum micrograms per gram
Alabama	94	88	24	56	4	3	0.2	47	39	35	0.7	3	4	1.7
Alaska	21	9	1	4.0	6	4	.5	42	34	25	2.2	0		
Arizona	23	17	0	.6	11	7	32	13	12	9	32	1	0	.0
Arkansas	32	28	6	4.3	11	3	.3	100	81	72	15	13	13	.5
California	99	75	16	12	43	26	4.2	157	99	80	12	26	22	.3
Colorado	362	196	3	4.5	92	22	.7	122	44	16	1.8	48	47	.1
Connecticut	34	34	1	3.8	2	0	.0	30	30	30	.7	38	35	3.7
Delaware	0				0			0				0		
Florida	50	40	1	3.6	19	17	.8	296	230	193	22	83	69	4.0
Georgia	77	42	3	2.8	6	2	1.6	40	6	4	1.8	11	8	.6
Hawaii	14	12	0	1.2	9	5	.9	10	8	3	.9	3	3	.1
Idaho	66	60	11	8.7	7	6	.3	43	43	40	8.3	1	0	.0
Illinois	82	79	1	2.2	9	6	1.6	26	24	23	3.5	6	5	.1
Indiana	27	20	0	.8	5	2	.1	23	17	11	.8	6	0	.0
Iowa	9	9	4	24	4	3	.4	15	15	12	1.8	0		
Kansas	20	14	3	3.0	8	8	10	29	29	26	10	1	0	.0
Kentucky	96	78	4	7.5	26	13	.6	95	87	78	7.9	39	32	15
Louisiana	150	122	2	2.3	53	52	5.4	155	133	121	5.0	188	170	9.0
Maine	11	11	0	.6	6	0	.0	16	16	16	5.5	5	3	.1
Maryland	2	2	1	5.0	2	0	.0	2	2	2	5.0	1	0	.0
Massachusetts	18	18	2	4.7	2	1	.2	21	21	21	.7	0		
Michigan	103	91	16	196	18	13	1.3	79	73	61	240	3	1	1.7
Minnesota	30	22	1	2.6	13	7	1.7	41	30	21	10	21	21	.2
Mississippi	20	16	2	2.7	6	6	1.5	67	56	30	17	53	31	37
Missouri	14	4	1	4.3	5	4	.8	28	21	16	4.8	2	0	.0
Montana														
Nebraska														
Nevada	84	72	7											

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Minnesota	33	22	2	2.7	6	6	1.5	67	39	26	4.8	2	0	
Mississippi	20	16	1	4.3	5	4	.8	28	21	16				
Missouri	14	8												
Montana	94	72	7	9.0	16	13	2.0	82	66	56	11	5	5	.2
Nebraska	63	56	17	44	32	24	6.8	66	60	53	92	0		
Nevada	8	8	0	1.8	6	6	1.4	15	13	12	25	0		
New Hampshire	6	6	1	3.7	1	0	.0	22	22	22	.7	0		
New Jersey	32	32	1	2.8	11	1	.2	53	42	41	5.9	10	8	270
New Mexico	23	14	0	.5	21	11	1.0	77	51	32	4.0	1	0	.0
New York	74	74	2	17	8	1	.2	360	360	369	2,800	6	6	.3
North Carolina	34	28	0	.8	22	13	2.5	76	51	48	8.8	18	17	.6
North Dakota	72	58	11	76	14	12	2.4	70	46	34	3.3	3	0	.0
Ohio	31	31	1	6.0	10	3	1.4	353	353	351	61	1	0	.0
Oklahoma	20	12	3	12	12	6	.7	27	24	18	15	6	6	.1
Oregon	19	14	0	1.0	10	7	.4	13	11	7	2.5	4	0	.0
Pennsylvania	61	61	0	1.3	8	2	.3	184	181	172	50	35	33	70
Rhode Island	9	9	0	.5	0			9	9	9	.5	0	0	
South Carolina	11	10	0	.3	7	7	.5	11	11	11	.5	5	4	.5
South Dakota	23	14	0	1.0	8	6	1.2	38	26	19	1.7	0	0	
Tennessee	19	18	0	.6	7	5	.4	58	53	35	110	1	0	.0
Texas	157	142	37	160	0			33	30	24	1.6	3	1	.2
Utah	78	50	2	7.0	14	9	1.3	37	20	12	1.3	0	0	
Vermont	4	4	1	3.4	1	0	.8	4	4	4	.5	0	0	
Virginia	4	4	0	1.6	3	3	.2	4	4	4	.6	0	0	
Washington	11	10	1	2.1	9	6	1.0	160	142	121	2,700	1	0	.0
West Virginia	52	52	3	5.0	48	5	2.1	50	50	50	5.0	15	7	.1
Wisconsin	36	25	1	2.0	8	7	.8	38	20	10	1.2	13	7	3.0
Wyoming	60	23	2	2.4	26	8	1.4	66	31	22	2.1	3	0	.0
United States	2,515	1,918	193	196	669	365	32	3,396	2,830	2,472	2,800	680	559	270

[1] N = Number of stations for which data are available.

[2] N>0 = Number of stations that have an analysis result greater than zero.

[3] N>2 μg/l = Number of stations that have an analysis result greater than amount specified.

[4] Maximum = Maximum value found.

Source: Surface waters (streams, lakes) reservoirs.

MONS 091500

SUBSTANCE: PCB

State	Dissolved				Suspended			Total				Bottom material		
	N [1]	N > 0 [2]	N > 1 µg/l [3]	Maximum [4] micrograms per liter	N	N > 0	Maximum micrograms per liter	N	N > 0	N > 0.002 µg/l	Maximum micrograms per liter	N	N > 0	Maximum micrograms per gram
Alabama	0				0			5	0	0	0	5	0	0
Alaska	0				0			0				1	0	0
Arizona	1	0	0	0	1	0	0	12	0	0	0	2	1	2
Arkansas	2	0	0	0	2	0	0	16	0	0	0	19	11	2,400
California	2	0	0	0	2	0	0	46	2	2	0.3	34	6	190
Colorado	2	0	0	0	2	0	0	20	0	0	0	4	3	2
Connecticut	0				0			15	7	7	.2	38	27	800
Florida	0				0			178	11	11	20	189	96	1,300,000
Georgia	7	7	7	1,300	0			12	0	0	0	10	7	87
Hawaii	0				0			1	0	0	0	1	0	0
Idaho	0				0			11	0	0	0	2	0	0
Illinois	0				0			5	0	0	0	6	3	44
Indiana	0				0			3	0	0	0	55	17	600
Iowa	1	0	0	0	1	0	0	9	2	2	.4	2	1	2
Kansas	3	0	0	0	3	1	0.2	8	1	1	.2	2	2	2
Louisiana	18	0	0	0	0			239	24	24	21	208	95	4,800
Maine	0				0			8	0	0	0	2	0	0
Massachusetts	0				0			11	4	4	.1	0		
Michigan	0				0			34	3	3	.5	17	8	60
Minnesota	0				0			2	0	0	0	2	0	0
Mississippi	0				0			56	0	0	0	55	14	170
Missouri	0				0			12	1	1	.1	0		
Montana	1	0	0	0	1	0	0	7	0	0	0	6	1	2

MONS 091501

Massachusetts	0				0						55	14	
Michigan	0						55	0	0	0	0		
Minnesota					0		12	1	1	.1	6	1	2
Mississippi	0				0		7	0	0	0			
Missouri	0				1	0	0						
Montana	1	0	0	0									
Nebraska	5	0	0	0	5	0	0	13	0	0	0	3	1	2
Nevada	1	0	0	0	1	0	0	5	0	0	0	3	1	2
New Hampshire	0				0			19	1	1	.1	15	6	38
New Jersey	0				0			38	10	10	.5	27	22	4,000
New Mexico	2	0	0	0	2	0	0	10	0	0	0	5	1	2
New York	0				0			24	6	6	.9	23	20	18,000
North Carolina	0				0			2	0	0	0	1	0	0
North Dakota	3	0	0	0	3	0	0	5	0	0	0	4	0	0
Ohio	0				0			16	2	2	.2	1	1	8
Oklahoma	2	0	0	0	2	0	0	33	4	4	3.0	3	1	2
Oregon	2	0	0	0	2	0	0	4	0	0	0	5	1	2
Pennsylvania	0				0			32	1	1	.3	91	66	700
Rhode Island	0				0			6	0	0	0	0		
South Carolina	0				0			5	0	0	0	5	1	17
South Dakota	0				0			2	0	0	0	1	0	0
Tennessee	0				0			1	0	0	0	1	0	0
Texas	2	0	0	0	2	0	0	114	16	16	3.0	68	42	990
Utah	2	0	0	0	2	0	0	21	0	0	0	3	2	2
Vermont	0				0			1	0	0	0	0		
Virginia	0				0			7	0	0	0	1	0	0
Washington	1	0	0	0	1	1	1	5	1	1	.1	4	1	2
West Virginia	0				0			1	0	0	0	0		
Wisconsin	0				0			27	1	1	.5	30	4	13
Wyoming	2	0	0	0	2	0	0	4	0	0	0	4	1	2
United States	59	7	7	1,300	34	2	.2	1,106	97	97	21	958	463	1,300,000

[1] N = Number of stations for which data are available.
[2] N > 0 = Number of stations that have an analysis result greater than zero.
[3] N > 1 μg/l = Number of stations that have an analysis result greater than amount specified.
[4] Maximum = Maximum value found.

Source: Surface waters (streams, lakes, reservoirs).

MONS 091502

SUBSTANCE: SILVER

State	Dissolved				Suspended			Total				Bottom material		
	N	N>0	N>10 µg/l	Maximum micrograms per liter	N	N>0	Maximum micrograms per liter	N	N>0	N>2.5 µg/l	Maximum micrograms per liter	N	N>0	Maximum micrograms per kilogram
Alabama	0				0			5	2	0	0.01	5	0	0
Alaska	0				0			1	0	0	0	0		
Arizona	1	0	0	0	1	0	0	13	4	0	.11	0		
Arkansas	2	1	0	.05	2	0	0	35	19	1	3.1	28	18	1
California	2	2	0	.02	2	0	0	85	26	2	15	28	17	4
Colorado	2	2	0	.05	2	0	0	27	4	0	.05	0		
Connecticut	0				0			15	10	0	1.5	28	0	0
Florida	0				0			217	92	7	6.0	110	18	310
Georgia	0				0			17	7	0	.12	12	0	0
Hawaii	0				0			1	0	0	0	0		
Idaho	0				0			21	5	0	.02	2	0	0
Illinois	0				0			5	0	0	0	6	0	0
Indiana	0				0			1	0	0	0	0		
Iowa	1	0	0	0	1	0	0	10	0	0	0	0		
Kansas	3	1	0	.01	3	0	0	9	4	0	.01	0		
Kentucky	0				0			1	1	0	.02	0		
Louisiana	18	0	0	0	0			223	84	0	.49	3	0	0
Maine	0				0			8	0	0	0	1	0	0
Massachusetts	0				0			5	2	0	1.2	0		
Michigan	0				0			36	22	2	120	18	0	0
Minnesota	0				0			4	3	0	.01	1	0	0
Mississippi	0				0			57	9	0	.90	55	0	0
Missouri	0				0			14	4	0	.37	0		

MONS 091503

Michigan							4	3	0	.01	1	0	0
Minnesota	0				0		57	9	0	.90	55	0	
Mississippi	0				0		14	4	0	.37	0		
Missouri	0				0								
Montana	1	0	0	0	1	0	0	22	8	0	.03	0	
Nebraska	5	0	0	0	5	0	0	22	10	0	.08	0	
Nevada	1	0	0	0	1	0	0	6	2	0	.21	0	
New Hampshire	0				0			2	1	0	.02	0	
New Jersey	0				0			43	16	0	2.0	0	
New Mexico	2	0	0	0	2	0	0	15	11	0	.86	5	2 1
New York	0				0			140	11	0	.09	3	0 0
North Carolina	0				0			1	0	0	0	0	
North Dakota	3	0	0	0	3	0	0	14	6	0	.01	1	0 0
Ohio	0				0			1	0	0	0	0	
Oklahoma	2	0	0	0	2	0	0	34	8	0	1.5	2	0 0
Oregon	2	0	0	0	2	0	0	6	0	0	0	0	
Pennsylvania	0				0			6	0	0	0	36	7 2
Rhode Island	0				0			7	2	0	.02	0	
South Carolina	0				0			5	0	0	0	3	0 0
South Dakota	0				0			20	11	0	.06	0	
Tennessee	0				0			1	0	0	0	0	
Texas	2	1	0	.14	2	0	0	158	73	0	1.8	43	37 5
Utah	2	0	0	0	2	0	0	22	0	0	0	1	0 0
Vermont	0				0			1	0	0	0	0	
Virginia	0				0			1	0	0	0	0	
Washington	1	0	0	0	1	0	0	5	0	0	0	0	
West Virginia	0				0			7	0	0	0	0	
Wisconsin	0				0			28	4	0	.03	13	0 0
Wyoming	2	0	0	0	2	0	0	7	0	0	0	0	
United States	52	7	0	.14	34	0	0	1,384	462	12	120	419	99 310

[1] N = Number of stations for which data are available.
[2] N>0 = Number of stations that have an analysis result greater than zero.
[3] N>10 μg/l = Number of stations that have an analysis result greater than amount specified.
[4] Maximum = Maximum value found.

Source: Surface waters (streams, lakes, reservoir

MONS 091504

SUBSTANCE: TOXAPHENE

State	Total				Bottom material		
	N [1]	N>0 [2]	N>0.01 µg/l [3]	Maximum [4] micrograms per liter	N	N>0	Maximum micrograms per kilogram
Alabama	5	0	0	0	5	0	0
Arizona	11	0	0	0	1	0	0
Arkansas	126	15	15	330	12	2	2,100
California	27	0	0	0	26	1	450
Colorado	16	0	0	0	1	0	0
Connecticut	15	0	0	0	38	0	0
Florida	166	4	4	1	183	6	250
Georgia	12	0	0	0	9	0	0
Hawaii	1	0	0	0	1	0	0
Idaho	6	0	0	0	1	0	0
Illinois	5	0	0	0	6	0	0
Indiana	1	0	0	0	55	0	0
Iowa	1	0	0	0	1	0	0
Louisiana	237	6	6	10	207	0	0
Maine	5	0	0	0	2	0	0
Massachusetts	11	0	0	0	0	----	----
Michigan	31	0	0	0	17	0	0
Minnesota	2	0	0	0	2	0	0
Mississippi	58	4	4	3	54	0	0
Missouri	6	0	0	0	0	----	----
Montana	6	0	0	0	4	0	0
Nebraska	0	0	0	0	0	----	----

MONS 091505

[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	56	4	0	0	0		
[illegible]	6	0					
[illegible]					4	0	0
[illegible]	6	0	0	0	0		
[illegible]	8	0	0				
Nevada	4	0	0	0	1	0	0
New Hampshire	19	0	0	0	15	0	0
New Jersey	33	0	0	0	22	0	0
New Mexico	9	0	0	0	4	0	0
New York	30	0	0	0	22	0	0
North Carolina	13	0	0	0	1	0	0
North Dakota	3	0	0	0	3	0	0
Ohio	15	0	0	0	1	0	0
Oklahoma	13	0	0	0	1	0	0
Oregon	3	0	0	0	1	0	0
Pennsylvania	30	0	0	0	41	0	0
Rhode Island	6	0	0	0	0		
South Carolina	5	0	0	0	5	0	0
South Dakota	1	0	0	0	0		
Tennessee	1	0	0	0	1	0	0
Texas	118	10	9	1	67	43	6,000
Utah	20	0	0	0	1	0	0
Vermont	1	0	0	0	0		
Virginia	7	0	0	0	1	0	0
Washington	3	0	0	0	2	0	0
West Virginia	1	0	0	0	0		
Wisconsin	22	0	0	0	30	0	0
Wyoming	2	0	0	0	2	0	0
United States	1,116	39	38	330	836	52	6,000

[1] N = Number of stations for which data are available.
[2] N > 0 = Number of stations that have an analysis result greater than zero.
[3] N > 0.01 µg/l = Number of stations that have an analysis result greater than amount specified.
[4] Maximum = Maximum value found.

Source: Surface waters (streams, lakes, reservoirs).

MONS 091506

SUBSTANCE: CADMIUM

State	Dissolved				Suspended			Total			
	N [1]	N>0 [2]	N>10 µg/l [3]	Maximum [1] micrograms per liter	N	N>0	Maximum [4] micrograms per liter	N	N>0	N>30 µg/l	Maximum [4] micrograms per liter
Alabama	54	31	1	32	0			7	5	0	7
Alaska	69	12	0	4	1	1	1	14	14	1	60
Arizona	21	7	0	9	0			0			
Arkansas	25	3	0	10	0			0			
California	30	12	3	1,400	0			7	7	0	10
Colorado	354	141	6	690	3	3	10	20	20	6	<7,500
Connecticut	22	8	2	21	0			0			
Delaware	0				0			1	0	0	0
Florida	232	75	7	21	17	7	5	338	192	0	20
Georgia	192	102	7	19	0			0			
Idaho	10	3	0	1	0			0			
Indiana	50	32	1	60	0			0			
Iowa	13	13	0	10	0			0			
Kentucky	14	10	1	<10	0			12	9	0	5
Louisiana	24	9	0	4	0			0			
Michigan	17	5	1	100	0			23	8	0	21
Minnesota	40	14	9	2	0			145	145	0	10
Mississippi	6	3	0	4	4	1	1	9	7	0	4
Missouri	0				0			17	17	0	10
Montana	41	6	0	5	0			0			

MONS 091507

[illegible]	4	3	[illegible]	[illegible]	0			[illegible]		
[illegible]	0				0					
[illegible]	41	8	0	5						
[illegible]										
[illegible]										
[illegible]			

SUBSTANCE: LEAD

State	Dissolved				Suspended			Total			
	N [1]	N>0 [2]	N>50 µg/l [3]	Maximum [4] micrograms per liter	N	N>0	Maximum [4] micrograms per liter	N	N>0	N>30 µg/l	Maximum [4] micrograms per liter
Alabama	53	39	1	110	0			6	5	1	32
Alaska	73	52	0	44	0			16	16	16	4,000
Arizona	24	14	1	60	0			0			
Arkansas	25	14	0	30	0			0			
California	89	36	7	6,000	0			7	7	7	100
Colorado	507	404	15	40,000	3	3	300	71	71	71	1,400
Connecticut	25	11	0	28	0			0			
Florida	483	269	7	340	49	34	150	400	358	111	3,600
Georgia	195	127	0	37	0			2	2	0	10
Idaho	20	19	0	6	0			0			
Indiana	50	45	1	500	0			0			
Iowa	13	13	1	60	0			0			
Kentucky	17	11	2	200	0			12	8	1	200
Louisiana	24	15	0	27	0			0			
Maryland	0				0			1	1	0	5
Michigan	17	5	0	6	0			23	22	3	190
Minnesota	39	38	2	180	0			15	15	15	100
Mississippi	3	3	0	10	3	2	8	9	5	0	13
Missouri	21	11	4	150	0			17	17	17	650

MONS 091509

Michigan	39	39	4	10	3	4	7	17	17	11	65
Minnesota	3	3	0	150	0						
Mississippi	21	11	4								
Missouri											
M											
Montana	38	30	2	90	0			0			
Nebraska	192	58	4	200	0			0			
Nevada	88	88	0	12	0			0			
New Hampshire	2	0	0	0	0			16	15	0	28
ew Jersey	28	25	11	960	0			39	37	11	470
New Mexico	62	44	0	27	30	30	4,000	85	85	77	4,000
New York	277	205	3	94	1	0	0	191	155	7	100
North Carolina	10	8	0	15	0			1	0	0	0
North Dakota	72	56	1	1,200	10	10	100	11	11	11	100
Ohio	16	13	0	18	0			38	35	2	70
Oklahoma	9	4	0	2	0			0			
Oregon	4	3	0	2	0			11	11	11	100
Pennsylvania	222	170	17	1,800	0			3	3	0	6
Rhode Island	0				0			12	12	0	10
South Dakota	64	47	0	12	0			9	9	0	25
Tennessee	6	6	6	50	0			18	16	0	24
Texas	90	40	0	12	0			0			
Utah	234	91	5	400	0			0			
Virginia	8	3	0	3	0			1	1	0	27
Washington	44	39	0	46	0			2	2	0	10
West Virginia	19	17	0	4	19	11	8	19	19	0	9
Wisconsin	48	35	3	80	0			0			
Wyoming	55	36	1	15	12	12	100	54	54	54	700
United States	3,266	2,145	94	40,000	127	102	4,000	1,089	992	417	4,000

[1] N = Number of stations for which data are available.
[2] N > 0 = Number of stations that have an analysis result greater than zero.
[3] N > 50 µg/l = Number of stations that have an analysis result greater than amount specified.
[4] Maximum = Maximum value found.

Source: Ground waters (wells, springs).

MONS 091510

SUBSTANCE: MERCURY

State	Dissolved				Suspended			Total			
	N [1]	N>0 [2]	N>2 µg/l [3]	Maximum [4] micrograms per liter	N	N>0	Maximum [4] micrograms per liter	N	N>0	N>0.2 µg/l	Maximum [4] micrograms per liter
Alabama	54	48	5	10	0			0			
Alaska	21	7	0	.6	0			18	12	6	1.7
Arizona	22	11	0	.2	0			0			
Arkansas	20	7	0	.4	0			0			
California	62	21	0	1.0	0			34	26	18	20
Colorado	305	77	5	5.3	3	1	.2	9	2	1	.2
Connecticut	10	8	1	5.0	0			6	6	6	.5
Florida	92	68	0	1.7	5	2	.1	302	219	148	4.0
Georgia	191	92	2	5.6	0			0			
Idaho	138	77	3	4.3	0			0			
Indiana	51	34	6	9.8	0			0			
Iowa	6	6	0	1.0	0			0			
Kentucky	7	6	0	1.4	0			5	2	1	.2
Louisiana	1	1	0	1.4	0			22	16	11	.5
Michigan	7	6	1	13	0			23	13	8	1.1
Minnesota	0				0			11	2	1	.6
Mississippi	3	0	0	0	0			4	0	0	0
Missouri	0				0			16	9	8	2.2

MONS 091511

Michigan	0				0			11	0	0	0
Minnesota	3	0	0	0	0			4	0	0	0
Mississippi	0				0			16	9	8	2.2
Missouri											
Montana	40	20	1	2.0	0			0			
Nebraska	151	67	6	13	0			0			
New Hampshire	0				0			16	16	15	5.0
New Jersey	7	6	0	.5	0			31	31	31	7.1
New Mexico	10	7	0	.7	7	0	0	88	21	8	2.2
New York	17	17	0	1.0	0			209	209	209	31
North Carolina	1	0	0	0	0			6	6	5	14
North Dakota	78	45	2	2.4	10	2	.4	11	9	3	.6
Ohio	0				0			5	5	5	.5
Oklahoma	9	1	0	.1	0			0			
Oregon	1	0	0	0	0			12	1	1	.4
Pennsylvania	63	63	1	11	0			7	5	5	.9
South Dakota	0				0			56	17	13	.5
Tennessee	0				0			18	13	5	.2
Texas	74	53	0	1.9	0			0			
Utah	57	29	0	1.0	0			0			
Virginia	2	2	0	.2	0			0			
Washington	0				0			39	31	4	.7
West Virginia	19	19	0	.5	19	3	5.4	19	19	19	5.9
Wisconsin	32	22	0	.9	0			0			
Wyoming	52	17	1	2.1	12	4	.3	54	25	13	5.3
United States	1,603	837	34	13	56	12	5.4	1,021	715	544	31

[1] N = Number of stations for which data are available.
[2] N>0 = Number of stations that have an analysis result greater than zero.
[3] N>2 µg/l = Number of stations that have an analysis result greater than amount specified.
[4] Maximum = Maximum value found.

Source: Ground waters (wells, springs).

MUNS 091512

SUBSTANCE: PCB, SILVER, TOXAPHENE

State	PCB, Total				Silver, Total				Toxaphene, Total			
	N[1]	N>0[2]	N>0.002 µg/l[3]	Maximum[4] micrograms per liter	N	N>0	N>2.5 µg/l	Maximum micrograms per liter	N	N>0	N>0.01 µg/l	Maximum micrograms per liter
Alabama	1	0	0	0	0				1	0	0	0
Arkansas	11	0	0	0	22	0	0	0	11	0	0	0
Florida	151	2	2	.1	157	10	0	.05	104	0	0	
Georgia	1	0	0	0	1	0	0	0	1	0	0	0
Idaho	0				4	0	0	0	0			
Illinois	25	1	1	.1	25	0	0	0	25	0	0	0
Indiana	13	1	1	.4	4	0	0	0	7	0	0	0
Kentucky	5	0	0	0	5	0	0	0	5	0	0	0
Louisiana	4	0	0	0	4	0	0	0	7	0	0	0
Michigan	22	1	1	.2	23	0	0	0	22	0	0	0
Nebraska	19	0	0	0	18	0	0	0	19	0	0	0
New Hampshire	16	0	0	0	0				16	0	0	0
New Mexico	0				1	0	0	0	0			
New York	64	0	0	0	61	2	0	.01	59	0	0	0
Rhode Island	12	0	0	0	0				0			
Texas	14	0	0	0	31	0	0	0	14	0	0	
West Virginia	0				3	0	0	0	0			
Wisconsin	24	0	0	0	24	0	0	0	15	0	0	0
United States	382	5	5	.4	383	12	0	.05	306	0	0	0

[1] N = Number of stations for which data are available.
[2] N>0 = Number of stations that have an analysis result greater than zero.
[3] N>0.002 µg/l = Number of stations that have an analysis result greater than amount specified.
[4] Maximum = Maximum value found.

MONS 091513

08-100—76—14

SUBSTANCE: SILVEX

State	Total				Bottom material		
	N [1]	N>0 [2]	N>2.5 μg/l [3]	Maximum [4] micrograms per liter	N	N>0	Maximum micrograms per kilogram
Connecticut	1	1	0	0.01	13	0	0
Florida	33	1	0	.04	23	0	0
Maine	1	0	0	.00	0	----	----
New Jersey	5	3	0	.06	0	----	----
New York	1	0	0	0	0	----	----
South Carolina	2	0	0	0	2	0	0
Wisconsin	1	0	0	0	0	----	----
United States	44	5	0	.06	38	0	0

[1] N = Number of stations for which data are available.
[2] N>0 = Number of stations that have an analysis result greater than zero.
[3] N>2.5 μg/l = Number of stations that have an analysis result greater than amount specified.
[4] Maximum = Maximum value found.

Source: Miscellaneous sources (estuaries, municipal waste, industrial waste, mines, public water supplies).

MONS 091514

SUBSTANCE: CADMIUM

State	Dissolved				Suspended			Total				Bottom material		
	N [1]	N>0 [2]	N>10 µg/l [3]	Maximum micrograms per liter [4]	N	N>0	Maximum micrograms per liter	N	N>0	N>10 µg/l	Maximum micrograms per liter	N	N>0	Maximum micrograms per gram
Alaska	1	1	0	1	0			0				0		
California	0				0			0				0		
Colorado	4	1	0	3	4	4	10	4	4	0	10	0		
Connecticut	1	1	1	27	0			0				36	26	19
Florida	45	23	2	2,300	0			56	34	2	18	9	9	10
Idaho	9	6	1	2,500	0			0				0		
Louisiana	1	1	0	1	1	1	4	1	1	0	4	0		
Maine	1	1	1	200	0			1	1	0	5	0		
New Jersey	6	6	6	<6,870	0			1	0	0	0	0		
New York	2	1	1	25	0			2	2	0	8	0		
North Dakota	1	1	1	20	0			1	1	0	20	0		
Pennsylvania	31	20	2	16	0			0				0		
South Carolina	2	2	0	1	0			0				2	2	10
Wisconsin	1	0	0	0	0			0				0		
United States	105	64	15	2,500	5	5	10	68	45	2	20	47	37	19

[1] N = Number of stations for which data are available.

[2] N>0 = Number of stations that have an analysis result greater than zero.

[3] N>10 µg/l = Number of stations that have an analysis result greater than amount specified.

[4] Maximum = Maximum value found.

Source: Miscellaneous sources (estuaries, municipal waste, industrial waste, mines, public water supplies).

MONS 091515

SUBSTANCE: LEAD

State	Dissolved				Suspended			Total				Bottom material		
	N [1]	N>0 [2]	N>50 µg/l [3]	Maximum [4] micrograms per liter	N	N>0	Maximum micrograms per liter	N	N>0	N>30 µg/l	Maximum micrograms per liter	N	N>0	Maximum micrograms per gram
Alaska	1	0	0	0	0			0				0		
California	0				0			0				0		
Colorado	6	6	0	5	4	4	99	4	4	4	100	0		
Connecticut	2	1	0	4	0			1	1	0	0	36	36	440
Florida	100	77	5	850	40	28	600	65	63	28	2,700	10	10	140
Idaho	9	6	0	17	0			0				0		
Louisiana	1	1	0	2	1	1	18	1	1	0	18	0		
Maine	1	1	1	360	0			1	1	1	50	0		
New Jersey	8	8	2	320	0			4	4	2	49	0		
New York	2	2	0	27	0			12	12	8	520	0		
North Dakota	1	1	0	10	0			1	1	0	18	0		
Pennsylvania	31	31	0	20	0			0				0		
South Carolina	2	2	0	17	0			0				2	2	100
Wisconsin	0				0			0				0		
United States	164	136	8	850	45	33	600	89	89	35	2,700	48	48	440

[1] N = Number of stations for which data are available.

[2] N>0 = Number of stations that have an analysis result greater than zero.

[3] N>10µg/l = Number of stations that have an analysis result greater than amount specified.

[4] Maximum = Maximum value found.

Source: Miscellaneous sources (estuaries, municipal waste, industrial waste, mines, public water supplies).

MUNS 091516

SUBSTANCE: MERCURY

State	Dissolved				Suspended			Total				Bottom material		
	N [1]	N > 0 [2]	N > 2.0 µg/l [3]	Maximum [4] micrograms per liter	N	N > 0	Maximum micrograms per liter	N	N > 0	N > 0.2 µg/l	Maximum micrograms per liter	N	N > 0	Maximum micrograms per gram
Colorado	4	0	0	0	4	0	0	4	0	0	0	0		
Connecticut	1	1	0	.5	0			1	1	1	.5	36	36	1.0
Florida	39	5	0	.8	33	17	.3	82	57	42	2.9	9	9	.1
Idaho	9	9	0	1.2	0			0				0		
Louisiana	1	1	0	.3	1	1	.1	1	1	1	.3	0		
Maine	0				0			1	1	1	.8	0		
New Jersey	0				0			4	4	4	.5	0		
New York	2	2	0	.5	0			11	11	11	7.3	0		
North Dakota	1	0	0	.0	0			1	1	1	.2	0		
Pennsylvania	31	31	0	.7	0			0				0		
South Carolina	2	1	0	.7	0			0				2	2	1.5
Wisconsin	1	0	0	.0	0			0				0		
United States	91	50	0	1.2	38	18	.3	105	76	61	7.3	47	47	1.5

[1] N = Number of stations for which data are available.

[2] N > 0 = Number of stations that have an analysis result greater than zero.

[3] N > 2.0 µg/l = Number of stations that have an analysis result greater than amount specified.

[4] Maximum = Maximum value found.

Source: Miscellaneous sources (estuaries, municipal waste, industrial waste, mines, public water supplies).

MONS 091517

SUBSTANCE: PCB, TOXAPHENE

State	Total				Bottom material			Total				Bottom material		
	N [1]	N > 0 [2]	N > .002 µg/l [3]	Maximum [4] micrograms per liter	N	N > 0	Maximum micrograms per kilogram	N	N > 0	N > .01 µg/l	Maximum micrograms per liter	N	N > 0	Maximum micrograms per kilogram
Connecticut	1	1	1	0.2	13	13	370	1	0	0	0	13	0	0
Florida	50	4	4	.1	18	12	60	47	0	0	0	18	0	0
Louisiana	3	0	0	0	0	----	----	3	0	0	0	0	----	----
Maine	1	0	0	0	0	----	----	1	0	0	0	0	----	----
New Jersey	2	2	2	2.1	0	----	----	2	0	0	0	0	----	----
New York	2	0	0	0	2	0	0	2	0	0	0	2	0	0
South Carolina	1	0	0	0	0	----	----	1	0	0	0	0	----	----
Wisconsin	3	1	1	.1	3	3	540	3	0	0	0	3	0	0
United States	63	8	8	2.1	36	28	540	60	0	0	0	36	0	0

[1] N = Number of stations for which data are available.

[2] N>0 = Number of stations that have an analysis result greater than zero.

[3] N>0 =µg/l = Number of stations that have an analysis result greater than amount specified.

[4] Maximum = Maximum value found.

Source: Miscellaneous sources (estuaries, municipal waste, industrial waste, mines, public water supplies).

MONS 091518

DEPARTMENT OF HEALTH, EDUCATION, AND WELFARE,
PUBLIC HEALTH SERVICE,
FOOD AND DRUG ADMINISTRATION,
Rockville, Md.

Hon. ROBERT L. LEGGETT,
Chairman, Subcommittee on Fisheries and Wildlife Conservation and the Environment Committee on Merchant Marine and Fisheries, House of Representatives, Washington, D.C.

DEAR MR. LEGGETT: I welcome this opportunity to present the Food and Drug Administration's views on polychlorinated biphenyls (PCB's) to your Subcommittee. As requested in your letter of January 22, 1976, we will address how PCB's are entering human food, the extent to which PCB's are present in food, and the status of the allowable level for PCB's in fish.

PCB's are a class of toxic industrial chemicals that are highly stable, heat resistant, and nonflammable. Prior to 1971, PCB's were used in a variety of applications, primarily because of their excellent chemical and thermal stability. They have been used as plasticizers, hydraulic fluids and lubricants, surface coatings, inks, sealants, adhesives, pesticide extenders and microencapsulation of dyes for carbonless copy paper. Although domestically-produced PCB's are used only as fluids for electrical transformers and capacitors, imported PCB's are still used in "open systems."

By late 1971, it was apparent that the unique physical and chemical properties of PCB's and their widespread, uncontrolled industrial application, had led PCB contamination of food from three sources:

(1) Industrial discharges and disposal of PCB's into the environment resulted in the indirect contamination of certain foods, principally those of animal origin.

(2) Industrial accidents such as spillage or leakage of PCB's from manufacturing equipment or contact with PCB-containing materials caused the direct contamination of food and animal feed.

(3) PCB's migrated to package food from paper food-packaging materials made from recycled paper composed of carbonless copy paper containing PCB's.

Although only limited information on the toxicity of PCB's was available in late 1971-1972, there were sufficient data for the Food and Drug Administration (FDA) to conclude that PCB's were poisonous or deleterious substances and that their presence in food posed a potentially serious health hazard.

As a result, FDA published a notice of proposed rulemaking in the *Federal Register* of March 10, 1972 (37 FR 5705) to minimize human exposure to PCB's by dealing with the direct and indirect sources of PCB's in the diet. On July 6, 1973, a final order on the proposed regulations was published in the *Federal Register* (38 FR 18096) (see Enclosure 1).

The final regulations have two main provisions:

(1) The industrial use of PCB's in establishments manufacturing, handling, or storing human food, animal feeds and paper food packaging materials is prohibited in order to preclude the direct, accidental contamination of these articles. The prohibition does not apply to the use of PCB-containing electrical transformers and capacitors.

(2) Temporary tolerances under section 406 of the Federal Food, Drug, and Cosmetic Act were established for unavoidable, indirect PCB contamination of milk and other dairy products, eggs, poultry, baby foods, animal feed and feed ingredients, and fish. FDA also has in effect an action level for PCB's in paper food-packaging materials.

Since issuance of the regulation, FDA has not encountered any industrial accidents involving the direct contamination of food and feed of the type that had occurred prior to 1971. Surveillance data gathered by FDA and the United States Department of Agriculture subsequent to the effective date of the temporary tolerances have shown that, with the exception of certain freshwater fish, the presence of PCB's in the individual foods subject to the tolerances, while still occasionally encountered, have substantially declined in both frequency and levels. These data further show that the average daily dietary intake of PCB's is quite low and well within the margin of safety. Details on the surveillance data are contained in Enclosure 2.

As you know, most fish intended for human consumption come from salt waters. The FDA sampling programs reveal that those fish are largely uncontaminated with PCB's (see Enclosure 2). Fish collected from commercial establishments contained an average of less than 0.2 parts per million (ppm) PCB's, substantially below levels that would pose a risk to health. However, consider-

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ably higher levels of PCB's are being detected in various species of freshwater fish, particularly sportsfish (e.g. coho and chinook salmon, lake trout) from several areas in the United States. We are currently developing information to determine the extent of the problem.

FDA's jurisdiction extends only to food in interstate commerce. Thus, the Agency cannot directly control sportfishing or the consumption of PCB-contaminated fish, unless such fish are being sold or shipped in interstate commerce. Nonetheless, we are concerned about the public health implications for sportsfishermen and others who may regularly consume fish that are caught from PCB-contaminated waters. We plan to work with individual State agencies regarding this aspect of the PCB pollution problem.

The presence of significant levels of PCB's in freshwater fish is caused by the continued industrial discharge and disposal of PCB's into the environment. For this reason, we strongly support the Environmental Protection Agency's (EPA) recently announced plans to curtail pollution of the environment by PCB's. We have assured EPA that the full scientific resources of FDA are available to assist in that Agency's efforts to control PCB discharges. Similarly, we have provided and will continue to provide the full range of our scientific expertise in support of individual State actions aimed at controlling industrial pollution of the environment with PCB's. As an example, FDA testified on the hazards of dietary exposure to PCB's at the October 1975 New York State hearings on PCB discharges into the Hudson River (see Enclosure 3).

Since the temporary tolerances were established in July 1973, additional toxicological data on PCB's have become available. These recently developed data have raised concern that PCB's may be more toxic than previously thought. Lowering the temporary tolerance, particularly the tolerance of 5 parts per million for fish, in light of these data, is under evaluation by FDA. As part of this indepth evaluation, we are gathering and reviewing data from different sources on the extent to which PCB's occur in fish and other foods. This information is needed, since section 406 of the Act requires an assessment of the impact on both human health and the food supply that would result from any lowering of the current temporary tolerances.

Additionally, on November 21, 1975, the Environmental Defense Fund and the National Resources Defense Council petitioned FDA to gradually reduce all the temporary tolerances for PCB's in food to zero. This petition and supporting information will be given full consideration in the Agency's current review activities.

If, on the basis of these reviews, lowering of any of the temporary tolernuces is warranted, a proposal to amend the existing PCB regulations will be published in the *Federal Register*, allowing an opportunty for public comment prior to implementing any revision.

As new toxicological data and data on the continued occurrence of PCB's in freshwater fish became available, we recognized the need to publicly address the issue. Thus, in the immediate future, FDA will publish in the *Federal Register* a statement of policy regarding the problem of PCB contamination of freshwater fish and the steps we have taken or may initiate to deal with the problem. All the information I am providing you in this letter, will appear in the policy statement.

In closing, we are very concerned about the hazards of PCB's since frequent consumption of fish containing in excess of 5 parts per million PCB's poses a risk to public health. I assure you that should additional regulatory actions become necessary in the future, the FDA will promptly take all appropriate steps, consistent with its statutory authority, to protect the public from PCB-contaminated fish.

If you and other members of the Committee need further assistance or have any additional questions, please let me know.

Sincerely yours,

ALEXANDER M. SCHMIDT, M.D.,
Commissioner of Food and Drugs.

Enclosures: (1) Commissioner of Food and Drugs, Polychlorinated Biphenyls-Contamination of Animal Feeds, Foods, and Food Packaging Materials, *Federal Register*, 38 (120) :18090–18103, July 6, 1973. (2) Levels of PCB's in the U.S. Food Supply by C. F. Jelinek and P. E. Corneliussen, Bureau of Foods, Food and Drug Administration, November 25, 1975. (3) Testimony of Albert C. Kolbye, Bureau of Foods, Food and Drug Administration, before the Department of Environmental Conservation, State of New York, October 17, 1975.

MONS 091520

U.S. DEPARTMENT OF COMMERCE,
NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION,
NATIONAL MARINE FISHERIES SERVICE,
Washington, D.C. November 12, 1975.

HON. RICHARD L. OTTINGER,
House of Representatives,
Washington, D.C.

DEAR MR. OTTINGER: In response to a telephone request by your office on October 23, 1975, for information on PCB in fish, I am enclosing data from the National Marine Fisheries Service (NMFS) in the National Oceanic and Atmospheric Administration (NOAA), and a cooperative study between NOAA and the Environmental Protection Agency (NOAA/EPA).

In these listings, only goosefish liver exceeds the current FDA guideline for DDT and PCB of 5.0 ppm (5000 ppb). Please note that the values for DDT and PCB from NMFS are expressed in parts per million (ppm). EPA/NOAA survey values are in parts per billion (ppb).

This information is preliminary in nature and as such presumptive conclusions should be avoided.

Please contact us if we can be of further assistance.

Sincerely,

for Robert W. Schoning, Director.

Enclosure.

ANALYSIS OF FOOD SPECIES FOR DDT AND PCB'S

Species	Number of fish	Total DDT concentration (parts per million) Mean	Range	Number of fish	Total PCB's concentration (parts per million) Mean	Range
Albacore	20	.019	.009-.031	20	<.05	<.04-<.07
Bass, striped	26	.527	.005-6.94	26	.714	.056-2.8
Bocaccio	10	.794	.099-3.07	10	.16	<.06-.37
Carp	1	.044	----------	1	<.06	----------
Halibut, Pacific	30	.039	.003-.175	30	.069	<.01-.149
Lingcod	20	.548	.027-7.28	20	.133	<.04-.80
Mackerel, jack	20	1.56	.004-4.54	20	.497	<.05-1.4
Marlin, blue	(1)	.014	----------	(1)	<.05	----------
Mussels	(2)	.001	----------	(2)	.092	----------
Salmon, chinook	4	.180	.067-.320	4	.172	.079-.29
Salmon, chum	2	<.011	<.01-.012	2	<.04	<.02-<.06
Salmon, coho	7	.047	.013-.174	6	.091	<.06-.17
Salmon, pink	2	<.015	<.01-.020	2	<.05	<.03-<.07
Salmon, sockeye	2	<.012	<.01-.014	2	<.04	<.02-<.06

[1] Composite of 10.
[2] Composite of 12.

POLYCHLORINATEDBIPHENYLS AND MERCURY IN STRIPED BASS (MORONE SAXATILIS)

Sample [1]	Weight (g)	Length (cm)	PCB (ppm)
S-5640	2,920	62.2	1.82
S-5641	2,350	58.1	17.2
S-5642	2,405	58.3	1.63
S-5643	2,285	56.4	1.37
S-5644	1,425	50.0	1.44
S-5645	2,085	56.0	0.92
S-5646	1,955	55.4	0.90
S-5647	1,800	54.0	0.82
S-5648	1,515	51.0	0.64
S-5649	2,170	59.5	1.05
S-5650	2,030	54.3	0.67
S-5651	1,755	52.7	1.69
S-5652	2,695	58.8	0.37

[1] Samples S-564 through S-5651 were caught on Aug. 25, 1975, off Romer Light, Raritan Bay, N.J., and samples S-5652 was caught on Aug. 11, 1975, off Long Branch, N.J.

The PCB results must be considered as preliminary at this time. Some adjustments may be necessary after the analyses of the DDT fractions have been completed. The PCB are calculated as Aroclor 1254 but the gas chromatographic analysis indicate the presence of some Aroclor 1242; thus, the values given may actually underestimate the real values.

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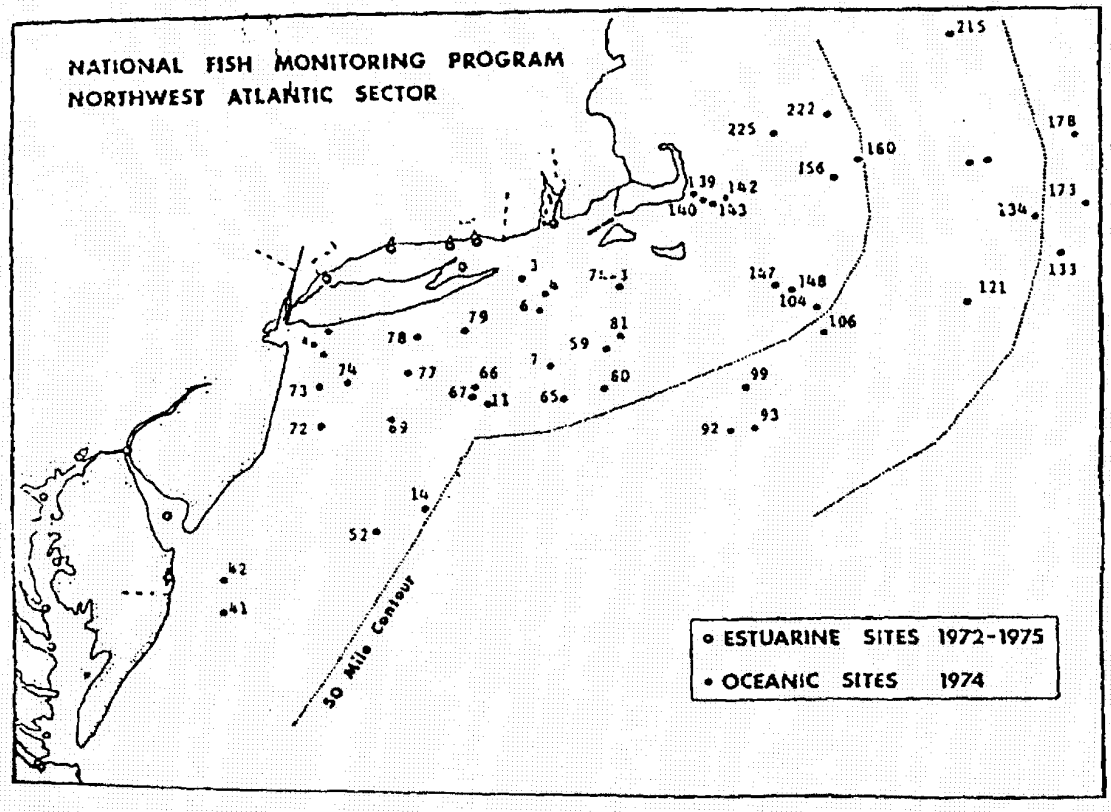
EPA-NOAA OCEAN FISH MONITORING PROGRAM, NORTHWEST ATLANTIC SECTOR—DATA SUMMARY

Fish livers	NMFS code numbers	Size range (inches)	Number of fish	Residue—average of 2 replicates, (parts per billion) sDDT	Residue—average of 2 replicates, (parts per billion) PCB[1]	Station numbers	Maximum bottom depth (meters)	EPA accession numbers 4-34-
Spiny dogfish	15	25-28	20	4764	2480	4, 6, 59	82	292
Little skate	26	12-18	3	616	1480	7	82	296
Do		10-18	8	180	968	106	50	297
Do		13-16	10	439	1427	41	39	298
Sea herring	32	8-12	40	93	133	76-3		315
Alewife	33	8-11	40	92	267	3, 66, 67	84	287
Silver hake	72	11-15	40	440	1009	11, 14, 78	219	295
Cod	73	12-22	20	700	1116	139, 140, 143	67	300
Haddock	74	16-22	10	557	1163	148	67	304
Do		18-23	10	242	619	134	81	305
Do		12-15	10	151	378	178	75	306
Pollack	75	25-29	12	1012	1276	184, 185	99	303
Do		16-18	6	1255	2606	173	116	311
Do		16-19	10	997	2413	148	67	312
Red hake	77	10-15	30	347	962	7, 14	154	314
American plaice	102	10-18	20	48	199	142, 156	140	290
Four-spot flounder	104	11-20	38	49	280	7, 11, 66, 79	219	294
Yellowtail flounder	105	10-14	20	16	177	74	39	301
Do		11-14	20	24	100	74-3		302
Mackerel	121	9-16	30	191	327	74-3		293
Butterfish	131	4-8	40	21	535	4, 7, 59	82	291
Scup	143	7-12	40	74	351	52, 66, 67	85	285
Redfish	155	9-15	24	374	338	160, 215, 222, 225	257	313
Longhorn sculpin	163	8-12	16	52	214	143, 147	89	307
Do		8-11	38	116	53	121, 133, 166, 167	99	308
Searobin	171	9-11	25	134	389	59	82	299
Ocean pout	193	16-26	50	67	308	4, 81, 104, 106, 142	77	309
Do		13, 17, 20	3	109	1234	72	39	310
Goose fish	197	9-20	5	1166	197	73	42	286
Do		9-22	5	6500	8909	14	154	288
Do		16-22	25	632	2040	7, 65, 81, 92, 93, 99	327	289

[1] PCB calculated as Arochlor-1254.

MONS 091522


NATIONAL FISH MONITORING PROGRAM
NORTHWEST ATLANTIC SECTOR
215
222
225
178
160
156
184
185
250 miles offshore
139
142
140
143
173
134
133
147
148
104
121
106
3
79
81
78
59
7
74
77
66
60
99
73
67
11
65
72
69
92
93
14
52
42
41
30 Mile Contour
ESTUARINE SITES 1972-1975
OCEANIC SITES 1974

MONS 091523

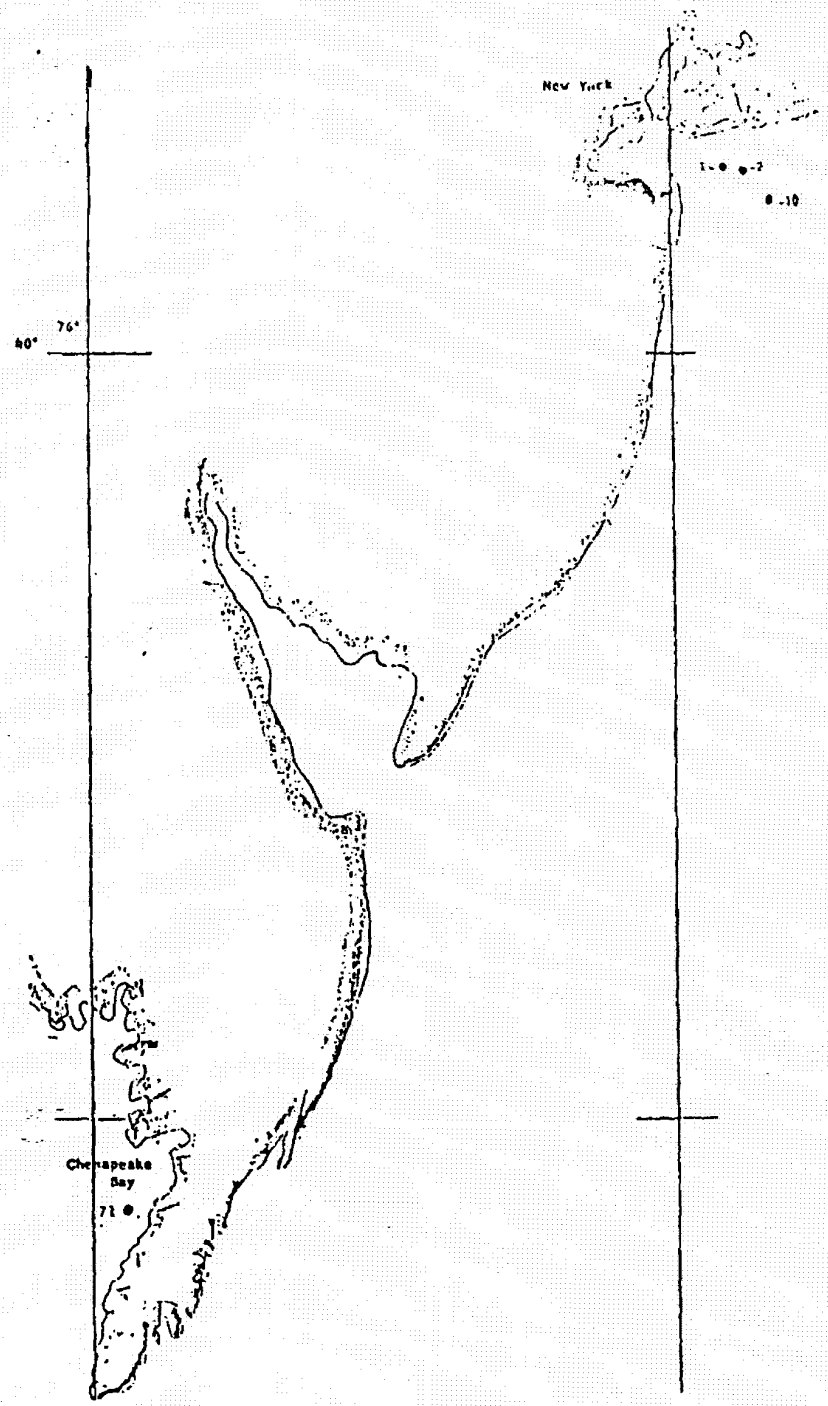


EPA-NOAA OCEAN FISH MONITORING PROGRAM, MIDDLE ATLANTIC STATES SECTOR

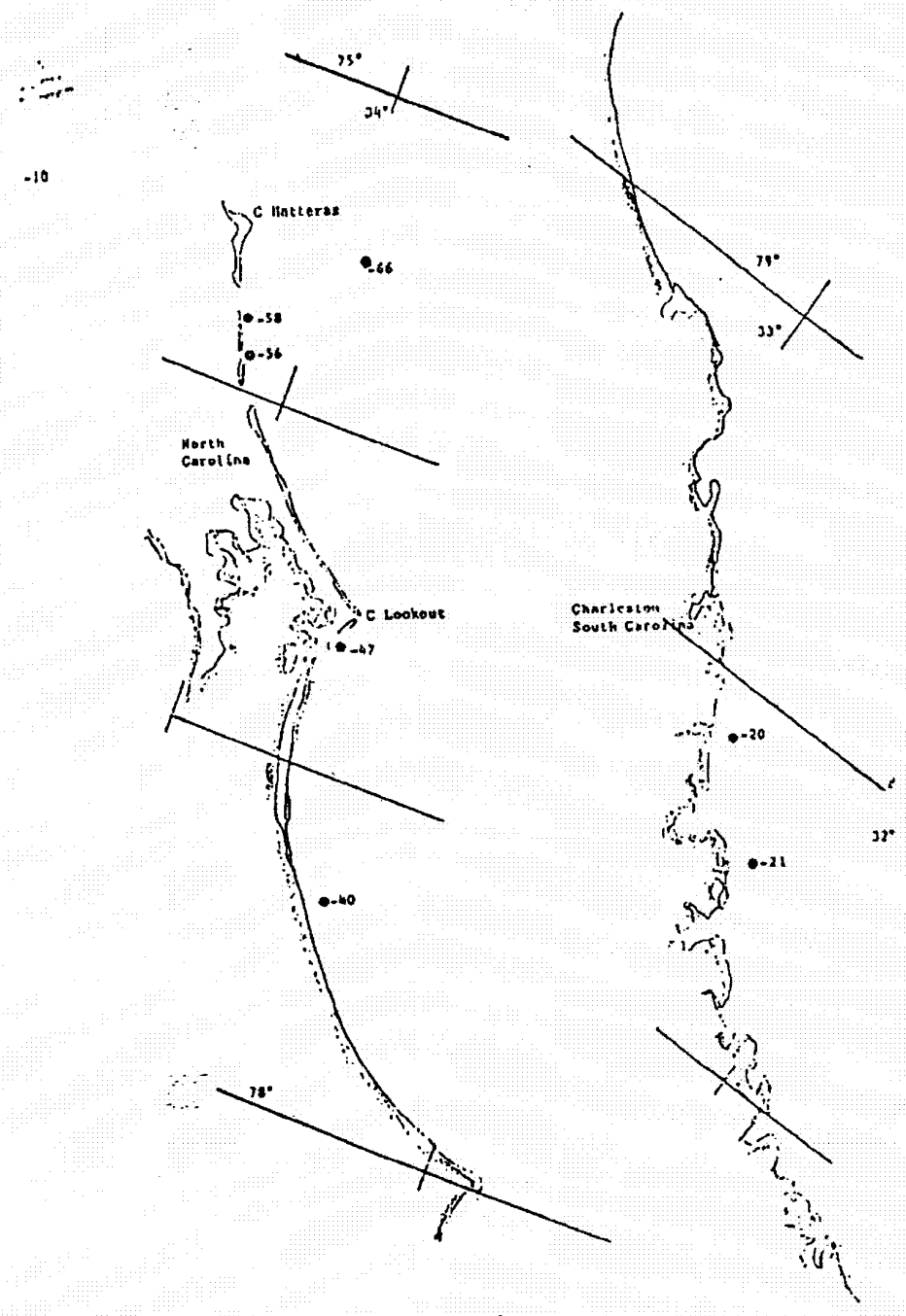
Whole fish	Size range (inches)	No residue detected	DDE (parts per billion)	TDE (parts per billion)	DDT (parts per billion)	PCB[1] (parts per billion)	Station numbers	Maximum bottom depth (meters)	EPA accession numbers 4-34-
Southern kingfish	7-8		87				38	15	387
Weakfish	5-8		35				58	09	388
Bluefish	8-10		63	16	17	259	2, 20, 71	26	389
Croaker	4-5	X					58	09	390
Red hake	3-5			25		100	2	26	391
Butterfish	4-6		16				1, 47, 56	28	398
Do	5-7		25				58	09	392
Spot	5-6		25			207	2, 20, 71	26	393
Do	5-6		19			149	1, 47, 56	28	397
Silver hake	4-7		14	13		127	8, 10	24	394
Spotted hake	3-4	X					1, 40, 66	28	395
Do	4-6	X					21	09	396

[1] PCB calculated as Arochlor-1254.

MONS 091524



MONS 091525


75°
34°
C Hatteras
-66
-58
-56
North Carolina
C Lookout
-47
-40
78°
79°
33°
Charleston
South Carolina
-20
32°
-21

MONS 091526

Mr. LEGGETT. Dick, do you intend to stay here now?

Mr. OTTINGER. I have to leave for a short period of time, but I will try to come back.

Mr. LEGGETT. There is no purpose in holding you here.

Mr. OTTINGER. I would like to insert for the record the article in today's New York Times.

Mr. LEGGETT. Without objection, so ordered.

[The document referred to follows:]

[From The New York Times, Jan. 30, 1976]

GOVERNOR EASES STAND ON PCB'S

OVERRULES REID AND TELLS G.E. IT HAS TILL 1977 TO MEET U.S. STANDARD

(By Linda Greenhouse)

Governor Carey, overruling his Commissioner of Environmental Conservation, has decided not to force the General Electric Company to stop completely its discharge of the toxic chemicals called PCB's into the Hudson River.

Instead, Mr. Carey has decided to require the company to adhere only to the Federal standard for PCB discharges, which calls for no more than 3.5 ounces a day by June 1, 1977.

The company now discharges about two pounds of the chemicals every day from two Hudson River plants compared with 30 pounds a day from 1971 to 1974.

The Environmental Commissioner, Ogden R. Reid, has asked General Electric to stop the discharges completely by next Sept. 30, and he is conducting hearings on whether the company has violated state water-quality standards.

Mr. Reid's policy has been opposed by the State Commerce Commissioner, John S. Dyson, on the ground that a standard that was stricter in New York than in other states would weaken New York's competitive position and drive out industry.

COMPANY'S POSITION

General Electric has said that while it could meet the Federal standard for 3.5 ounces a day, a zero discharge was not feasible and might lead to a decision to close the plants.

Governor Carey's acceptance of Mr. Dyson's argument is the first concrete sign of the policy the Governor announced this month in his State of the State speech. At that time, Mr. Carey said that he would weigh economic considerations in the formulation of environmental policy.

Mr. Reid was informed yesterday afternoon by Robert J. Morgado, Director of State Operations, of the Governor's decision. The Commissioner was not reachable for comment.

For the state to require zero discharge of PCB's, one of the Governor's top aides said yesterday, would "put us on the same old self-destruct course" of creating an unfavorable climate for industry here.

ISSUE CALLED "PHONY"

Furthermore, this aide, said, "after all those years of discharging 30 pounds a day, no one can tell me there's one bit of difference between zero and 3 ounces."

"It's a totally phony, symbolic issue," he added.

Mr. Reid and Mr. Dyson have also clashed publicly on the implementation of a new law requiring developers to file environmental-impact statements.

PCB's—polychlorinated biphenyls—have caused liver cancer, reproductive failure and skin infections in laboratory animals. Hudson River fish tested by state and Federal researchers have shown PCB levels far in excess of the allowable limit of five parts per million set by the Food and Drug Administration.

Earlier this week the Monsanto Company, the only maker of the chemical, said it would phase out production as soon as acceptable alternates were available. PCB's are used primarily in the production of capacitors and electric generators.

Mr. LEGGETT. Our next witness this morning is Mr. Gus Speth, Natural Resources Defense Council.

Mr. Speth, it is nice to have you here.

STATEMENT OF J. G. SPETH, NATURAL RESOURCES DEFENSE COUNCIL, WASHINGTON, D.C.

Mr. SPETH. Thank you very much.

Mr. LEGGETT. We have your statement, and we can include that as though you read it all. It is some 11 pages. You go into section 504 and EPA's actions thereunder, and section 311. Please proceed as you see fit.

Mr. SPETH. Thank you very much, Mr. Chairman.

I would like to spend a few minutes with you this morning, looking back over the past few years.

Mr. LEGGETT. I might state that we have all gotten pretty much the case in chief here, and if we want to develop some of these points through consultation and debate, it is my intention to have the people who are witnesses participate as a panel after they have testified, so keep that in mind.

I recognize it is now 20 minutes past 11, and we have other witnesses to hear.

Mr. SPETH. I appreciate that, Mr. Chairman. I shall try to move through the statement very quickly.

Mr. Chairman, members of the subcommittee, thank you for this opportunity. In the few minutes which I have this morning, I would like to look back over the events of the past few years, focusing particularly on the Federal regulatory responses to the PCB problem.

My hope is that as a result we can better understand the underlying problems which have led us to the current crisis situation regarding PCB's.

Over 3 years ago the Federal Water Pollution Control Act—FWPCA—directed the Environmental Protection Agency—EPA—to take swift action to reduce the discharge of PCB's and other toxic water pollutants to safe levels. The congressional authors of the FWPCA believed that the hazards posed by toxic substances made their effective regulation especially urgent.[1] Accordingly, they established in the act a national policy that the discharge of toxic pollutants in toxic amounts be prohibited.[2] Congress included in the act three tough provisions to insure that this important goal was fully implemented: Section 307(a) relating to industrial dischargers; section 311 relating to spills and leaks; and section 504, the emergency powers provision.

Yet, during the past 3 years, EPA has failed to carry out these provisions. For example, if section 307(a)'s mandatory deadlines had been met, pollutant effluent standards covering PCB's and other toxic pollutants would have been promulgated by EPA roughly 2 years ago and complied with by manufacturers and users of PCB's about 1 year ago. To date, however, EPA has failed to promulgate a single standard under this provision.

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[1] S. Rept. 92-414, 92d Cong., 1st sess. 61 (1971).
[2] FWPCA sec. 101(a)(3), 33 U.S.C. 1251(a)(3).

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It is instructive to review the events leading up to this debacle. Section 307(a) requires EPA to first develop a list of toxic water pollutants. For the substances on this list EPA must subsequently develop and enforce strict effluent standards, standards which must protect the users of the waters with an ample margin of safety.[3]

EPA began inauspiciously by failing to meet FWPCA's deadline for publication of the list of toxic pollutants. When, 4 months later the list had still not been published, the Natural Resources Defense Council brought suit challenging EPA's default. That suit ended in June 1973, when the U.S. district court ordered EPA to publish the list.[4] The list published by EPA as a result of this court directive though limited to only nine toxic pollutants, did include PCB's.

Section 307(a) also requires that prior to promulgating final standards for substances it has listed, EPA must first propose such standards for public comment and then hold a formal, trial-type hearing on them. Standards for the nine substances, PCB's included, were in fact proposed by EPA in late 1973. The required hearing began in early 1974 and continued through May 1974.

Under section 307(a) EPA is mandated to promulgate final standards not later than 6 months after publication of proposed standards or immediately if EPA chooses to modify the proposed standards as a result of the hearrings.[5] Yet, despite this requirement, 2 years have elapsesd without the promulgation by EPA of a single standard under section 307(a).

Mr. LEGGETT. What loopholes does EPA have in promulgating regulations to ban toxic substances like PCB's?

Mr. SPETH. You mean what are the problems that have come up?

Mr. LEGGETT. You have mandated they should do this. They have some loopholes, obviously, that I would suspect Governor Carey has used as a rationale for his action yesterday.

Mr. SPETH. I propose to answer that when I come to page 5 of my testimony, where I begin to discuss what I see as the important factors that led up to the debacle under section 307(a).

This failure to develop final standards is being challenged in a lawsuit brought in the District of Columbia.[6] The NRDC and the environmental defense fund—EDF—plaintiffs in the suit, are claiming that the EPA's omission is contrary to FWPCA's requirements and are seeking a ruling establishing court-ordered deadlines for final EPA action on toxic pollutant effluent standards.

In affidavits filed in this lawsuit, EPA has stated that the record of the original hearing could not justify or support the promulgation of either the originally proposed standards or any specific modification thereof.[7] In support of this conclusion, EPA claims that the evidence at the hearing was inadequate to permit the agency to determine what level of each of the toxic pollutants would provide an ample margin of safety as required by section 307(a) of the act. EPA also stated

[3] FWPCA sec. 307(a)(4).
[4] *Natural Resources Defense Council* v. *Fri*, D.D.C. civil action No. 849-73, decree and stipulation (June 10, 1973).
[5] FWPCA secs. 307(a)(2)–(3).
[6] *Environmental Defense Fund and Natural Resources Defense Council* v. *Train*, D.D.C. No. 75-0172.
[7] Affidavit of Robert V. Zener, August 12, 1975, filed in *EDF and NRDC* v. *Train*, supra.

that it was unable at the hearings to either assess or respond to industry evidence tending to show that the proposed standards would have substantial economic repercussions on the regulated industries.[8]

Accordingly, EPA now intends to propose new toxic pollutant effluent standards, and to begin the hearing process again. The agency states that under its new schedule it expects to propose new standards for PCB's in late February 1976.[9] EPA has also informed the parties to the lawsuit that these new PCB standards, unlike the original standards, will be limited to dischargers who manufacture PCB's in castings, electrical transformers and capacitors.

Behind this record of delays lies a series of complex problems which deserve to be examined in a far more comprehensive manner that I can undertake here. My own judgment, based on our work in this area over the past 3 years, is that several underlying factors are principally responsible for this failure of Federal regulation. I offer them for further examination and discussion.

First, EPA has never had a strong institutional commitment to doing something about the problem of toxic water pollutants. Partly this is a reflection of the historic concerns of the sanitary engineering profession, concerns which still dominate much of EPA's thinking, and partly it results from the failure of EPA leadership to assign priority attention to this problem during the formative period of the Agency's programs.

Even as Congress was developing the Act, EPA informed the House Public Works Committee that "we do not endorse the provisions of section 307 relating to toxic substances." [10] Subsequently, the resources EPA allocated to the toxic pollutant problem were miniscule in comparison with the need, and this pattern continued despite the fact that it was repeatedly criticized. As late as March 1975, EPA's priorities in the water pollution area completely neglected control of toxic pollutants. In a discussion of priorities for fiscal year 1976, EPA failed to mention toxic pollutants in a table listing the Agency's first, second, and even third priorities for the coming year.[11]

A second factor has been the very large and well financed efforts by the dischargers of toxic pollutants to oppose development of standards under section 307(a). Approximately 35 major corporations and industry groups challenged EPA's proposed standards in the formal hearing that was held in early 1974. The talents of many of the country's best paid lawyers and scientists were at the disposal of the PCB, mercury and cyanide dischargers, and it seems almost certain that far more resources were spent picking apart EPA's proposed standards than EPA had used in developing them.

One theme developed by the dischargers at these hearings was the potential economic impact of meeting the proposed standards. Evidence was introduced at the hearings to show that the technology to meet some of the standards was not available or that where it was available it could only be installed at substantial expense. It was also contended that the proposed standards would force segments of major industries to shut down.

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[8] Ibid.
[9] Affidavit of Kenneth M. Mackenthun, August 12, 1975, filed in *EDF and NRDC v. Train, Supra.*
[10] Senate Committee on Public Works, *A Legislative History of the Water Pollution Control Act Amendments of 1972*, Serial No. 93-1, 93d Cong., 1st Sess. (1973) at 1199.
[11] See 6 BNA Environmental Reporter, Current Developments, 1893 (Mar. 28, 1975).

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EPA, though it has never rigorously investigated these claims, has nevertheless acted on them to the point that concern over economic dislocations has become a major inhibiting factor with the Agency, overshadowing any concern with public health and environmental quality.

Environmentalists have urged EPA, unsuccessfully, not to delay standards developments on these grounds, pointing out the self-interest in such claims of hardship and also EPA's obligation to implement the act as Congress wrote it.

If a discharger believes that a variance from a section 307(a) standard is jusified in light of economic hardship, that plea, environmental groups have urged, should first be addressed to Congress, since section 307(a) does not now contain a variance provision. But the absence of such a variance provision should not be used to justify inaction, or inadequate action, by EPA.

Finally, there is the problem of EPA's inadequate resources. Even if EPA's priorities reflected more concern with toxic pollutants, the Agency would not have sufficient qualified personnel and contracting capability to mount a program of the magnitude required.

The past 3 years have been years in which EPA has been kept in a permanently underfunded state even though more adequate funding has been consistently sought from the Office of Management and Budget by the Agency.

Mr. LEGGETT. That would be OMB's fault, rather than the Agency.

Mr. SPETH. Absolutely.

Mr. Chairman, to make matters worse, the President's proposed budget for the coming fiscal year contains severe cuts in the funds for EPA's water pollution program, just at a time when increased efforts should be going into controlling toxic pollutants.

SECTION 311

Similarly, EPA's program to regulate "spills" of hazardous substances under section 311 of the act is beginning late and heading in the wrong direction. For almost 6 years EPA and its predecessor have been obligated by our Federal Water Pollution law to promulgate a list of hazardous water pollutants.

A few weeks ago EPA finally proposed such a list. Moreover, these proposed regulations, which are admirable in many respects, would be completely undercut by the terribly weak penalties provisions associated with them.

Whereas the act authorizes EPA to impose fines of up to $5 million for spills of hazardous materials such as PCB's, EPA announced in these regulations that it intended to voluntarily limit fines to a maximum of only $5,000, except in cases in which gross negligence on the part of the polluter can be proven. Since gross negligence is extremely difficult to prove in the context of spills, $5,000 is likely to be the maximum fine in most cases—hardly a deterrent to a large corporation.

It has been reported that this weakening of the penalties provisions was essential to secure White House approval of the proposed regulations.

I am sure the committee is aware of what is euphemistically called the "quality of life review," under which regulations proposed by

FDA and EPA, where questions of health and questions of environment are concerned, must be approved by other Federal Agencies, including OMB.

Mr. LEGGETT. So down there you do not blame the EPA, but the White House.

Mr. SPETH. Absolutely. I think it is extremely important to appreciate that this "quality of life review," so-called, has been used throughout the history of the Federal Water Pollution Control Act to weaken and cripple EPA programs.

SECTION 511

Section 504 of FWPCA directs EPA to initiate emergency court action against polluters when there is an "imminent and substantial endangerment" to public health or welfare. This provision, although it would be clearly applicable to PCB discharges, has never been invoked by EPA in the PCB context and, indeed, has rarely, if ever, been used by EPA in any context.

More recently, press stories regarding major PCB contamination of the Hudson, the Great Lakes, and other water bodies spanned much of 1975. Together with the pleas of citizen groups, these reports finally spurred EPA to belated action last month, at least on PCB's.

Our organization, together with the Hudson River Fishermen's Association, urged EPA in August 1975, to use its powers under section 504 to move immediately to impose strict conditions on PCB users.

In its announcement last month EPA rejected this approach and indicated instead that it would proceed in the coming months to impose strict PCB discharge limitations by amending individual discharge permits.

In the one action of which we are aware that EPA has taken of this type, the Agency has proposed that G.E.'s facility on the Hudson be required to achieve no discharge of PCB's by mid-1977. This is an admirable proposal, and one which we obviously support.

However, this move applies to only one facility. We must also question whether EPA's objective might not be more swiftly achieved by action under section 504.

The preceding so try is hardly one which inspires confidence. It is a story of corporations with no sense of responsibility to the public—corporations which in their supreme arrogance have quite literally destroyed public property and poisoned our food.

It is also a story of a regulatory agency that was unprepared—both in terms of its own motivation and resources provided to it—to deal with the problem until embarrassed into doing so by an attentive press and an aroused and startled public. And even though public pressure has now forced EPA to act on PCB's, it must be stressed that that is only one pollutant, one carcinogen.

The public awaits the next bad news. The present situation is intolerable, and the question the public wants to know is: What is Congress going to do about it?

The only thing I would like to add, Mr. Chairman, at this point, is that it was brought to my attention just the other day that there is a treaty agreement as part of our arrangement with the Organization for Economic Cooperation and Development regarding PCB's.

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This is, as I read it, a binding treaty of the United States. It requires that a number in a very specific and far-reaching steps be taken to eliminate the contamination of the environment by PCB's. It was entered into by the United States in early 1973, 3 years ago, and I think a fair reading of this treaty, and a comparison of what the United States has done since that time, would indicate that we are certainly very close, and probably in violation of our treaty agreement with the other members of the OECD.

I do not pretend to be an expert on international law, or an expert on this treaty, since it just came to my attention, but my quick perusal of it does suggest that conclusion.

I would like to submit that for the record, as well as a letter that we wrote to EPA, urging that they act under section 504. I should also like to submit EPA's two paragraph response, which told us nothing more than "thank you," and our comments, which are not lengthy, on the proposed discharge limitation for the General Electric facility on the Hudson.

Mr. LEGGETT. Without objection, so ordered.

[The following was received for the record.]

NATURAL RESOURCES DEFENSE COUNCIL, INC.,
Washington, D.C., August 29, 1975.

RUSSELL E. TRAIN,
Administrator,
U.S. Environmental Protection Agency,
Washington, D.C.

DEAR MR. TRAIN: We are writing on behalf of the Natural Resources Defense Council and the Hudson River Fishermen's Association to request that you take immediate and decisive action under Section 504 of the Federal Water Pollution Control Act Amendments of 1972 (the Act) to curtail the discharge of polychlorinated biphenyls (PCB's) into the Hudson River from industrial and other sources.

As a result of past and continuing discharges of this extremely toxic and cancer-producing chemical from General Electric and other plants on the Hudson River, it is now almost impossible to catch fish in the Hudson which can be considered safe to eat under the existing Food and Drug Administration (FDA) contamination limits applicable to PCB's. Yet the Hudson supports an intense recreational and commercial fishery. It is estimated that approximately 22 million pounds of Hudson River striped bass are consumed each year from both commercial and sport catches. Accordingly, the continued discharge of PCB's into the Hudson constitutes a serious and imminent danger to the health and welfare of the public.

Ample authority exists under Section 504 of the 1972 Act for the Environmental Protection Agency (EPA) to correct this poisoning by a few firms of a major food and recreational resource. We urge that you initiate legal proceedings under this provision immediately. In the 1972 Act Congress declared the "national policy that the discharge of toxic pollutants in toxic amounts be prohibited." Section 101(a)(3). The current Hudson River situation presents a compelling case for the implementation of this important policy.

In the remainder of this letter we set out certain considerations which should be helpful to you in implementing Section 504. First, we will describe briefly the toxic and carcinogenic properties of PCB's. Next, we will summarize the data indicating the nature and extent of the Hudson River fishery. Then, we will set out the facts as we know them regarding the discharges of PCB's into the Hudson and the resulting contamination of the fish population. Finally, we recommend appropriate steps for EPA to take under Section 504 and otherwise.

I. CHRONIC TOXICITY OF PCB

The toxicity of PCB to humans has been clearly demonstrated. In 1968 a severe form of skin disease was diagnosed of Japanese families that consumed

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rice oil contaminated with Kanachlor 400 (PCB with 48% chlorine content).[1] A total of 1,057 poisoning cases have been recorded to date in Japan,[2] and the disease is characterized by swelling of the upper eyelids, visual impairment, acne-like formations and heightened pigmentation of the skin.[3] Patients with this disease also exhibited neurological disorders and showed a signs of hearing loss. Several babies born of women patients had many of the symptoms of the disease which indicated a placental transport of PCB, and most fetuses were born smaller than the national average.[4] Another disturbing feature of this disease was the observation that most patients recovered very slowly, which suggested that PCB was retained in the human body over a very long period.[5]

It should be noted here that human contamination with PCB's is not isolated. PCB's have been detected in human adipose tissue in such widespread occurrence that over 40% of the U.S. population contains 1 part per million (ppm) or more.[7]

A number of studies have conclusively shown the effect of PCB's on the reproduction of several animal species. At 100 ppm in the diet of experimental rats, PCB (Aroclor 1242 and 1254)[8] caused a reduction in the number of offspring that were born.[9] Similarly, in another study, dietary levels of as little as 20 ppm of Aroclor 1254 caused a decreased number of litters to be born to female rats.[10] In a reproduction study carried out with minks, dietary levels of less than 1 ppm of PCB's caused a marked depression on the ability of minks to reproduce.[11] The effects of PCB on the reproduction of pheasants and chickens have also been demonstrated. Aroclor 1254 has a noticeable effect on both the production and hatchability of pheasant eggs.[12] With chickens, dietary levels of as little as 10 ppm of Aroclor 1242 and 100 ppm of Aroclor 1254 caused thinning of eggshells, reduced egg production and reduced hatchability.[13] In this context, it is important to note that homologs of PCB with lower chlorine content may have a greater effect on reproduction than biphenyls with higher chlorine content. In a recent review article on the toxicology of PCB, Dr. Renate Kimbrough of the Center for Disease Control in Atlanta, Georgia stated:[14]

"The results obtained from the reproduction studies in birds particularly seem to indicate that the lower chlorinated biphenyls affect reproduction more than the higher chlorinatd biphenyls, and it is very important to determine whether the lower chlorinated biphenyls that have been suggested as replacements for presently employed chlorinated biphenyls have an effect on reproduction."

In an extensive series of studies carried out by Dr. James Allen and his colleagues at the University of Wisconsin Medical School, PCB's fed in the diet of rhesus monkeys caused significant effects that mimicked both the symptoms of known human toxicity and reproduction failures in experimental animals. When female rhesus monkeys were given 25 ppm of Aroclor 1248 for a period of two months, severe symptoms of facial swelling and skin eruptions were

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[1] R. D. Kimbrough, "The Toxicity of Polychlorinated Polycyclic Compounds and Related Chemicals," *CRC Critical Reviews in Toxicity*, January 1974, p. 445.

[2] M. Kuratsune, *et al.*, "An Epidemiological Study on 'Yusho' or Chlorobiphenyls Poisoning," *Fukuoka Acta Med.*, 59, 513, 1960.

[3] M. Kuratsune, *et al.*, "Epidemiological Study of Yusho, a poisoning caused by ingestion of rice oil contaminatated with a commercial brand of polychlorinated biphenyls," *Environ. Health Perspectives, No. 1*, 110, 1972.

[4] *Op. cit.*, Kimbrough, p. 466.

[5] *Ibid*, p. 466-467.

[6] *Op. cit.*, Kuratsune, *et al.*, *Environ. Health Perspectives.*

[7] H. A. Price and R. L. Welch, "Occurence of PCBs in Humans," *Environ. Health Perspectives, No. 1*, April 1972.

[8] Monsanto, the sole producer of PCB in the U.S., sells its product under the trade name, Aroclor. This product is sold under different formulations: Aroclor 1260, 1254, 1248, 1242, 1016, etc. The last two digits in this biphenyl series denote percentage of chlorine in the mixture. Aroclor 1016 is an exception to this nomenclature, since it contains 41% chlorine, and in fact is very similar in composition to Aroclor 1242. Other trade names abroad for PCB are: Kanaclor and Santhaterm in Japan, and Clophen, Flenclor, Phenoclor and Sorol in Europe.

[9] *Op. cit.*, Kimbrough, p. 455.

[10] *Ibid*, p. 455.

[11] N.S. Platonow and L. H. Karstad, "Dietary Effects of Polychlorinated Biphenyls on Mink," *Canadian J. Comp. Med.*, 37, 391, 1973.

[12] R. E. Dahlgren, R. L. Linder and C. W. Carlson, "Polychlorinated Biphenyls: Their Effects on Penned Pheasants," *Environ. Health Perspectives, No. 1*, 89, 1972.

[13] M. L. Keplinger, O. B. Fancher and J. C. Calandra, "Toxicologic Studies with Polychlorinated Biphenyls," *Toxicology & Applied Pharmacology, 19*, 402, 1971.

[14] *Op. cit.*, Kimbrough, p. 455.

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manifested.[18] At lower dietary levels of 5 ppm and 2.5 ppm (Aroclor 1248) similar clinical symptoms were observed after a few months, and more significantly, these low levels of PCB caused marked effect on reproduction. After three matings with male monkeys, only 12.5% of the 5 ppm PCB dietary group and 37.5% of the 2.5 ppm group were pregnant as compared to 90% pregnancies with a comparable control group.[19] At the same time, fetuses that were born were significantly smaller in size and continued to ingest high PCB levels from the nursed milk of their mothers.[20] These effects at low PCB levels are particularly important to note, since the present Food and Drug Administration tolerance limit for PCB residue in fish and shellfish is 5 ppm,[21] and were based on an assumption of a higher no-effect level.

Of serious concern is a recent study conducted by a group of research investigators at the Center for Disease Control, Atlanta, Georgia, the U.S. Environmental Protection Agency, the National Cancer Institute and the Johns Hopkins University School of Medicine.[22] They observed that when Sherman strain female rats were fed 100 ppm of PCB (Aroclor 1260) for about 21 months, 26 of 184 of the experimental animals examined had malignant liver tumors (hepatocellular carcinoma) whereas only 1 of 173 control animals had the same disease. At the same time 140 of the experimental and none of the control animals had tumorous lesions (neo-plastic nodules) in the liver. That PCB's can cause malignancies in experimental animals is not altogether surprising, since it has been pointed out in the studies with rhesus monkeys that PCB is metabolized to a potent carcinogenic intermediate compound, the arene oxides:[23]

"The arene oxides have been shown to be strong alkylating agents capable of producing sufficient changes in the proteins and nucleic acids to cause death or neoplastic transformations in affected cells."

Other toxic effects of PCB that have been reported in the scientific literature include: (1) increase in the biological activity of certain hydroxylating enzymes in the liver and increased estrogenic activity in the rat, (2) induction of liver porphyria in several animal species, (3) interference with the immune defense mechanisms of rabbits, (4) neurological disorders in rats, (5) increased PCB residue in fatty tissues, crum and milk, and (6) teratogenic effect in the chick embryo.[24-26]

After reviewing data such as the preceding, the Lake Michigan Toxic Substances Committee made the following observations in its draft report:[27]

"1. The effect level of PCBs in primates reproduction is recently documented is recently documented as less than 2.5 ppm and is much lower than has been observed in Standard test mammals (rats).

2. As a result of recent court decisions the FDA is now enforcing the 5 ppm residues maximum in fish intended for human consumption and is likely to review the 5 ppm maximum allowable based on recent primate toxicological evidence."

The FDA review of its 5 ppm residue maximum referred to by the Lake Michigan Committee is timely and essential. Our present judgment is that the available data support at least an order-of-magnitude reduction of this PCB residue maximum, i.e. at least a reduction to 0.5 ppm. Significantly, this recommended 0.5 ppm maximum permissible PCB concentration in fish is the same as that recommended by the National Academy of Sciences and the National Academy of Engineering in *Water Quality Criteria*, 1972[28] and by EPA in its proposed *Criteria for Water Quality*.[29]

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[18] J. R. Allen, L. A. Carstens and D. A. Barsotti, "Residual Effects of Short-Term, Low-Level Exposure of Nonhuman Primates to Polychlorinated Biphenyls," *Toxicol. & Appl. Pharmacol.*, 30, 440, 1974.

[19] J. R. Allen, "Response of the Nonhuman Primate to Polychlorinated Biphenyl Exposure," *Federation Proceedings*, 34, 1675, 1975.

[20] J. R. Allen, University of Wisconsin Medical School, Regional Primate Research Center, Madison, Wisconsin, private communication.

[21] *Federal Register*, Vol. 38, No. 129, p. 18008, July 6, 1973.

[22] R. D. Kimbrough, R. A. Squire, R. E. Linder, J. D. Strandberg, R. J. Montali and V. W. Burse, "Induction of Liver Tumors in Sherman Strain Female Rats by Polychlorinated Biphenyl Aroclor 1260," preprint of study obtained from R. D. Kimbrough, Center for Disease Control, Atlanta, Georgia.

[23] *Op. cit.*, Allen, *Federation Proceedings*, p. 1670.

[24] "*Polychlorinated Biphenyls and the Environment*," Interdepartmental Task Force on PCB's, Washington, D.C., May 1972.

[25] J. F. Allen and D. W. Narbeck, "Polychlorinated Biphenyl and Terphenyl-Induced Gastric Mucosal Hyperplasia in Primates," *Science*, 179, 498, 1973.

[26] Environmental Protection Agency, *et al.*, State of Concerns of the Lake Michigan Toxic Substances Committee Related to Polychlorinated Biphenyls, draft, July, 1975, p. 21.

[27] NAS-NAE, *Water Quality Criteria, 1972*, p. 177.

[28] EPA, *Criteria for Water Quality (Proposed)*, October, 1973, p. 21.

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II. IMPORTANCE OF HUDSON RIVER FISHERY

The Hudson River is a productive breeding ground for fish, not only for resident species such as white perch but for migratory oceanic species like striped bass, shad and herring. The shortnose sturgeon, which has been classified as an endangered species, is also an inhabitant of the Hudson River.[26]

Striped bass are the most economically important of the fish that spawn in the Hudson since the species supports a major recreational and commercial fishery. For that reason, too, it is a species of particular concern in terms of invoking Section 504 because of the high levels of public consumption of Hudson River striped bass and the economic dependence of commercial fishermen on the species.

The weight in 1970 of the striped bass commercial catch in the New England Region plus New York State (including the Hudson River) was 2,780,000 pounds.[27] The weight in 1970 of the striped bass sport catch in the North Atlantic (which includes New York State) was 45,844,000 pounds.[28] Hudson-spawned striped bass are a major component of the Atlantic stock. Though estimates have varied, there is no doubt that the contribution is substantial. The Staff of the Nuclear Regulatory Commission [29] has taken the position that:

1. The Hudson River stock is the major source of striped bass caught in the Hudson River, the western half of Long Island Sound, and the New York Bight (Barnegat Inlet, N.J. to Moriches Inlet, N.Y.). In this "Inner Zone" of influence the NRC Staff estimates that more than 50% of the sports and commercial landings are made up of Hudson-spawned striped bass and uses a figure of 90% for its own estimates.[30]

2. In the "Outer Zone" of influence, extending from Maine to Cape May County, N.J. (less the Inner Zone), Hudson-spawned striped bass constitute somewhere between 10 and 50% of the sports and commercial fishery.

The average annual commercial catch of striped bass for the years 1961–1969 in the Inner Zone was 268,200 pounds.[31] Using the NRC's 90% figure, 241,000 pounds represents the average annual commercial catch in the Inner Zone attributable to Hudson River striped bass. The average annual commercial catch in the Outer Zone is 1,900,000,[32] 50% of which is 984,500 pounds. The annual total for commercial catch of Hudson River striped bass is therefore estimated to be about 1,200,000 pounds.

In 1970, a pound of striped bass would bring a commercial fisherman $.26/lb. on the average. The retail price would be, at a minimum, 3 times that amount. Striped bass is now selling at $1/lb. in New York. Using this retail value of $1/lb., the value of the commercial catch of Hudson River striped bass appears to be in the range of $1.2 million per year.

In 1970, the striped bass sports catch exceeded the commercial catch in the North Atlantic (which includes N.Y. State) by a factor of 16.6.[33] Assuming an annual commercial catch of 1,200,000 pounds of Hudson River striped bass, one can extrapolate to a sports catch of 21,200,000 pounds. This amount represents a little less than 50% of the 45,844,000 1970 sports catch of striped bass in the North Atlantic and, therefore, is if anything an underestimation of the Hudson River sports catch. In sum, something on the order of 22,000,000 pounds of Hudson River striped bass are probably consumed each year, if we combine these commercial and sports catch figures. Moreover, the problem is even more serious than the above information would indicate. The striped bass is a migratory fish with stock from various sources (*e.g.*, the Chesapeake, Delaware, and

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[26] U.S. Department of the Interior, "Endangered Species of the United States," Bureau of Sport Fisheries & Wildlife, U.S. Fish & Wildlife Service, 1970. Because the sturgeon is a bottom-feeding fish, eating mostly snails, clams and crustaceans, as well as plants, it may be particularly threatened with PCB contamination. Any failure by EPA to act with respect to PCB effluents in the Hudson would appear to violate Section 7 of the Endangered Species Act of 1973, 16 U.S.C. § 1536, which requires all agencies of the federal government to take such actions necessary to "insure that actions authorized, funded, or carried out by them do not jeopardize the continued existence of such endangered species . . . or result in the destruction or modification of habitat of such species determined by the Secretary [of the Interior] . . . to be critical."

[27] National Marine Fisheries Service Publication, "Fisheries Statistics of the United States," 1971.

[28] Deuel, D. G., "1970 Salt-Water Angling Survey," U.S. Department of Commerce, NOAA, National Marine Fisheries Service, Current Fishery Statistics No. 6200, 1973.

[29] Final Environmental Statement (FES), Operation of Indian Point Nuclear Generating Station Unit No. 3 (Consolidated Edison Company of New York, Inc.), February 1975.

[30] FES, p. V-189.

[31] FES, Table V-24.

[32] FES X 1–86.

[33] FES, p. V-176.

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Hudson) intermingling. Since there is no way to distinguish origin of a striped bass, the entire North Atlantic stock may be contaminated.

III. HUDSON FISH CONTAMINATION AND INDUSTRIAL DISCHARGERS

Studies performed over the past few years by both EPA and the State of New York confirm the severe contamination of Hudson River fish by PCB's. New York State results, for example, show that striped bass samples collected in 1973 at the Tappan Zee Bridge area had PCB levels ranging between 3.7 ppm and 49.6 ppm, with over 80% of the fish sampled in excess of the FDA maximum of 5 ppm. Striped bass samples collected this year had levels averaging around 6 ppm, with one sample as high as 37.8 ppm. Results typically higher than 5 ppm have been found at other Hudson sites.

EPA investigators have found similar results in the Hudson Falls–Ft. Edward Area.[24] This study yielded PCB concentrations in yellow perch averaging 17 ppm. Shiner minnows ranged from an average of 7 ppm at one site above the General Electric plants to 78 ppm below them. A sample of rock bass below GE contained 350 ppm. The EPA report noted:

"It is significant that the shiners and sunfish both contained PCB's, especially since these species are important grazers upon periphyton communities and serve as food for large consumers, namely the game fish; i.e., pike, pickerel, bass and larger yellow perch.

The PCB level in the rock bass is greater than the maximum level documented for fish taken from any industrial river of the U.S. (Nisbet & Sarofim, 1972). This represents a new record for PCB contamination of fresh water fish.

Although the game fish species are not commercially utilized in this stretch of the Hudson, sport fishing is a common widespread recreational activity for the inhabitants of Hudson Falls and Ft. Edward."

Industrial and related discharges are the principal source of PCB's in surface waters. The chemical is biomagnified as it moves up the food chain to fish which may eventually be caught and eaten by people. The PCB's remain biologically active throughout this process. Significantly, the Lake Michigan Committee made the following recommendation:

"Because biological accumulation of PCBs by fish and other aquatic organisms has been documented as greater than 40,000 and 75,000 times the exposure level respectively, it is recommended that PCBs do not enter the receiving waters of Lake Michigan at detectable concentrations."[25]

There appear to be several point sources discharging PCB's into the Hudson. Prominent among them are the General Electric facilities at Hudson Falls–Fort Edward. In its NPDES permit application GE indicated that it was regularly discharging approximately 30 lbs./day of PCB's from these plants into the Hudson, and this is the amount the company is permitted to discharge today under its proposed EPA permit. The amount actually being discharged by GE today may be somewhat smaller but is still far in excess of acceptable levels. For example, EPA's proposed permit limit on PCB's (which is presently under challenge by GE and is not in effect) would require GE to reduce its PCB discharge to roughly ¼ pound per day over the next two years. Yet even a discharge of ¼ pound per day would result in an estimated concentration of PCB's in the Hudson 10 times higher than that recommended by the NAS–NAE and EPA.[26] In light of the large past and continuing discharges of PCB's from these GE plants, it is not surprising that the EPA study concluded that the contamination of aquatic species at the sites downstream of the GE plants "is probably from the General Electric outfalls" and that "the high level of contamination in the downstream sediments is probably from the Ft. Edward [GE] outfall."[27] The EPA analysis of the fish samples taken below the GE outfalls indicates that the PCB in the edible tissue appeared to be a mixture of Aroclor 1242 and 1016.[28] Aroclor 1242 was the PCB mixture discharged by GE until about two years ago, at which time Aroclor 1016 was substituted.

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[24] R. J. Nadeau and R. P. Davis, "Investigation of Polychlorinated Biphenyls in the Hudson River: Hudson Falls-Fort Edward Area," EPA Region II Report, circa October, 1974.

[25] *Lake Michigan Committee Report*, *op. cit.*, pp. 12–13.

[26] Both *Water Quality Criteria*, *op. cit.*, and *Criteria for Water Quality (Proposed)*, *op. cit.*, recommend that the receiving water concentration of PCB not exceed 2 parts per trillion (ppt). Using a stream flow of 2000 cfs, instream dilution of a discharge containing .25 lbs./day yields a downstream PCB concentration of roughly 20 ppt.

[27] "Investigation of PCB's in the Hudson River," *op. cit.*, p. 15.

[28] Memoranda from Gilman D. Veith, Ph.D., Research Chemist, National Water Quality Laboratory, Duluth, to Dr. Rogal L. Nadeau, EPA, Region II, September 13, 1974, and October 23, 1974.

IV. RECOMMENDED EPA ACTIONS

Under Section 504 the EPA Administrator is given the authority to seek whatever emergency relief may be necessary to deal with pollution sources presenting "an imminent and substantial endangerment to the health of persons or to the welfare of persons." In light of the evidence outlined here—fish consistently contaminated with PCB's far above acceptable levels, the great danger to the public health posed by ingestion of PCB's, and the adverse economic impact on a major national commercial fishery which depends on the Hudson—we believe that EPA must use its emergency powers to curtail the discharge of PCB's.

The harm posed by the continued discharge of PCB's into the Hudson unquestionably meets the criteria set out in Section 504. There is clearly an "endangerment" to human health, since continued ingestion of sport and commercial fish contaminated with PCB's presents a "liability or exposure to harm or injury" (Oxford English Dictionary). The endangerment is also "substantial," as amply documented by the scientific studies on the adverse effects of PCB ingestion and the information available on the size and nature of the Hudson River fishery. Furthermore, the endangerment is "imminent" ("impending threateningly, hanging over one's head"—Oxford English Dictionary). Imminence does not require actual illness or death from the pollution, though illness certainly may have occurred already. Likewise, there is a serious and imminent endangerment to the welfare of commercial fishermen who make their living selling fish from the Hudson.

We therefore call upon you to take the following steps:

1. To initiate legal actions pursuant to Section 504 to reduce the PCB discharges from all industrial and other point sources on the Hudson, including for example the General Electric plants, to a level which will ensure that receiving water concentrations of 2 ppt will not be exceeded and that, to the fullest extent possible, PCB contamination levels in edible species will not exceed .5 ppm.[*] These levels should be achieved on an urgent basis within a period not to exceed one year.

2. To announce that as early as possible and certainly within a very few years EPA will commence enforcement on a nationwide basis of a strict policy of no discharge regarding PCB's. Such a policy could, and hopefully will, result in a ban on PCB manufacture or use. There are excellent reasons to believe that PCB substitutes exist, even for the one allegedly indispensable use—a dielectric fluid in transformers and capacitors. Possible substitutes in transformers and/or capacitors include mineral oil, silicones, alkylated chlorobiphenyloxide (Dow XFS 4169.), and dioctyl phthalate.[**] Japan now has a ban on PCB's, and Canada is seriously considering such a step.

3. To impose, in cooperation with other federal and state agencies, an immediate moratorium on all dredging activities in the Hudson which might have the effect of disturbing PCB contaminated sediments or sludges. Extensive investigations should be undertaken of the potential effects of such dredging.

We appreciate this opportunity to share our views with you on this important matter. Please let us know in what ways we can cooperate further with you in this effort.

Respectfully,

J. G. Speth,
A. Karim Ahmed, Ph. D.,
Sarah Chasis,
Khristine L. Hall,
Natural Resources Defense Council.

Natural Resources Defense Council, Inc.,
New York, N.Y., January 26, 1976.

Re: *Public Notice No. NPDES 75-870, December 26, 1975.*

Chief,

Status of Compliance Branch, U.S. Environmental Protection Agency, Region II, New York, N.Y.

Dear Sir or Madam: Enclosed are the comments of the Natural Resources Defense Council, *et al.* concerning EPA's Notice of Proposed Modification of

[*] See the discussion on p. 7 and in note 36, *supra*.
[**] We do not by these references endorse any of these specific substances.

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NPDES Permit (No. NY 000 7048), issued to the General Electric Company for its facilities at Hudson Falls and Fort Edward, New York.

We request that notice of any final decision by the Administrator with respect to the proposed modification, as well as notice of any public hearing or request for an adjudicatory hearing, be given to NRDC, *et al.* by serving a copy thereof upon the undersigned.

Yours sincerely,

SARAH CHASIS,
Staff Attorney,
Natural Resources Defense Council.

Enclosure.

COMMENTS OF THE NATURAL RESOURCES DEFENSE COUNCIL, THE HUDSON RIVER FISHERMEN'S ASSOCIATION, THE HUDSON RIVER SLOOP RESTORATION, AND THE FEDERATED CONSERVATIONISTS OF WESTCHESTER COUNTY ON EPA'S PROPOSED MODIFICATION OF NPDES PERMIT NO. NY 000 7048, ISSUED TO THE GENERAL ELECTRIC COMPANY FOR ITS FACILITIES AT HUDSON FALLS AND FORT EDWARD, N.Y.

(By Sarah Chasis, Esq. and A. Karim Ahmed, Ph.D., Natural Resources Defense Council, Inc. January 26, 1976)

These comments are submitted on behalf of the Natural Resources Defense Council, the Hudson River Fishermen's Association, the Hudson River Sloop Restoration and the Federated Conservationists of Westchester County. The Natural Resources Defense Council (NRDC) is a national environmental organization with a membership of over 18,000. NRDC's purposes include protection of America's endangered resources and protection and improvement of the quality of the human environment. The Hudson River Fishermen's Association (HRFA) is a conservation organization with a membership of approximately 750. Its purposes include encouragement of the rational use of the aquatic resources of the Hudson River and its tributaries and abatement of pollution in the Hudson River. The Hudson River Sloop Restoration (HRSR), with a membership of approximately 4,000, many of whom reside in the Hudson Valley, is dedicated to maintaining the ecology and condition of the Hudson River. The Federated Conservationists of Westchester County (FCWC) is a coalition of 75 environmental groups in Westchester County, dedicated to providing support for solution of regional problems in conservation. Over the years, each of these organizations has devoted substantial resources to improvement and protection of the resource-rich Hudson River estuary.

Most recently, these groups, represented by NRDC attorneys, have intervened as full parties in the New York State enforcement proceeding against General Electric relating to its discharges of PCBs into the Hudson River at Hudson Falls and Fort Edward. Because of this involvement, these groups are particularly knowledgeable concerning the issues related to GE's continuing discharges of PCBs. These groups are also especially affected by EPA's action on PCBs because of the stake they and their members have in protection and enhancement of the resources of the Hudson River.

THE PROPOSED MODIFICATION OF GE'S NPDES PERMIT

In August 1975, NRDC and HRFA wrote to EPA Administrator Train demanding that he exercise his emergency powers under Section 504 of the FWPCA. The request was based on evidence that GE's discharges of PCBs into the Hudson River presented an "imminent and substantial endangerment" to the health of human consumers of Hudson River fish and the welfare of commercial fishermen who make their living selling fish from the Hudson River. We asked, *inter alia*, that GE's discharges be radically curbed by September, 1976 and that there be an immediate moratorium on all dredging activities in the Hudson River which might have the effect of disturbing PCB contaminated sediments. However, EPA has in the past and continues to refuse to exercise its 504 powers.

The evidence adduced during the course of hearings before the New York State Department of Environmental Conservation concerning GE's alleged violations of state law supports an exercise by EPA of its emergency powers. Fish in the Upper Hudson River below GE's plants at Hudson Falls and Fort Edward contain PCB concentrations in the range of 20–300 ppm Aroclor 1016/1242, with one fish sample containing 658 ppm. Fish throughout the Lower Hudson

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contain levels of PCBs well above the 5 ppm temporary tolerance level set by FDA. Furthermore, it is clear that it is GE's past and ongoing discharges of PCBs in the Upper Hudson River which have resulted in these high levels of contamination.

These levels of PCB contamination constitute an imminent threat to the survival of fish species in the Hudson River and to the extensive commercial and sport fisheries dependent thereon. Most importantly, the concentrations of PCBs in the edible portion of fish in the Hudson River present a serious health hazard to the human consumers of such fish.

The fact that GE has curbed its discharges during 1975 does not alleviate the need for emergency action. GE's present discharges from its two plants range from .7 to 13.0 lbs/day, with an average daily discharge for October and November, 1975 of at least 3.2 lbs/day. These discharges result in concentrations in receiving waters far in excess of the 1 ppt standard recommended by EPA's National Water Quality Lab at Duluth, Minnesota. The present discharge also results in concentrations in fish greater than .1 ppm, the standard recommended for fish by the Great Lakes Water Quality Board of the International Joint Commission.

Moreover, just as GE's past discharges have contributed to present levels of contamination in Hudson River biota and sediments, so too will GE's present discharges. The persistent nature of PCBs, combined with the manner in which they bioaccumulate from water and sediments and biomagnify up the food chain, necessarily means that daily discharges over time will contribute to the buildup of PCB concentrations in sediments and biota at levels toxic to fish and humans. Moreover, GE's present discharges exist against a background of already high levels of PCB contamination, resulting from 20-25 years of PCB discharges by GE. Thus, further contribution to already dangerous levels of PCBs threaten injury to the Hudson River fishery and human consumers thereof.

In view of such evidence, combined with the evidence of the toxicity of Aroclor 1016/1242 to both fish and humans, we deplore EPA's failure to exercise its emergency powers. The present route EPA has chosen to follow, namely modification of the existing NPDES permit, is unsatisfactory for three major reasons. The foremost reason is that the proposed effluent limitations on present and future discharges of PCBs may not become effective if GE challenges the proposed modifications, until after an adjudicatory hearing. 40 C.F.R. Section 125.35(d)(2). If a request for an adjudicatory hearing is made and granted, it would mean that the discharge limitation of 30 lbs/day contained in GE's existing NPDES permit would be the only federal limitation in effect. Second, the proposed modifications of the present limitations on GE's discharge, even if they were to go into effect immediately, are too high. Third, EPA has failed to address the problem of limiting GE's discharges of PCBs into the Hudson Falls sewage treatment plant.

Rather than sanctioning GE's present discharge level by setting limits of 1.5 lbs/day PCBs for the two plants during dry weather and 5.3 lbs/day PCBs for the two plants during wet weather, EPA should establish an abatement schedule which requires GE to attain a maximum daily discharge of "none" [1] at all discharge points at the Fort Edward and Hudson Falls plants, as soon as such a level can be technologically achieved. Technological achievability should be defined not only on the basis of available treatment technology, but also with reference to the existence and commercial availability of substitutes for PCBs.

GE itself has said on record in the DEC proceeding that it has the technological capability for attaining a maximum daily discharge of 100g PCBs by the end of 1976. At the very least, EPA's proposed effluent limitations should take account of this admitted capability by requiring such a discharge level, if not a more stringent one, for December, 1976.

In addition to EPA's failure to exercise its 504 emergency powers or to propose sufficiently stringent effluent limitations, EPA has failed to address a very real problem connected with GE's discharges into the Hudson River, namely GE's indirect discharges of PCBs into the Hudson River via the Hudson Falls sewage treatment plant. It appears that the discharge of PCBs from the treatment plant (measured at .37 to 7.13 lbs/day) is in fact an indirect discharge

[1] For enforcement purposes, a violation of the "none" limitation should be defined as occurring at the point where the level of PCB concentration in the effluent can be detected by the most sensitive analytic technique available.

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into the Hudson River from GE's Hudson Falls plant. Pursuant to its authority under Section 307(b) of the FWPCA, EPA should immediately establish pretreatment standards applicable to the GE discharge into the Hudson Falls sewage treatment plant and, pursuant to Section 402(a)(1), impose an appropriate condition in the NPDES permit. If this is not done several pounds per day of PCBs will continue to be discharged into the Hudson River by GE without control or limitation.

In addition to these major criticisms of the proposed permit modifications, we have certain other comments. We agree on the proposed designation of "none" as the maximum daily discharge for DSN 001, 003 and inclusion of DSN 003B, 003A and 006, also with a proposed maximum daily limitation of "none". However, we recommend that effluent limitations for discharges 003A, 005 and 007 also be included, with a maximum daily limitation of "none".

We agree that effluent limitations should be met as gross discharge values. This is particularly appropriate for the Hudson Falls plant where the main discharge pipe (002) is located near the intake and the other discharge pipes, i.e., 001 and 007, as well as the Hudson Falls sewage treatment plant are located upstream of the intake. Cross-contamination of the intake waters with discharge waters is likely, making use of net figures unreliable.

We recommend that Paragraph 12 of the permit be modified so as to require *weekly* rather than bimonthly monitoring of the effluent from the two plants.

Just as Paragraph 10(c)(2) correctly incorporates the terms of the State's 401 certification limiting the discharge of toxic wastes, so should Paragraph 9 in order to accurately reflect the conditions placed by New York State on GE's present discharges.

Finally, we have serious questions concerning the adequacy of the limitations placed on GE's discharges of oil and grease into the Hudson River. For DSN 002, the present limitation is 100 kg/day of oil and grease (220 lbs/day), with a 1000-fold reduction required by July 1, 1977. What is the reason for permitting such a substantial discharge. If 180g/day can be attained by July 1, 1977, why not require such a reduction now? Has any determination been made of the receiving water concentrations resulting from a 220 lb/day discharge at low, average and high flows and of whether proposed receiving water standards for oil and grease would be violated by such a discharge? The present limitations on discharges of oil and grease from both DSN 002 and 004 are particularly troubling because of the solubility of PCBs in the oil and grease component of the effluent.

CONCLUSION

Immediate and stringent controls are needed for the discharge of PCBs from GE's facilities and premises at Hudson Falls and Fort Edward, New York. The imminent threat to human health and to a vital fishery require no less. NRDC, *et al.*, view EPA's proposed permit modifications as a step in the right direction, but as inadequate to the task at hand. We urge the exercise of emergency powers under Section 504 of the FWPCA and the establishment of a maximum daily discharge level of "none" for all GE's discharges as soon as is technologically achievable. In addition, we call on EPA to undertake those other actions, such as the imposition of a moratorium on dredging in the Hudson River, which are necessary to control the substantial threats to health and welfare posed by the present situation.

ORGANISATION FOR ECONOMIC CO-OPERATION AND DEVELOPMENT: DECISION OF THE COUNCIL ON PROTECTION OF THE ENVIRONMENT BY CONTROL OF POLYCHLORINATED BIPHENYLS

(Adopted by the Council at its 315th Meeting on 13th February, 1973)

The Council, having regard to Articles 5(a), 5(b) and 12(c) of the Convention on the Organisation for Economic Co-operation and Development of 14th December, 1960;

Having regard to the Recommendation of the Council of 26th May, 1972, on Guiding Principles concerning International Economic Aspects of Environmental Policies [C(72)128];

Having regard to the Note by the Secretary-General of 7th February, 1973, concerning Proposals for Concerted Action with respect to Polychlorinated [illegible]

Considering that the use of Polychlorinated Biphenyls (PCBs) should be controlled by international action in order to minimise their escape into the environment pending the realisation of the ultimate objective of eliminating entirely their escape into the environment;

On the proposal of the Environment Committee;

I. DECIDES

1. Member countries shall ensure that in their respective territories, Polychlorinated Biphenyls (PCBs) shall not be used for industrial or commercial purposes, except in the following categories of use: *Dielectric fluids* for transformers or large power factor correction capacitors; *Heat transfer fluids* (other than in installations for processing of foods, drugs, feeds and veterinary products); *Hydraulic fluids* in mining equipment; and as regards the foregoing categories, PCBs may be used only in those applications in which the requirements for non-inflammability outweigh the need for environmental protection and in which Member countries are satisfied that sufficient controls are exercised in order to minimize risk to the environment.

2. In pursuance of paragraph I.1 above, Member countries shall: (a) control the manufacture, import and export of bulk PCBs; (b) institute adequate arrangements for the recovery, regeneration, adequate incineration or other safe disposal of surplus and waste materials; (c) institute a special, uniform labelling system for both bulk PCBs and PCB-containing manufactured products; and (d) establish safety specifications for containers and transport.

II. RECOMMENDS

Member countries in implementing the Decisions set forth in Section I above:

1. Control and manufacture, import and export of PCB-containing products.

2. Work towards the elimination of the use of PCBs in small capacitors.

3. Give priority attention to the elimination of the following applications of PCBs: (a) heat transfer fluids in the food, pharmaceuticals, feed and vethary industries; (b) plasticizers for paints, inks, copying paper, adhesives, sealants; (c) hydraulic liquids (other than in mining) and lubricating oils; (d) vacuum pump fluids and cutting oils; and (e) pesticides.

4. Request firms to use, as PCB replacements, materials which are less hazardous to human health and the environment than the range of PCBs now in use.

III. DECIDES

At the beginning of 1974, 1975 and 1976 within the frame-work of the Environment Committee, Member countries shall exchange information on the main statistical data concerning PCBs, notably on: (1) amounts of PCBs, including: amounts manufactured by PCB type, amounts imported by PCB type and by country, amounts exported by PCB type and by country, amounts incinerated by PCB type, amounts consumed by PCB type and by use;

(2) PCB replacements supplied by manufacturers, including the following points: identification, total amounts for each chemical type and for each use, known toxicity and environmental hazard of each chemical type; and (3) disposal of surplus PCBs by incineration (including evaluation of incinerator efficiency) or by other efficient means.

IV. NOTES

"Technical Note on Polychlorinated Biphenyls" contained in the Appendix to this Decision.

V. INVITES

Member countries to report to the Organisation at the beginning of 1974, 1975 and 1976 on measures taken in application of this Decision.

VI. INSTRUCTS

Environment Committee to follow the implementation of this Decision, to report at regular intervals to the Council on the information exchanges provided for in Section III of this Decision and to make such proposals to further improve and strengthen the control of production and use of PCBs as may

seem appropriate in the light of experience gained and the continued work of the Organisation in this field.

APPENDIX—TECHNICAL NOTE ON POLYCHLORINATED BIPHENYLS

INTRODUCTION

1. Polychlorinated biphenyls (PCBs) are a group of stable substances comprising theoretically more than 200 individual compounds, many of which are widely used particularly because of their dielectric properties and non-flammability. At present they are obtained through chlorination of diphenyl, resulting in mixtures that are characterised by their average content of chlorine. Due to the persistence and toxicity of some of these compounds,[1] effects have been observed in the environment and accidents reported over the last few years, which have given rise to serious concern in Member countries. In view of this concern the Sector Group on Unintended Occurrence of Chemicals in the Environment has investigated, on a priority basis, the need for, and feasibility of, concerted action to control the use and emissions of PCBs. The results of this inquiry, which have been presented in document NR/ENV/72.49, lead to the following conclusions:

(a) Because of unacceptable levels of PCBs found in the environment and because of a number of incidents involving human health, some countries have taken, or are considering taking action to control the use of PCBs;

(b) There are (1972) only six companies in O.E.C.D. Member countries that manufacture PCBs: five of them have already taken steps to reduce production to the supply for a few approved uses;

(c) PCBs can be replaced except for some users where their dielectric properties and non-flammability are essential;

(d) The technology for destruction of PCBs exists;

(e) Because of the many applications of PCBs in the wide range of consumer products moving in international trade, the situation will almost certainly become complicated unless international agreement is reached on allowable uses; and

(f) A rough estimate[2] indicates that consumption of PCBs in O.E.C.D. countries is matched by production. Considering in addition that import of chemicals from non-O.E.C.D. to O.E.C.D. countries is still restricted to basic chemicals, import of bulk PCBs is unlikely. It is, therefore, reasonable to suggest that the major part of the problem of unintended occurrence of PCBs can be solved through concerted action between O.E.C.D. Member countries.

USES OF PCBS

2. The applications of PCBs fall mainly into two categories: uses in closed systems and dissipative uses.

CLOSED SYSTEMS

3. The use of PCBs in closed systems can be defined as applications from which the PCBs are recoverable. PCBs in transformers, capacitors, heat transfer systems, hydraulic equipment, and vacuum pumps are in principle recoverable, since during use, the PCBs are not generally dispersed into the environment.

4. It is, however, important to distinguish between closed system uses that are controllable in practice and those where control cannot be guaranteed either: because frequent replacement of relatively small quantities will lead to disposal rather than recovery, or because a large number of small units widely dispersed will make collection extremely difficult, or because accidental leakage will cause imminent danger to human health.

5. A truly controllable use may therefore be defined as an application where: the PCBs are contained in a sealed circuit in large, long-life units; the quantities involved are such that there is an incentive for regeneration.

6. Following what has been said above, the only truly controllable uses of PCBs are in dielectrics for *transformers* and for *large capacitors* for power fac-

[1] As of the time of the preparation of this Note, limited research studies with certain selected PCB-compounds seem to indicate that some of these compounds could eventually safely be used for certain applications.

[2] Production in 1971 amounted to about 48,400 metric tons and consumption in the 13 countries that provided numerical information to about 35,300 tons.

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tor correction. Preventing escape of PCBs from these applications is mainly a problem of engineering design and of collection and destruction of used liquids, or, in the case of capacitors, of removal and destruction of PCB-impregnated material. These uses also being essential for safety reasons, it would be unreasonable to suggest that they be discontinued at the present time.

7. In all other closed systems, recovery of PCBs, although theoretically possible, would not be practical. Such applications should, therefore, be discontinued, unless safety requirements prevent the use of substitute products:

(i) *Heat transfer systems.*—There may be some installations where the risk of explosion or fire must be avoided at all cost, and the danger of some escape of PCBs therefore is of less importance. Because of the risk of leakage, which can never be totally guarded against, the use of PCBs as heat transfer media in the food, drugs and feed industries should, however, be prohibited.

(ii) *Hydraulic equipment, vacuum pumps.*—Although the quantities involved in the individual case are relatively small, they will, unless recovered, add significantly to the environmental burden of PCBs. Theoretically, used fluids could be recovered, but in view of the difficulty of establishing a system to collect small quantities from many users, these applications should be discontinued. Furthermore, PCBs are generally not essential in hydraulic and pumping fluids, with the possible exception of hydraulic equipment in underground mining.

(iii) *Small capacitors.*—These are typical examples of an application of PCBs in sealed units that are almost completely non-recoverable. Considering, for example, the many domestic electrical appliances in which capacitors are used, the cost of recovery would probably be prohibitive. A warning label showing that the equipment must not be disposed of as ordinary waste has been suggested; it is however, not likely to be sufficient, unless manufacturers and retailers would accept return of appliances that are out of use. The problem of recovery remains unresolved at the present time, but it has to be noted that Japan has stopped the use of PCBs in the manufacture of small capacitors.

DISSIPATIVE USES

8. The dissipative uses are those where recovery of used PCBs is not possible, since they are not contained in closed systems but in direct contact with the environment:

(i) *Lubricating and cutting oils.*—The conditions under which these oils are used are such that there is continuous emission of small quantities into the environment. These applications, not being essential, should be discontinued;

(ii) *Pesticide use.*—This use has fortunately been abandoned in most countries already; if not, it should be banned with immediate effect. Since all O.E.C.D. countries require registration of pesticides, such a measure can easily be taken under existing legislation;

(iii) *Plasticizers.*—The most important category, by volume of dissipative use is in the field of plasticizers. They are or have been used in most countries in a wide variety of consumer products including paints, inks, copying paper, adhesives, sealants, plastic products, etc., many of which are traded internationally. The major applications seem to be in the printing and paint industries.

9. *The printing industry:* Because of the risk of contamination of paper, which after recycling may be used in food packaging, the use of PCBs in the printing industry should be banned. In view of the fact that printing inks can be produced without PCBs and that in any case the amount used probably represents a total value of only about $30,000 in O.E.C.D. countries, such a measure should not cause serious economic damage. Assuming that copying paper is usually provided by the copying machine manufacturers (relatively few and big companies), any economic effects should be small.

10. *The paint industry* poses a somewhat different problem. Over the last decade, production has increased by 3.5 per cent—5 per cent annually and the trend is rising in the O.E.C.D. area.

The over 2,000 million dollar West European paint industry alone accounts for some 40 per cent of the world output. Production is assured by a few large and a great many small companies (United Kingdom=480, Italy and France=350 etc.). This picture suggests that an overall ban on PCBs in paints could have some economic consequences.

It appears, however, that where used (e.g. in stoving applications) PCBs constitute something like 5–10 per cent of the paint. Few details are available in

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respect of the amounts used in paints, but taking one example (France) where 250 tons were used (1971) in a paint industry that produced something like 700,000 tons of paint, presumably only 2500–5000 tons would contain PCBs. Considering in addition that small paint manufacturers are generally highly specialised, and that the manufacturing process would not have to undergo a major change to replace the use of PCBs, a ban on PCBs should not cause any serious disturbance. The use of PCBs in paints has, in fact, been discontinued in some countries already. Figures for production (8,654,200 tons in 1969) and consumption (8,517,500 tons) in O.E.C.D. countires again suggest that import of paints from non-O.E.C.D. producers may be of minor significance.

11. In practice, none of the products where PCBs have been used as plasticizers can be recovered. Unless the use is totally eliminated, there will be continuous emissions into the environment due to evaporation, insufficient incinceration, etc. Judging by the action already taken in several countries, substitutes can readily be found for the whole category of plasticizer use of PCBs, which should, therefore, be banned.

12. It follows from what has been said above that for adequate protection of health and environment, but also to avoid undue competition in international trade, agreement is necessary on allowed uses of PCBs. In order to ensure that home production is not substituted by import, control action by governments, through licencing or other means, is essential. Measures are further necessary to ensure collection of used material, safety in transport of raw PCBs, and assessment of substitute materials:

(a) A uniform labelling system, internationally recognisable, should be developed for use on containers of raw PCBs as well as on any equipment or product containing PCBs.

(b) Suppliers (i.e. manufacturers and importers) should further provide containers for the transport of PCB-containing liquids: such containers must meet the appropriate specifications that have been laid down to ensure safety in transport of dangerous chemicals.

(c) Development of substitutes that are less hazardous than persistent PCBs[*] should be encouraged, but in view of the fact that no system for pre-market control of new chemicals has been introduced, testing for environmental effects is so far entirely the responsibility of the manufacturers. Information on replacement products should, therefore, be collected and reviewed.

Mr. LEGGETT. Are they manufacturing these PCB's in the OECD countries?

Mr. SPETH. I do not know.

Mr. LEGGETT. Monsanto indicated that they exported considerable of this commodity, and we did not get a rundown of exactly who bought it, but the export to OECD countries?

Mr. SPETH. I would imagine if they are exporting, they are, but I cannot say for sure.

Mr. LEGGETT. No, I guess EPA would say that they have done a prima facie good job in that they have cut down the utilization of PCB's over 4 or 5 years by 50 percent, and they have restricted it to closed systems.

Now they are surprised that the net results show that closed system limitation is not really all that closed, and second, apparently these PCB's tend to disseminate all over irrespective of attempts to limit. They do persist for a very, very long time.

There appears to be at this point very little correlation between reduction in PCB's and in fish and other items, reduction in production of PCB's.

Mr. SPETH. Well, Mr. Chairman, it is a phased thing, I suppose. We will have to stop some time.

Mr. LEGGETT. That is right.

[*] See footnote on page 234.

Anyway, we are now coming to the point where everybody is kind of coming up to speed, and we recognize that this is a problem that has got to be taken out of the environment. It does have a long life and after life, and multiple life, I suppose.

I think everybody now is getting reasonably polarized.

I would not call EPA arrogant, however.

Mr. SPETH. I called the corporations arrogant, not the EPA.

Mr. LEGGETT. I shall not comment on that.

Mr. SPETH. Let me just point out one other matter.

A number of times the question has come up as to EPA saying, on the one hand, that it does not like the legal authorities that it has to deal with. Yet, I think it is important to appreciate that EPA has not sought to amend section 307(a), for example, or to amend section 504, except in one instance in section 307(a) on a very limited basis, just to extend the deadline for 2 additional years.

Mr. LEGGETT. But you say they have a mandate there, and they have not carried out the law.

Mr. SPETH. We have to carry it one step further, and ask ourselves well, why has not the EPA come to Capitol Hill to get some of these changes, and you get two very interesting answers.

One of the answers is that they cannot get these things through the administration.

Mr. LEGGETT. So that is not EPA's fault, either, is it?

Mr. SPETH. That is correct.

The other answer is, they are afraid to get some of these issues up to Congress because they are concerned they do not have the support on Capitol Hill they need. And that is Congress' fault.

Mr. LEGGETT. What?

Mr. SPETH. Thank you.

Mr. LEGGETT. Mr. Anderson?

Mr. ANDERSON. No questions.

Mr. LEGGETT. Mr. Forsythe?

Mr. FORSYTHE. No questions.

Mr. LEGGETT. Mr. Oberstar?

Mr. OBERSTAR. No. questions.

Mr. LEGGETT. Mr. Mannina?

Mr. MANNINA. Two questions, if I may.

On page 5 of your testimony you indicated that EPA's new standard would be limited in certain matters.

What will fall through the cracks if the standards are limited.

Mr. SPETH. Well, it is my feeling that when you promulgate a standard on something as serious as PCB's you should make it apply across the board to anyone who might be discharging PCB's out of a point source, OK?

The PCB standards EPA is now discussing will be limited to manufacturing, and to the uses in capacitors and transformers. Anyone else who is discharging PCB's, for example, a recycling paper operation, or anyone else who might be using it, will not be covered. I am not in a position right now to identify across the board everyone who is discharging PCB's in the country, but there is some evidence that PCB's are being imported. There are uses of PCB's in the country that are going on which are outside of those categories that the General Electric plant falls into.

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I think it is important when you are dealing with PCB's not to narrow your standard to just the easily identifiable categories of dischargers, but to make it broad, and catch everyone.

Mr. MANNINA. Do you have any idea what percentage of PCB users will be covered by the new EPA standards?

Mr. SPETH. No, I do not have that data, but I think EPA's own Office of Enforcement should be able to provide that to you.

Mr. MANNINA. On page 6 of your testimony you indicate that EPA's first three priorities do not include toxic substances.

Do you know what their three first priorities listings are?

Mr. SPETH. I do not have that with me. What I am quoting here is the draft version of EPA's water strategy document for last year. It was finalized a couple of months later, as I recall, and basically that section of it did not change. To what extent EPA has reformed in recent months and raised the priority, I do not know, but the point is, as of just 1 year or so ago this whole question of toxic water pollutants was not a high priority within the Agency, and it has not been over the past 3 years.

I can provide you with those priorities, if you like.

Mr. MANNINA. Thank you, Mr. Chairman.

Mr. LEGGETT. Thank you very much.

Our next witness is Mr. Joe Highland of the Environmental Defense Fund.

Mr. Highland, nice to have you here. Your statement will be received, consisting of 14 pages, and you have charts and graphs on pages 9 and 13, and all of those will be included in our record.

You may summarize your statement, highlight it, or read it.

The option is yours.

STATEMENT OF JOSEPH H. HIGHLAND, Ph. D., CHAIRMAN, TOXIC CHEMICALS PROGRAM, ENVIRONMENTAL DEFENSE FUND

Mr. HIGHLAND. Thank you, Mr. Chairman.

Let me reflect on one point you were discussing with Mr. Speth.

It has not been EPA that has restricted the use of PCB's to closed systems, or cut down on the production. That is not the EPA.

Mr. LEGGETT. Who did that?

Mr. HIGHLAND. That is a voluntary action by Monsanto Chemical Co.

As far as the levels in fish in the years subsequent to that cut down, there is no indication of any reduction in the levels of PCB's in fish.

As a matter of fact, in one of the fish in the Great Lakes, I believe it is chinook salmon, there has been an increase still in the levels recorded in fish tissues.

I believe that the whole consideration of how EPA has regulated the problem of PCB's contamination has to be considered in light of two basic questions; that is, the health hazard posed by exposure to these chemicals, and in this case, actual exposure we suffer.

Let me get into my statement and highlight some of the points. Let me first tell you something about our organization.

The Environmental Defense Fund is a nonprofit, public interest organization, with a membership of some 40,000 scientists, lawyers,

and citizens nationwide. Since our inception in 1967, we have been actively involved in actions aimed at reducing the involuntary exposure of the public to carcinogenic chemicals.

Our past actions, resulting in a ban on the carcinogenic pesticides DDT and Aldrin/dieldrin, are examples of our successes in halting widespread exposure of the public to carcinogenic chemicals.

Although the Environmental Defense Fund is actively involved in a variety of public health issues, I will confine my remarks this morning to a discussion of the need for immediate and appropriate regulatory action to limit our further unnecessary exposure to polychlorinated biphenyls—PCB's.

Appropriate regulatory action is long overdue. Additional delay in reducing the release of PCB's into the environment will needlessly expose this generation and future generations to the potential carcinogenic risks posed by these chemicals.

Cancer has reached epidemic proportions in the United States. The rate of increase appears more rapid than either the rate of increase of population, or the rate of increase in the total death rates.

Today, one in every four Americans contracts cancer during his lifetime, and two-thirds of these die from the disease. In 1973, there were over 600,000 new cases of cancer, and approximately 350,000 deaths. Cancer is a leading cause of premature death in the United States.

U.S. deaths from various causes: Cancer deaths [1969]—323,000; World War II battle deaths—292,000; Auto accident deaths [1969]—59,000; Vietnam war deaths [6 years]—41,000; Korean war deaths [3 years]—34,000; and Polio deaths [1952, worst year]—3,300.

The economic impact of cancer is massive. The direct and indirect costs of cancer, including loss of earnings, during illness and during the balance of normal life expectance, have been estimated at a total of $15 billion for 1971.

Although the etiology of cancer is usually complicated, the causes have frequently been traced to carcinogens in the environment. Carcinogens are chemical, physical, or biological agents which, when administered to animals or humans, increase the probability of tumor induction.

Carcinogens may act at the site of initial contact, at the site of selective organ localization or accumulation, at the site of excretion, or at the site of metabolism. Some carcinogens act at single sites only; others act at multiple sites.

There is now growing recognition that the majority of human cancers are due to chemical carcinogens in the environment, and, therefore, as suggested by the World Health Organization (WHO), are "* * * potentially preventable."

Estimates by the World Health Organization, the National Cancer Institute, and various cancer specialists suggest that somewhere between 60 and 90 percent of human cancers are environmental in origin.

The basis of these estimates largely derive from epidemiological studies, in large community populations over extended periods, which reveal wide geographic variations in the incidence of cancer of various organs.

Although less certainty exists on the role of most environmental contaminants in human cancer than say, cigarette smoking, drugs, and

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occupational airborne particles, a recent Presidential panel concluded that:

> Cancer incitements by so far unrecognized chemicals combine to form a threat to health, that may well be of at least the same general size as the three major threats just described (i.e., cigarette smoking, alcohol abuse, and choice of dietary composition). These chemicals may be natural or synthetic.

Although most of the evidence for the effect of environmental carcinogens on man has come with industrial exposure to high levels of these carcinogens, most cancer experts agree that the low levels of carcinogens to which the general population is exposed are responsible for the majority of human cancers.

Although others would argue that the levels of these chemicals in the environment are too small to be of significance to the general population, the scientific evidence simply does not support this viewpoint.

For example, the chemical "aflatoxin" is known to cause cancer in man, and in experiments on trout, it was shown to produce liver tumors when present in feed in concentrations as low as 400 parts per trillion; even at this low level, its carcinogenic effect was enhanced by addition of various noncarcinogenic oils to the diet.

Similarly, dieldrin—a chlorinated hydrocarbon pesticide now banned by EPA—has been found to be carcinogenic in the lowest concentrations tested, 100 parts per billion. Therefore, lacking scientific evidence that a threshold exised for any chemical carcinogen, the Ad Hoc Committee on the Evaluation of Low Levels of Environmental Chemical Carcinogens reporting to the Surgeon General in 1970 concluded that:

"No level of exposure to a chemical carcinogen should be considered toxicologically insignificant for man."

It is with a recognition of these facts that I would like to address the issue of PCB's.

PCB's are considered to have a low acute toxicity. In adult rats, the oral LD_{50} ranges from 4 to 10 grams per kilogram body weight. In weanling rats, an oral LD_{50} for Aroclor [1] 1254 of 1,295 milligrams per kilogram body weight and 1,315 milligrams per kilogram for Aroclor 1269 have been reported.

However, a low acute toxicity does not mean the absence of health hazards. On the contrary, PCB's are subacutely and chronically toxic at relatively low dose levels.

The chemical nature of PCB's in part may help explain why they are subacutely and chronically toxic rather than being acutely toxic. They have a low solubility in water but are highly soluble in fat. Therefore they tend to accumulate and concentrate in the body's fat stores rather than being rapidly metabolized and excreted.

It appears that the metabolism and excretion of PCB's, especially of those Aroclors with high chlorine content, are even slower than for some of the most persistent pesticides, such as dieldrin and DDT.

Thus, after ingestion, PCB's persist in the body for long periods of time and thereby may elicit chronic effects.

From both animal and human data we know that PCB's accumulate in adipose tissue. Animals continuously fed PCB's show a steady

[1] The term Aroclor is Monsanto's trade name for the PCB's it produces. Monsanto is the sole U.S. producer of PCB's. The last 2 digits of the 4 digit number indicate the percent chlorination of the product (for example, Aroclor 1260 contains 60 percent chlorination). Other trade names for PCB's manufactured outside the United States include: Kanaclor (Japan) and Clophen, Fenclor, Phenoclor, and Sorol (Europe).

buildup of these compounds in their tissues; to date no known upper limit for PCB storage has been found.

Steady State levels of dietary PCB's have been reported for certain, but not all tissues in rats fed 100 parts per million Aroclors 1248, 1254, and 1262 for approximately 10 months.

Once these levels were reached, they appeared to remain relatively stable for a long while even after dietary exposure to PCB's ceased.

Rats fed PCB's for 58 days showed levels in their adipose tissue 5 times greater than their daily dietary intake. When the dietary exposure was for 240 days rather than 58 days, levels of 10 times dietary intake were noted.

If PCB feeding was curtailed after 58 days and the levels in tissues measured after 71 days on a PCB-free diet, adipose tissue still showed 80 percent of the highest level previously measured while the levels in brain showed no decrease but remained relatively constant.

As noted above, significant levels of PCB's have been found in the adipose tissues of humans as well. It is estimated that levels of 1 to 3 parts per million PCB exist in 50 percent of the general U.S. population.

In a few cases, levels as high as 200 and 600 parts per million have been reported.

Moreover, as PCB's continue to be consumed, the composition of the residues stored in the body no longer directly reflect what has been ingested. This is due to differences in the body's retention of various PCB homologs. The more highly chlorinated homologs, which tend to be more chronically toxic, are retained longer.

Therefore, the toxicity of the PCB's stored in tissues may actually increase and the mobilization and metabolism of a given amount of stored PCB can produce a more severe toxic effect than the ingestion of an equivalent amount—by weight—of a commercially produced PCB mixture.

It is not only the direct toxic effects of PCB's with which we must be concerned, but also the effects of their metabolites as well. Many times metabolites are more toxic than the parent compound.

In fact, in the case of the PCB metabolite 5-hydroxy-2, 4, 3', 4'-tetrachlorobiphenyl, this has been shown to be the case.

The nature of PCB metabolites not only warns us of possible increased toxicological risks, but also of the types of toxicological responses that may be expected. The metabolism of PCB's in monkeys—primates like man—occurs by way of the formation of an epoxide intermediate. Aromatic hydrocarbons such as PCB's, metabolized via this intermediate often produce cancer, birth defects, mutation and cell death in experimental animals.

In response to PCB poisoning, several adverse effects have also been observed in man. In 1968 over 1,000 Japanese experienced PCB poisoning after consuming rice oil contaminated with Kanechlor 400.

In addition to causing headaches, numbness of limbs, vomiting, temporary loss of vision, and many other symptoms, PCB's stored in the adipose tissue of pregnant women were passed through the placental wall and into their fetuses. As a result, 9 of the 10 live-born babies had unusually greyish, darkened skin, and most were born underweight.

The importance of these observations cannot be underestimated, especially in light of very recent findings reported by Allen and

coworkers on the effects of low level exposure of nonhuman primates to PCB's. The effects seen in these monkey studies are similar in appearance and persistence to the symptoms of the human poisoning already discussed.

Moreover, these symptoms were documented at levels of dietary intake of as low as 2.5 parts per million. To date a noeffect level for PCB's in monkeys has not been established.

Although carcinogenicity in primates in response to the dietary intake of PCB's has not yet been observed, it has been reported for both mice and rats. The World Health Organization has reported that Kanechlor 400 and Aroclor 1254 are carcinogenic in mice and induce both benign and malignant liver cell tumors following oral ingestion. Most recently, a team of research investigators [1] from the Center for Disease Control, Atlanta, Ga., the U.S. Environmental Protection Agency, the National Cancer Institute, and Johns Hopkins University School of Medicine reported that 26 of 184 experimental animals [rat] fed 100 parts per million of Aroclor 1260 for approximately 21 months developed hepatocellular carcinomas. Only 1 out of 173 control animals developed this lesion in the same period of time. Moreover, 146 of the experimental animals, but none of the controls, had tumorous lesions—neoplastic nodules—of the liver.

The importance of these findings cannot be underestimated and must be properly evaluated. Using an appropriate statistical model such as that developed by Mantel and Bryan, one can estimate the potential risk from long-term or lifetime exposure to low levels of PCB's in terms of the probability of tumor induction.

Performing the appropriate calculations on the most recent and most complete carcingenicity data—the study of Kimbrough, and others, cited above—one obtains the following relationships between the intake of certain levels of PCB's and the risk of developing tumors. The indicated values take into account the standard one/one hundredth safety factor normally used in estimating the risks to man calculated from data obtained in animal experiments.

[The analysis referred to follows:]

ANALYSIS OF CARCINOGENIC RISK TO HUMANS FROM INGESTED PCB'S BASED ON THE STUDY OF KIMBROUGH ET AL. (1975)

Confidence limits (percent)	Intake level in parts per trillion for specified levels of risk			
	$1/10^6$	$1/10^5$	$1/10^4$	$1/10^3$
—	A. Based on the Observed Development of Hepatocarcinomas			
95	20	51	141	436
99	16	43	118	366
	B. Based on the Observed Development of Neoplastic Nodules			
95	0.3	0.7	2.0	6.0
99	.2	.6	1.7	5.1

Mr. HIGHLAND. It is clear that ingestion of PCB's at levels as low as 2 parts per trillion may cause the induction of 1 tumor per 1 million people, and therefore, as such, pose a significant threat to human health.

[1] The team of research investigators was headed by Dr. Renate Kimbrough.

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ly of Kimbrough, and
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the risk of developing
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estimating the risks to
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ASED ON THE STUDY OF KIMBROUGH

ecified levels of risk	
1/10⁵	1/10⁴
carcinomas	
141 118	436 366
tic Nodules	
2.0 1.7	6.9 5.1

PCB's at levels as low
of 1 tumor per 1 mil-
dificant threat to human

mata Kimbrough.

Since 1929, approximately 1 billion pounds of PCB's have been produced for use in the United States. In addition, millions of pounds of both PCB's and PCT's—polychlorinated tripehnuls—have been imported from foreign manufacturers. Even today, production and importation continue.

In 1973, and 1974, 42,179 and 40,466 million pounds of PCB's respectively were produced at William G. Krummrich plant of the Monsanto Chemical Co. in Sauget, Ill. Moreover, recent forecasts for 1990 show little, if any, decrease in the expected levels of PCB production.

However, now the environmental consequences of PCB production, importation and use have become clear. The latest results of scientific surveys of our air, food, and water show that PCB's are literally everywhere. The food we eat, the water we drink, and the air we breathe have all in part become contaminated with PCB's.

As an example, PCB's indiscriminately discharged into our air, land, and water now contaminate fish throughout the country and the impact of this problem has only begun to be felt. The pattern observed in New York State of discovering the extent of the problem only after it has become monumental, is likely to be repeated many times throughout the country in the months to come.

Initially, it was reported that some fish, particularly striped bass, in the lower Hudson River, had become so contaminated with PCB's as to exceed the FDA's tolerance. Now we have learned that not only striped bass in the lower Hudson River are contaminated to levels far in excess of the FDA's tolerance, but also coho salmon, chinook salmon, lake trout, smallmouth bass, largemouth bass, white suckers, walleye, yellow perch, white perch, American eels, and carp.

Moreover, such findings are not limited to fish caught in the lower Hudson River. Many fish caught in various watersheds throughout New York State including the upper Hudson River, the Mohawk River, Lake Ontario, the Seneca-Oneida-Oswego Rivers, the Genessee River, Lake Champlain, the St. Lawrence River, and the Black River have been shown to exceed current FDA tolerances.

Unfortunately, the extensive contamination of fish is likely to continue for a long time for it is, like the canary in the mine shaft, a reflection of a more extensive problem.

We know that PCB's contaminate most of the rivers, streams and lakes in the United States. In many cases, it is more than the water that is contaminated. It is the bottom sediments as well.

The table on page 12 lists the extent of PCB contamination of bottom sediments for a variety of places along the Hudson River and for one sampling point in Fort Lauderdale, Fla.

[The table referred to follows:]

PCB residues in sediment

	PCB levels (parts per billion)
A. Along the Hudson River:	
Sampling point:	
Chelsea	1, 800; 3, 200
Poughkeepsie	3, 600; 11, 000
Waterford	640; 13, 000
Roger's Island (south of Glen Falls)	18, 000
Winebrook Hills	0. 1
B. New River Canal at Southwest 31 Ave., Fort Lauderdale:	
Date of sample:	
Dec. 15, 1971	1, 100
Mar. 22, 1973	43, 800
Apr. 7, 1975	1, 300, 000

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Mr. HIGHLAND. As can be seen, the contamination is extensive and for the sampling station in Fort Lauderdale, documented to have greatly increased in the last 4 years.

But the PCB's and the hazards they pose are not unique. They are only one of thousands of chemicals that have been indiscriminately dumped into our environment without concern or regulation—without concern, that is, until the evidence starts to accumulate on the toxic and/or carcinogenic health hazards posed by the exposure to these chemicals. Even in light of these findings we are painfully slow to react.

The Environmental Protection Agency has had the power for the last 3 years, under the Federal Water Pollution Control Act, to limit the discharges of toxic chemicals into the waterways of our nation. To date not one effluent standard has been set.

The EPA has the power to regulate the direct emissions of toxic chemicals such as PCB's into the air under the Clean Air Act. To date, they have taken no action.

Late last year the EPA promulgated interim drinking water standards under the Safe Drinking Water Act. Although directed by Congress to set standards for toxic chemical contaminants, the EPA failed to do so, while at the same time issuing a report that over 250 different organic chemicals had already been identified in the Nation's drinking water supplies.

The failure to promulgate standards extends the time during which the public continues to be exposed to the potential health effects posed by the ingestion of these chemicals. Moreover, it once again exemplifies the inadequate protection given the public by the piecemeal regulatory approach taken by the Federal Government.

For example, in 1972 the Food and Drug Administration set temporary tolerances for the levels of PCB's which would be allowed to contaminate the food we eat. This action was taken to limit our intake of these chemicals in recognition of the severe health hazards posed by them.

However, by failing to promulgate standards for PCB's in drinking water, the EPA is allowing the average citizen of Poughkeepsie, N.Y.; Winnebago, Ill; Sellersburg, Ind.; and possibly Escondido, Calif.; New Bedford, and Bridgeport, Conn. to consume more PCB's daily in the water they drink than they consume through their daily intake of meat, poultry, milk, eggs, cheese, cereal, grains, fruits, and vegetables.[1]

However, regulatory inaction is not limited to EPA. In light of recent scientific findings, the FDA's temporary tolerances for PCB's in food are now obsolete and inadequate to properly protect the public health.

However, there has been no indication by the FDA that these tolerances will be lowered. In addition, the FDA has a long history of failures in properly regulating toxic chemicals directly added to food, one example of this being the use of the carcinogen diethyl stilbestrol in animal feed.

[1] This calculation is based on the levels of the PCB contamination of drinking water supplies reported by the EPA and the data for PCB contamination in 1975 of meat, poultry, milk, eggs, cheese, cereal, grains, fruits, and vegetables reported by the FDA.

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It is also clear that the regulatory agencies have not had sufficient powers to completely regulate our involuntary exposure to toxic chemicals. One provision desperately needed is the power to require premarket testing of all new chemicals.

Unfortunately, the law providing EPA with this power has floundered in Congress for almost 5 years.

It is essential that we turn our knowledge into action now. We must see that the Toxic Substances Act is passed, that regulatory agencies discharge their regulatory responsibilities properly, and effectively, and that involuntary exposure to toxic substances is curtailed. Unless we act now, the incidence of environmentally caused cancer will continue to increase, needlessly taking precious lives.

Mr. Chairman, it is clear the PCB's are toxic chemicals. They are not an acutely toxic chemical, but they tend to be chronically toxic, and have a fairly high acute chronic toxicity.

Perhaps the most recent evidence that supports this is evidence from Dr. James Allen's laboratory at the University of Wisconsin, in which he showed that monkeys, that is female monkeys, when fed levels as low as 2 parts per million in their diet, had severe toxic effect in terms of loss of hair, edema; had problems in conceiving; and even baby monkeys born to these mothers and nursed from these mothers showed a 50 percent mortality rate for the first 6 months of life in PCB poisoning.

The only PCB's these babies received was from the central transfer which occurred during the pregnancy, and through the contamination of the mothers' milk.

Clearly nonhuman primate animals show an acute toxicity to PCB's.

The PCB's, because of their structure tend to bioaccumulate in tissue, and tend to be fat soluble.

We know now that between roughly 50 percent of all Americans walking around have levels of 1 to 3 parts per million stored in their tissues.

We also know it is not only the toxicity posed by the PCB's which are a problem, but the toxicity of their metabolites which can either be directly toxic, or the metabolizing of the PCB's via certain toxic intermediates, such as air and oxides, which are known to produce cancer, birth defects, mutations, and cell damage in experimental animals.

We have data from the unfortunate case in Japan of effects of PCB's in humans, where the similar effects to those seen in the nonhuman primates that Dr. Allen saw in human beings.

One of the most important considerations is the carcinogenic data of PCB's.

I have outlined some of those results for you in my testimony, and I would just like to point out that I have applied a statistical method to try to extrapolate from animal data, the most recent data from Dr. Kimberley, and his coworkers.

I have tried to extrapolate the data in order to show the levels of intake of PCB's that might be hazardous in terms of tumor formation. And the important conclusion, I guess, is drawn where the

levels of as low as 2 parts per trillion for lifetime intake could be forming 1 tumor in 1 million people.

We are talking about finding much higher levels in the daily diet now, and very much higher levels in fish.

The second question was the extent of exposure—how likely we are to come in contact with PCB's.

I think there is no doubt now that the results of the latest scientific survey shows that our air, our food, and our water are all contaminated with PCB's.

We have produced roughly 1 billion pounds since 1929, and we continue to produce about 40 million pounds a year, and projections for as late as 1990 are for us to continue to continue to produce 35 million to 40 million pounds.

Mr. Chairman, the consequences are grave, and I would like to say I think the example that we have seen in the Hudson River is an unfortunate kind of showing that we will see over and over in the future, and the months to come.

We initially heard of the striped bass in the lower Hudson River that were contaminated. We have now learned it is not only the bass in the Hudson River, but the coho salmon, the Chinook salmon, the lake trout, smallmouth bass, largemouth bass, the white suckers, the walleye, the yellow perch, the white perch, the American eels, and even carp.

All of these are in excess of the 5 parts per million tolerances set by the Food and Drug Administration.

Moreover, we learned from a recent report from the Department of Environmental Conservation in the State of New York that it is not only the lower Hudson River which has fish which are so contaminated, but, for instance, we have the various watersheds around New York State, including the upper Hudson River, the Mohawk River, Lake Ontario, the Seneca-Oneida-Oswego Rivers, which all have fish which are in excess of the tolerance.

This, I think is only a pattern in one State which will be repeated throughout many.

We know that the problem is even more extensive, because the problem of the contamination of fish is sort of like the canary in the mine shaft. It is just perhaps the outward sign of the more expensive contamination of waterways.

Several sampling points along the Hudson, and some data from Fort Lauderdale, Fla., you will see an astronomical level now being recorded in the USGS surveys of PCB levels in the silt there.

Mr. LEGGETT. Were they random samples?

Mr. HIGHLAND. The samples in Florida at Fort Lauderdale have the same sampling point over the last 4 years, and it is important to note that the levels have constantly increased from 1,100 to 43,000, to 103,000 parts per billion.

Mr. LEGGETT. Did you find any correlation in that area with PCB's utilization?

Mr. HIGHLAND. So far as I know, that is not being investigated now. That comes from a USGS survey which was available to the EPA for a number of years.

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I have recently been able to see this data, and as far as I know at this point I cannot identify a particular source, because obviously we had an increasing level of contamination.

Mr. LEGGETT. Was that an EPA test?

Mr. HIGHLAND. No, that is a USGS test, which I believe is on file in the EPA computers, though, and they have access to that information.

Mr. Chairman, there are a variety of others. I mean the printout of the computer on the extent of contamination is great.

Here I have just tried to pick out some examples, back where we knew something about the water and fish problems in the Hudson River.

The EPA has had the power for the last 3 years under the Federal Water Pollution Act to limit the discharge of toxic chemicals in our waterways. Today, not one effluent standard has been set, Mr. Chairman.

The EPA has the power to regulate the direct emissions of toxic chemicals, such as PCB's, into the air under the Clean Air Act. To date, they have taken no action.

One point that Representative Ottinger brought up was the possible contamination of drinking water.

EPA had the power under the interim drinking water standards to promulgate a standard for PCB's and other toxic chemicals. They failed to do so.

By failing to promulgate standards for PCB's in drinking water, the EPA is allowing the average citizen of Poughkeepsie, N.Y., Winnebago, Ill., Sellersburg, Ind., and possibly Escondido, Calif., New Bedford, Mass., and Bridgeport, Conn., to consume more PCB's daily in the water that they drink than they consume through their daily intake of meat, poultry, milk, eggs, cheese, cereal, grains, fruits, and vegetables.

Mr. LEGGETT. Is that more than 5 parts?

Mr. HIGHLAND. That is not more than 5 parts, Mr. Chairman.

The 5 parts per million, as I tried to point out, limited here is really an obsolete standard, and totally inadequate to protect the public health.

Mr. LEGGETT. The drinking water in these areas, what do you charge that the PCB's are in that water?

Mr. HIGHLAND. Well, the EPA has reported a range between 0.1 part per billion to, I believe, 3 parts per billion for the contamination, but one must realize you consume at least 2 meters of water a day, and that they made the calculations on the average consumption of water, but I think I could supply you with the kind of calculation, if you drink 2 meters of water a day, or one of many more millions of people such as diabetics, or workers in heavy industry, they are consuming much more water.

A level I believe in New Bedford, Mass. was reported as roughly 2 parts per billion, which is 2 micrograms per meter.

That is on the order of 2 meters per day, which would be 4 micrograms.

The Food and Drug Administration currently says the daily dietary intake is 6 micrograms a day, and that is chiefly from fish.

But the point is, by consuming the water, where it is contaminated even to 2 parts per billion, you are consuming roughly 50 percent of the standard dietary intake currently, and that is going totally unregulated.

Mr. LEGGETT. Have there been post mortem examinations of people who have died there, and have lived there for a long period of time, does the assimilation of the PCB's show up?

Mr. HIGHLAND. We know there are high levels of PCB's now stored in our fatty tissue, which as I said, were in the level of 1 to 3 parts per million.

The only way I can give you a feeling for that number is in Allen's recent studies, where he fed 2½ parts per million in a diet to test the monkeys, which is not the same. The mother suffered severe toxilogical effects, and the babies, which just got the PCB's through the central transfer, and the mothers' milk, have died through the PCB's poisoning.

The problem is going to be increasing now with the water, because we have contaminated silt, and contaminated water, and for instance, in New York State there are 14 municipal or private institutions that take their drinking water from the Hudson River.

The problem of water usage, and possibility of further contamination of the water supply is ultimate. That is a whole area where the EPA did have the power to regulate peoples' exposure, and has failed to do so.

It is also clear that the regulatory agencies have not had sufficient powers to completely regulate our involuntary exposure to toxic chemicals.

One provision desperately needed is the power to require premarket testing of all new chemicals. Unfortunately, the law providing EPA with this power has floundered in the Congress for almost 5 years.

It is essential that we turn our knowledge into action now. We must see that the Toxic Substances Act is passed, the regulatory agencies discharge their regulatory responsibilities properly, and effectively, and that involuntary exposure to toxic substances is curtailed.

Unless we act now, the incidence of environmentally caused cancer will continue to increase, needlessly taking precious lives.

Mr. LEGGETT. You do not think it is essential for us to pass a special bill on the subject?

Mr. HIGHLAND. I think there would be a combination of benefits.

If you pass a special bill with respect to it, you might eliminate a particular problem, but you would have to pass bills on and on for the next chemicals on line.

We need a change of approach as to how we deal with toxic chemicals.

I was happy to see FDA announce some action against DES before Congress banned that.

There are now some 16 other chemicals that you would have to pass bills on.

Mr. LEGGETT. Very good.

We will hold questions of this witness, and it might be best if we take next Mr. John Harris-Cronin of the Hudson River Sloop Restoration, Inc.

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Mr. Cronin, it is nice to have you here.
Feel free to proceed with your statement.

STATEMENT OF JOHN HARRIS-CRONIN, ENVIRONMENTAL ACTION COORDINATOR FOR THE HUDSON RIVER SLOOP RESTORATION

Mr. HARRIS-CRONIN. There is an important story I would like to go through.

My name is John Harris-Cronin, and I am environmental action coordinator for the Hudson River Sloop Restoration, a nonprofit environmental/educational organization whose 4,000 members own and operate the 106-foot sloop *Clearwater*.

We began researching and investigating the PCB problem in the Hudson in August 1975 through our ongoing program of checking and watchdogging polluters and environmental agencies. Currently, we are intervening in the New York State Department of Environmental Conservation enforcement proceeding against General Electric of Hudson Falls, N.Y.

I am here today to relate to this committee the Hudson River chapter of the PCB story, because it represents a scandalous and deplorable episode of inaction and ineffectiveness by the U.S. Environmental Protection Agency, EPA, because of the health and safety of the people who drink of the Hudson's waters and eat of its bounty are in imminent and substantial danger and because the Hudson estuary, one of the most important fisheries on the East Coast, is seriously threatened, as are the livelihoods of those who depend on its rich resources.

I would like to sketch for you a brief history concerning the largest point sources discharge of PCB's into this country. While Mr. Train, in his remarks on Wednesday, denigrated point source discharges of PCB's as insignificant in light of the many millions of pounds lost to the aquatic environment each year through other means, I would like to point out that if Mr. Train's 10,000-pound figure is correct, the Hudson has been the receptacle for close to 90 percent of that "insignificant" 10,000 pounds per year.

The General Electric facilities at Hudson Falls and Fort Edward, N.Y., have been discharging an average of 30 pounds of PCB's per day directly into the Hudson for the last 25 to 30 years. In addition, it was recently discovered that another 3.75 pounds per day was also being discharged by GE via the local sewage-treatment plant.

The decisionmaking process involving GE's discharge of PCB's into the Hudson began in 1971, when GE first applied to the Army Corps of Engineers for permission to discharge 30 pounds of PCB's per day into the river under the Refuse Act of 1899.

With the enactment of the 1972 Federal Water Pollution Control Act Amendments, responsibility for issuing a discharge permit was passed on to the EPA.

In January 1973, GE submitted an updated application—again asking for a permit to discharge 30 pounds per day of PCB's—and, in March 1974, public notice was given of EPA's intention to grant a permit for GE to discharge the requested amount: 2 months later, in May 1974, a General Electric representative, testifying at EPA's

hearings on toxic effluent standards, told Alan Eckert of EPA's Office of Enforcement in Washington that GE was, in fact, at that time discharging 30 pounds per day of PCB's into the Hudson.

Later that month, Mr. Eckert wrote in a memo to EPA's region II office in New York:

> • • • we calculated that concentration of Aroclor 1016 (PCB) would result at the point of discharge, assuming complete mixing with the Hudson River. At low flow, five parts per billion would be in solution. Using bioaccumulation factors set forth in a study by John H. Ryther of Woods Hole . . . a concentration of 37.5 parts per million would result in Hudson River fish.

Following up on Mr. Eckert's memo, Sandra Kunsberg, of the region II EPA enforcement branch, requested the Regional Surveillance and Analysis Division to:

> • • • undertake and complete as soon as possible whatever sampling, testing and analytical procedures are necessary to form the basis for a responsible determination under Section 504. The final report of investigation should include a finding as to whether or not the concentration levels for PCBs established by the FDA have been exceeded.

The EPA surveillance effort resulted in a report completed in October 1974. In it, Royal Nadeau and Robert Davis, of EPA's biology section, reported concentrations in the Hudson below GE's outfall far in excess of the FDA standard of 5 parts per million. They found 27 parts per million and 45 parts per million in composites of snails, 78 parts per million in shiner minnows, and 350 parts per million in a rock bass, the latter representing a new record for PCB contamination of freshwater fish.

The report concluded that biotic components of the river ecology are heavily contaminated with PCB's, that man could be contaminated by ingestion of such fish, and that downstream contamination was probably from the General Electric Co.

The recommendation was made in the report that results of this investigation should be forwarded to the enforcement branch for legal action, and that a joint action may be necessary in order to effectively prosecute under section 504.

Astonishingly, at the very same time, the EPA's office in New York was preparing to have the 30-pound-per-day permit go into effect on January 31, 1975.

I am unaware of any action whatsoever by the Enforcement Division in response to the Nadeau-Davis report.

What appears to have happened is that, after a lapse of some 8 or 9 months, the results of the Nadeau-Davis report were made known to Commissioner Ogden Reid of New York's Environmental Conservation Department, who began immediate actions.

Following Dr. Reid's department's disclosures of the PCB problem in the Hudson in August 1975, the Hudson River sloop *Clearwater*, the Hudson River Fishermen's Association and the Natural Resources Defense Council requested that EPA take immediate action under

The question in large measure depends on whether data exists or can be developed to establish that an 'imminent and substantial endangerment to the health of persons or to the welfare of persons' is caused by the discharge.

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section 504 of the Federal Water Pollution Control Act Amendments to stop the discharge of PCB's into the Hudson River.

In response to this request and despite the findings of its own staff, EPA stated:

Now, some 5 months later, in testimony before this committee, the EPA Administrator has stated in his Wednesday testimony:

> PCBs are a significant hazard to human health and the environment. Laboratory tests show they cause reproductive failures, gastric disorders, skin lesions and tumors in mammals. Their destructive effects on fish and wildlife are well documented.

There is no waterway where PCB contamination is better documented than the Hudson River.

Information recently collected in the course of the New York State investigations shows a range of 20 to 300 parts per million of PCB in fish from the upper Hudson, with one fish sample reaching an all-time high of 658 parts per million. Fish throughout the lower Hudson contain levels of PCB's well above the 5 parts per million temporary tolerance level set by FDA.

It is no coincidence that the river containing the most PCB-laden fish in this country also has served as the receiving waters for the largest PCB discharge.

In a letter, dated January 26, 1976, the Hudson River sloop Clearwater, along with Natural Resources Defense Council, addressed EPA's inaction under section 504. In that letter we stated:

> These levels of PCB contamination constitute an imminent threat to the survival of fish species in the Hudson River and to the extensive commercial and sport fisheries dependent thereon. Most importantly, the concentrations of PCBs in the edible portion of fish in the Hudson River present a serious health hazard to the human consumers of such fish.

While I fully understand the limited authority of this committee and the limited scope of these hearings, I do believe it urgent that the members of this committee appreciate all the tools which can be used to protect our waters from toxins such as PCB.

There is no doubt that a Toxic Substances Control Act could deal with a situation such as exists in the Hudson as effectively as could section 504 of the 1972 Water Pollution Control Act Amendments. That this has not happened is not only tragic, but scandalous.

Rather than implement section 504, EPA has chosen to propose immediate limitations on General Electric's PCB discharge of 1.5 pounds per day during dry weather and 5.8 pounds during wet weather. These standards are to apply until June 30, 1977, when G.E. is supposed to reach zero discharge. This, by the way, is 9 months later than the achievement of zero discharge being demanded by New York State. And the EPA proposed permit does not—even now—include the 3.75 pounds G.E. discharges through the local sewage treatment plant.

That any further intentional discharges of PCB's into the Hudson River be permitted is, to my mind, intolerable.

Commercial fishermen on the Hudson, some 70 in number, are now awaiting word as to the status of their 1976 licenses.

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Fishermen and buyers all along the northeast coast are awaiting word concerning the marketability of fish caught or which spawned in the Hudson.

Residents of mid-Hudson and upper Hudson communities are fearful of the safety of the drinking water they draw from the Hudson, and rightfully so.

But mostly people are asking why this poison is still allowed to be dumped into our river.

I hope members of the committee will be asking the same.

I thank you for the opportunity to appear before you today.

Mr. LEGGETT. Very nice having you here.

I note that you are representing the River Sloop Restoration, Inc. Is that actually incorporated?

Mr. HARRIS-CRONIN. Yes, it is a nonprofit environmental educational organization.

I have with me the EPA laboratory report and numbers which I referred to if the committee would desire to incorporate them into the record.

Mr. LEGGETT. Good.

Give that to our counsel.

Mr. HARRIS-CRONIN. I would also like to point out after reading today's New York Times article of Governor Carey's action, I think it becomes all the more important that the Federal Government take considerable steps to limit intentional discharges, such as that of General Electric, to a river like the Hudson which is in such very, very bad shape already.

I think Governor Carey's action is deplorable. And I think the EPA should be looking at this with renewed effort now.

Mr. LEGGETT. Very good.

We will give EPA chance to respond to your challenges.

Next we will hear from Mr. John Hesse of the Michigan Department of Natural Resources.

STATEMENT OF JOHN HESSE, SUPERVISOR, TOXIC MATERIALS UNIT, MICHIGAN DEPARTMENT OF NATURAL RESOURCES

Mr. HESSE. I am John Hesse, supervisor of the Toxic Materials Unit of the Michigan Department of Natural Resources. I am an aquatic biologist by training.

Because of the extreme importance of these hearings, Dr. Howard Tanner, director of the Michigan Department of Natural Resources, wanted to personally testify but, due to prior commitments, was unable to attend.

We do very much appreciate the opportunity to appear today. Dr. Tanner asked me to relate to you the seriousness of the PCB problem in the Great Lakes, actions of our department and our State legislature toward solving the problems and our feelings as to the effectiveness of past and proposed U.S. Environmental Protection Agency actions.

Populations of the natural predator fish species in the Great Lakes, primarily lake trout, were decimated in the 1940's by a combination of factors, including predation by the sea lamprey and overexploitation by commercial fishermen.

In 1966, the State of Michigan made a major policy decision to mount a full-scale program to rehabilitate its Great Lakes fisheries resources. Michigan introduced coho and chinook salmon from the Pacific Ocean to supplement the sea lamprey control and lake trout restoration programs of the United States and Canadian Governments.

Michigan's entire hatchery system was revamped at a cost of several million dollars to produce these new species and steelhead and brown trout in sufficient numbers to restructure the fish populations of these large lakes. After signs of early success in Michigan, other Great Lakes States developed similar programs.

Annual plantings of trout and salmon fingerlings now total over 12 million in Lake Michigan alone. Expenditures for lamprey control to insure survival of our sports fish in the Great Lakes are approximately $3.5 million annually.

While costs of the restoration program have been high, benefits from these efforts have also been great. Michigan sports fishermen spend in excess of 3 million angler days per year on the Great Lakes. The Great Lakes Fishery Commission, in an economic appraisal, has estimated the value of the Great Lakes sports fishery at $350 million, and the commercial fishery at $100 million. We believe that the Great Lakes now have one of the best trout and salmon fisheries in the world.

This fishery is now being jeopardized by contamination with polychlorinated biphenyls, PCB's, which have accumulated in several Great Lakes fish species at levels either approaching or exceeding the current Food and Drug Administration guideline of 5 parts per million, p/m.

Because of the high PCB levels, public health officials from several States have issued warnings to sports fishermen against consumption of Great Lakes trout and salmon more frequently than one meal per week. The U.S. FDA is currently reviewing their 5 p/m limit to determine if it should be lowered for human health protection. Canada has already established a lower level of 2 p/m.

Lake trout in Michigan commonly contain PCB's two to three times the 5 p/m limit. Some PCB values are as high as 60 p/m in lake trout from the southern portion of the lake. Concentrations in salmon range from 5 to 20 p/m. Chubs average 3 to 5 p/m. Millions of pounds of surplus Lake Michigan salmon are being buried every year because of excessive PCB's.

The problem is not limited just to Lake Michigan. Even Lake Superior, considered to be the purest of the Great Lakes, has lake trout exceeding the 5 p/m limit. PCB's in Lake Superior water have been measured at less than 1 part per trillion, p/t, so this gives one an idea of the tremendous potential for uptake and concentration by aquatic organisms, contrasted to when DDT was in use.

65-706—76——17

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Particularly disturbing is the fact that PCB levels in Great Lakes fish have not shown any decline—figure 1—since 1971 when Monsanto Chemical Co., the sole U.S. PCB producer, voluntarily restricted sales of PCB's to "closed-system" uses. Prior experience with DDT showed that, within 2 years after DDT use was banned in the Great Lakes area, a rapid downward trend in DDT levels in Lake Michigan fish had begun—figure 2. (See p. 259–60 for figures.)

Michigan officials have been studying the PCB situation since 1969 when excessive PCB residues were first detected in Great Lakes fish. After development of adequate laboratory capabilities, we instituted a monitoring program for PCB's early in 1971, consisting of a statewide water sampling survey in inland waters and tributaries to the Great Lakes. Supplementary sampling has since been conducted on fish from inland and Great Lakes waters, stream sediments, potable water intakes, sanitary landfill runoff, municipal wastewater treatment plant effluents, and industrial discharges. Limited questionnaire surveys of industrial usage have also been conducted.

We have tested over 900 industrial samples with approximately 40 percent of effluents sampled containing PCB's above our laboratory sensitivity limit; 23 percent of the industries tested had greater than 0.5 parts per billion—ppb—18 percent greater than 1 ppb, 6 percent greater than 10 ppb, and 2 percent greater than 100 ppb. This represents a diversity of industries showing contamination and, in many cases, the source of effluent contamination could not be determined. We have learned enough about the problem to recognize that it is a very complex situation.

You are probably already aware of the diverse number of applications for which PCB's have been used in the past. The five largest uses of PCB's prior to 1970 were dielectric fluids in capacitors and transformers, plasticizer applications, hydraulic fluids and lubricants, and heat transfer fluids. The list of other uses is lengthy.

In Michigan we have documented losses from all of the major uses and many of the minor ones. I have prepared a few case histories to characterize types of losses from each of the major use categories.

ELECTRICAL APPLICATIONS

While losses from the use of PCB's in electrical applications, such as transformers and capacitors, has been estimated as minimal, and they are often referred to as "closed-systems," incorrect disposal practices and accidental losses from equipment and storage areas do occur and can result in environmental contamination.

In response to an industrial questionnaire sent to a cross section of Michigan industries in 1971, one major power company in Michigan reported an annual use of 562,000 pounds of PCB's—250,000 in precipitator transformers and 312,000 in capacitors. Company records showed annual losses of approximately 300 pounds of PCB liquids to soils from burst capacitors and 12,000 pounds from salvaged capacitors. This fluid from the capacitors was reportedly disposed of through waste haulers. Waste haulers then dispose of these wastes in many

ways, including dust control on roads, sale of oils as fuel in low temperature boilers, and treatment and discharge to municipal sewerage systems.

In the same industrial questionnaire survey, a smaller power company reported that they had been disposing of approximately 700 pounds of PCB's per year by mixing with other waste oils and using the oils for dust control on their driveway and parking lot.

In October 1975, a 55-gallon drum of PCB transformer oil on inventory at a Michigan power company developed a leak from a defective seam. Approximately 45 gallons of the fluid soaked into the ground resulting in more than 100 cubic yards of contaminated soil having to be removed and disposed of in an approved landfill. These situations illustrate the lack of proper safeguards and disposal practices by so-called "closed-system" users.

PLASTICIZER APPLICATIONS

Plasticizer applications represent the single largest "open-ended" or dissipative use of PCB's. PCB's are or have been used as plasticizers in most countries in a wide variety of consumer products including paints, inks, copying paper, adhesives, sealants, plastic products, and textile coatings, many of which are traded internationally. Monsanto's U.S. sales figures for 1970 showed a volume of nearly 20 million pounds for plasticizer applications. Sales for this use were discontinued in 1971, but environmental losses from past sales will likely continue for a long period of time.

Papers used in the thermographic, xerographic, or pressure sensitive copying processes have had PCB's added as plasticizers either in the ink or paper coatings. Recycling of these papers can result in contamination of food packaging materials, other paper products, and effluents from paper recycling or de-inking plants.

In Michigan, paper industry effluents have been found to commonly contain from 1 to 10 ppb of PCB's. Contamination of fish has been identified as high as 110 ppm in the Kalamazoo River downstream from Kalamazoo, Mich., where Michigan's paper industry is primarily centered. Stream sediments in the Kalamazoo area contain as much as 360 ppm PCB's believed to be a result of past de-inking processes in the area. Lower level contamination continues from processing of recycled paper, but most de-inking mills have ceased operation over the past 10 years.

Burning of waste papers containing PCB's undoubtedly results in losses to the atmosphere. Significant atmospheric transport is occurring as evidenced by detection of PCB's in snowfall samples in Wisconsin at concentrations greater than found in most Great Lakes tributaries.

The largest quantities of PCB's in plasticizer applications end up in dumps and landfills. Much of the material is in sealed containers or impregnated in plastics and may be eventually released to the environment. Open burning in landfills would release PCB's to the atmosphere and the potential exists for losses to surface waters and

leachate. Samples of surface runoff water from nine landfills in Michigan showed five of the nine samples having PCB concentrations ranging from 0.04 to 0.30 ppb, while the others contained less than 0.01 ppb.

HYDRAULIC FLUIDS

PCB's have found wide usage in hydraulic systems involving extreme pressure and high temperature conditions. Annual U.S. domestic sales of PCB's for hydraulic uses totaled approximately 8 million pounds in 1970.

In Michigan, the automotive and metal finishing industries have used PCB-containing hydraulic fluids extensively. Industrial inspections and questionnaires documented past usage to have been as much as 878,000 pounds per year in individual plants with most being collected and disposed of through waste haulers.

Large losses of PCB's from these plants to municipal sewers or directly to surface waters have also been identified.

Wastewater discharges from identified users of PCB-hydraulic fluids have had concentrations as high as 7.1 milligram per liter PCB's indicating losses greater than 30 pounds per day.

In a materials balance study, one industry, which showed in its records that it was replacing approximately 30,000 pounds PCB's per year in hydraulic systems, calculated that 10,000 pounds per year was entering the atmosphere through vaporization losses, 8,000 pounds per year in absorbents placed in landfills, 6,000 pounds per year lost to soils and drainage systems on plant property, 5,000 pounds per year going to waste haulers, and the remainder incinerated.

All industries which we have identified as using PCB's in hydraulic systems have converted to substitute products, mostly phosphate esters. Complete elimination of PCB residues from the systems has proven ineffective even with repeated flushings. Sampling of replacement fluids indicated PCB contamination as high as 100 ppm.

Residues in discharge lines combined with loss of contaminated replacement fluids appear to result in continued low level discharges. Because of existing inventories and possible purchase from foreign sources or reprocessing companies, it is unlikely that all hydraulic systems not included in our surveys or questionnaires have been switched to replacement fluids. One facility which we investigated had an inventory of 9,000 gallons of PCB fluids in storage.

In summary, Michigan's surveys of hydraulic system usage of PCB's suggests that this has been a major source of environmental contamination and may continue to contribute to the problem to a lesser but still significant degree.

HEAT TRANSFER SYSTEMS

PCB's heat transfer fluids have been used in place of steam or superheated water in many industries and large building complexes. In 1970, Monsanto sold approximately 4 million pounds of PCB's for this application but phased out all sales in 1972. I heard testimony at the National PCB Conference in Chicago that 15 percent of im-

ported PCB's to the United States are currently being sold for this purpose.

From 1971 through 1973, Michigan identified at least 12 facilities discharging PCB's to surface waters or municipal sewers from this usage. Concentrations in some discharges were as high as 5.2 ppm.

One automotive company in Michigan reported using 34,000 pounds of PCB's per year in heat transfer systems at three of its plants. The waste fluids were reportedly disposed of by industrial waste haulers. Another smaller plant reported loss of 800 pounds in 1972, and that approximately 700 pounds of this total was incinerated, 75 pounds disposed of in dumps, and 25 pounds lost to sewers and drains.

In another Michigan survey, a chemical company complex was found to have an effluent concentration of 35 ppb resulting from heat transfer system losses.

Heat transfer losses are not all from industrial facilities. Sampling of interceptor lines of the Detroit, Mich., sewerage system resulted in the identification of heat transfer usage from two residential building complexes and one hospital as large sources of PCB input to the system.

MISCELLANEOUS USES

In 1971, Michigan officials found a PCB concentration of 6.6 ppb in the waste lagoon of a soap and detergent company. The source was traced back to the company's usage of PCB's as a dedusting agent at 0.7 percent in one of their powdered products. The company had discontinued this usage in June 1970, and the PCB's were apparently leaching from contaminated lagoon sediments.

The investment casting wax industry has been recently identified as another user of PCB's. This metal casting method uses formulated waxes as a basic molding compound. The waxes form a primary mold which is then coated with ceramic. The wax is melted out in an autoclave. Residues of wax are removed in a high temperature furnace. During these two procedures, PCB's may be lost to vaporization, cooling water contact, and poor housekeeping practices.

One of the few wax suppliers is a major importer of decachlorobiphenyl from Italy.

Most PCB-containing waxes have approximately 20 percent of PCB's or polychlorinated terphenyls—a closely related compound. An effluent sample from one of the Michigan companies using investment casting wax contained 2.5 ppb of PCB's.

CONCENTRATIONS IN MUNICIPAL WASTES

Because of the diversity of PCB usage, municipal wastewater is likely to receive PCB's from numerous domestic and industrial sources, many of which are listed above. Sampling of 58 municipal wastewater treatment plant—WWTP—effluents throughout Michigan in 1973 showed an average concentration of 0.52 ppb and a range of 0.10 to 3.2 ppb. Widespread contamination of municipal wastes is a source of PCB loss to surface waters.

One-half to two-thirds of the PCB's entering municipal waste treatment facilities are removed and incorporated into the waste sludge.

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Disposal of these sludges may add to environmental PCB levels. Sewage sludges are commonly disposed of by incineration, spreading on agricultural land, or placing in landfills.

Officials from Michigan and other States bordering on Lake Michigan have concluded that there are many small PCB discharges in the Lake Michigan basin. These discharges are difficult to trace by current monitoring techniques. We feel that large atmospheric losses may perpetuate the problem even if all direct water discharges were found and eliminated. Incorrect disposal practices certainly add to the environmental burden.

In light of considerable impact of PCB contamination, the Michigan Department of Natural Resources urges a national ban on all domestic and imported PCB's destined for use other than in transformers and capacitors be immediately and critically reviewed in light of current potential replacement products.

In the absence of a ban at the Federal level, Michigan is attempting to pass needed legislation at the State level. Bill 5619, introduced by Representative David Bonior, passed the Michigan House of Representatives on January 27, 1976, by a vote of 101 to 2, and has now been assigned to our Senate Committee on Conservation. The bill would prohibit the manufacture, sale, and use of PCB's in Michigan for all applications other than in transformers and capacitors.

It will provide labeling, reporting, and disposal requirements for continued uses. It also calls for a stepwise elimination of PCB's with the sale, manufacture, and use of products containing 25 percent or more PCB's forbidden after July 1, 1976; 1,000 parts per million or more forbidden after January 1, 1977; and 100 parts per million or more forbidden after January 1, 1978.

Upon adequate documentation of the availability of substitutes which meet performance standards and environmental acceptability, PCB use in transformers and capacitors will no longer be exempted.

We are encouraged by the fact that Indiana, Wisconsin, and Minnesota are in the process of preparing similar legislation.

We have been urging the U.S. EPA to take firm action since 1969, when we first became aware of the problem. Frankly, we have been disappointed with their lack of positive action until extensive publicity was generated in 1975.

In 1973, EPA did designate PCB's as a toxic substance under section 307 of the Federal Water Pollution Control Act. Public Law 92-500. Establishment of effluent and pretreatment standards for PCB's as required under sections 307(a) and 307(b), however, are long overdue. We understand now that these will be promulgated perhaps by March 1976.

As evidenced by recent statements by Russell Train, EPA Administrator, EPA is finally devoting a great amount of effort toward the PCB problem. We maintain, however, that more is needed than establishment of water quality and effluent criteria. We need to eliminate any further use of this toxic and persistent compound.

We in the State of Michigan feel that a national ban is the best answer.

[The charts referred to follow:]

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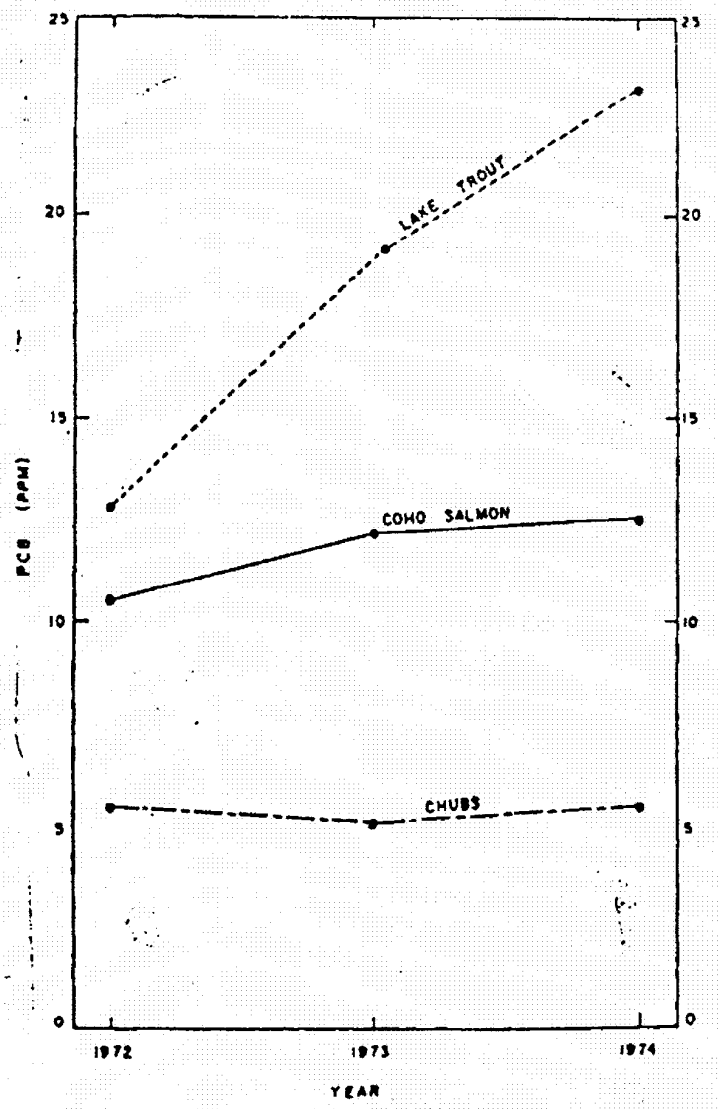
FIGURE 1

TRENDS IN PCB LEVELS
LAKE MICHIGAN FISH



DATA SOURCE WAYNE WILLFORD
GREAT LAKES FISHERY LABORATORY
U S FISH & WILDLIFE SERVICE
ANN ARBOR, MICHIGAN

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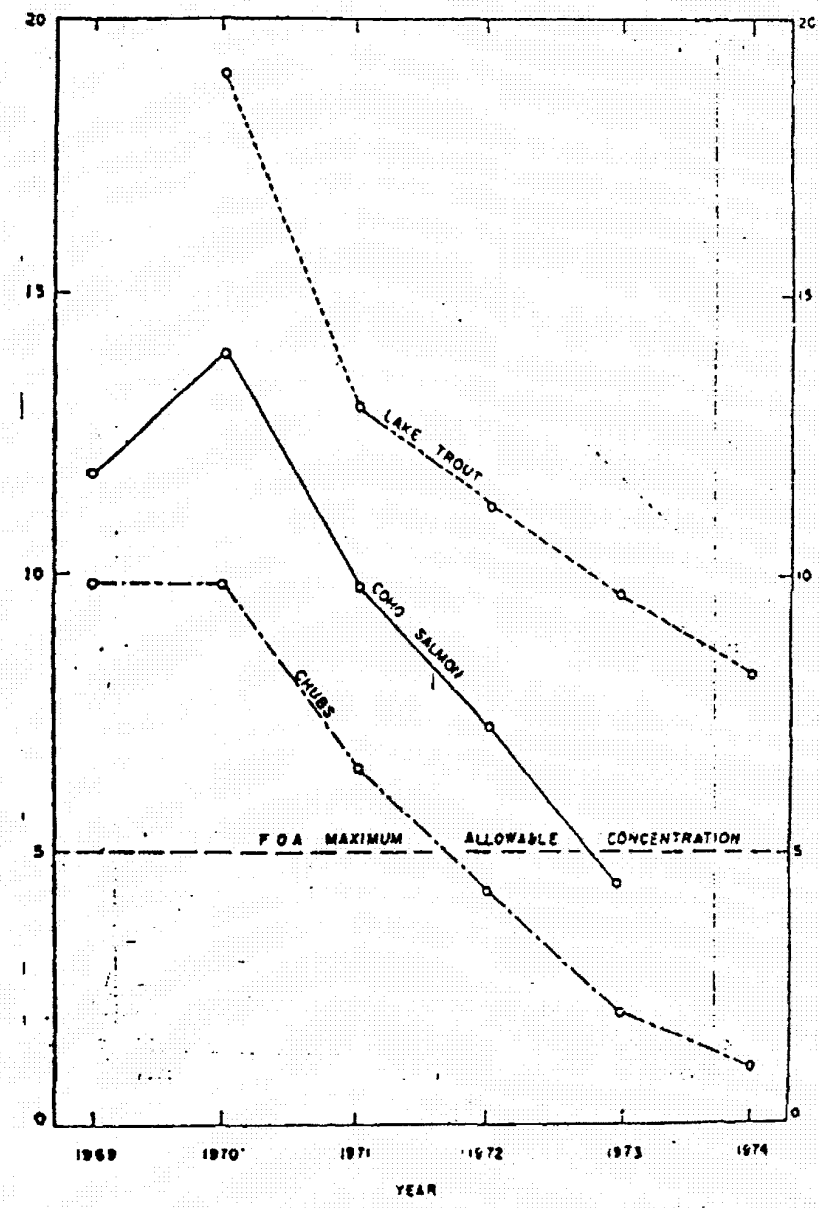
FIGURE 2
TRENDS IN DDT LEVEL
LAKE MICHIGAN FISH



DATA SOURCE : WAYNE WELFORD
GREAT LAKES FISHERY LABORATORY
U S FISH & WILDLIFE SERVICE
ANN ARBOR, MICHIGAN

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Mr. LEGGETT. Considering the problem you have in Michigan with these PCB's, have you attempted to legislate a ban on PCB's in Michigan?

Mr. HEGER. Yes; we have.

We are excited about the progress that we have made. Representative Dave Bonior of our Michigan House of Representatives introduced a bill last August, and this week, after a series of public hearings, it passed the House by a vote of 101 to 2.

It has also been passed on to the Senate.

I would like to describe that bill a little bit for you, if you like. The bill would prohibit the sale of PCB's, and it has language that would allow or that would require the exempted uses, speaking particularly of the transformers and capacitors to be that exemption, to be removed once acceptable substitutes are proven in terms of the environmental acceptability and their performance standards.

It also calls for the labeling of products containing PCB's. This would be labeling of transformers and capacitors that contain them and reporting and disposal requirements for the continued uses.

To implement the bill, it is a stepwise elimination of PCB's, starting off with the level of 25 percent.

The products containing 25 percent or more would be forbidden after July 1, 1976; 1,000 parts per million or more forbidden after January 1, 1977; and 100 parts per million—and the bill got us into an area that I am not sure people are familiar with—the problem that we got into regarding the definition of PCB's.

Basically, people have been defining PCB's as a chlorinated biphenyl or biphenyl molecule that has had two or more hydrogens replaced by chlorine.

With that definition, it could also be interpreted to include many other compounds that have other functional groups attached to the biphenyl molecule, such as NH_2, and when you put it on the PCB's, it becomes dichlorobenzidene, and it is a largely used compound, and we do not know of the environmental hazard of it.

It is a hazard in the workplace, however, and is a carcinogen.

In Michigan, we have narrowed our definition to include only those chlorinated hydrocarbons without additional functional groups but have left a provision to include some of these back in if we do find they are an environmental hazard.

Mr. Chairman, this may become very important. We recognize there are hydroxilated PCB's on the market that would be exempted by our bill, but we do not know what happens to them in the environment.

We do see hydroxilated PCB's in Great Lakes fish, but we do not know if it is through the metabolism rate that it is hydroxilated or taken up through the loss of commercial product.

I think at this point I want to conclude by saying that we have been urging the U.S. EPA to take firm action since 1969, when we first became aware of the problem.

We have been disappointed with their lack of action until the extensive publicity was generated in 1975.

We recognize in 1973 EPA did designate PCB's as a toxic substance under 307 of the Federal Water Pollution Control Act, but we have felt that the effluent and the pretreatment standards that

would be required under 307(a) and 307(b) would have been of greater help to us in enforcing our programs in Michigan had we had them when they were supposed to have come out.

We understand these now will be promulgated, perhaps by March of 1976.

Mr. LEGGETT. Of course, you in Michigan could have set a higher standard.

Mr. HESSE. Yes; we have been taking action under our act, 245, which has wording that says no substance may be discharged into the waters of the State which is or may be injurious to fish and wildlife, industrial water uses, and a whole lot of different uses.

We have been using that legislation, Mr. Chairman.

Mr. LEGGETT. Have you been enforcing it?

Mr. HESSE. Yes; we have had voluntary compliance from all of the major dischargers we have been able to identify.

Mr. LEGGETT. How long have you been doing that?

Mr. HESSE. Since 1971.

Mr. LEGGETT. Have you found that has had any effect at all on your fish poisoning?

Mr. HESSE. In one situation we can see some impact.

In the Saginaw River, which perhaps equals the Hudson River's contamination situation in its lower reaches—except it goes into Lake Huron a short distance below where all the contamination came from—we found 10 major point sources of loss.

Some of these were municipal plants as well as industrial. We worked with each of those industries toward getting them to switch over, and some of these switchovers to substitutes cost up to $500,000.

It is important to say we found fish in the river with 160 parts per million of PCB's. After shutdown, within 2 years, the levels in those fish had dropped very significantly, lower than the 5-part-per-million limit, very few exceeding it.

The level in the water dropped from 3 parts per billion in the Saginaw River to where it was below our sensitivity limit, 20 parts per trillion.

It has fluctuated back and forth since that time, so we know it is not completely solved. We know the companies that substitute, to switch to substitute products, still discharge PCB's at much lower level, but they cannot purge their systems of this contaminant completely.

After flushing their hydraulic systems out, the substitute product becomes contaminated at levels up to 100 parts per million, even after seven flushings. Continued losses both leach out from the discharge lines and from continued losses of the substituted product which has become contaminated.

We had this individual plant discharging in the neighborhood of 30 pounds per day also. These were hydraulic system uses and heat transfer uses primarily. No one is talking about heat transfer uses. Have not heard it mentioned.

Mr. LEGGETT. We have mentioned it.

Mr. HESSE. Have you?

Mr. LEGGETT. Yes.

Mr. HESSE. I have heard that up to 15 percent of the imported PCB's are being diverted into that usage, and we recognize that many

industries have large inventories of PCB's in stock that they can continue to top off their systems with.

We feel legislation to ban its use is the only way, Mr. Chairman.

We cannot go out and test every effluent in every State and find it to be a source and then apply effluent limitations only. We need to stop the use of it completely.

Mr. LEGGETT. You keep talking about Lake Michigan.

How about Lake Erie, is that not even worse off?

Mr. HESSE. It is an incredible story. In searching our tributaries for major contamination, we find that streams with the greatest amount of contamination are going into the lower portion of Lake Huron, and the tributaries to Lake Erie.

We would have expected a massive problem in Lake Erie with PCB's, but we do not see the levels in fish that we see in Lake Michigan. We think it might have something to do with the flow through rate of Lake Erie.

The resident time in the water is in the neighborhood of 5 years compared to 500 years in Lake Michigan.

The enrichment of Lake Erie compared to Lake Michigan may be a factor.

Lake Superior has its problem with lake trout, because it is a different variety of lake trout. It has 20- to 50-percent fat in the sense PCB's are so soluble in the fat it is accumulating in that species particularly.

Mr. LEGGETT. Very interesting. I thank you very much. Maybe we can use you as part of our panel for questions.

Now, we have our two remaining panelists, Bob Zener, General Counsel of the Environmental Protection Agency, and Mr. Richard A. Flye, Chief of the Water Enforcement Branch of Region II.

STATEMENT OF BOB ZENER, ESQ., GENERAL COUNSEL, ENVIRONMENTAL PROTECTION AGENCY; ACCOMPANIED BY RICHARD A. FLYE, CHIEF, WATER ENFORCEMENT BRANCH, REGION II, EPA

Mr. ZENER. I would like to make a few comments, if I may, with respect to the previous testimony.

Mr. LEGGETT. A number of charges have been made, and I assume you have written them down.

Mr. ZENER. First, I would like to set the record straight with respect to Mr. Ottinger's characterization of Mr. Train's testimony on Wednesday as an attempt to justify a lack of action against PCB's on the ground that the Toxic Substances Control Act has not been passed.

Mr. Train has said to me on a number of occasions, and I understood him to say on Wednesday that we did not justify any lack of action by EPA on the ground that the Toxic Substances Act has not passed.

His position is this, that even if EPA's record under its existing authorities had been perfect, as it clearly has not been, let us not pretend that that would take care of the problem.

I am very much afraid that the impression will be created that we do not realy need a Toxic Substances Control Act because, after all, if EPA just got together and used its existing authorities, this kind of problem would be taken care of.

That is why I am anxious to set the record straight on that point.

Mr. LEGGETT. To clear up this point. Mr. Train indicated that 10,000 pounds a year were getting into the streams and rivers, and such as that.

We have identified apparently this one source from General Electric on the Hudson, and that apparently generates that amount.

Now, is that information known to EPA, and does that cause Mr. Train to readjust his overall appraisal of the numbers, or do you include that?

Mr. ZENER. Mr. Chairman, I am not personally familiar with those figures.

Mr. LEGGETT. How about you, Mr. Flye?

Mr. FLYE. I think the figures that we refer to of 30 pounds are discharges which occurred several years ago.

The level of discharge now at General Electric is approximately 1 to 2 pounds per day when the discharge is not affected by storm waters, and approximately 5 to 6 pounds a day when it is.

Mr. ZENER. Let me add a point to that.

I believe the point Mr. Train made is even if we eliminated point source discharges completely, there are a lot of other sources over which we have no authority.

Whenever a chemical like this is manufactured, it gets out into the channels of commerce and there are many, many different ways of it reaching the environment and reaching human exposure.

You can try to stop point source emissions and air emissions, but you will inevitably be doing an incomplete job.

If a chemical is dangerous to human health and if there are adequate substitutes for essential uses as a matter of policy the manufacture ought to be stopped or restricted, and that is why we would like to have the legal authority to do so.

Let us get to the specific questions concerning EPA's actions under its existing authorities.

We recently decided to attempt to eliminate point source discharges by the permit route, that is the administrative route, rather than by filing lawsuits under the Refuse Act, or section 504 of the Federal Water Pollution Control Act.

That decision has been subject to criticism this morning. Let me give you my perspective on it, if I may.

As a lawyer, I am only too painfully aware that filing a lawsuit does not necessarily do the job. You have got to obtain relief. You have to follow that lawsuit through to a successful conclusion.

When this question came up, I asked myself by which route did we have the best chance of an expeditious solution, filing a lawsuit in the case of every plant, or going the administrative route.

It seemed to me, at least, the best chance for an expeditious solution was going the administrative route, that is setting permit limitations, going through an administrative hearing if the company requested a hearing, getting the permit finally in effect, and going through judicial review if the company filed an action for judicial review in the court of appeals.

The alternative, of course, is going to court, going through a judicial hearing, hopefully getting relief, and then going through an appeal to the court of appeals if that were taken.

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It seems to me the advantages of the administrative route are two. In the first place, I think it would be more expeditious. The delays of litigation are notorious.

We have recently, not very recently, but we have been through a very disheartening experience in connection with attempting to get relief from a discharge threatening human health.

In the case of the Reserve Mining Co. in Lake Superior, in which Mr. Oberstar is very familiar with, we filed that lawsuit in 1972. We asked for a preliminary injunction in 1973 on the grounds of what we believed to be a very serious hazard to human health.

Well, the company is still discharging. The point is simply that filing a lawsuit does not automatically do the job, no matter how strong your case is.

Another problem with the judicial route is raised by a comment that Mr. Ottinger made this morning. He very correctly said this morning that this is a situation in which there ought to be a national standard. You cannot have one solution on the Hudson and another solution some place else.

All companies ought to be subject to the same standard.

Now, if you filed a lawsuit in different district courts against separate companies, there is a very great possibility of a different result emerging from every court.

As lawyers, we all know that the result in a case, both in terms of a level of relief and the time of compliance that the judge orders can depend on the judge you get.

Mr. LEGGETT. I get your point on that and I fully agree that ligitation, many times, has its limitations.

The permit procedure you use, how about a regulation procedure as opposed to that?

Mr. ZENER. Well, we are, at the same time, proceeding with the permit route. We are proceeding under section 307(a) of the Federal Water Pollution Control Act, and in April we expect to propose a toxic effluent standard under section 307(a).

We should have completed rulemaking under section 307(a) sooner, and Mr. Speth was quite right in saying that.

Section 307(a) has been a very difficult statute for the Agency to operate under for at least two reasons.

For one thing, it requires a formal judicial type administrative hearing, and when we had an administrative formal hearing on our section 307(a) PCB's regulation in the spring of 1974, I believe it was, we ran into a very serious problem concerning a ruling on the burden and order of proof, a problem which would not have occurred outside of the context of a formal judicial type hearing.

Another problem with section 307(a) is the 1-year deadline that the statute imposes.

In many cases, it is not possible for dischargers really to do anything in 1 year, and then you are faced with a choice of either imposing no meaningful standard at all, or imposing a meaningful standard which requires a shutdown.

We would like to have authority to impose standards and compliance schedules that are more realistic.

Mr. OTTINGER. Would you yield for a minute, Mr. Chairman?

Mr. LEGGETT. We said we were going to have a panel of Mr. Speth, Mr. Eginton, and Mr. Zener, also Mr. Harris, [illegible] and Mr. Fiske.

Would you like to come up to the table?

Mr. OTTINGER. I am entirely in accord with new legislation I dearly hope we can get strong legislation through this year, and get the House and Senate to agree to it.

There is no conflict at all, and there would not be much point in hashing over it except for the fact that, at least in region II, EPA has just been miserably derelict in using the authorities it has at the present time.

These administrative people know better. First of all, region II licensed General Electric to put in 30 pounds per day which is outrageous.

Second, the Government did not enforce any of the permits they had.

Third, that process dragged out interminably, and now a new regulation has been proposed by EPA for still very high standards. That process will also drag out through hearings and so forth.

It does seem to me that since the Agency recommended action under the Refuse Act as far back as 1971, then action should have been taken.

Now, this is just one example, and I would not use the hearing to go through all the others, that region II is not on the ball in terms of abating pollution and seeing to it that the people are adequately protected.

Mr. LEGGETT. Mr. Flye, do you care to respond?

Mr. FLYE. I think that calls for me to say something, Mr. Chairman.

I think that the region and the Agency have been far from derelict. I think that is an improper word in dealing with this particular case, Mr. Chairman.

It is possible for reasonable men, I am sure, to differ on what we did, whether that was the right thing or the wrong thing, but the statement that we did nothing or we did things too slowly, I think is incorrect.

Mr. OTTINGER. From 1971 to 1974, nothing was done.

Mr. FLYE. In what regard?

Mr. OTTINGER. In a case under the Refuse Act in different jurisdictions.

Mr. FLYE. The only thing that can be said about that period before the existence of the problem in GE came to the attention of the regional enforcement people is simply that, from my point of view, a voluntary agreement to limit PCB's to closed systems is a very attractive solution for an understaffed and overworked agency.

The problems is over. It is going to be in closed systems.

Mr. OTTINGER. I will not drag this out forever. But, on January 24, 1972, a memorandum went out from EPA to all Administrators recommending action under the Refuse Act.

The action was not taken, and that is derelict.

Mr. FLYE. I feel, since the problem came to our attention in May, the agency has taken steps to deal with it. And, as I say, those steps are legitimately under attack.

People may differ on what we did. We feel the most expeditious route is a permit route.

We followed that route after evaluation of the material prepared by our analysis and investigations group.

Mr. OTTINGER. How could 30 pounds a day be considered adequate?

Mr. FLYE. We are talking, in that respect, about an interim level. The level that was required to be attained under the principle of best practicable control technology currently available was a level of 3.5 ounces or 100 grams.

The general rule of procedure, not always followed, of course, is to limit the final effluent discharge after a period of necessary abatement and the construction of facilities. It is very rare that situation can be handled immediately. If it can be, we ask that it be handled immediately.

Mr. LEGGETT. Let me ask you this: Could you not handle this kind of like atomic waste and require that this 45 million pounds that is currently being manufactured by Monsanto be registered; that the location of that material be spelled out and located by your computers at all times so we could make sure that this is not escaping you?

I am sure the General Electric example is just one that has kind of come on.

Mr. FLYE. The Agency does not have the authority to take those kinds of steps.

Mr. LEGGETT. Do you need the Toxic Substances Control Act in order to do that?

Mr. FLYE. Absolutely. This is legislation that will allow us to require protesting and preproofing by those who are responsible for the use of new chemicals being introduced—that they will not be harmful to the environment.

Mr. OTTINGER. So far as the discharge in the water that affects the jurisdiction of this committee, you have authority under section 504.

Mr. FLYE. I think, as Mr. Zener said, and I support what he said in that regard, we feel in this particular instance—I can only speak for this particular instance—regarding General Electric, that it is going to be more expeditious and produce better results for us to proceed along the permit route.

Mr. ZENER. Let me add one thing there.

The decision not to file 504 action right now is, I might say, only a temporary decision.

If things do not seem to be working out in the administrative proceeding, we certainly retain that option of filing a lawsuit.

Mr. OTTINGER. That section 504 action has never been taken against any company in the country, is that not correct?

Mr. ZENER. I believe that is correct.

We have proceeded under the Refuse Act, and in the case of Reserve Mining Co. in Minnesota, asked for emergency relief.

Mr. LEGGETT. There are some other charges made here that EPA has never had a strong institutional commitment to do something about the problem of toxic water pollutants.

Mr. Flye, would you care to respond?

Mr. FLYE. Mr. Chairman, before Mr. Ottinger left, there was one other comment he made that was certainly outside the scope of this hearing.

Mr. LEGGETT. He has gone.

Mr. FLYE. I know that he has, but he made charges that region II has no enforcement program.

I think that our record on enforcement is as good as the record of any other Agency region.

Our region has the first criminal conviction under the water pollution control statute that was obtained in the United States.

Mr. LEGGETT. Are you from region II?

Mr. FLYE. Yes.

I am Chief of the Water Enforcement Branch in region II, the Enforcement Division of the regional office.

We have enforcement programs under other authorities, such as the ocean dumping, which is easily the finest of EPA's enforcement programs in terms of compliance and fines collected if that is a legitimate barometer.

I would certainly take exception to the charge that EPA does no enforcement in region II.

I thank you for letting me throw that in.

Mr. LEGGETT. Are you satisfied on another issue like ocean dumping out of region II that you will meet the criteria in your district by 1981?

Mr. FLYE. I am satisfied we will try as best we can to do that.

I think our program is the largest program. Obviously, we have the largest amount of ocean dumping.

Mr. LEGGETT. Is that merely because you did not come here to testify on that?

Is that just a target or a goal, or is that the time limit?

Mr. FLYE. I think the permits we have issued under the Marine Protection Act require, in most cases, getting out of the ocean and finding an alternate means of disposal by 1979 or 1980 in the general case.

I am not familiar with every single permit we have issued in that regard, but the more major ones I am familiar with do call for that type of time frame.

I expect we will meet those requirements in region II.

Mr. LEGGETT. EPA says we do not enforce the provisions of 307 relating to toxic substances.

Was your agency against that when it was enacted, Mr. Zener?

Mr. ZENER. I do not have any personal recollection of that.

Mr. LEGGETT. You said EPA has never vigorously investigated these claims; nevertheless, acted on them to the point that concern over economic dislocation have become a major inhibiting factor overshadowing the deep concern of public health and environmental quality.

Would you want to respond to that?

Did you understand the question?

Mr. ZENER. Yes, I understand the question.

Well, we have been concerned over the economic impacts of our regulations, including the regulations on toxics, and I do not apologize for that.

Mr. Chairman, I think the Agency has to understand the economic effects of what it is doing in any area.

I do not agree that it has overshadowed the concern for human health.

Mr. SPETH. Mr. Chairman, would it be appropriate to respond to that?

Mr. LEGGETT. Yes.

Mr. SEITH. One of the reasons EPA has offered for a long time—there was a period, maybe it has been 2 years now, in which EPA has sat on section 307 and not done anything—one of the excuses the Agency has repeatedly offered for this delay was that to promulgate the standards would cause significant dislocation.

Now, the act says to promulgate the standards, and it says how that should be done. So EPA has no judgment to make. It must promulgate the standards as Congress told them to and protect the public. If the dischargers want to come to Congress for variance, they can do that. Instead, however EPA opts for the industrial position, which is not to put out the standards because there is no variance.

It seems to me it is clearly a case of where concern for the dischargers and protecting the polluters overshadows the concern of EPA for the public health.

I do not know how else to read the facts of this case.

Mr. LEGGETT. Well, it is a problem obviously.

Congress many times legislates in a breadbasket and dumps it on an agency, and the agency has to carry out the will of the Congress, and they have got to continuously figure out whether Congress meant precisely what it said or whether it did not. And we have, of course, ran up against that problem in the Clean Air Act where the agency has moved aggressively and business has erupted, and Congress has responded. And so we do find that there is a cyclical feedback in these situations.

The agency in my area is quite aggressive, I must say, and, of course, as a Member of Congress you get pressures from both sides, and I am sure the agencies are getting pressures from both sides.

In all of these things, we have to guard against this backlash, and also we have got to determine, it would seem to me, what the clear and the present danger is.

It is only when the clear and present danger, health or whatever, is not precisely isolated that we get into these problems of why you need to not park in the city and why you need to not dump, and such things as that.

It is a little bit of a feel of where we are. I am satisfied that the PCB's problem has been established as a strong and clear and present danger.

I think that we have now got some alternatives. We heard evidence yesterday that McGraw-Edison has an alternative for PCB's for use in capacitors.

The Japanese apparently do not apparently allow PCB's over there, and it would seem to me that the Agency might well consider reviewing the benefits that they derive from fire safety in using PCB's in transformers and weigh that against the possibility of their escape from so-called closed-system programs and regulations, and that we forthwith determine whether or not we can have our cake and eat it, too, but do not put industry out of business but move them forthwith to other items besides PCB's because, apparently, we have extreme difficulty in controlling them when we do not know where they are coming from.

Mr. ZENER. Mr. Chairman. I think your statement is exactly right.

I would like to comment that the kind of determination you would like the agency to make is a determination that we could make under

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Mr. ZENER. What I am saying is, when you are faced with a national problem, particularly the administrative route may be better in order to obtain uniformity, as well as an expeditious result.

I would not want to see a repeal of section 504, and I cannot think of any amendment at the moment. That is, by statutory amendment you cannot deal with the problem of delay in litigation, and you cannot deal by statutory amendments with the problem that in different courts you get different results.

As you know, Mr. Spensley, that is part of the judicial system.

I would not say the section is not workable, but it has its limitations.

Mr. LEGGETT. Mr. Oberstar?

Mr. OBERSTAR. Thank you, Mr. Chairman.

We have had a very interesting series of presentations within the last 2 or 3 days, developed some useful information, and enlightening information.

We have established some facts now that I think are incontrovertible: there are considerable amounts of PCB's in commercial use circulating through the industry, and in domestic use in homes; considerable amounts of PCB's deposited in sediment in rivers and lakes that are being removed through dredge operations, considerable amounts in landfills and dumps that are being returned to our waterways by runoff.

It is evident there are some alternative chemicals that can fulfill the current need for PCB's, at least in the near term possibility for commercial development.

The question that I see now is where does this committee go with this?

We have established this information. We have developed a body of knowledge.

We know what the effect on wildlife is, and on the food chain.

We also have a pretty good idea of what are the authorities of EPA.

Where do we go with this, given our jurisdiction?

Mr. LEGGETT. Very good.

Mr. OBERSTAR. That is a question for the chairman.

Mr. LEGGETT. Restate the question. What is your final caveat?

Mr. OBERSTAR. My question is, where does this committee go with this problem, given our jurisdiction?

Mr. LEGGETT. Counsel is going to solve the problem.

Mr. SPENSLEY. One of the advantages of these hearings is that all of the Federal legislation we have dealt with including the toxic substances legislation, in my opinion, addresses the question of how do we cure the problem as distinct to how do we prevent the problem.

This committee and the subcommittee can consider the case of PCB's as a perfect case example, as well as in other areas where we might consider legislation that perhaps gives additional authority, not necessarily to the EPA, or Interior, or to Commerce, but some way of being able to anticipate, or prevent these kinds of problems.

A good example is the toxic substance legislation which could help prevent the problem. In fact, as I questioned Mr. Train the other day, he indicated that he would place some burden on the chemical pro-

ducers, to show that the chemical is not hazardous before it is introduced in the environment as distinct from merely providing notice that they are doing it, and testing it, to be undertaken at that time.

Mr. LEGGETT. I think Mr. Train, and some others have indicated proving the negative is quite a formidable thing, and we might have a great difficult time doing something like that.

Mr. Train did indicate to Mr. Forsythe, accepting for the moment that he would support legislation to totally ban the manufacturing work, the use of PCB's after a period of time, and give, I believe, a crunch date for conversion.

We have to look at that, but I think that we could do that. I think Monsanto is going to do it.

Monsanto is totally committed to getting out of this business.

Counsel, do you recall their testimony?

Mr. SPENSLEY. They said they would phase out PCB's production in an orderly fashion.

Mr. LEGGETT. Monsanto supports the bill. The only thing they do not agree on is the time.

While we do not like to get into the jurisdiction of other committees, considering the fact that we are concerned with fish, and particularly right now the sturgeon levels, the PCB's level in the Hudson River are apparently legend and intolerable.

Mr. SPENSLEY. This subcommittee also has jurisdiction over national environment policy.

Mr. LEGGETT. We might consider taking action.

We do have legislation on the books to take care of discharges and things like that.

They could probably, if there are regulations, I would think they would have a better opportunity to promulgate regulations, were we to effect a law totally banning these from getting into these systems, and recognize the closed system program really does not work, and then try to find out, over the next few weeks, just exactly what are the adverse effects by effecting a conversion, say within a 6- or 8-month period of time in all systems.

Mr. OBERSTAR. Yesterday afternoon when we reconvened, following the last vote, I raised a point that I had been very much concerned with for some time, and that is the need, for the Federal Government to develop the kind of advanced technological assessment, a kind of environmental institute that is prospective rather than retrospective, that looks ahead to solving problems, and Mr. Train touched on that, of course, in his testimony. A few years ago I began developing legislation to set up a program of Federally financed institutes that would join the private sector with universities and the Federal Government in a long range program of review of these 600 to 1,000 chemicals that enter our commercial use every year, and provide a means of evaluating them before they have that impact, Mr. Chairman.

I have nearly completed my draft bill and shall introduce the legislation soon.

I would hope one of the benefits would be that we could have hearings on that legislation in the forseeable future.

Mr. LEGGETT. We obviously have had a lot of things presented in this hearing that we can get very upset and very emotionally moved

about, but I think we all recognize that it takes a while to kind of become alert to some of these problems, in spite of the fact that some folks think we are not becoming of age on the PCB problem, and I am prepared to take some action.

Mr. Speth?

Mr. SPETH. Mr. Chairman, just a couple of comments.

Mr. LEGGETT. The gentleman next to you wanted to speak first, Mr. Harris-Cronin.

Mr. HARRIS-CRONIN. I just wanted to express a little frustration, and add a little of my concern with regard to lack of confidence.

I think that section 504, though I am not a lawyer, is very distinct on permit control. It exists for emergency situations.

Mr. Chairman, I think it is quite clear the reasons why the EPA can use it, and one of the things it touches on is fisheries.

The EPA has very clear authority, and I think to my mind, and this is a differing opinion, there is a very clear need in the Hudson River that that authority can be used.

I cannot express confidence when EPA is given authority to have the same sort of bite where EPA really has some teeth to use something, I really cannot be confident in the case of toxic substances, the Control Act that is, why should EPA start using its teeth now?

To think that the Toxic Substances Control Act is going to reduce controversy, or is going to reduce economic impact, is going to reduce court cases for situations such as that in the Hudson River, is fallacious.

I am not a lawyer, but I do think this is a very grave inconsistency.

Mr. LEGGETT. On the Hudson River problem, now we are talking about the General Electric discharge again, are we not?

Mr. HARRIS-CRONIN. Yes.

Mr. LEGGETT. That is what, 30 pounds a day? Is that the application pending, or is that their existing history?

Mr. HARRIS-CRONIN. Their history has been an average of 30 pounds a day, although they have testified that they are reaching an average of 3 pounds a day as recently as last October.

They discharged 116 pounds in 1 day, and in November, 168 pounds in 1 day.

There is no data that exists that I could get ahold of using my rights for this summer that showed they discharged any less than that.

Mr. LEGGETT. Mr. Flye, how much are they discharging right now?

Mr. FLYE. There are several issues involved. On the latest survey we did, our surveillance analysis did show a high on a day that was influenced by storm water, something in the realm of 5.9 pounds, and a low on a day when it was not raining, and it was a production situation only of about 1-point-something pounds.

The company has also taken several tests, and they show a range down in that order, with a number of excursions.

I think the company says 116 is an analytical error, but there is a documented showing of 70 pounds in 1 day, due to construction activities, according to the company, but the company says they will meet the 100 grams, and that is one of the things we are looking at, how

to control the excursions so that we do not create a problem while we are trying to solve another.

Our people are up there again this week, and we will have some more data.

Mr. LEGGETT. They are still working on it. You have to have confidence in it.

Mr. HARRIS-CRONIN. There is a situation where a substance is dangerous enough where you have to stop it immediately.

The permit processes, you cannot compare the two. The idea here is not, well, which is not addressed to limit a discharge. The idea is there is a substantial danger to the health, and a danger to the fisheries, and the act clearly recognizes when this danger occurs this is a reason to completely stop a discharge.

I think the act pointed out very clearly. I just cannot seem to understand, you know. It is beyond my comprehension, and the second point I want to make is that EPA has not consistently provided reasons, that is, consistent reasons why they have not used section 504.

One of the reasons I heard today was because litigation is just too tough. Well, I am sure it is.

The reason given to me in writing from the EPA was, in fact, that the question in large measure depends on whether or not data exists, and can establish the imminent danger to the health of persons. That was the reason given to me in writing. That is the lack of existence.

Mr. LEGGETT. How long ago did you get that?

Mr. HARRIS-CRONIN. It not only breeds lack of confidence, but you wonder if there are reasons.

Mr. LEGGETT. What was the date?

Mr. HARRIS-CRONIN. September 11, 1975. This is what was apparently holding them back.

This may be belabored after a while, but this committee should understand there are a number of ways of protecting the fisheries, and this Section 504 is a very important one.

Mr. LEGGETT. Now, under your existing authorities, do you have the authority to ban the use of PCB's?

Mr. ZENER. No, sir, ban of discharges, but not the use.

Mr. LEGGETT. Of course, that is part of a problem, you see, that if the Congress would show the courage to go ahead and make the determination if you are going to allow these things to be legally used, the inference is then that some tolerable limit should be allowed to be shipped out.

Now, I think that we found it does not work well, but I believe that is the existing state.

Mr. HARRIS-CRONIN. The Congress recognizes the protection of environment goes beyond the corporate interest, and the profit motive.

That was what supposedly constituted the 1972 law, Mr. Chairman.

Mr. LEGGETT. But if you get down to your total concept, you would have a revolution here.

Mr. SMITH. Can I make a very few brief remarks?

I would strongly urge you to enact a ban on PCB's, and strongly urge you to enact the strongest possible Toxic Substances Control Act. But I think if the thrust of what has happened over the years, the past few years, if there is any meaning in that, is that the enactment of legislation by the Congress is not going to do the job.

I fear that we might fall into the pollutant-of-the-month syndrome. The people are awake to the PCB's problem today. But there are other PCB-type things out there in the environment, and they will be increasingly coming into view. So it is not going to be enough just to enact a law. I think Congress has a continuing responsibility. Existing laws are being undercut, and crippled by funding restrictions, and by lack of support in the U.S. Congress after they are enacted, and by a lack of push on EPA by people in the administration, and in the Congress. It is a delusion to think that the mere enactment of the law without looking at the budget, and seeing what happened to the water program this year, without looking at what has happened in OMB on these programs, and without looking at the lack of oversight by the U.S. Congress up until this day on substances such as this. We are just deluding ourselves if we think enactment of these laws alone is going to do the job.

Mr. LEGGETT. We are deluding ourself if we think the enactment of law is the great panacea a lot of people think it is.

Unfortunately, many times the legislative history of legislation is, you know, somebody is eating lunch, or something like that, and that is a fact that many times we do legislate in areas where we move, and sometimes we move precipitously.

As an example, I can go ahead in the legislation, as I indicated I am prepared to do, to outlaw PCB's at a time certain, and maybe have no exceptions for anything, unless they can prove that the alternative is a problem.

But you must recognize that the existing suggestion of the McGraw-Edison for alternative use for capacitators apparently also is a low level toxic substance.

Now, we do not think it is nearly as comparable to the PCB's. It may well be that a stampede from one area into another area.

That is why, you know, to legislate on a specific chemical, it is not the best way to do it.

On the other hand, if you have so much tug and balance in the Congress you cannot reach a conclusion perhaps we want to consider the effects of chemicals on fish and wildlife, and again our evidence is that we are not going to see protracted results for several years of time.

Mr. HIGHLAND. The reservations you express to legislating on a chemical I think are very important.

I certainly support the concept of banning the PCB's, but I would support again Mr. Harris-Cronin's concept that you do not want to do a chemical a month.

I would not want to be back here in 1 month, talking about vinyl chloride contaminating the fish.

You mentioned the fact that if we are willing to have certain chemicals in our society in use, that we have to realize there will be a flowing of them throughout our environment, that we will find them everywhere, and that brings to light the point also that in any legislation you consider, I think you should consider the consequences of these in the sense that what are we using these chemicals for.

You point up that PCB's in transmitters and capacitators, and the question of alternatives, and it is a very good point. We just have to know.

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You point up that PCB's in transmitters and capacitators, and the question of alternatives, and it is a very good point. We just have to know.

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We should not jump from the "fire into the frying pan," just jumping from chemical to chemical.

We also have to have consideration as to what uses chemicals have, and not just assume all uses they are produced for are necessary.

PCB's were used in a variety of things, in paints used on the inside of silos that stored fishmeal that went into animal feed.

Mr. LEGGETT. Carbonless paper, et cetera.

Mr. HIGHLAND. Right. We have to look at that.

We have regulations on polyvinyl chloride now, 85 percent of the uses EPA have alternatives, and many are known, and less hazardous, and they say if we do not have alternatives for such things as vinyl chloride, credit cards, I think, in any legislation you think about we should consider why do we use those chemicals, and the need for the kind of exposure, the need to limit those uses, and the environmental consequences of those uses.

Mr. LEGGETT. Gentlemen, we are fresh out of members, and I think almost fresh out of our ears, and I hope we can address this problem, as well as the Toxic Substances Control Act, which is scheduled for floor action over the next several weeks, which is my understanding.

We have to look to a kind of situation of where we stand on that, whether it does look like we are going to get a bill out, and if we are going to get a bill out there, I think that might solve the problem.

We want to reappraise our situation with respect to the permit program within the Environmental Protection Agency.

I am sure the Agency is doing what they can on that, and we will be reviewing this again, I am sure, in a short period of time.

We will determine, over the next week or so, whether or not we will be legislating out of this committee.

Anyone who has any additional ideas, you can file them with the committee, and maybe we can get them in the record.

We are going to ask General Electric, and we are going to give them parts of this presentation, and ask them for their comments, particularly up there on the Hudson River, and maybe in other parts of the country, and their comments shall be filed with this record.

I want to thank everyone for participating, and the meeting will now stand adjourned subject to the call of the chair.

[The following was submitted for the record:]

STATEMENT OF MINNESOTA POLLUTION CONTROL AGENCY

PCB INVESTIGATIONS IN MINNESOTA

Two events occurred in May, 1975 which focused the attention of the Minnesota Pollution Contol Agency on the PCB problem in the Mississippi River. The first was the action taken by the U.S. Food annd Drug Administration to halt the interstate shipment of carp taken from Lake Pepin by a Wisconsin commercial fishermen. An estimated 20,000 pounds of carp fillets were disposed of after FDA's analysis of selected samples showed that the fillets exceeded the FDA's "Action Limit" of 5 ppm PCB. The second event was the publishing of a report by the Wisconsin Department of Natural Resources which indicated high levels of PCBs in fish collected from the Mississippi River and Lake Pepin.

Because of the serious nature of the situation and the complex problems relating to areas of jurisdiction and authorities which are involved when an interstate body of water is investigated, a task force composed of federal, state and metropolitan agencies was formed. Members of the Task Force are the Wisconsin Department of Natural Resources, Wisconsin Department of Agriculture, Minnesota Department of Natural Resources, Minnesota Department of Health, Minne-

sota Department of Agriculture, Minnesota-Wisconsin U.S. EPA District Office, U.S. Food and Drug Administration District Office, U.S. Army Corps of Engineers District Office, U.S. Fish annd Wildlife Service, Metropolitan Waste Control Commission anad the Minnesota Pollution Control Agency which coordinated the Task Force efforts. The primary objective of the Task Force is to identify the source or sources of PCBs to the Mississippi River and to determine the extent of the pollution problem so that PCB contamination may be controlled.

The Task Force has initiated a field sampling program on the Mississippi River and its tributaries which includes water sampling, bottom sediment sampling, point source sampling and fish flesh sampling. Information received at this time from the Task Force sampling program has shown that there are areas of the Mississippi and Minnesota Rivers which have a PCB contamination problem. Fish with concentrations greater than 5 ppm in their fillets, the U.S. FDA action level, have been taken from the Mississippi River in and below the Minneapolis-St. Paul area and from the Minnesota River in the New Ulm and Mankato, Minnesota areas.

The sources of PCBs to these rivers have not yet been identified. Monitoring of the water and bottom sediments of the Minnesota and Mississippi Rivers has shown that PCBs are present, yet sampling efforts on municipal and industrial effluent discharges to the rivers have shown no gross PCB contamination of the wastes.

Other possible sources (such as landfill leachate, sewage sludge, and deposition of PCB's which are carried by the air) are being analyzed for the presence of PCBs. Although no extreme PCB inputs have been identified, any contribution of PCBs to the environment no matter how small should be viewed with concern because of the tremendous biological accumulation and biological magnification of this chemical.

The Minnesota Pollution Control Agency Board has shown its grave concern with the PCB pollution problem in Minnesota and the nation by passing resolutions calling for federal and state legislative action to ban or control PCB inputs into the environment (copies attached).

We ask that the Subcommittee on Fisheries, Wildlife, Conservation and the Environment heed and act in accord with the Minnesota Pollution Control Agency resolution concerning the federal ban on PCBs.

PCB RESTRICTIONS IN MINNESOTA

Be it *Resolved*, That the Minnesota Pollution Control Agency Board reaffirm its position of June 24, 1975, in support of a federal ban on the sale and use of polychlorinated biphenyls (PCBs); be it further

Resolved, That the Minnesota Pollution Control Agency Board urges the Minnesota Legislature to adopt legislation prohibiting the use, sale, purchase or manufacture of PCBs in Minnesota, and authorizing the granting of exemptions when it is demonstrated that no substitutes or feasible alternatives are reasonably available for PCBs or products containing PCBs.

MRS. MARION WATSON,
Chairwoman, Minnesota Pollution Control Agency.

Date: January 27, 1976.

MINNESOTA POWER & LIGHT CO.,
Duluth, Minn., February 14, 1976.

Re: Merchant Marine and Fisheries Committee, Subcommittee on Fisheries and Wildlife Conservation, and the Environment—Polychlorinated biphenyls.

Hon. JAMES L. OBERSTAR,
U.S. House of Representatives,
Cannon House Office Building,
Washington, D.C.

DEAR JIM: Thank you for your letter of January 28, 1976 concerning the above subject. I referred it to our Vice President, Engineering & Environmental, Mr. K. A. Carlson, and he referred me to an article that appeared in the February, 1976 issue of "Environmental Science & Technology" which states:

"One possible alternative to POB's may be diisononyl phthalate (ENJ-2065), developed by Exxon Chemical Co., U.S.A. ENJ-2065 is now being used in some commercial capacitors. Others may consist of Dow Corning substitutes found

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in gas-cooled or air-cooled dry-type transformers, or silicone oils now in volume used in Japan. Dow Chemical Co. and McGraw Edison said that butylated monochlorodiphenyl oxide is effective, and far less bioconcentratable aand more biodegradable than PCB's. Prodelec (Courbevoie, France) which makes PCB oils under the names "Phenoclor" and "Pyralene", is looking at a mixture of pure dichlorobiphenyls and chloralkylene, an alkylated derivative in 20:80 proportion, with B. Rey Coquais, a Prodelec engineer, told the conference has a low toxicity and is biodegradable."

Mr. Carlson feels that more substitutes will eventually be developed and used, even if transformer and capacitor costs must increase accordingly. However, a testing program on any new alternative takes time and allowances for this should be taken into consideration whenever a ban on PCB's is discussed. In the meantime, our Company ships all used PCB's back to the capacitor manufacturer for proper disposal, a procedure which we feel would be in compliance with any anticipated state and federal regulations.

Our Company's concern is that any ban placed on PCB's should take into consideration the time element required to prove the acceptability of an alternative product and that any PCB's presently utilized in transformers and capacitors be allowed to remain in service with the understanding that disposal procedures, when required, shall comply with state and federal regulations established in the future.

Sincerely,

S. LASKIN.

[From The Washington Post, Thursday, Feb. 26, 1970]

NEW YORK BANS MOST FISHING IN HUDSON RIVER

Albany, Feb. 25 (UPI)—State Environmental Conservation Commissioner Ogden R. Reid, warning that chemical PCBs in the Hudson River pose a health danger, today prohibited nearly all commercial fishing in its waters.

[Whereupon at 12:37 p.m., the subcommittee adjourned, subject to the call of the chair.]

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