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HAZARDOUS AND TOXIC WASTE DISPOSAL



JOINT HEARINGS
BEFORE THE
SUBCOMMITTEES ON
ENVIRONMENTAL POLLUTION
AND
RESOURCE PROTECTION
OF THE
COMMITTEE ON
ENVIRONMENT AND PUBLIC WORKS
UNITED STATES SENATE
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MARCH 28 AND 29, 1979

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HAZARDOUS AND TOXIC WASTE DISPOSAL

WEDNESDAY, MARCH 28, 1979

U.S. SENATE,
COMMITTEE ON ENVIRONMENT AND PUBLIC WORKS,
SUBCOMMITTEES ON ENVIRONMENTAL POLLUTION
AND RESOURCE PROTECTION,
Washington, D.C.

The subcommittee met at 9:35 a.m., pursuant to call, in room 4200, Dirksen Senate Office Building, Hon. John C. Culver presiding.

Present: Senators Culver, Muskie, Bentsen, Stafford, and Chafee.

OPENING STATEMENT OF HON. JOHN C. CULVER, U.S. SENATOR FROM THE STATE OF IOWA

Senator CULVER. The subcommittee will come to order.

I am pleased to welcome you this morning to the first of 2 days of hearings on hazardous and toxic wastes to be conducted jointly by the Subcommittee on Resource Protection and the Subcommittee on Environmental Pollution. These hearings are the first in a series over the next few months examining the serious and alarming problems that have developed because we, as a nation, have for too long paid little attention to the generation, distribution, and disposal of toxic and hazardous materials.

We now face the formidable task of trying to correct past errors. Some of these errors, as we will learn, cannot be corrected: The damage to human life and to the environment is in some instances irreversible.

I am reminded of the statement by the philosopher George Santayana who said that those who are ignorant of history are doomed to repeat its mistakes. I would paraphrase that, however, to say a society that ignores the environmental and health effects of its chemical wastes is doomed to pay an enormous premium later.

The Resource Conservation and Recovery Act, passed by Congress in 1976, requires that future hazardous wastes be contained more safely and effectively. There are, however, several major gaps in that act, largely because there was little recognition at that time of the significant number of abandoned disposal sites which contain hazardous and toxic substances. Now, every week we read about chilling new examples of human suffering and environmental degradation resulting from inadequate disposal practices.

In my own State of Iowa, chemical waste leaking from one dump site spews hundreds of pounds of hazardous waste daily—including arsenic and benzene derivatives—into the Cedar River. Traces of some related chemicals have now been detected in the drinking

water of a city 140 miles downstream. The price tag to clean up this one site near Charles City may be several million dollars. However, if the waste spreads into the Cedar Valley Aquifer, this principal water supply for 330,000 Iowans—more than 10 percent of the State's population—would be contaminated. This is a health problem of the first magnitude which we cannot ignore.

We will hear today from people who have been directly and personally affected by several such abandoned dumps. In addition, we will receive testimony from scientific and medical experts on the long-term consequences of these environmental catastrophes. And, finally, officials from the Environmental Protection Agency will provide their perspective on the scope of the problem nationally.

In later hearings, the committee will consider a series of legislative proposals, including the establishment of a fund to provide some type of permanent containment or disposal for wastes in the abandoned sites. During this effort I look forward to working closely with Senator Randolph, the distinguished chairman of the Committee on Environment and Public Works, Senator Muskie, the chairman of the Environmental Pollution Subcommittee, and Senator Chafee and other members of the Resource Protection Subcommittee. And, of course, the ranking committee member on the full committee, Senator Stafford.

I look forward this morning to the testimony of our witnesses. We thank them for taking the time to join us, and for their willingness to share their experiences with the subcommittees.

I would like, at this time, to enter Senator Randolph's statement into the record.

[The statement referred to follows:]

STATEMENT OF HON. JENNINGS RANDOLPH, U.S. SENATOR FROM THE STATE OF
WEST VIRGINIA

Mr. Chairman, management and disposal of hazardous wastes and toxic substances may very well be one of the most pressing issues confronting the Congress this year.

Certainly it will be among the most significant where public health and environmental factors are concerned—a fact already evident from the nature of emerging problems in those areas.

The subject clearly warrants immediate attention and the type of high priority you have assigned it in the joint hearings of the Environmental Pollution and Resource Protection subcommittees.

You are to be commended for your assessment of its importance and for your discernment in selecting witnesses qualified to focus on the situation from a wide variety of viewpoints.

They can contribute much to our understanding of the nature and scope of the problem with which we will be dealing. I look forward, as I am sure all of us do, with much interest and anticipation to their testimony.

It is not over-stating the case to suggest that the dimensions of the dilemma are awesome and that its implications are vast and far-reaching.

As I envision the task before us, we must devise new and much more effective ways to protect health and safety in the storage, transportation, treatment and disposal of toxics and hazardous materials.

We must, I am convinced, also develop a system for compensating those who incur cleanup costs, loss or damage resulting from release by others of such materials in dangerous form or quality into the environment.

Those are clear-cut goals. Their attainment, however, will be a very formidable task. Yet it is one that we cannot shrug off or ignore.

I will cite few statistics to indicate what that will involve.

Better controls must be established for an estimated 275,000 generators of hazardous wastes, about 90 percent of whose output is now being disposed of in ways falling short of Federal standards.

Between 35 million and 50 million metric tons of industrial waste produced each year is now considered hazardous, with the total increasing at about three percent a year.

Present estimates, about which we may be hearing more in the next two days, are that hazardous waste may be improperly buried in at least 1,200 sites around the country. There could be more. As you may already know, the EPA thinks it may take as much as \$22 billion to clean up those already in their projection.

Obviously, it will require either amendment of existing legislation or development of a new management and disposal control package to deal with these and related conditions.

These hearings are a starting point for your deliberations on the sound course to follow.

Regardless of what course is followed, however, I suggest that it should address at least three basic goals.

Top priority must be assigned to devising procedures for cleaning up inactive or abandoned disposal sites, with recovery from former users or other responsible parties where identifiable.

I believe, too, that we must consider a funding mechanism based on contributions of generators, perhaps along the lines of the oil spill liability and compensation bill proposed in the Senate last year. We may be able to avoid sporadic, inadequate and after-the-fact responses to separate spill and damage situations and instead make advance preparations for orderly handling and effective remedies in cases of this type.

Finally, I suggest the need for more effective provisions for siting of approved hazardous waste disposal facilities with maximum exercise of State jurisdiction and incentives. We may also want to consider prohibiting generation or interstate transport of such waste or associated products where a State has not provided adequate waste management capacity within its own borders or by agreement with an adjoining State. An exception could be made where an affected industry had made its own arrangement for adequate and safe disposal.

Such provisions would be fully consistent with other objectives of the solid waste program and would, I believe, offer the best prospect of success.

These aims are ambitious, certainly, and will require full partnership and maximum consultation between Congress and industry if they are to be achieved in a practical and effective way. The basic principle will be the ultimate responsibility of the generator of hazardous wastes for their acceptable disposal.

That is the challenge and the obligation we face in fashioning any new legislation to address the hazardous and toxic management and disposal issue. We must not settle for less.

Senator CULVER. I wonder at this time if Mr. James Clark would come forward. But before he does that, I wonder if you, Senator Chafee, or you Senator Stafford, have a statement.

OPENING STATEMENT OF HON. ROBERT T. STAFFORD, U.S. SENATOR FROM THE STATE OF VERMONT

Senator STAFFORD. I have a short statement, Mr. Chairman. It is important to emphasize, I think, at the outset that these hearings deal with more than just the problem of abandoned hazardous waste sites. The orphaned site problem is important, and it is justly receiving a great deal of attention. Not only are water supplies being contaminated, but untold numbers of innocent persons are exposed to extremely toxic and hazardous chemicals. Some places, such as Love Canal, have become environmental ghettos. But these hearings are to inquire into the universal problems caused by the release of toxics into the environment.

If these hearings were to deal only with the Love Canal or Toone, Tenn., we would be neglecting the radium sites in Denver. And if we were to deal with the Denver sites as well, we would still be neglecting PCB's in the Hudson River and PBB's in Michigan. If

we restrict ourselves just to the waste, we will leave a large gap because in the chemical business one man's meat is literally another man's poison. Waste from one company is feedstock to another. What we must explore is the entirety of how and why toxics are entering the environment, whether they are injuring people, and if so, how. Then we must decide whether there should be a scheme to compensate victims, and if so, for what injuries. Ultimately the committee may decide that a legislative solution should be restricted just to the abandoned site problem or that a fund should pay only for cleaning up the Love Canal. But in the beginning, at least, we must take a broad view, not a restricted one.

Thank you, Mr. Chairman.

Senator CULVER. Thank you, Senator Stafford.

Senator Muskie, did you have a statement at this time?

**OPENING STATEMENT OF HON. EDMUND S. MUSKIE, U.S.
SENATOR FROM THE STATE OF MAINE**

Senator MUSKIE. It is a very brief statement, Mr. Chairman. I am sure that all that needs to be said has been said, but that has never prohibited Senators from saying more.

I would just like to say this, that I approach these hearings with a sense of urgency as well as a sense of hope.

We have a sense of urgency because the chemical horror stories across the Nation will not go away and, in their path, hazardous chemicals continue to seep into the environment with no parties clearly held responsible.

We have a sense of hope because this committee is resolved to address those problems.

Last week Senator Culver and his subcommittee held oversight hearings on the Resource Conservation and Recovery Act and its solid waste regulations.

Today and tomorrow we seek more information on the problems of dangerous chemicals and hazardous waste which were not addressed in the solid waste regulations.

I commend Senator Culver for his commitment and interest in this very important subject. It seems to me we have three clear tasks.

First. We must begin the difficult chore of identifying and cleaning up the inactive or abandoned disposal sites in this country.

Second. We need to discuss the ramifications of a fund, based on contributions from the generators of hazardous waste, to provide compensation and liability so we may have an effective and orderly mechanism through which to resolve chemical catastrophes.

Third. We must begin to address the great difficulty in siting approved disposal facilities.

The problems we will explore in the next 2 days are not regional problems. The potential for disaster exists in every region and every State.

Today, we will hear from witnesses who have had personal contact or involvement with incidents involving hazardous chemicals in four States. Their testimony will be important. We need to know the scope of the personal suffering, the scope of economic hardships, and the personal loss which has been experienced, so we may determine how broad the legislative proposals should be. We also

need to know what damage is caused to our natural resources from hazardous chemicals.

Tomorrow, we will deal more specifically with industrial practices and responses to hazardous waste accidents.

I am sure this is only the beginning of a much larger discussion in this Congress on the issues involving chemical management.

I welcome our witnesses here today. I am most appreciative to Senator Culver for offering his leadership in this very important challenge.

Senator CULVER. Thank you very much, Senator Muskie. I do want to thank you very much for all your efforts and leadership in this area and also to say how very much we appreciate the invaluable work of your staff in helping organize these hearings that we are having jointly.

Senator Bentsen?

OPENING STATEMENT OF HON. LLOYD BENTSEN, U.S. SENATOR FROM THE STATE OF TEXAS

Mr. BENTSEN. Mr. Chairman, today's hearing addresses an issue that has grown in importance and complexity as more and more knowledge has been obtained. The impact of hazardous substances on our lives has generated a widespread sense of urgency that these compounds must be somehow controlled. A responsible Congress must now begin to understand the complexities associated with the manufacture, emission, discharge, and disposal of these materials. It must devise a system that can responsibly respond to inadequate past practices in the use of these materials.

It would be unrealistic to believe that this task of creating effective hazardous substance legislation will be either easy or straightforward. While Congress cannot ignore the national concern that hazardous substances are not adequately controlled, it cannot conclude that all hazardous substances can be eliminated, that life can exist without risk. Rather, we must realize that where circumstances dictate the use of hazardous substances, it must mandate a prudent use. It must foster effective control of hazardous substance emissions, discharges, and disposal; must weigh the ability of State and local governments to control these wastes versus the ability of the Federal Government to participate across the Nation in their control; and must recognize that some who are controlled by such legislation will attempt to avoid it while others who sincerely attempt to comply with it will fail. We must understand that our knowledge of hazardous substances is constantly changing, constantly growing. Judgments that were made in the past would not be made the same way now. Control technology that is available now may not have been available in the past.

I believe that the questions of hazardous substance impact and control may well be the most complex and perplexing issues of pollution control that this committee has yet to confront—and we have confronted many of them hammering out the environmental legislation of the past decade. The decisions we make on developing new legislation in this area must be made on a clear understanding of the risks, the benefits, and the costs of hazardous substances exposure and control. We will need to view our options here against the existing laws we have passed. We must look at the

priorities we have set in those laws and the priorities we may wish to set here; we may need to reprioritize our efforts—we must assure the American people that the most pressing environmental problems are resolved first. Today's hearing should begin the process of defining the impact of hazardous substances.

A second issue that must be addressed is how to determine the degree of hazard associated with these substances. It is important to recognize that there is a broad range of effects which may be considered hazardous. It is equally important to insist that the laws we pass and the regulations that are subsequently promulgated recognize these differences.

We must seek to attack the most hazardous waste problems first. If we do not, we may well frustrate our entire effort. Not all hazardous substances require the same degree of control to assure protection to the population. If the definition of highly hazardous substances is too broad, our ability to properly store, handle, control, or dispose of these materials may be overwhelmed. For example, the Texas Department of Water Resources has executed a successful solid waste disposal program during the past 2 years. One of the key elements of this program is the division of waste material into different classes based on degree of hazard. It was fundamentally necessary to create divisions to assure that high hazard wastes received priority treatment and that high hazard disposal sites were not overwhelmed by less hazardous material. Recently, EPA has proposed regulations to control hazardous material disposal. The Texas Department of Water Resources tell me that the hazardous definition within these regulations would shift material from its moderately hazardous category to its highly hazardous category—altering a well formulated, efficient system. This same question of hazardous definition has been voiced by the Texas Railroad Commission, which controls oil and gas production within my State, and by the Texas Department of Agriculture. These are issues that I will explore further during the hearing.

Clearly, in my view, Congress must address the issue of hazardous substances control; I believe that every Member sincerely wants to correct the appalling abuse of hazardous substance disposal and provide sound practices where past efforts have failed. But Congress must focus its efforts to assure that adequate protection of the public is provided. Our resources must be devoted to those problems where the needs are greatest.

Senator CULVER. Senator Chafee?

**OPENING STATEMENT OF HON. JOHN H. CHAFEE, U.S.
SENATOR FROM THE STATE OF RHODE ISLAND**

Senator CHAFEE. Good morning. Today's hearing will have a sobering effect on all of us. We have witnesses here from areas all over the country who have borne the horrible effects of hazardous and toxic wastes in their environment. Their thoughts, along with the testimony from the Environmental Protection Agency, will help the Environment and Public Works Committee to investigate the extent of the abandoned hazardous site problem, as well as other serious releases of toxic substances. But I suspect that we are only beginning to chip away at what is really buried or otherwise present in our land and water.

I see the next few years as being the time when all of us, the Congress, local government, industry, and the public will have to face the discouragingly stubborn and infinitely more serious pollution problems. In the early and mid-1970's we passed several major environmental laws: the Clean Water and Air Acts, the Toxic Substances Control Act, and the Resource Conservation and Recovery Act. In the water pollution area, for example, we have spent this decade in cleaning up our rivers and controlling normal municipal and industrial wastes and raw sewage. And there is much basic work still to be accomplished.

But now we are moving into a tremendously more complicated and expensive task. We are entering the time when the really toxic and hazardous bad actors must be dealt with. I am talking about the problems created in the past, such as abandoned chemical dumps, as well as hazardous substance releases that will occur in the future.

The question of what to do with these substances is always there. It seems that we are hemmed in on all sides: if you burn the substance, it goes into the atmosphere and its sludge still remains; if you bury the substance or its sludge, it seeps into the ground water and seeps up into our homes. If you put the wastes into our waters, it must be treated or pretreated. But what is the alternative? Less regulation? Should we assume that environmental needs will be met in the free marketplace? I am not very sure that is the way to proceed.

The most sobering thought as we act on the policy for dealing with these substances is that our decision now affects generations to come. Or else the number of abandoned sites will only increase far beyond the thousands that may already be out there.

When you consider that the women who live in Love Canal area have experienced a high rate of miscarriages and birth defects—that is the kind of effect that is devastating and understood. It is not stated in confusing scientific terms. Ground water pollution by land disposal of hazardous wastes in the past is an ominous threat to our Nation's drinking water supply. More than 100 million Americans depend on ground water for their drinking water supply. Springs and wells form the main drinking water reservoir in 32 States.

This morning is the beginning, as Chairman Culver stated, of a detailed investigation into the scope of the hazardous waste problem and the health and natural resource damages suffered as a result. My own State of Rhode Island has 40 sites which may have received significant quantities of hazardous wastes.

Tomorrow we will meet with companies who have been connected with Love Canal and Toone, Tenn. And the Resource Protection Subcommittee, which has jurisdiction over the Resource Conservation and Recovery Act, and the Environmental Pollution Subcommittee investigation will take us into the field in the months to come, so that a background and suggestions for legislation can be explored and finalized.

The toxic substance-hazardous waste problem is a monstrous one to solve. But if we in the Congress think it is overwhelming, that is minute compared to what is happening to our people and resources. So, Mr. Chairman, I look forward a great deal to these

hearings and to the leadership which you are giving to this situation.

Senator CULVER. Thank you very much. Senator Moynihan has a statement which will be made a part of the record at this point.

[Senator Moynihan's statement follows:]

STATEMENT OF HON. DANIEL PATRICK MOYNIHAN, U.S. SENATOR FROM THE STATE OF NEW YORK

I wish to thank the distinguished Chairmen of the Subcommittees on Environmental Pollution and Resource Protection for allowing me an opportunity to say a few words about this most serious environmental problem: the grave threat posed by the existence of hazardous and toxic pollutions.

This is a problem of which New Yorkers are all too intimately aware. Toxic chemical poisoning at the Love Canal and the threat posed by the PCBs (polychlorinated biphenyls) in the Hudson River represent only two such examples of this problem.

As my colleagues are aware, the Love Canal situation is only the first and perhaps the most publicized of many potentially similar disasters, in which the disposal of hazardous chemicals has caused the environmental and health tragedies with which we are now attempting to deal. You all know of the basics of the catastrophe in Niagara Falls, New York: the Love Canal was used as a dump for many kinds of toxic chemicals during the period just after the Second World War. These chemicals infiltrated the homes of residents who later settled on the land-filled Canal, and polluted the environment at the Canal. The presence of chemicals found in concentrations far surpassing those accepted as safe posed an immediate threat to the livelihood and well-being of hundreds of people.

I will not belabor these points, but would note to you that these people were the victims of a technological assault that demonstrates the grave problems associated with toxic waste disposal in a most dramatic and forceful way. It is incumbent upon us to take prompt and responsible steps to address this problem. This hearing is demonstration of our intention to do so.

This is not a problem of which either States or the federal government have been unaware. Indeed, in the Love Canal situation, each level of government moved with admirable swiftness to cooperate in mitigating this disaster. The State is relocating the residents of the Canal; the Federal Disaster Administration has provided aid to residents to help in meeting the demands of their situations; and the Environmental Protection Agency, through an amendment attached to their budget last year by myself and the senior Senator from New York, will contribute up to \$4 million to help clean up the Canal site. The State will continue to monitor the situation and is, I know, committed to its rapid resolution.

We must, in our deliberations, consider the appropriate roles the government, industry and the public can take in the process of alleviating these problems. We must consider what the proper mechanism might be to permit the federal government to take a uniform and active role. We must be part of the solution. Notions of a "superfund" to provide funds allowing an immediate response to spills or cleanup of sites that pose an imminent health hazard have been tentatively discussed, and certainly well deserve further attention. We must begin to consider a national response to a problem that is growing. I look forward to working closely on its development.

I understand that our witnesses from the Love Canal wish to discuss their interactions with various governmental institutions. I am anxious to hear their testimony, and know that it will contribute greatly to our consideration of these matters in the future. I look forward to hearing them, and welcome them to the Committee.

Senator CULVER. I wonder now if we might have Mr. Clark and Mrs. Hillis.

Good morning. It is a pleasure to welcome you folks here. Who would like to begin?

STATEMENTS OF ANN HILLIS AND JAMES CLARK, LOVE CANAL HOMEOWNERS ASSOCIATION, NIAGARA FALLS, N.Y.

Mrs. HILLIS. I will.

Senator CULVER. Mrs. Ann Hillis, Love Canal Homeowners Association, Niagara Falls, N.Y.

Mrs. HILLIS. Thank you, and good morning ladies and gentlemen. My name is Ann Hillis. I am a wife and a mother, and I live in Niagara Falls, N.Y. I also live close to a dump, a dump called Love Canal. I don't want to live there any more. I hate Love Canal. I hate my life at Love Canal. The strange life that I lead now is filled with disruptions and frustrations and sleepless nights and a grip of fear that only those in similar situations could understand. My family and I live on a historically wet area east of Love Canal. From State air testing, my home, like most homes, shows chemical contamination. Homes along the canal edge are empty. A green fence surrounds them now and the fence, I feel, is far too late because the contaminated water has been running in our homes, our cellars and yards for years.

We lived in the home for 13½ years. We lost a child there. My 10 year-old son went to 99th Street School as did other children in the neighborhood. Some of these children are gone now after the August 1978 emergency was declared by Dr. Whalen, New York State Health Commissioner at the time, and President Carter. The remaining children are still in the homes, the same bad air and the same horrible environment, despair, hopelessness. We ask, What are we doing to our children and to our own bodies by staying? The stress alone is enough to break anyone. I think many of us are at this point.

Our homes are valueless. We can't sell. Who would buy a house like this? Some have thoughts of trying to rent. But how could we rent a contaminated house, a house we ourselves fear to live in.

I want to tell you a little bit about my son. As I said before, he is 10, and he is a bright boy. He has a 91 average in school. But as a baby, he never required much sleep. He was put on a sedative at age 7 months to about 18 months. He developed rashes, frequent bouts of diarrhea and respiratory problems, always respiratory problems. His first year at 99th Street School, kindergarten, he was admitted to the hospital very ill. The diagnosis was acute gastroenteritis, cause unknown. After that, more respiratory infections and tonsilitis. At age 6 the tonsils and adenoids were removed but the respiratory problems did not improve and he developed asthma.

In 1977, we were told to consult an allergist. He was tested and he was found to have many allergies. He has been on a desensitizing program for a year and a half but with no improvement.

He started school last September, 7 miles across town. His school was closed due to chemicals, chemicals in the air and chemicals on the playground where he and all the children played. He started the school year off with an abscess in his nose and he was on antibiotics. He had repeated respiratory infections and bouts of asthma. By this time we the people were well aware of Love Canal as were our children. My son went into a depression, withdrawing from school, from his mother and his father, and he begged to leave. I promised that we would soon. One night last winter I got up to go to the bathroom and I looked in on him and his bed was empty. I looked all over and it was 2 a.m. I heard a cry from under the couch. My son was under there with his knees drawn up to his chin. I asked him to come out and tell me what was wrong, and his

reply was, "I want to die. I don't want to live here any more. I know you will be sick again and I will be sick again."

My husband and my son and I cried together that night. We went to a counselor with family children services. The counselor arranged for a change in school because he was refusing to go to school. He would stay in bed night and day. We did all we knew to reassure him. We changed the school and he had been out about 8 weeks at the time. We did get him back into school and he was doing fine and then 2 weeks ago another bronchial infection, more antibiotics and medication.

March 22, back to the doctor, the antibiotics didn't work. He was changed to another. He went to the hospital for more blood work and chest X-rays. The doctor knows my son is sick, but they don't know how to help him. I do—get him out, him and all sick people out, out of the contaminated hell that we live in.

December 8, 1938, was my birth date. December 8, 1978, I celebrated my 40th year by getting up at 5 a.m. and going out in zero weather to walk a picket. The air we breathed was cold and so heavy with chemical stink that you could taste it. We neighbors, out of desperation, walked together to halt the movement of trucks from the canal site into our neighborhoods, for now we knew of over 200 chemicals brewing beneath our soil, and dioxin, one of the most deadly poisons known to mankind. We also knew radiation was at Love Canal. We publicly protested these crimes. We had been made to feel that we were the criminals, but were not. We are the victims, so we protested.

I was arrested, as 15 others were, for being victimized by Occidental Petroleum Co., the parent company of Hooker, the U.S. Army, the State of New York, the city of Niagara Falls and the school board, for knowing from day one, knowing the chemicals were there. Hooker knew. Why did they not stress this to the school board? They are a big company. They produce the chemicals. Surely they have some idea of what the chemicals can do. The people of Love Canal now know what they have done. They have produced children with extra fingers, extra toes, double rows of teeth, cleft palate, enlarged hearts, vision and hearing impairment and retardation. State officials announced February 8, 1979, that all children under 2, and pregnant women should be moved out of the area. If it is not safe for them, what about my child? He is not 2 now but he was 2 once. He was sick when he was 2 and now he is 10 and he is still sick.

How about pregnancies? Many women cannot get pregnant because they have had hysterectomies due to excessive bleeding, tumors, cancers at an early age, age 20 to 30. I myself am in this group. Dr. Beverly Paigan, a cancer researcher at Buffalo's Roswell Park Memorial Institute, who has worked with the Love Canal Homeowners Association, says analysis of health data collected by the association shows incidents of attempted suicide, nervous breakdowns, hyperactive children, epilepsy, asthma, and urinary tract problems occurring three to four times higher among the residents living in the wet areas compared to the dry areas.

Dr. Paigan says the data indicates 24 out of 120 children born to women who live in the wet areas have birth defects. In the 5 years

from 1974 through 1978, 9 of 16 children born to women in this area had birth defects, a rate of 56 percent.

Dr. Paigan says that 39 out of 155 pregnancies in this area end in miscarriages, a rate far above national average. The wet areas that she refers to are swales, are old stream beds that are carrying chemicals from the former Hooker landfill or Love Canal. I am a sick woman and I am nurse to a sick child. My thoughts are will he live to have children? If so, will they be sick or deformed? Man-made chemicals are not to be lived with 24 hours-a-day for years. We are not guinea pigs. We are human with human needs. We want hope and hope for our children.

We want simple things like a spring garden. Even this has been denied us since the State has said the vegetables may not be safe for human consumption. But for years my family has eaten vegetables grown in our yard, also vegetables grown at the canal edge where a friend lived on 99th Street and she grew them there. Her husband died 5 years ago from cancer, her son 6 months later from cancer. The State moved her out, out of a home that she lived in over 20 years. The State air tests showed chemicals in her home, but there are readings outside of the 99th Street area higher than hers were. Such a home is up the street from mine.

A 9-year-old child asked State officials at a public meeting, "Will I grow up to be a normal man?" The State told his parents not to let him sleep in his bedroom, for chemicals were found there. The boy has asthma. His father has asthma, his mother and his little brother have epilepsy. They remain in that home, for they do not have the financial means to get out, like everyone else.

I believe most Americans assume that the Government will be there when they need help. The people of the Love Canal area are now very disillusioned. Is this belief wrong? Do the people of Love Canal have to feel a hopelessness? Are we not Americans? Our city, our State has done nothing to help the people in the area outside of 99th and 97th Street. If our Federal Government does not help us, we are all doomed at Love Canal. May God help us and our country, for we need it. We need help desperately. Thank you.

Senator CULVER. Thank you very much, Mrs. Hillis.

I wonder if we might have Mr. Clark's testimony now, and then we will ask some questions.

STATEMENT OF JAMES CLARK

Mr. CLARK. Good morning. My name is James L. Clark. I am a disabled American veteran having served approximately 14 years in various paratroop, Green Beret and Guard units. I have lived over 8 years in the Love Canal area. Since living there my family has suffered many serious health problems. The adverse health effects in that area are real. These people need to be immediately evacuated from that contaminated area.

Dr. Beverly Paigan's findings in many cases substantiated by surgery. The New York State Health Department's attempt to disprove the illnesses seems to be working against the purpose of a health department. With all the contaminants found, one can only assume that there is a definite risk to the population of the Love

Canal area. They found over 200-something, I have them all here. I would like to put this in the record, my testimony, too.

Senator CULVER. We will review that material and, without objection, if it is appropriate, we will put it in. I don't know what the limitations of space might be, but we will certainly try to accommodate that request if we possibly can.

[The material referred to may be found beginning at p. 98.]

Mr. CLARK. We had another suicide discovered this past Friday. A 22-year-old male shot himself. No one knows why, nor will they know why the next one will do it. This is a fact of life we live with every day.

New York State Health Commissioner, Dr. David Axelrod's statement before the congressional subcommittee that "The cancer data could not be substantiated," is absolutely ludicrous. New York State law requires that all cancer and tumors be reported to the New York State Health Department.

Besides our area has one of the finest cancer research institutes in the world, Roswell Park Memorial Institute in Buffalo, and New York City has Sloane Kettering Institute. Why can't cancer findings be substantiated?

The blue ribbon panel that was secretly assembled to look into the health problems—and no names revealed to the public—was an absolute insult to our intelligence. I wrote Dr. David Axelrod advising him of the New York State law on freedom of information. When a panel rules on a matter affecting the health and lives of my family, I would like to know who they are, if they are qualified individuals who can tell what is wrong and what course of action is to be taken to alleviate any problems. I have received no answer.

In the first two rows of houses, the people were removed without any scientific investigation, solely on a political campaign promise. When the human cry went up from the people, the Governor promised them on national TV: Allow us to move these two streets and anyone with health problems or chemicals also will be removed.

Approximately 23 families submitted their health records, under a short time limit. Our answer back was this enclosed form telegram—even people with heart conditions got it, but were afraid to open it; 3 days later we received a certified letter saying the same thing. Gentlemen, the evidence is in. The chemicals have leached. The health problems are real. These people must be relocated. You do not solve a problem of this magnitude by arbitrarily drawing a line on a map, putting up a fence, at our expense, and have the Governor say, "That is all the houses we are going to buy."

Only now are they doing hydrology studies in the outer area. They have drilled 18 holes and 12 are contaminated, and the people are telling them that they are drilling in the wrong places.

This document from the State tells of the fact that the ambient air in the Love Canal area is infested with chlorinated hydrocarbons 80 times greater than in downtown Niagara Falls, which isn't too sweet.

The New York State Health Commissioner at every meeting simply states there is a risk of flying in an airplane, that there is a risk in crossing a street. We want to know what the risk is of living in an environment with known human carcinogens where the

quantities are 80 times greater than in the downtown air of an industrial city—Niagara Falls. We know the effects of dioxin. These are the only statements that we have on dioxin that we received from the Health Department. "We anticipate no problems," one of them says.

Hooker's role in this entire affair has been to launch a massive advertising campaign, in essence claiming that the victims caused the problem by moving into the area and disturbing the clay cap. The Love Canal dump, according to Hooker, was done in the most scientific, expertise manner of the times: A secure landfill, meeting all the requirements of a secure landfill: isolation, barrier, sealed vault, clay cap, and so forth. All of this is readily disputed by this 1952 photo showing it leaching into the river.

Here is the Love Canal. Hooker has stated many times that it was buried in secure sealed vaults, stacked the barrels. In the graph you see the barrels were open, dumped into open pits. There are no security. There is houses here. There is no fence up to keep the children out of it, and even down here where it is leaching into the river. This is the 102d Street dump, which is also Hooker's. And if anyone was ever going to put in a dump, you would never put it on top of your drinking water supply. Yet they have five of them: the S dump, N dump, 102d, the Love Canal. At one time this was all a swamp. It is going to wind up in the river because the bedrock 40 feet down is limestone. This area, some of these diagrams I have here, states it has silt, sand. So whatever was dumped here, anybody with commonsense can see that is going to wind up in the river. Why wasn't it corrected then? Why are we using approximately the same technique now? It did not work then and it will not work now nor 10 years from now by the State's own admission. The whole remedial plan—their 6-inch pipe—is only an engineering hypothesis which has yet to be proven. The chemicals that have and are leaching from the canal are not going to be brought back into the canal. The people are, and will be continually exposed to, dangerous toxic chemicals.

This remedial plan was drawn up between city, State, Hooker, and an engineering firm which happens to be a Hooker business associate. The construction work for this plan was awarded, without bid, to another Hooker business associate: The Newco Chemical Corp. Our city manager, who awarded the contract for the construction work, resigned and moved to Florida to work for Newco.

If the construction work had been implemented all at once, instead of in three phases, there might have been the possibility of containing some of the chemicals. Just the other day, north of the completed construction site, this fact was clearly shown by chemicals leaching from the ground, running into the storm sewers, and into the Niagara River for 3 days. After news coverage, the remedial construction crew instigated emergency procedures. "Emergency Procedures" because the insurance policy did not cover this—an insurance policy that New York State paid \$1.3 million for to cover approximately 40 workers. In the next 3 days, over 12,000 gallons of leachate were sucked up. I wonder how much they did not contain from going into the river. With hundreds of chemicals, of dioxin, of radiation, how much longer will these people be forced to

stay? Niagara Falls itself is a scenic wonder. Why are they allowing to be turned into a chemical dump?

I have about 6,500 signatures on a petition here that is begging please stop the dumping. I have letters from unions, church groups. They formed an ecumenical council. I think in the task force there were 16 different denominations, including Roman Catholics, Protestant, Jewish, and Unitarians, and they are all begging the Federal Government to identify the Love Canal as a disaster area. The community extends from 93d to 103d and they insist upon the complete neutralization of toxic wastes and complete regional incineration for toxic wastes and to make safe disposal of toxic wastes a top national priority. As I said, they represent over a million people. So the need the cry is up from the people.

Newco, while doing the remedial work at the 16.5 acre Love Canal, is building a potential 400 acre Love Canal on 56th Street. Another secure landfill? This is what a secure landfill looks like. This is SCA right below the falls. And SCA is building a 900 acre site below the falls that affect our friends to the north in Canada. SCA has permission from the Department of Environmental Conservation to dump up to 3 million gallons per day of so-called treated waste into the Niagara River starting in late March 1979. Presently they are dumping only 550,000 gallons. This is a new secure landfill under here, while at the same time the one they just closed, they are digging the leachate up and taking it to the brandnew secure landfill.

There is no such thing as a secure landfill. While being the greatest industrial Nation in the world, we are using antiquated methods of waste disposal and of regulating it. What we are actually doing is regulating the slow, systematic poisoning of our citizens. The people want this dumping to stop. We have letters from unions and religious leaders to this effect. The technology for a total, safe method of waste treatment exists. We must initiate a national program on the mandatory industrial high temperature incineration of toxic wastes.

But this solution cannot be left to private industry. It has been proven time and time again that industry will not police its own garbage even though laws and regulations exist. I know it is not by design or intention, but a situation could exist where a company that pollutes forms another company to clean up the pollution at the taxpayer's expense.

A national program would be expensive, but we cannot afford not to start it. What is one child worth? What is the next Love Canal worth? We cannot victimize our Nation's children through carelessness and greed. The Niagara Frontier will be a perfect place to initiate a pilot program with over 50 chemical dumps identified and more being built.

Thought must be given to the identification, registration and exchange of waste among industries because one industry's waste is another industry's raw material. Recycling, reclaiming and detoxifying these wastes would help the energy crisis. Even electricity could be generated from the steam created by the high temperature incineration.

Consideration must be given to the transportation of chemicals to be incinerated. Something such as MS-5 could be added to them,

it would turn the wastes to jelly to prevent spillage. If an accident occurred during transportation, at least people surviving the accident will not be splashed with acid.

This would open up a whole new area of environmental studies where the cause and effect of waste-induced environmental problems and the use of industrial byproducts could be explored. And more exploration could be done in the area of solar furnaces for incineration, and for high energy ceramic magnets for detoxification. Without such a program, we will continue to have one Love Canal after another with its disease, its birth defects, and jeopardy of the next generation.

Gentlemen, to show what the Love Canal really means, a little girl in the neighborhood asked me to show you this photo. Her condition came about when the remedial digging started and it has grown steadily worse. Several doctors have said it is definitely not teen-age acne. Last Friday she was taken to Roswell Park Memorial Institute. They did not know what is causing the severe rash. That girl, gentlemen, is my daughter.

Thank you.

Senator CULVER. Thank you very much, Mr. Clark, and Mrs. Hillis.

I believe your tragic experience and the experiences of your neighbors are certainly very grim and frightening proof that old waste dumps can be nothing but environmental time bombs that can spew forth human suffering and tragedy.

It is my understanding that, as you mentioned here, there has been some efforts by the State of New York to evacuate a number of homes, I believe 200 homes.

Mrs. HILLIS. I think 237.

Senator CULVER. 237 homes. Will the owners of these homes ever be able to return to them in safety?

Mrs. HILLIS. I don't think so.

Senator CULVER. Can you give the committee an idea of the typical sale prices of these homes before this crisis erupted?

Mrs. HILLIS. They were in different ranges. I would say probably from in the \$20,000 up to \$35,000.

Mr. CLARK. You mean in neighborhoods that have been evacuated?

Senator CULVER. Yes.

Mr. CLARK. Probably \$25,000 to \$48,000.

Senator CULVER. And their value now is zero or virtually zero.

Mr. CLARK. They are even less than zero. They are a detriment.

Senator CULVER. What alternative living arrangements are being made for those people?

Mr. CLARK. You mean the ones outside of 97th and 99th Street?

Senator CULVER. The ones that have been moved.

Mr. CLARK. Some of the people bought new homes.

Mrs. HILLIS. Some moved to temporary housing and some are still in temporary housing. They are looking for new houses.

Senator CULVER. Who was paying for the homeowners' losses to date?

Mrs. HILLIS. The State has helped, has taken these losses; yes.

Senator CULVER. Can you supply the committee, either one of you, with information on how many people have lost their liveli-

hoods as a result of this disaster? And if you don't have it handy, maybe you could provide it for the record.

Mr. CLARK. I don't know. In my case, I haven't worked since November 14. I have kidney problems, high blood pressure, enormous other problems. I broke out in a terrible severe rash when we were picketing because they weren't washing trucks, which is ridiculous anyway, because that doesn't take away dioxin. We were trying to bring this to the world's attention. What is sort of ridiculous, now, as we left yesterday from Niagara Falls, they had a film on television where they were taking spray cans containing 245T off the market. Right behind my house there is 200 tons of 245T. At the end of my street, there is 200 tons of 245T. Down the river there is 200 tons of it, 200 tons in the N dump. 200 in the S dump. I don't know where they got the 200 tons in each of these dumps, but it works out nice. On Bloody Run we have 3,300 tons and they are taking little spray cans off the market. I thought that was good.

Senator CULVER. Could you give us some information on that issue of loss of livelihood in the area? Could you get it for us? Do you know of any available statistics?

Mrs. HILLIS. No, I don't; I really don't.

Mr. CLARK. The Homeowners Association itself has never even considered that, because they have so many health problems and other related things. I know we have a lot of people out of work because of nervous conditions and kidney problems.

Senator CULVER. You have commented that the hazardous chemicals may be moving out of the Canal through dry stream beds and endangering the other residents of the area. Do you have any information on this? Do you have any idea how many homes may be ultimately threatened?

Mr. CLARK. Well, from 93d to 103d, I think at the last rate it was 200-something homes they think was affected. You have to understand some of these streets are only half streets, like 100 Street is only a half street. I have a unique case. The State calls this a unique case. This is on the street that Mrs. Hillis lives. That family just has a multitude of problems. They live on 102d Street. They have readings in the basement. They were told, "Don't go into your basement, don't go into the bedroom." The State is doing \$7,000 remedial work in their yard. They had a sewer in the middle of their back yard. What it actually was was from the old swales that used to drain off that area when they first started construction. Somehow it got tied up into the sewer. But by the State's own admission, the stuff is leaching and it has leached for years. Everyone has known that. All this stuff, the photographs of the old swales, the swale beds—

Mrs. HILLIS. You can see the old swale in that one black and white photograph and there are other swales in the lower park, and the freshwater streams—

Senator CULVER. Could you bring that up here, Mr. Clark?

Mr. CLARK. To show the magnitude, you see this here? This is all fill. You see how the shoreline is changed. This is Hooker's 102d Street dump. This highway you see ends here. We have all this.

Senator CHAFEE. This is the old 1952 picture, is it?

Mr. CLARK. Yes.

Now, over here, this is what I was talking about, the old swales.

Senator CHAFEE. A swale is an abandoned river?

Mr. CLARK. According to the geological studies, the water goes in one way, may go out the other way, depressed area. You can see this is the Canal itself and 99th Street School is here. My house is here. It wasn't built at that time but it is approximately here. What happened, all these white spots and everything, when they started construction here—they never bring this up but all the oldtimers will tell you this. The farmers sold the top soil to the contractors and they would dump that filth there. What you have is an indiscriminate dump over here in this area.

Senator CHAFEE. These are the houses, the 237 houses?

Mr. CLARK. These are gone. They weren't even built in this picture.

Senator CHAFEE. Right along there? Is this where the 237 are?

Mr. CLARK. Yes. This is 100 Street. They put the fence right there.

Senator CHAFEE. Now, where does Mrs. Hillis live?

Mr. CLARK. She lives over in this area here, sir.

Senator CULVER. Thank you very much.

Mr. CLARK. This is the new 900-acre site below the falls. This is a covered secure landfill that is leaching. I have another picture that shows that, with the crane picking up the leachate to take it to the new secure landfill.

Senator CHAFEE. Where it will have a chance to leach again.

Senator CULVER. Senator Muskie?

Senator MUSKIE. I think we ought to have for the record something that picture may answer. What was the basis for the decision to relocate 200 families on the two streets?

Mrs. HILLIS. 239. I think there are about four families that still remain that refuse to move out of the area.

Senator MUSKIE. What was the basis for selecting those families and not others?

Mrs. HILLIS. They were right around the outer edge of the canal. The school sits right on the canal, or just the edge of the canal, and the homes were on both sides of the canal proper.

Senator MUSKIE. Before that decision was made, did the State undertake to make a health survey of the people in that area to determine the extent of health effects, defects and so on that you described?

Mrs. HILLIS. In the immediate area?

Senator MUSKIE. In the area that was relocated.

Mrs. HILLIS. They did somewhat of a survey, yes, they did.

Mr. CLARK. The State moved into the area on August 2nd, and the Governor came around the 8th, because the people were in a rage. You can imagine. And they printed a book—it was released in September. It was a special report to the Governor and the legislature. Here they said they ruled because of an imminent health danger. But every other document we got from the State, the people were removed because of remedial construction. See, the construction—we don't understand where construction was a danger. When they formulated this construction plan, they had no provisions for safety for the resident that had to remain. We screamed and made noise about that and they finally put us on a bus program. If they unearthed chemicals that were dangerous, or

explosive or radiation, or something, they were supposed to pick us up in buses.

Senator MUSKIE. What I am trying to get at is the basis for the State's decision on the 239 families that were relocated. Were they families whose problems relate to this dump and nothing else? I would like to know whether or not there is a rational basis for choosing these 239 families and no others. As I understand your testimony, this problem spreads far beyond the two streets. I think you mentioned 93d to 103d Streets. Now, has anything been done since the decision to relocate these 239 families? Has anything been done by the State to determine whether or not areas outside those two streets are similarly affected and ought to get similar treatment?

Mr. CLARK. Right, sir. The first program they came out with, the first initial evacuation—at that time it was Commissioner Whalen. Commissioner Whalen was the Commissioner of Health. He said they were going to move the children and the pregnant women. This was on an initial evacuation. February 8th, after Dr. Beverly Paigan's statistics and everything was finally brought out, the State agreed that there was a danger existing to the fetus. So the other areas, only pregnant women and children under 2. This is the February 8 decision.

Senator MUSKIE. That is February 8, this year?

Mr. CLARK. Yes, of 1979. So there were approximately 30 people in that area that came under this. And at this time only 7 have taken the State up. But that is only temporary relocation until the child becomes 2 years old. And then they are to move back.

Senator MUSKIE. Let me ask you this question.

Mr. CLARK. I see you are confused, because I was confused by that one myself.

Senator MUSKIE. I don't expect to get all the answers from you, but I expect to get some indication of what hasn't been done. Now, is there a comprehensive survey underway, a continuing survey underway to determine to what extent these health effects are above what would normally be expected and over what area? Is that kind of health survey being done?

Mrs. HILLIS. It has been to a certain extent. They did come into our area with forms to fill out, and questionnaires. But there has been a lot of conflict between the State's findings and some other researchers' findings, as they do say, yes, definitely there is danger to the fetus and to young children, and possibly other people.

Senator MUSKIE. Well, how thorough has that survey been?

Mrs. HILLIS. I don't think it has been very thorough, sir, as far as I am concerned.

Senator MUSKIE. Has it been limited to that questionnaire?

Mrs. HILLIS. Yes. We have had a few phone calls from Albany and that has been the limit.

Senator MUSKIE. But there have been no medical teams in the area?

Mrs. HILLIS. No. The medical team that came in, they just came in with questionnaires, that is all. This was from Dr. Vianna's office.

Senator MUSKIE. So the selection of the 239 families, that decision was a geographical one?

Mrs. HILLIS. Yes.

Senator MUSKIE. It was not a health decision?

Mrs. HILLIS. Excuse me, sir, but we have had a lot of blood work. We have had blood work drawn.

Senator MUSKIE. Over what area?

Mrs. HILLIS. Over the entire area of the Love Canal area, as well as people that have formerly lived in the area that came back for blood work. We have had repeated blood work.

Senator MUSKIE. On a regular basis?

Mrs. HILLIS. Well, yes. Some children that have liver problems, or whatever, are still having blood tests.

Senator MUSKIE. I take it with health problems of this kind that most families have had to go to their own doctors?

Mrs. HILLIS. Yes.

Senator MUSKIE. Have those doctors been surveyed by the State's health team?

Mrs. HILLIS. From my viewpoint, sir, I don't think a lot of the doctors have been very cooperative. My own doctor, my family doctor, refused to send my health data to the Health Department.

My son's pediatrician did very good in that. But my doctor did send a statement, but he did not release my health data.

Senator MUSKIE. What is the basis for his refusal?

Mrs. HILLIS. He said: "The Health Department is a bunch of dumb asses".

Senator MUSKIE. Has any other organization, your own organization, tried to assemble the medical records?

Mrs. HILLIS. Yes, we have; from the homeowners' association we have, with the help of Dr. Beverly Paigan, and we made a fairly good survey; yes, I would say so.

Senator MUSKIE. Have you had any professional analysis?

Mrs. HILLIS. Dr. Paigan who is a professional.

Senator MUSKIE. Is she a public health doctor?

Mrs. HILLIS. She is a researcher for Buffalo's Roswell Park Institute Cancer Hospital.

Senator MUSKIE. Now, when you mention the value of the homes of the 239 families, those were values as of what period?

Mrs. HILLIS. Sir, I didn't understand.

Senator MUSKIE. You gave us the value, I think of \$20,000 to \$30,000—as of what date? You have had a lot of inflation.

Mr. CLARK. The 239 homes the State was going to buy, the actual purchase was \$7½ million. They threw some other things in like moving costs and things of this nature, and I think the total price of evacuation was \$8 million plus.

Senator MUSKIE. Senator Culver asked you about loss of work. Is there any data at all on the extent to which people have lost work because of their health problems in this area?

Mr. CLARK. I don't think we have ever assembled any, but just the people that live in the area, all you would have to do is contact the plant and see how many days they have missed. See, we expect to have asthma and colds and all these other things that you get once a year; that is a continual process with us.

Mrs. HILLIS. We have had so many things, this is one thing we have not done.

Senator MUSKIE. Now, it is your feeling that there is at least a 10-street area—occupied by people whose homes are now valueless?

Mrs. HILLIS. Yes, definitely.

Senator CULVER. Senator Chafee?

Senator CHAFEE. Mr. Clark, as I understand your testimony, you indicated that Dr. Axelrod said that people are going to get hurt crossing a street and there is a risk in flying an airplane? Is there some particular report he is working from? In other words, is it the State's contention that this incidence of cleft palates, deformed children, were just coincidence, that they weren't directly related to the situation in the Love Canal?

Mr. CLARK. Well, I really can't speak for him because apparently he is trying to put a medical connotation to a political decision. And when they drew the line on the map without any scientific investigation at that time, I told all my neighbors, I said: "They will put up a fence, and that's the ball game." Sure enough, they put up a fence and have not brought anything out of the fence except four or five houses to the north of the canal, with no fence around it. But they were contractors and—

Senator CHAFEE. I am confused a bit here regarding the fence. They put a fence around the property where it had been condemned?

Mr. CLARK. There is the area right there, and the fence is beautiful. It matches just what they drew on the map.

Senator CHAFEE. So that was where the houses, the 237, or 239 houses were?

Mrs. HILLIS. Yes; all but just a few that were on the outside.

Senator CHAFEE. So they took that area and now have closed off the fenced-in area?

Mrs. HILLIS. No; it is not closed off. You can go in. The school is still open and you can go in, anyone.

Senator CHAFEE. The school is still open?

Mrs. HILLIS. Oh, yes. No children, no. It is used for offices.

Senator CHAFEE. Is there some kind of report? I think we ought to get hold of it and see the doctor's report, because the statistics that you give—that is, Mrs. Hillis and all—in connection with the childbirths, the miscarriages, the deformities, defects, seem extraordinary. Yet I gather that the New York State Health Department says that there is nothing extraordinary.

Mrs. HILLIS. They do say there is something extraordinary, but they just have limited it to the possibility of pregnant women and children under 2 being damaged.

Senator CHAFEE. These reports you have given me, Mr. Clark, who prepared this material?

Mr. CLARK. Dr. Beverly Paigan did.

Senator CHAFEE. She is the doctor from Roswell Park?

Mr. CLARK. Yes.

Senator CHAFEE. Now, I missed the last part of your testimony. What specifically are you recommending to us?

Mr. CLARK. Specifically we have to move the people out of that affected area. We have to stop dumping—

Senator CHAFEE. How far would you go? Do you have a geographic area that you would suggest?

Mr. CLARK. I would say 93d to 103d.

Mrs. HILLIS. As of this time. That would include that picture. Would the people go?

Mr. CLARK. Some of them wouldn't, believe it or not. In fact, I doubt if 50 percent of them would leave. You have to understand, most of these people are old. They have already suffered the effect. A lot of the people have their homes paid for. And, you know, with inflation and everything, buying another home would put a burden on them, and they just wouldn't do it.

Senator CHAFEE. Did the price New York State gave for the homes seem like a fair price?

Mr. CLARK. Everybody at first was pleased with it. But I think the first batch that they purchased were just overjoyed to get out. Those homes on 97th and 99th Streets were mostly younger people in the 30 age group, working, who had been there probably 5 to 8 years.

Senator CHAFEE. The other suggestion you had to us was developing a high-temperature incineration, a national program on that?

Mr. CLARK. That has to be done. And you can't leave it up to the States, because it is a very amusing thing. One of the members of the regional planning board is also a partner with NEWCO, who at the same time they are so-called cleaning up the Love Canal, they are building a 400-acre site almost in the middle of the city. It has to be set up with a scientific community. The Europeans have it. I have all the data on this.

We look forward to getting some information out of that. We will certainly ask Mr. Jorling about the possibilities in that area.

Thank you very much, Mr. Chairman.

Senator CULVER. Thank you very much, Mr. Clark, Mrs. Hillis.

Senator MUSKIE. May I ask you one question? There is a great drive on in this city and across the country to get government out of the regulation business. Government gets into regulation and the clean air field and clean water field, safety fields, and the health field, and it is being argued over and over again that government is overregulating, imposing unacceptable costs on industry, particularly. Now, what you are saying here is there was underregulation that led to this problem. Am I correct?

Mr. CLARK. No, sir. I said you are regulating the most antiquated and ridiculous system in the world. You are regulating secure landfills. Secure landfills do not exist. This is a result of a secure landfill. We are living in a result of a secure landfill.

Senator MUSKIE. You say the means used are inadequate. Are you saying there should be no means?

Mr. CLARK. No; we should set up a regional incineration program where all things are identified, computerized. Don't bring those 5,000 gallons of acid to this place; take it over to this other gentleman's industry. He needs it.

Senator MUSKIE. You want government to be doing something it is not now doing?

Mr. CLARK. Absolutely. It has to be, because all we got is this, and that is not worth it.

[An attachment to Mr. Clark's statement follows:]

QUESTIONS WE WOULD LIKE TO HAVE ANSWERED:

1. Why is Niagara Falls, New York as a scenic wonder, allowing SCA, Hooker, and Newco to turn it into a chemical dump?
2. Why was the engineering study turned over to a Hooker Associate who is doing the remedial work for Hooker at Bloody Run?
3. Why was Newco, a Hooker associate, given remedial construction of Love Canal with no bids asked for?
4. Why did Donald O'Hara leave the City of Niagara Falls to work for Newco in Florida.?
5. Why can't we get straight answers from New York State Health Department?
6. Why, if this was declared an Emergency Disaster area can't we get help from the Federal Government?
7. Why, when we can bring home 900 dead bodies from Guyana, can't we get the Government to help in Love Canal?
8. Why, if we can send billions of dollars to Egypt and Iran can't we help in Love Canal.
9. Why did Hooker receive three million dollar grant for a building downtown.
10. Why did our Mayor, with the taxpayers money, build Hooker a parking ramp for their new building, which by the way was built not for them but for Carborundum. Hooker is now planning to build their own and the City is also agreeing to put up another parking ramp.
11. Why was our Mayor so intent on reviewing the television documentary which brings to light all the truth in regard to the anguish and suffering of the people of the Love Canal and the like canals in our country?
12. Why did Hooker receive a ten million dollar grant for municipal garbage incinerator?
13. Why did Hooker turn this property over to the Board of Education for the sum of \$1.00?
14. Why did the Board of Education sell this property to contractors for the

- construction of homes when they knew there were reservations in their deed.
15. Why must we ~~die~~ be here while blame is affixed. Their chemicals came in my yard, I did not go in their yard and mess with their chemicals.
 16. Why did Dr. David Axelrod refuse to testify before the subcommittee?
 17. Why is the New York State Health Department do diligently trying to disprove that Love Canal caused health problems?
 18. Bruce Davis, Head of Hooker, says that Dioxin in those minute levels will not harm you. Dr. Axelrod, New York State Health Commissioner, says it will kill you. Why are we still here?
 19. Why are our children still attending 93rd Street School where they have proven that radiation levels are higher than the maximum permissible dose level (yearly) than a worker around a nuclear reactor?
 20. How can a fence stop leaching?
 21. Why does the City of Niagara Falls have Hooker do their water tests for our drinking water?
 22. Why, if Dr. David Axelrod is ~~so~~ concerned about kidnapping wasn't an arrest made?
 23. Why are they pumping leachate from Storm to Sanitary Sewers during high rains?
 24. Why was all the workers with rashes sent to Roswell for first aid?
 25. Why is the sewage treatment plant unable to filter all the known chemicals out of our effluent. This treatment plant has not worked since March 1978.
 26. Why have soil samples of yards not been taken?
 27. Why did our Governor say he was definitely not going to buy anymore homes which is reality ~~is~~ tantamount to a death sentence.
 29. Why, if this is a demonstration project, are we not demonstrating to the world that we can clean up and not cover up and protect our citizens?

Senator CULVER. Thank you very much, Mr. Clark, Mrs. Hillis, you have been extremely helpful.

Mr. Clark, a member of our staff would like to go over some of those materials with you before you leave to see what might be proper for the record.

[A statement from the Ecumenical Task Force To Address the Love Canal Disaster follows:]

First Presbyterian Church

FIFTH and CAYUGA STREETS
LEWISTON, NEW YORK 14092

TEL. 716-754-4945

Dr. Paul L. Moore
Pastor



Founded 1817

March 27, 1979

The Honorable Edmund Muskie, Chairman
Senate Sub-Committee on Environmental Pollution
Room 4202
Dirksen Senate Office Building
Washington, D. C. 20510

Dear Senator Muskie:

As official representatives of the Ecumenical Task Force to Address the Love Canal Disaster in Niagara Falls, New York, we are sending this communication of concern with James L. Clark, resident of Love Canal.

The Ecumenical Task Force, composed of representatives from 16 denominations including Roman Catholics, Protestants, Jews and Unitarians, as well as the New York State Council of Churches, Buffalo and Erie County Council of Churches, Niagara Council of Churches and Catholic Charities, together represent a combined membership of one million people from the Western New York area.

The Ecumenical Task Force is calling upon the federal government

- ...to identify the chemically contaminated Love Canal neighborhood as a disaster area;
- ...to execute the immediate evacuation of all families who live between 93rd and 103rd Streets who wish to leave, and to make reparation for their worthless homes to those who wish to stay;
- ...to insist upon complete neutralization of toxic wastes and to take the lead in establishing regional incineration facilities for toxic wastes;
- ...to make the safe disposal of toxic wastes a top national priority.

We strongly urge that this appeal be shared with the appropriate governmental officials, and that prompt action be taken to relieve the physical, emotional and economic distress of citizens living in immediate danger and affected by this ecological tragedy.

We are grateful for your concerned interest and stand ready to assist in the implementation of relief efforts.

Sincerely,

Paul L. Moore
Paul L. Moore

Donna H. Ogg
Donna H. Ogg
Officers Pro-Tem

PLM/br

Senator CULVER. Our next witness is Mr. Frank Kaler, Jamesburg, N.J.

Mr. Kaler, it is a pleasure to welcome you here this morning. I notice your statement is rather lengthy. We are under some considerable time constraints trying to accommodate all the witnesses we have scheduled, so the extent to which you could perhaps summarize the highlights of that testimony would be appreciated by the committee and it would give us time for questions.

STATEMENT OF FRANK KALER, JAMESBURG, N.J.

Mr. KALER. Sir, I was told I had 15 minutes to speak. I timed this at 14 minutes and 10 seconds. I have come down here at my own expense, at your invitation. I would appreciate it if I would be able to read the entire statement. I am not that comfortable with this situation.

Senator CULVER. You may proceed. Why don't you read your entire statement.

Mr. KALER. My name is Frank Kaler. I live in South Brunswick Township, Middlesex County, N.J.

I should like to thank this committee for having given me the opportunity to testify here today about the problems I have had in a case involving the pollution of the aquifer from which thousands of central New Jersey people draw their water. But after hearing of the Love Canal situation, I feel my problem is like the acorn which did not become an oak tree only because I was fortunate enough to have detected the problem early and persisted enough to have gotten some sort of ameliorative action going.

My well became polluted as a result of uncontained leachate from an adjacent landfill which was licensed by the State of New Jersey and regulated by the New Jersey Department of Environmental Protection.

Upon first discovering the contamination, I followed the chain of command from the municipal and county level to the State, and finally to the EPA. The course was a rocky one, replete with bureaucratic obstruction, reluctance to act, inefficiency, and incompetence.

The township, county, and State all told me that there was nothing wrong with my water, but one sniff of the samples which I have provided for you will, I am sure, convince you that I was justified in my complete lack of confidence in officialdom's competence or sincerity.

I was going to pass the water samples around, but maybe in a break you can check them out.

The specifics of my difficulties in prompting any sort of positive action could easily consume the entire day, so I shall have to confine myself to a few of the most blatantly frustrating incidents with only a reminder that for each incident recorded here, there were dozens of others of a similar nature.

When I first discussed my water problem with the DEP's Chief of the Bureau of Potable Water, his reply was, "Y'know, Mr. Kaler, you keep this sorta thing up, first thing's gunna happen, they're gunna condemn your well."

A State test of my water in the summer of 1975 declared it to be potable. Later analyzed by the EPA, it showed the presence of

chloroform, toluene, xylenes, trichloroethane, trichloroethylene, benzene, dischloroethylene, and other organic compounds, in most cases in shockingly high concentrations.

In spite of the wide dissemination of a private lab's report which showed five wells in this area to be dangerously polluted, all testing stopped until I petitioned the township and shotgunned copies of the petition to Governor Byrne and many other legislators.

When I asked a top county health official why they were not out testing in ever-widening circles to determine the extent of the contamination, his reply was: "Oh, c'mon, Frank, you know as well as I do that if we tested all those wells out there, they's all come up bad."

Samples which my neighbor, Ted Kordus, and I collected in the landfill, and photographs I had taken of landfill scenes were lost by the DEP personnel at whose request I had delivered them.

Telephone reports of illegal deposits in the landfill, which I made to the DEP, very often appeared to trigger frantic coverup activity on the part of the landfill operators.

A DEP official, upon being chided by me for not going into the landfill to sample a load of waste from BASF Wyandotte, gave as his reason for inactivity: "We have our jobs to worry about." A mayor of our township told me that the reason he did not want to issue summons to the landfill for violations for local codes was that he was afraid the landfill would sue the township for harassment.

A township committeeman, upon first being apprised of this problem at a board of health meeting, addressed that group and said:

Landfills being a necessary part of the industrial scene, and there being only a limited number of landfills in the State of New Jersey, with little likelihood that any new licenses will be issued, we're going to have to be very careful how we handle this.

His remark was a harbinger of the general attitude which appeared to prevail among township and State officials and bureaucrats.

And I cannot leave out the comment of still another of our town fathers who was quoted in a local newspaper with this model of specious stupidity in defense of everlasting pollution, he said: "What good will clean air and clean water be for the people if they don't have jobs?"

When my township officials first began investigating the problem, it appeared as though the main thrust of their activities was to attempt to show that I, being a painting contractor, had in fact polluted my own well, not to mention the entire aquifer and the landfill itself. County and later State DEP people followed the same sort of trend and by the time we arrived at the stage of litigation, the thrust of all defense counsel was such that I began to feel like a woman who, having been brutally raped by 14 escaped sex maniacs, is accused of being the town trollop.

After having failed to obtain satisfactory results, either through test results or ameliorative action up through the DEP, we managed to enlist the aid of the EPA Division II Laboratory in Edison, N.J. On October 3, 1975, I picked up the results of the first of many tests that were done for us there. That report showed the presence of five of the organic compounds mentioned earlier.

Without the help, cooperation, and understanding of the people of the Edison Labs, I should in all likelihood have had to abandon my home.

The EPA's assistance, however, was limited to testing and advisory matters. It did not appear to me that this organization had any real capacity or authority to enforce or correct. As is the case with the township, county, and State, the EPA, ostensibly designed to regulate, depends, finally, on the courts, and one judge, making one wrong decision, will either tragically delay or totally prevent correction. Our regulatory agencies thus become powerless to be effective in doing the job for which they were created.

With confirmation that my well was indeed polluted, and with what we thought was adequate proof of the contaminant's source, we acquired an attorney who immediately filed suit against industrial giants such as BASF Wyandotte, Phelps Dodge, General Motors, Shell Chemical, Ortho Pharmaceutical, Cities Service, and others who had used the landfill.

Then finally our day in court arrived and after 4 days of trial our attorney informed us that even if the court found in our favor, there was not likely to be more than a \$10,000 award, and that if the court should find in our favor, the landfill and Patterson Sargent—the only remaining defendant long with the landfill, all others having been released in summary judgment before trial—would “appeal and appeal and appeal.”

I asked what opposing the first appeal would cost us, and he said \$5,000 to \$8,000, and finally facing up to reality, we verbally agreed to settle for \$10,000. We had paid one expert witness about \$7,000. We were economically bludgeoned out of the courtroom.

Judge Furman was quoted in a local newspaper as saying that he would not close the landfill as requested to by the DEP because the man has a considerable investment in equipment. He apparently did not take into consideration the considerable investment a parent has in four children, or the considerable investment my coplaintiff, Ted Kordus, had in his nursery. He also said that he would not close the landfill because we and the State had not proved that the landfill had irreparably damaged the aquifer. He did not deny that the landfill had damaged the aquifer. In fact, he implicitly agreed that it did, so what he really said was that the landfill had poisoned my well and maybe my children, but perhaps in a 1,000 years the pollution might dissipate to the point where it would be undetectable, so no harm was done.

With litigation at an end, we returned home to our newly installed waterline complete with chlorine, water bills, and an assessment.

The township also assessed the landfill for its share of the line, and they assessed Ted Kordus, my coplaintiff. Mr. Kordus is a nurseryman who used to irrigate profusely. In New Jersey, land used for agricultural purposes earns a deferral on assessments for such improvements as waterlines, therefore Mr. Kordus is not required to pay the near \$10,000 fee his broad frontage demanded until such time as the land goes out of agricultural use. However, the township has decided that interest must be charged against the original assessment, or to put it another way, Mr. Kordus must pay

interest on money which he does not owe, and will not owe until the land usage changes to other than agricultural.

This assessment and its cumulative interest, should Mr. Kordus or his sons operate their nursery long enough, will amount to a confiscatory tax. He would lose his land for interest on money he doesn't even owe.

Aside from that he stands now, afraid to chance harming delicate clones by irrigating with water laced with phenols, zinc, trichloroethane, trichloroethylene, chloroform, selenium, and no one knows what other chemicals or compounds which have as yet been undetected.

He stands, however, in a position where he could hazard irrigating with municipal water containing, hopefully, only chlorine, which alone is considered by nurserymen as being harmful to young and tender plants, and in addition, should he elect to risk this path, he hazards bankruptcy from the cost of municipal water during one dry season.

In looking back at the whole picture, one finds that industry, through the landfill, by and with the at least tacit, and often the explicit, permission of government, polluted my well, and under the present system which is heavily loaded in favor of industrial interests, as opposed to private citizens, individually or in groups, I was, almost totally, legally impotent.

I am forced to the conclusion that there was no equity in our courtroom because I did not have enough money to pay for it, for under the present system equity is a very high-priced commodity.

There appears to be an unspoken but clearly understood Malthusian theory of ecology among many of our lawmakers. That law says that the public shall be allowed a good enough environmental quality to survive and produce without being driven to the wall of rebellion, and no more.

In looking back in another direction, I see our institutional structure, where it was not simply and honestly incompetent, inefficient and uncaring, desperately eager to protect industrial tax ratables, frantically appeasing industry lest those industries be scared off to less ecologically harsh climates. I have to consider the possibility that our Government is operating the premise that clean air and clean water will be useless to the public if they don't have jobs, but should like to remind them that jobs will be useless to the public if their air and their water is allowed to die.

What were we really up against? I thought that we were fighting a totally obvious and just fight against parties which had wronged us, parties which had violated my property and personal rights, and that in the United States of America, with liberty and justice for all, it was simply a matter of fairly presenting the facts and being fairly judged on the basis of them.

What we were really up against was more like this: Picture a flock of birds, posed tremulously on a branch, ready for instant flight at the first pop of an ecologist's gun, and one has a picture of New Jersey industry today. If the court had found in our favor, the precedent set would have changed the face of industry throughout the United States.

Industry feels persecuted by ecological interests. They claim that cleanup is too expensive, but cleanup will cost industry nothing at

all if all industry is made to clean up at the same time so that one will not gain a competitive edge over the other. Industry will not pay the cost of a clean environment, the consumers will. They will pay that cost either through taxation or through an increased cost of goods. There is no escape from that, but the consumer has to be convinced that not only is the price of cleanup necessary, it is also the week's best buy.

Once uniform ecological regulations are established, the battle will have been only half won. There will remain the problem of enforcement, and without enforcement, all the regulations in the world will be less than useless.

New Jersey's title 7:26, a DEP regulation, contains enough good, solid thought on the subject of waste management to make it truly a Garden State, but the DEP is like an old lion sitting in the Sun, it has a loud voice, but no teeth and no claws.

It is patently ridiculous for Government to set up a regulatory agency and then permit its entire function to be negated by political and economic interests which are often diametrically opposed to the original goals of those agencies.

Legislation must be enacted of such a nature that control of environmental matters is safe from arbitrary handling by the judiciary and placed with the agency structured to intelligently and fairly regulate.

I see two other ways in which pollution could be stopped almost entirely. The hard way would be for 10 million families to be burned the way we were. The other involves what I feel may very well be a now almost totally capable technology to the point where one may be able to illustrate precisely who did what to whom. Polluters then placed in a position where they know they will most certainly be held accountable for their deprecations will, as a simple matter of self defense, be forced to run a clean house.

There were heroes involved, and because they were so grand, I feel that I should name those with whom I had dealings. I know there had to be many other sincere, capable, honest and caring, who were in one way or another involved, and to all these I offer my deepest gratitude and hopes that the political and bureaucratic tangle which hampers their good intentions will lessen and their accomplishments increase.

I heartily commend: Mr. Francis T. Bryzenski, Laboratory Director, Division II, U.S. EPA, Edison, N.J.; Dr. Theodore P. Shelton, Rutgers University, department of environmental science; Mr. William Althoff, DEP, Trenton, N.J.; Ann Kruger, environmental commissioner, South Brunswick, N.J.; and deputy attorney general, Jack VanDalen, Trenton, N.J.

Thank you very much.

Senator CULVER. Thank you.

Senator Muskie?

Senator MUSKIE. I appreciate that statement very much. I hope that we can create that kind of regulatory environment.

It is frustrating, and we seem to be again at a point where, as the regulatory impact of laws already written begins to bite, those who are regulated will begin to resist again, as they resisted the writing of the laws in the first place. And the laws that have been written really are not sufficiently comprehensive to deal with the

kind of problems that you and the Love Canal people have brought before this committee this morning.

I simply want to commend you for your persistence. It isn't easy as an individual citizen to come down here at your own expense and speak your piece. You have spoken it and you have spoken it well, and I compliment you.

Senator CULVER. Senator Chafee?

Senator CHAFEE. I would like to join, Mr. Kaler, in those compliments. There was a Norwegian author who wrote a play called "The Enemy of the People." The person complained to the authorities that the local town beach was being polluted, and the authorities wanted to ignore it because it would destroy the summer trade. I suppose, as you indicated in your testimony, you have run, into a lot of harsh remarks because you might be harsh on industry—

Mr. KALER. Yes.

Senator CHAFEE [continuing]. In your area, which is all-controlling. I thought the point you made was good at the end of your testimony, that if these regulations can be evenly applied across the Nation, then industry won't be able to flee from New Jersey to an area where it is less environmentally conscious. I think that is a very good point. I am glad you are here and appreciate what you have said.

Thank you, Mr. Chairman.

Senator CULVER. Thank you very much, Mr. Kaler, We appreciate your appearance here and your testimony.

Senator CHAFEE. Mr. Kaler, are you going to be around, or are you—

Mr. KALER. I am going to stick around for the rest of the day.

Senator CHAFEE. I would like to chat with you a bit.

Senator CULVER. Our next witness is Dr. Michael Bender, and also Mr. Morgan.

It is a pleasure to welcome both of you gentlemen here and I wonder if you might find it possible to summarize the highlights of your statement. We will make the full statements part of the record, if you are comfortable doing that.

STATEMENT OF W. CRANSTON MORGAN, PRESIDENT, W. F. MORGAN & SONS, INC., WEEMS, VA., ACCOMPANIED BY MICHAEL E. BENDER, ASSISTANT DIRECTOR OF ENVIRONMENTAL SCIENCES, VIRGINIA INSTITUTE OF MARINE SCIENCES, GLOUSTER POINT, VA.

Dr. BENDER. I think I would like to let Mr. Morgan go first because he is going to talk about the economic impact on the industry, which many people are interested in, and then I will summarize mine.

Senator CULVER. Thank you very much.

Dr. BENDER. Mr. Morgan is president of the W. F. Morgan & Sons, Inc., from Weems, Va.

Senator CULVER. We are delighted to welcome you here.

Mr. MORGAN. I thank you for having the opportunity to speak. I would like to speak about the kepone effects on the James, Hampton Roads, and Elizabeth Rivers.

I am in the seafood processing industry. The word that describes what happened to us is simply "disastrous." I don't think the

horrible example mentioned in the Love Canal area, while being more of an impact on some people, was as far-reaching as the kepone. In the early 1960's after testifying for clean water in our Nation, for many years we had Rachel Carson's book that kicked off our 1964, 1968, 1972, and amended 1974 Clean Water Acts. We need such a book today. However, in lieu of the book, we have certainly had an example in kepone that resulted in the State of Virginia and the Nation getting the Toxic Substances Act. I think that is all the good that came out of kepone.

We have about 8,000 licensed watermen in the State of Virginia who fish for oysters, crabs, eels, what-not, from our waters.

The closure included 75 miles of the James and Hampton Roads and the lower bay area. Unlike New York, our State health officials acted commendably, I think, in creating a task force to observe what could be done about kepone. And I think they did the best that they could out of the situation.

The unfortunate part and the most damaging part to our industry watermen was in the fact that these people on the James were equipped with small boats, gillnets, and other devices for catching the fish. And these are not adequate for fishing elsewhere. We had 1,070 licensed catchers of fish and gillnets in 1975 when kepone was discovered. And last year this was down to 300 and some gillnetters. A way of life had been destroyed. The livelihood of very independent people was destroyed. It was most difficult to help these people because they are what I fondly believe to be the same type that created our nation. They are tough, they are independent, they are basically uneducated, but they are diligent people. And to give you an example of the type of people, Governor Godwin bent laws and other things in order to make money available to these fishermen during the cold winter of 1976. And only three of our fishermen accepted this money that he made available. I think that tells the story of the type.

Our marine resources commission estimated in an evaluation to the Governor that our losses would be projected at \$2 million per year for 40 years. However, Dr. Bender will comment on other time projections today.

We believe this to be extremely low. For instance, we were taking a million pounds of crabs out of the James-Hampton Roads area. This is completely gone. Our last year's records in VMRC admits these are very low figures. Our striped bass amounted to 460,000 pounds, and they are bringing about \$1.50 a pound. And, of course, we have large catches of croaker, flounder, spot, and other species in the area.

The unfortunate part of the evaluation of this is that our national marine fisheries service have not been able to evaluate the catches. Many of these fishermen load their catches on small pickup trucks and take them in to wholesalers or into the cities as well. The remainder of our fishermen in the James have had larger boats and have gone to other areas for harvesting. This is very deceptive on their ability to harvest. In our oyster production, both in the Nation and the State of Virginia, we have lost over a third of our grounds to pollution. This impairment of harvesting area cuts down on the total catch.

In a nation that needs high proteins in great quantities, and in a nation where the 200-mile limit has just been enacted, it seems incongruous that we should be restricted in our areas of catch.

We in the State of Virginia have been awarded the dubious honor by the Environmental Protection Agency of being declared in the James River, one of the four worst polluted areas in the nation. However, some of those industries the New Brunswick person mentioned, they have adequate climate in the State of Virginia to come down our way, and we are being invaded in great numbers.

Our lower Hampton Roads area, five-city area, is the fastest growing area in the Nation. Also, I would like to point out that our pollution grows correspondingly. We have recently engaged in a 6-year fight about the mislocation of a refinery in Portsmouth, Va. I had better be careful with that.

However, I will say this: Our entire scientific community declared that this was the worst possible place to locate a refinery due to its being adjacent to the richest seed oyster beds in the world. And in spite of all of the scientists cooperation, our political world creates bad water quality on the State level. And, unfortunately, the same procedure is going on at the national level, as with the refinery.

Senator CHAFEE. Is that refinery being built, or where does it stand?

Mr. MORGAN. General Morris, after much agonizing, decreed in favor of the refinery last week and passed on his conclusion to Secretary Alexander. We are engaged in letter writing and asked Congressmen who object to send letters to Alexander, and many other activities which I hope will be more successful than we have been in the past.

In the State of Virginia, now that you ask, we have article XI of the constitution of the State of Virginia, which particularly protects these shell fish areas. However, in court, we didn't get very far with that. Although the article is still there, we approved the refinery decision anyhow. I had hoped, also, that the State of Virginia would pass a coastal zone management plan, which they rejected in our general assembly this year.

We have many things going for us in the way of laws and agencies. And as has been mentioned before, when laws and agencies in the political world come up against major siting, we generally lose.

I would like to comment on the last part. Inflation is a hypersensitive issue at this time. The battle for the control of toxic substances has just begun. We will be determining very minute amounts of toxics, because of our sophisticated equipment. And I am hoping that this Senate committee and our Congress can get into this battle and try to stop the various contaminants that are going into our streams.

One final comment. The Orient, for 5,000 years, has been using their sewage as an asset. About three-fourths of Europe today is using their sewage as an asset. We are treating it and dumping it in our streams, or dumping it in landfills. I regret that this attitude is hard to change. And when you come up against a sanitary

engineer, it is like coming up against a brick wall. But this must be changed if we are going to survive in the fishery industry.

Thank you very much.

Senator CULVER. Thank you very much, Mr. Morgan.

Dr. Bender?

STATEMENT OF MICHAEL BENDER

Dr. BENDER. I would like to summarize on kepone and there are two things that often get confused in the public's mind about how it, or any chemical, can have an effect. The first one is that the resource can be contaminated to the extent that someone declares it unfit to eat; that agency is usually FDA or in the case of pesticides with recommendations from EPA. The other avenue is that the resource itself can be damaged; that is, fewer crabs because the chemical or whatever it is is harming resources. In the case of Kepone, we know that the resource is contaminated and there is information for your reading in that regard. Laboratory studies do also indicate that the resource in the river, some of the resources are being influenced, being harmed by the presence of kepone. But the biggest effect by far is probably on the utilization of the resource. In other words, there are still plenty of crabs and fish in the river. It certainly hasn't killed them to the extent they have been wiped out. And as Mr. Morgan mentioned, the present estimates are \$2 million a year for commercial fishing; that is, harvest that has been lost due to the presence of kepone.

We don't know how much sport fishing would have been involved. We know that it is considerable. I would guess in the neighborhood of at least double the commercial fishing.

Senator CULVER. What was your comment on the harvest?

Dr. BENDER. We aren't harvesting except for a very limited species. It is closed to harvest. It is \$2 million a year lost through commercial harvest.

Senator CULVER. You are saying even though you still have substantial fish concentrations, that the way they are contaminated has stopped commercial fishing?

Dr. BENDER. No, they can't be legally sold because they are contaminated with kepone, PCB's, or whatever else. In other words, the level of kepone in most species in the James River is so high or is above the action level so they can't be marketed.

Senator CHAFEE. And if they are eaten, you get the slurred speech and all the problems that come?

Dr. BENDER. No. If they are eaten, you might in 20 years develop cancer. That is the projections made by FDA. That is the reason they can't be harvested. Kepone caused cancer in laboratory animals. It is just as it is with PBB's and PCB's. It hasn't caused anything in humans. Now, we are not talking about industrial exposure.

Senator CHAFEE. Those people that had industrial exposure in that plant, did they have cancer?

Dr. BENDER. They had motor disorders and neurological disorders which were related to very high levels of industrial exposure, mainly absorption in the skin or inhalation, not food containing very small levels, which is what we are talking about with kepone in the river.

Senator CULVER. Dr. Bender, you mentioned it may take 50 to 100 years for the James River to cleanse itself through natural processes. Is there any effective remedial action that industry or Government could take to clean up the river in a shorter period of time?

Dr. BENDER. Yes, I believe there is. This is where I was trying to get the economics into it. If we take the \$2 million loss of commercial fishery and double that for the recreation fishery you can fish but you have to throw them back; most people won't go fishing that way—you can say it is \$4 million a year. Now, if that were to extend for the 100 years—now, these are estimates—that is \$4 billion, not accounting for inflation. This is in present dollars. The estimates that have been made on at least a partial cleanup on the river are in the order of nuclear aircraft carrier, about \$2 billion. The fines leveled—of course, this is the largest suit the EPA handled—were minuscule to the projected cost to clean up the river, which is around \$2 billion, as I say. Whether that could all be cleaned up or not is probably questionable, because the damage done if you cleaned up the whole river, the damage to the river would probably exceed the benefit. But certainly the timespan that exists could be shortened, in my mind.

It may need more research on how to best do it, but there certainly is something that I think should be done. And to my knowledge we in the State government, anyhow, are proceeding the way we can with trying to come to a solution. The Environmental Protection Agency at the moment is not, at least in my view, doing anything.

Mr. MORGAN. May I interject, the State pursued a possibility of dumping the residue from Bailey's Creek, which was highly contaminated by kepone, in Germany. And an arrangement was tentatively made, and then at the last minute, this was rejected by Germany.

Dr. BENDER. No, we have done that. It was kept quiet. But that was just high contaminants.

Senator CHAFFEE. It wouldn't be now.

Dr. BENDER. Let me make one general point, if I might. I would like to say something about damage assessment in a general sense. That is, the present system of damage assessment, as it has evolved through the courts and I have been involved with at least 10 different firms in various lawsuits—at present the system of damage assessment involves doing counts of dead bodies, how many dead worms were there after an oil spill, or perday fines for effluent violations. And it is a simple way to write a law, but it doesn't really solve the problem. I think EPA has just addressed that in that they are considering changing the daily charge because it is often cheaper to pay the daily charge than to clean up your act. And second, body counts don't take into account the length of time a resource may be damaged. It may take a year, if an oil spill kills half the worms, in half a year they are back, or a year they are back, whereas with the kepone the problem might be there for 50 years. It is not an equitable means of assessing fines in one way. And also, if we are really assessing what the amount of damage was because it is readily apparent when you kill a canvasback duck, that he is dead, so I think there needs to be, in an adminis-

tration order, or legislation, an ability to put together a reasonable package on damage assessment, not as they do in California, charge per barnacle killed and per sea urchin killed.

Senator CULVER. Dr. Bender, do you foresee the James River being reopened to commercial fishing within the foreseeable future?

Dr. BENDER. Not unless some action is taken, maybe by changing the action level, which would allow harvesting, and this does not appear likely to me at this time. Something must be done other than that or it will stay closed.

Senator CULVER. Mr. Morgan, did you know any reduction in the size or quality of your catch before commercial fishing in the James River was completely discontinued?

Mr. MORGAN. Well, actually, it had been going down in the James for about 12 years preceding knowledge of kepone.

Senator CULVER. It had been going down.

Mr. MORGAN. The catches have been generally going down. Our total catch of species as recorded by national Marine Fishery Service has been retarded.

Senator CULVER. For 12 years you say?

Mr. MORGAN. Over at least that period. And while we have not been able to associate this with kepone, it is a fact that it had been deteriorating.

Dr. BENDER. If I might add, it had been going in the river for 12 years, too; we just didn't know it until 1975.

Senator CULVER. Is it beyond the scientific confidence and capability to confidently make these correlations?

Dr. BENDER. It is in a way because the James also receives a lot of other waste from other industries. It is also, other than the Potomac, the most polluted by domestic sewers also. It is the only one we knew about that had that amount of kepone in it. It is like correlating the birth rate of babies in Hawaii to the snowfall in Alaska. They correlate fine but it doesn't prove them.

Mr. MORGAN. Before, the determination on kepone, Virginia marine scientists made a statement about the pollution of the river to the Governor, and to all concerned on the refinery issue, because the refinery determined that the pollution was such that the addition from the refineries would add to this pollution. So there were previous determinations.

Senator CULVER. Now, we don't have that hard in numbers, but the Environmental Protection Agency says it may cost \$7 billion to clean up the river. You are quoting ballpark figures. What has been the economic loss to the commercial fishermen in the area?

Dr. BENDER. The most precise number we have, the only number we have, is the one Mr. Morgan gave and that is \$2 million a year. So that is what it costs. And the real problem is if it extends any real length of time. How long is that going to continue?

Senator CULVER. Mr. Morgan, you indicated these fishermen were reluctant to accept various forms of help the State was apparently trying to provide. What have they done to earn their living, those that have depended on the James River, since this commercial ban was imposed?

Mr. MORGAN. As I mentioned, over 800 of the fishermen are no longer in the industry. The State tried to incorporate some of them

in the WIN program, some have gone to work, full work in the shipyard, shipbuilding, drydock, service stations and other types of work which they were capable of. And in the larger fishermen, as I said, which was the bulk of the fishermen, with their larger rigs and their equipment that will stand rougher waters of the bay, have gone up the bay to make their catches. So the solution seems on the surface to be that the James River fisherman should be equipped with equipment that could go elsewhere to take his catch. This will be a transmigration problem that I don't know whether it would be successful or not. In the Appalachian, and the coal miners, they didn't work very well. So these people are relatively the same makeup.

Senator CULVER. Senator Chafee?

Senator CHAFEE. Dr. Bender, maybe you can answer this one, or Mr. Morgan. What are the possibilities that the kepone in the James River will get into other parts of the Chesapeake?

Dr. BENDER. I can answer that.

Senator CHAFEE. Is it going to work its way up?

Dr. BENDER. Under normal conditions it has not and it has been there long enough. We have studied it and are fairly certain about that. The real thing that concerns the scientists involved is that if we have a major hurricane, which we have not had—we have had tremendous storms that have dumped tremendous amounts of rain but they have not caused high tides and this sort of thing associated with a hurricane—that it could transport a good deal of it to the mouth of the bay or further down the bay. The contaminants sediment are fairly far up the river. If that were to move down river in a slug or with a big storm, it could very well endanger possibly the whole bay, which is a frightening aspect. Talking about a couple of billion to clean up the river doesn't bother you if you are talking about the whole bay being closed. That would be a disaster of worse proportions.

Senator CHAFEE. Now, in order for the river to become clean once again in the traditional way we use that term—in other words, be able to take fish there—has the bottom sediment got to come out?

Dr. BENDER. At least the first couple of feet in many places do. The kepone is stored in those sediments. It has to come out or in some way magically be fixed so it doesn't desorb or come off the sediments. The things we have looked at to do that chemically have not worked.

Senator CHAFEE. Your comments on damage assessment, environmental damage assessment, I thought were good ones. We might ask you if you could provide some thoughts on how to do the assessment. Perhaps you could do that for the record. Have you written out anything on that?

Dr. BENDER. Not with me today. I didn't have time to do that, but I can do that if you will hold the record open for a little while. I will provide it to somebody; yes.

Senator CHAFEE. Why don't you send it to me and I will distribute it to the others on the committee. I would appreciate more information on how to arrive at a damage assessment.

Dr. BENDER. I can give you what I think.

Senator CHAFEE. Fine. Thank you very much.

Senator CULVER. Thank you very much, gentlemen, for your appearance here today.

Our next witness is Dr. David Allen. Dr. Allen is the director of community health services administration, Tennessee Department of Public Health, Nashville, Tenn.

It is a pleasure to welcome you here this morning.

STATEMENT OF DAVID T. ALLEN, M.D., DIRECTOR, COMMUNITY HEALTH SERVICES ADMINISTRATION, TENNESSEE DEPARTMENT OF PUBLIC HEALTH NASHVILLE, TENN.

Dr. ALLEN. Thank you. I think all the members have a copy of the testimony and I would like to review a couple of highlights and make a couple of points at the end. You will have a complete record for the committee.

A brief history: The Velsicol Co. plant disposed of its waste in the Hollywood Dump in Memphis until a major fish kill in the late sixties, and they changed their site to a very isolated site in a Hardeman County farm, 240 acres. About half of that particular farm was covered with a landfill and 300,000 barrels or around 16 million gallons of chemicals and various intermediates used in the manufacture of pesticides were buried on this farm.

Despite a of clear lack of knowledge of identifiable hazards to the public, an order was given by Commissioner of Public Health Eugene Fowinkle, in February of 1972, to stop the dumping by August 31, 1972. Yet from that time in 1972 we had no complaints of water contamination until November of 1977, when some neighbors to the north of this landfill first complained of odors coming from their water supplies.

The first water samples tested were negative for the chemicals for which qualitative analyses were done. But in March of 1978, the first two wells were found to be contaminated with measurable levels of chemicals and shortly thereafter three more wells in this area adjacent to the dump were found to be contaminated.

At that time the residents were told not to drink the water and not to use it for food preparation. But we were not sure of levels of contamination and not sure of what the impact or the health effects might be.

Immediately a temporary water supply was provided with tank trucks and then studies were initiated to determine whether in fact this contamination was coming from the landfill.

In October 1978, a hydrologic study was completed that showed the migration of the chemicals from the landfill. It had been thought in the 1960's to be impermeable clay, but there are sand lenses in the clay and the direction of groundwater migration was, in fact, found to be in a flume that encompassed these homes. The Velsicol Chemical Corp. joined the Department of Public Health, EPA, and others, in a vigorous pursuit of solutions, which is, I think, worthy of note.

The corporation also assisted in totally replumbing the houses, and putting in a permanent alternate water supply. That was beginning in October of 1978. I think that it is also worthy of noting that the contamination to date is predominantly low molecular weight solvents that are migrating the fastest and in the highest concentrations. There has been a continuous increase in

the concentration of these contaminants. In fact, the highest contamination level in one of the wells now is carbon tetrachloride at 18,700 parts per billion.

I would like to make a couple of points relative to protection of the public. The first point is that as soon as we suspected there was chemical contamination in the wells, the Department of Public Health felt the first order of business was to provide alternate water supplies for drinking.

Senator CHAFEE. Twenty-five parts per billion of carbon tetrachloride doesn't mean much one way or the other. What is a lot? What is dangerous?

Dr. ALLEN. Senator, I am glad you asked that question because one of the points I want to make at the end is that nobody knows the level at which any one of thousands of chemicals changes from a coincidental, insignificant exposure to one that constitutes a true health risk. One of the real dangers that we face, I believe, is panic precipitated by lack of knowledge. If any one of us here were examined carefully, if we were to donate a fat tissue biopsy, we would find DDT in everybody sitting in the room, probably 9 or 10 parts per billion. That, as far as we know, has had no negative physiologic impact on any of us. We have DDT in us because we eat vegetables grown in fields that were sprayed with DDT years ago. So one of the real problems we run into is that we do not know what these threshold levels for danger are. I noticed in the testimony on the kepone incident, the fish harvest was discontinued because of the presence of kepone in fish. We know that certain parts of food chains contain chemicals. I don't know much about the biology of fish and kepone. We don't know about the concentration of these chemicals in Towns, Tenn. either, the ones that have migrated.

Our best guess, though, is that with the low molecular weight solvents the health impacts would also be short term. You can get serious liver damage, as an example, if you have a heavy exposure to carbon tetrachloride, chloroform et cetera. But if you eliminate the exposure, and if the exposure was low to begin with, we don't know what a long-term effect might be. In other words, if you had low levels of exposure for a long period of time, what would the cancer rate be in 20 years? We really don't know that answer.

Senator CHAFEE. Thank you. Go ahead.

Dr. ALLEN. So that we in fact felt the first thing to do was provide alternate water supplies in this particular case. And as written in the complete testimony, the testing of people can be valuable when there are problems that can be corrected if found, or if one wishes to document the negative effects of an experiment in nature. The risk one runs when extensive testing is done is that a false sense of security can be transmitted when the health effects of the chemicals have a long incubation period. Cancers are now showing up in certain factory workers who were exposed decades ago. Many of these had had extensive physical examinations and blood tests with no abnormal test result found.

In the recent kepone tragedy in Virginia, the exposure and illness was short and dramatic; that is following the industrial exposure. However, these exposures were very, very high and the kepone incident is the exception to the rule. While we applaud

testing human beings when it helps, we must remember that the important action to protect the public health is to find out the source of potentially hazardous contamination and stop that contamination.

Parenthetically, one of the risks that we run where examining any one of these experiments of nature is the creation of unnecessary anxiety. That is, if we go into neighborhoods that have had a potential, physiological insult that is we examine the people who have been exposed to chemicals that could do harm, we have to be very clear in saying that studies are done to try to identify whether or not damage was done, and if damage was done what kind of damage was done. And further that the studies do not necessarily translate to a cure or treatment if damage is found.

Many times we will find something that is out of the range for normal but we don't know what that slight abnormality means. Let me give you an example. Some of these chemicals involved in Tennessee would be expected to change liver function. If we were to test individuals and find that they had levels of enzymes in their bloodstream higher than the normal, but only slightly higher, we could say to those individuals, "You have elevated enzymes, but we don't know what that means." If a person has an overt case of hepatitis, he may have a tenfold, or even a hundredfold increase in certain enzymes. But if the level is just slightly above normal, we really don't know the significance of that. I think it is a mistake to lead people to believe that what they are getting is examination and treatment when in fact what we are doing is trying to identify that there have been measurable physiologic changes.

Senator CULVER. You also don't know in a situation like that whether continued exposure to low incidents might have effects in terms of cumulative concentrations.

Dr. ALLEN. That is absolutely correct. So the State health department position was to try to discontinue the exposure. You have in your prepared testimony the positions of various experts relative to human testing. I will skip over that and just make a couple of summary points. I think that some of the things that are needed are: No. 1, we need a mechanism of establishing relative risk associated with levels of exposures in the occupational setting. There are certain threshold levels that have been set for certain chemicals, for ambient concentrations in the air, et. cetera. But we don't have any thresholds for various items that in all probability are finding their way into our water supplies. But we have never looked for them. In this particular instance, when we looked for tetrachloroethylene, that was one of the first compounds we found. When we looked for that same substance in neighboring water supplies totally unrelated to this particular landfill, we found it also.

The point is that our abilities to detect trace amounts of thousands of chemicals far exceed our ability to identify physiologic damage. So we need relative risk rather than absolute risk.

Second, we will need an assignment of responsibility for the ultimate disposition of hazardous materials. If anyone makes something that is not biodegradable, somebody has to see to it that it is disposed of ultimately rather than concentrated in the food chain.

The third point, we need to be careful we do no harm at the time we are doing examinations of individuals who are exposed. We need to be careful that we make no false promises as to expected outcomes from these examinations. When you are testing for damage we should not mislead by implying we have treatment available if we detect damage, when in many cases there is no treatment known.

Fourth, we have to admit we do not know the significance of slight elevations of many kinds of physiological variables. Liver enzymes are used frequently as an index to damage, but we really don't know what slight variations mean.

We need to have more studies done methodically to determine relative levels of exposures that create toxicity. And then we need dollars committed to clean up, if it is possible, improperly disposed wastes. But I suspect in many cases cleanup will not be possible, and then we will need to study alternatives for containment. And this containment problem will cover a wide array of things.

Perhaps this is dreaming, but it would be desirable if we could find in a few instances industries that will have made commitments to take care of the whole chain of ramifications of their production. I think those may be available if we look.

Senator CULVER. Dr. Allen, thank you very much. When you speak of the need to continually monitor those exposed to contaminated well water, for example, to determine the potential impact on their health, I guess it is just an open-ended question as to the duration of that monitoring. Is that right?

Dr. ALLEN. It certainly is. I think that many of us here know that it took 20 years for us to know that mothers treated with diethylstilbesterol had daughters who had an abnormal incidence of vaginal cancer. It has taken years of research and hundreds of thousands of exposures for us to begin to be able to assess cumulative risk. If you take oral contraceptives and smoke, you have a compounded risk for heart disease. For those exposed to certain kinds of chemicals, it will take years for us to know the full range of risks.

Senator CHAFEE. Doctor, I am not sure I followed all your testimony, at least the last part. It seems to me what you are saying is that we just don't know what quantity of these chemicals are harmful?

Dr. ALLEN. Well, there are very large numbers of chemicals that we know to be harmful in massive quantities. For many of these we have set exposure limits in industrial settings. But what we haven't done is take those chemicals and calculate relative risk for lower levels of exposure, for example, carbon tetrachloride or chloroform would be good examples, and we have not built a relative scale of risk outside of industrial setting. If this material should make its way into a water supply, what is the normal level that a human being can continue to live with without expectation of harm. We don't know those limits.

Senator CHAFEE. Thank you very much.

Dr. ALLEN. There are some chemicals that do people good at certain levels, but if you increase those same chemicals too high they can do you in. For a long time in the United States more people died of aspirin poisoning than any other kind of chemical—

that is, children who got overdoses. But aspirin is a very good chemical by and large. We just don't know where the breaks are between an acceptable and a nocuous levels for many chemicals.

Senator CULVER. What about the general problem of shortage of toxicologists as we get into this whole area, Dr. Allen? It seems to me we are going to be increasing demands in the private sector as well as the Government for people who can marshal and mobilize the critical mass to give us—

Dr. ALLEN. I definitely concur in that. Even if you were to launch something that was funded and said we want tomorrow to study the 200 most toxic things that get into the water courses, it would be difficult to get an immediate response. And then it would take years to do the studies.

Senator CULVER. Thank you very much, Dr. Allen. We appreciate it.

Senator CHAFEE. You painted a difficult picture for us.

Dr. ALLEN. Yes, I think this is something very difficult—it took us a hundred years to make and bury all these chemicals. It will take us many decades to approach the problem. It is difficult. I don't think we will have an immediate solution.

Senator CHAFEE. I think all the companies will be saying what you have been saying.

Dr. ALLEN. I suspect some of them will.

Senator CHAFEE. Thank you.

Senator CULVER. Mr. Thomas Jorling, the Assistant Administrator for Water and Hazardous Materials, Environmental Protection Agency.

I want to thank you very much for your appearance here, Mr. Jorling. We look forward to your testimony.

STATEMENT OF THOMAS C. JORLING, ASSISTANT ADMINISTRATOR FOR WATER AND HAZARDOUS MATERIALS, ENVIRONMENTAL PROTECTION AGENCY

Mr. JORLING. Thank you. We have submitted a statement to the committee yesterday which I think it would be helpful to avoid reading in its entirety.

I will only make a few comments and then I am sure you have additional questions.

First, I would like to commend the committee for bringing the reality of these fact situations to those of us who are increasingly forced to evaluate these problems on an abstract basis—an abstract procedure, I might add, that often serves to do one very important thing, and that is to immunize us from the human dimensions that are revealed here today and which are in fact the reason Government exists.

Government exists to prevent that suffering and from having those adverse effects. I think it is very helpful for us to have firsthand reports on these kinds of incidents.

The second point would be simply that because of these hearings, the scrutiny and the attention that they bring to these issues, we will get improved Government performance, not only from EPA, but I think from State and local governments as well. It is refreshing, very refreshing, to come before a committee and in effect be asked to explain why we are not doing more rather than the more

frequent visits to Capitol Hill to explain why we are doing too much. So these kinds of scrutinizing exercises will improve our performance.

With those introductory comments, I would like to turn to a couple of issues which are very important for this committee to consider which the administration is also very concerned about; that is, with respect to these abandoned site problems with respect to the movement and transport of hazardous materials generally, what is the status of our legislative authority and what is the status of agencies' implementation of it.

In the prepared statement, there are a series of summary tables, conclusions, and what have you, describing current and past incidents of improper disposal. Unfortunately, the magnitude of this problem was not well perceived by EPA, or the Congress, at the time the Resource Conservation Recovery Act was enacted. As a result, RCRA is not well suited to remedying the effects of past disposal practices which were unsound. RCRA does provide authority to deal with imminent hazards under section 7003. It is a section similar to the similar authority in the Clean Water Act, Clean Air Act, Safe Drinking Water Act, and Toxic Substances Control Act. It authorizes EPA to bring suit in Federal district courts to enjoin an owner or other responsible party of an active or inactive site to take remedial action to abate an imminent and substantial danger to human health or the environment.

At the outset, we know we can effectively exercise this authority only where there is an owner or responsible party identifiable and financially or otherwise able to remedy it. However, where these circumstances are not present—and we have a disconcerting feeling that that is the great predominant number—section 7003 is not an effective tool. We can also take similar actions under these other authorities as appropriate, and if you would read the complaints in the cases we have filed to date, we generally use all of them as authority for the action.

The States have various authorities to take enforcement and injunctive actions. In fact, the States with their plenary power have considerably more authority than the Federal Government. We are increasing our efforts to use section 7003 and other authorities to control these problems.

Last November the agency launched a campaign to evaluate particular disposal sites which may provide or pose an imminent hazards.

On December 8 the Office of Enforcement established an imminent hazard task force. Three evaluation teams consisting of personnel from the Office of Enforcement, Office of Solid Waste, Department of Justice, and National Enforcement Investigation Center visited five regional offices during December to review available data. EPA reviewed site evaluation process in each region. These efforts have resulted in technical assistance and enforcement actions such as the following:

Kin-Buc landfill, Edison, N.J., where the U.S. attorney for the district of New Jersey filed an action in U.S. district court on February 7, 1979.

Lee's Lane landfill, Louisville, Ky., where NEIC and region IV personnel have made an extensive investigation and determined

that an imminent hazard does not exist but where continued surveillance has been established.

Chemical Control Co., Elizabeth, N.J., where the State of New Jersey, with cooperation from EPA personnel, initiated a State court action on January 19, 1979.

Sangamon Grain Co., Fort Worth, Tex., where EPA effected the proper disposal of a cylinder containing hydrogen cyanide prior to bringing suit against the recalcitrant property owner at a prehearing conference before filing of such an action in U.S. district court.

Other cases are in preparation and will be filed as soon as they are completed, and still other sites are being intensively investigated for possible case preparation. Approximately 30 work years are currently being devoted to these efforts. In addition, EPA is closely monitoring the status of the 103 sites identified last fall. Corrective action on some of these has already been taken and State or Federal action is under way on the remaining.

The problem of improper disposal is made more difficult by the fact that many former waste disposal sites have now been abandoned. In many cases the property used for waste disposal has changed hands; in other cases the companies responsible for the problems are either no longer in business or do not have the resources to pay for cleanup of the sites. As I mentioned earlier, section 7003 is often not effective in these situations. Further, certain of the sites operating today may very well be abandoned in the future, especially as the regulations under the Resources Conservation Act creating a hazardous waste management structure come into effect.

With regard to discharges of hazardous substances and oil, section 311 of the Clean Water Act establishes a control program for certain of these incidents. For discharges into navigable waters, section 311 provides for reporting of discharges, establishment of penalties, and liability limits, mitigation by the Federal Government, and a revolving fund to pay for mitigation. There are, however, limitations to the use of section 311. First, section 311 is limited to a discharge or substantial threat of such discharge into navigable waters.

Thus, spills which threaten or contaminate, for example, soil or air, but not surface water, are not addressed by section 311. This jurisdictional limitation prohibits the application of section 311 to most hazardous waste disposal sites and all spills into other than navigable waters.

Second, section 311 is only applicable to designated hazardous substances. A discharge of a substance not designated under section 311 would not be covered by the section's revolving fund.

A second limitation relates to the size and nature of the 311(k) fund.

Senator CHAFEE. But that limitation you can do something about, can't you? If you find that a problem, can't you come to the committee and try to get the limitation changed?

Mr. JORLING. Yes. And we will be doing that in effect in legislation we will be proposing, Senator. The limitation is also subject to our control in that we do have authority to add substances to the 311 list.

We now have on the list 299 chemicals and half of those go into effect in June of this year, and we will turn our efforts to increasing the universe of provisions.

The 311(k) fund was established at \$35 million and currently has approximately \$5 million. It is drawing down very rapidly as the hazardous waste program comes into effect.

It is appropriated originally and maintained by any funds received by the Government under section 311 and additional appropriations. As I described earlier, estimated costs for remedy of hazardous waste problems range from \$3.6 to \$44.1 billion. Even if the fund were somehow applicable to the bulk of hazardous waste disposal sites, the size limitation on the 311 fund would preclude its use in most cases.

The emergency powers provision of section 504 of the Clean Water Act is another relevant authority for addressing hazardous materials and waste. Although it does not have the jurisdictional problems associated with section 311, section 504 is authorized at only \$10 million, which might be inadequate for even a single abandoned site. Furthermore, section 504 has no cost recovery provision. It must rely totally on appropriations. The administration has not requested funds, and the Congress has not funded this section.

In summary, there are existing provisions of statutes which EPA administers which apply to parts of both the hazardous waste and hazardous substances and oil spill problems. Taken together, however, these provisions are inadequate to solve the environmental and social problems caused by improper hazardous substances and waste management.

EPA is presently working with other Federal agencies on an approach to solving hazardous materials management problems. Our current thinking is that a comprehensive scheme to address environmental problems of hazardous wastes in abandoned sites, hazardous substances, and oil is necessary. We believe that to the extent feasible such a scheme should be compatible with the Government's emergency response program under section 311 of the Clean Water Act.

We believe that environmental problems from oil and hazardous substance spills and hazardous wastes from abandoned sites raise complex questions of cleanup, damages, compensation, and Government response which are interrelated. In addition, these types of incidents frequently occur together. As a result, we believe that the public interest would best be served by a comprehensive approach to the problem of hazardous materials incidents.

With regard to financing the fund, we believe that the burden of responding should be upon those who have benefited and those connected to commercial practices involving the substances in question. Difficult issues involving equitability among parties contributing to the fund and collection and administration of such a fund must be resolved.

We expect to develop recommendations on how to establish and administer the fund and to forward a legislative proposal to Congress in May of this year.

That completes my prepared remarks, and I will be happy to answer questions regarding the general or the specific issues that you might have.

Senator CULVER. Thank you very much, Mr. Jorling. I want to say at the outset how much we appreciate the cooperation your office has provided the subcommittee in its consideration of this general subject. And I think we will undoubtedly want you back for an entire day of hearings when we get to these particular legislative proposals to respond to this situation.

Could you elaborate just a little bit more on why the Agency favors this comprehensive fund to cover hazardous waste substances and oil spills, rather than separate funds to cover each form of environmental accident?

Mr. JORLING. Yes, Mr. Chairman. If we start with an identification of the problems that we think do not have sufficient authority under present law, they include the ability to respond to hazardous substances spills, to oil, to the problems associated with abandoned sites. And in that description I would include the types of situations we have been hearing about this morning. There are others. How broadly we would make it will, I am sure, ultimately be decided by Congress. But there are problems associated with radioactive materials that have accumulated in various places, and there are also problems associated with events which, while causing harm, are not typically addressed by the standards and environmental control legislation, such as explosions at refineries of chemical companies and those types of situations. When you look at that series of problems and investigate the ways we can go about solving them, the principal impediment that we see now is resources, is the generation of a resource base, dollar resource base, which would enable response by Government to these situations as they are identified and as they are identified to be acute and in need of immediate Federal or State response.

When we begin to look at that fund and the ability to generate it, we have basically several early threshold choices. One is, should we generate the fund by using the general taxpayer as section 311 is currently supported? It is our judgment that it should not be; that it should be transferred to those who have benefited in the past or who continue to benefit in a commercial sense from the movement of these materials. Therefore, some kind of a fee structure begins to emerge.

With respect to the specific legislative proposals, there is a track record of legislative proposal in the area of oil where a fee would be attaching on movement of oil incorporated into this fund and disbursed accordingly.

We believe that a single fund is a better device, singly managed, reduced overhead and a lot of administrative reasons, but also because the people who will respond, who will have authority to make disbursements from this fund frequently respond to situations where oil, hazardous substances are both involved, and they need to have a single reference authority to make the judgments that they must make on the very few situations. It is not frequent that our officials, Transportation, Coast Guard, will make a decision to evacuate a town. When they act, they need to have the security of what authority they are acting under.

We feel a single comprehensive set of principles, authorities, is necessary to have good government result in these situations.

Senator CULVER. Now, as we are all painfully aware, most existing landfills today do not contain features to prevent the leaching of these chemical wastes. To what extent is this fact attributable to just the absence of appropriate technology at an earlier time when most of them were built, established, or is it more likely because this is a cheaper way to build with no regulations required? Is it a little bit of both?

Mr. JORLING. As a general matter, it is not a function of technology but rather a function that most individuals who manage materials will manage them the most cheap way they can until they are told otherwise. So the practices in the past are not a function of technology, necessarily—there are some situations where that is the case—or lack of knowledge, but rather it was cheaper. And they have chosen it.

Senator CULVER. We still have a lot to learn about technology here, don't we? This is also something through vigorous R. & D. and other things where we are still very much on the cutting edge of some of this, aren't we?

Mr. JORLING. There are areas where technical innovation is occurring and should occur in the future. In proposed regulations we expressed strongly two policies or two preferences in that. The first of those preferences is that waste should be disposed of, not in the conventional sense of ultimately disposed of but rather reprocessed, recovered, recycled. There are areas where technology can be improved in those areas, especially with certain waste streams. So that is one area we are trying to generate increased research and development.

Senator CULVER. On that one point, which nations in the world have become more advanced in that regard than we have? Is there anyone that has been particularly effective?

Mr. JORLING. I think whenever you fly the national flag in competition with others, one is hesitant, but I think there are other nations that—

Senator CULVER. We are not hesitant to talk about the Soviet military buildup, are we?

Mr. JORLING. No.

Senator CULVER. Let's see who is doing anything on waste.

Mr. JORLING. I think the German Government and the German industry have moved further, not with innovation or discovery, but with application, than this country. And in certain waste streams there are other countries that have moved more quickly than we have. But there is, within this country, a large number of industrial facilities that have adopted these types of techniques for their own use very extensively. So there is that kind of technology available.

The second point on technology that I would like to make, because it bears on some of the comments earlier this morning, is the preference toward incineration of certain waste streams. We have expressed a preference in the regulations that high temperature incineration and the standards for that technology are set forth in regulations—it is normally 1,000°, 2 seconds of combustion—that is a preferred method of disposal for liquid organic wastes.

That is based on our experience with combustion, with incineration, in the industry with herbicides, originally conducted by the Army.

Under EPA instruction, where we reached 99.99 percent destruction of the pesticides, including the component dioxin which was included within it.

The experience in Europe is also much more long-term than in this country on high temperature incineration. We used the European ship for that particular episode.

Senator CULVER. You mean much more long-term or much more advanced?

Mr. JORLING. They have a longer track record. They have been doing it for a longer number of years.

Senator CULVER. You said apparently to a House subcommittee the other day that licensing of all firms that are handling the toxic wastes will take up to 10 years due to funding limitations in the EPA budget. How are funding and time of licensing related? What would be a reasonable time and how much more would it cost EPA?

Mr. JORLING. The cost dimension has two features. One is dollars; the other one is personnel. And the more scarce currency is, the more lack of personnel at both EPA and State level, which is going to be administering the bulk of that program. That figure is based on an estimate that we have 20,000 permits to issue. Some of these permits will be complicated and require considerable technical and legal personnel in the issuance. It is also based upon the experience that the agency went through in the permit program under the Clean Water Act. I might add there we still have 20,000 unissued permits under the Clean Water Act. We have begun to focus our efforts on more major sources and issue those permits. But the cost requirement is for the processing, evaluation, the procedures that must be gone through, and any permit issuing process, and we estimate that to cover the universe that we estimate is out there will take 10 years.

We do not believe, however, that that is necessarily a bad thing. We do believe that our first priority will be to permit those offsite facilities which are necessary to bring these wastes under proper control, and on issuing or commencing the permit process on those facilities which we think will not survive the permit process and therefore should be closed, or at least upgraded. Those are the two areas we will come at this as we commence the program.

Senator CULVER. How much will you use the State governments in this? It seems to me it is an enormous undertaking for the Federal bureaucracy to do. Almost all these regulatory schemes are way behind, as you know, meeting any mandated timetables. Isn't it just essential that taking on something this ambitious is going to require vigorous participation by State government?

Mr. JORLING. It is absolutely essential, Mr. Chairman. As a general formula, 80 percent of the environmental control management resources in this country are under State authority. In other words, EPA at the national level is only 20 percent of manpower that are applied to these programs. That will continue and must continue under the implementation of the hazardous waste program under RCRA. Our estimates now are that 45 States will assume, after a 2-

year period, the responsibilities for managing the hazardous waste program.

There is, however, a very powerful political dynamic occurring around hazardous wastes, and many people, when the political liabilities associated with managing hazardous wastes will tend to transfer to another arm of government, another level of government. So it is possible programmatic assumptions on State exercising this authority may be overestimates. We hope that there will be political leadership in the State governments, by the governments and their legislatures, and we will have that kind of performance. The statute says if they do not, EPA must bear the burden of managing the program and we will attempt to carry that mandate out in those States that do not assume responsibility.

Senator CULVER. In designing regulatory schemes to effect the kind of compliance and responsible participation you are speaking of, to what extent do you give consideration to using tax incentives? For example, you could reward outstanding efforts, and let them reap benefits because of the public being served. Is this in any way being seriously considered?

So much of this has to be up front to do it right, to do it well. And the earlier you can get to this waste and reprocess or recycle it to stop it from ever getting into the stream, the better. What kind of incentives can we really give by way of carrots rather than just sticks to industries to do this?

Mr. JORLING. In theory, there are some aspects about that which are quite attractive. In practice, however, the programs operate to produce incentives much more from a different direction. We find, for instance, that as environmental controls are placed on waste streams, industrial waste streams, industries begin to review whether or not there is a better way of producing their widget and avoiding some of the costs associated with environmental controls.

In that process they have found in many industries that they achieve savings because they are using different raw materials, fewer raw materials, much less water. And they have achieved that kind of benefit. But as far as an overt Government structure, we do not have in our present arsenal of tools very much in the way of carrots in the front end of the process. It rates more after the effect of our regulatory structures have been applied.

Senator CULVER. You say that the second-level costs, so-called, to clean up a dump site are estimated to be an average of \$25.9 million per site?

Mr. JORLING. There is a study which I believe I made available to this committee earlier.

Senator CULVER. What is EPA's estimate of the cost of constructing these sites in an environmentally sound manner? For example, how much would it have cost in retrospect to assure that no waste leaked out of Love Canal?

Mr. JORLING. I think we have some formulations of specific cases where we can guess what the cost would have been to do it properly in the first instance and what the cost will be now to repair it. My memory is that on Love Canal the volume of waste disposed there could have been properly managed for \$4 million.

We are now estimating that the permanent remedy for Love Canal, without taking into account the hardship costs, the third

party costs which you have heard very eloquently described to you this morning, will be on the order of something like \$50 million. So you have that kind of ratio.

Senator CULVER. And of course those third party costs, potentially outstanding legal liabilities, are in the billions of dollars. Isn't that correct?

Mr. JORLING. They could be in the billions, but I am very sympathetic to the comments made by the citizens that the normal processes of the law to get that redress are insufficient, so it is unlikely they will ever be compensated properly.

Senator CULVER. Did you have another point?

Mr. JORLING. On the PCB disposal in North Carolina, where an individual took a waste stream that was generated elsewhere under contract to dispose of it properly and simply operated it along the roadside at night, the costs of that would have been less than \$100,000. It is now going to cost many millions and unknown millions until a site is found, sited in the State of North Carolina and elsewhere and the material actually excavated and moved. So we can draw these kinds of post evaluation estimates, and I think they demonstrate conclusively that regulations are very cost effective.

Senator CULVER. Thank you.

Senator Chafee.

Senator CHAFEE. Mr. Jorling, I take it from your testimony that indeed safe disposal sites can be built. And I am interested in that. In other words, through some reaching process the carcinogens or the toxics can be gotten out of the chemicals. Is that right? Or is it just a permanent holding pool that is built?

Mr. JORLING. Senator, we in our proposed regulations establish the standard or the criteria governing safe practices for a wide range of practices—incineration, recycled, reuse, landfilling, land spreading, storage, what have you. All those can be made safe given the use of those facilities for the proper waste streams and proper operation of maintenance and custody over time. We are concerned, however—I remain concerned. There is a preference stated in the policy that the last resort should be land spreading—not land spreading because that can be the incorporation of systems in productive systems, but landfill should be a last resort over time, because of the fact you are dedicating increasing portions of our landscape. I refer to them as the pyramids of our society. We can't afford to devote large amounts of landscape to that use. It is not prudent. But they can be made safe and we will need landfills for certain waste that there are no other preferred alternatives for alternate disposal. But we think there are ways of making these facilities safe and bringing into control the roughly 35 million tons of hazardous wastes we estimate will be included in this program. We estimate of 35 million metric tons that more than 80 percent is now being improperly disposed of, so that we can bring this about.

Senator CHAFEE. 35 million tons what? A year?

Mr. JORLING. Yes.

Senator CHAFEE. Now, in that high temperature incineration you were discussing, is that extremely costly? Let's take this situation down to Kentucky, Valley of the Drums. Suppose they went in there now and tried to pull those drums out and stop burning the

materials. You have to have a very specialized type of facility to do that burning in. Do they exist?

Mr. JORLING. Mr. Chairman, while I respond to that, I am going to ask the staff to take up the recent pictures of Valley of the Drums, because it is one of our success stories. I do think evidence of government acting responsibly can also be used occasionally.

Yes, incineration of organic materials is used presently by industry, and it is used in some other countries by government, and it has been used with great success. I don't know whether any of the corporations that you will be hearing tomorrow have their own industrial incinerators. My instinct is that if they do, they would be in a better position to respond. But the track record is quite good in the destruction of toxic organic chemicals through high temperatures.

Senator CHAFEE. What do they do with the ash?

Mr. JORLING. There is very little ash. If you combust organic material, physically and in theory, you should get CO₂ and water as the combustion byproduct.

Senator CHAFEE. Back in 1976, as I understand it, EPA recommended to Virginia and Maryland that the Chesapeake be closed to blue fishing as a result of the kepone levels. Now EPA, as I understand it, is saying it is doubtful kepone will noticeably spread from the James River out into the bay and that it may be unnecessary and too expensive to remove the kepone from the James River itself. This seems to be a change of approach. In other words, in 1976 you were saying to Maryland and Virginia to close the Chesapeake to blue fishing. Now you are saying that it is doubtful the kepone will spread from the James to the bay and that it may be unnecessary and too expensive to take the kepone out of the James River itself.

Mr. JORLING. I think the change—and I will confirm this and supply a different answer for the record if this is not correct—in 1976, it was shortly after the episode was discovered, and the activity was in an enforcement mode and reactive mode. As a result of the disclosure of roughly 38,000 pounds of kepone that had been discharged into the James River sediments, in part because of the settlement agreement and the litigation against the corporation, a \$1.4 million feasibility study was performed that went into questions of whether or not the materials could be removed, whether there was technology to remove it and what the effects were and what have you.

During that period, the same period, there have been continuous dialog between EPA, Federal Drug Administration, State of Virginia, State of Maryland on what were the species that brought this material into their biological systems and which were in commercial or recreational financing practice. That has led to changes over time. The important change that you mentioned is in the figure that was mentioned earlier by the chairman: \$7.2 billion is the cost estimate that resulted from that million dollar study. If the removal and mitigation were undertaken because of the unavailability of that amount of money, it is our recommendation at the present time that the sediment be allowed to stay stable and hopefully the hurricane that was mentioned earlier will not occur and that the various species be restricted from harvesting. That is our present

and the State of Virginia's present plan for protection in that area. The costs of sediment removal are extremely high.

Senator CHAFEE. Two doctors that testified, Dr. Bender and Dr. Allen, and both said there is a great gap apparently in our knowledge as to the level of contaminants that are considered to be safe. And you heard them testify to that.

Now, is your agency completing research to see what these safe levels are?

Mr. JORLING. Yes.

Senator CHAFEE. And can you acquire this information fast enough to carry out a regulatory program for the chemicals?

Mr. JORLING. We cannot bring to empirical results the evidence on the myriad of chemicals out there in the environment at the present time fast enough to assure the public is protected, no. But what I do think it demonstrates and what I strongly support is the posture that is in the legislation which we are implementing, and that is prevent the release of these materials into the environment. Ultimately, that can be done. The elimination of discharge into the environment of industrial synthetic chemicals is a doable task over time. That is the better protective mode than to release this material and try to determine for each of the chemicals what the threshold levels will be. Soon as you get into that framework, you have multiple chemicals coming out which may have thresholds on them. But on carcinogens I don't believe anyone will agree on a threshold. Then you have the accumulative effects on a wide range. So you are putting the protective elements of our society into an impossible task. There are better ways of achieving that than allowing it to happen and then trying to determine safe levels.

Senator CHAFEE. Thank you. We will be hearing from you again as we complete our hearings and then come back. Thank you.

Senator BENTSEN [presiding]. Mr. Jorling, I am pleased to have a chance to visit with you on some of these problems concerning hazardous substances. I think probably the most difficult problem we yet have to deal with in this committee is how we dispose of hazardous substances. And certainly the public has every right to demand that they have protection from the abuse of the use or the disposal of them. I am equally convinced that unless any legislation congress develops reflects the degree of hazard that is associated with hazardous materials with the different materials, that such legislation will have a very difficult time in its implementation. I want to pursue that.

Recently, EPA proposed regulations that controlled hazardous waste disposal, and these regulations represent an effort to define hazardous substances. I would like to use them to focus on the problem of defining hazardous material. While much of the proposal is clearly necessary, there are certain elements that bear directly on the issue of degree of hazard.

Now, Mr. Jorling, I am particularly concerned because the President is about to come out with a new energy proposal. We are facing an increase in the price of oil from the OPEC nations.

We have further uncertainty about our sources of supply. We have a standby energy program that is proposed to us. So trying to bring about the most effective, efficient, and safe means of production of energy in this country is terribly important to us. I would

like to examine the impact of these proposed regulations on certain aspects of oil and natural gas exploration and production. It is my understanding that the drilling muds and production water associated with exploration are tested to determine whether they meet EPA's hazardous waste definition. Is that correct?

Mr. JORLING. Yes. There is a special provision in the regulations for oil and natural gas drilling muds and brines.

Senator BENTSEN. Now, one part of this provision includes an extraction procedure to determine the toxicity of leachate from the tested material. Can you describe the procedure and the basis for its development?

Mr. JORLING. Senator Bentsen, there is a model, the use of a construct, to help us evaluate what constitutes the threshold of hazard under RCRA. The basic statute says a material is hazardous if, when improperly disposed of, it poses a risk to public health or welfare. We have chosen a leaching model to determine that in a hypothetical fact situation, which is that if materials are disposed of in an abandoned gravel pit and they are subjected to a certain amount of rainfall per year, will that material reach the groundwater? That was the use of that test.

We could have chosen under RCRA, dumping material in a schoolyard and whether or not that would have posed a risk. That certainly would have broadened the universe of the regulatory program much beyond what we could carry out. So we adopted this to give us a threshold when something is on the hazardous side of the ledger or on the nonhazardous side of the ledger. With respect to the drilling muds and brines, there is a separate provision in the proposed regulation for that. They are identified as special waste stream and the regulation does not anticipate them to come into the general fabric of biodegradable management, but rather at the Federal level we imposed practices from those materials being released into groundwater, which is where the concern is primarily with those activities.

I would be happy to supply specific evaluation of the regulation, proposed regulation to oil drilling muds for you, and then we could perhaps engage in additional dialog to see if we are having a meeting on the minds of these.

Senator BENTSEN. I want to do that, but I want to engage in a little additional dialogue at the present time. Let me talk to you about drilling muds and there use at the present time. They are used to cool drilling bits, remove rock fragments, reinforce well walls. They are primarily water based fluids, viscosity agents such as bentonite and viscosity thinners. They are stored in reserve pits during drilling operations. They are subsequently covered with soil, becoming part of the soil base. The bentonite is a strong sealant and that limits migration of other materials from the pits. I want to make sure your prototype is in conformity with the real practices and what is happening out in the field. Under normal conditions these areas would be subjected to limited further modification. However, I am told that use of the EPA extraction procedure, which puts acid in the water that is leached through the drilling muds, extracts chemicals that would normally stay within the drilling mud. Now, is that correct? That is what I have been told.

Mr. JORLING. I am going to have to supply a specific answer to that for the record. I cannot respond to that description of our regulation.

Senator BENTSEN. If you are not following the ordinary procedure of what actually happens out in the field, then you are going to have some real problems in the application of a regulation.

Mr. JORLING. I can assure you that the regulation, both under RCRA and under the underground injection program, which also addresses itself to drilling operations, are aimed at being tailored to fit the practices in the field.

Senator BENTSEN. I am told in this instance it is not. That is why I want to be further assured of that.

Does failure to meet the limits of this test then subject these drilling operations to the proposed EPA regulations if those are the conditions, if I am correct and have been told correctly the conditions?

Mr. JORLING. I simply will have to review your articulation of what you have been told would operate with what we think and supply you the answer.

Senator BENTSEN. I suppose if it fails to meet the limits of the test, it is subject to the EPA regulations, isn't it?

Mr. JORLING. It is not that simple. We are treating oil and gas brines not in the fabric of the regulations generally. I am having trouble understanding how the leaching test, when applied to that, would alter that. I will have to evaluate that.

Senator BENTSEN. I have been talking to the Texas Railroad Commission and they have been in this business longer and are probably more sophisticated than anyone else in the country in that regard. I am told that they have been controlling drilling operations for some 30 to 50 years, and they tell me that they have never had any hazardous problems associated with the proper use of drilling muds.

Now, that is quite a statement for them to make. That is the statement they have made to me. I am also told by many oil producers that the cost and burden of drilling muds being considered hazardous could be enormous and far reaching. They come up with a figure that is, frankly, hard for me to accept. And if it approaches reality, it poses an incredible economic problem to the country in trying to solve our energy problem. They say it could cost as much as \$10.8 billion. And that is a year. Now, that is more than the total cost, more than the total cost of drilling domestic oil and gas wells in 1977.

Mr. JORLING. Senator, I do not share that cost estimates accuracy. The evidence that we have of the effect of our regulations as proposed is not anything like that. I will provide you, however, with why we disagree, for the record.

Senator BENTSEN. Other elements of these regulations that affect production water threaten the continued operation of domestic stripper wells that account for over 12 percent of 1977 domestic crude production. I have another piece of legislation that calls for deep stripper well exemption. If they also get affected in this regard, we are talking about a lot more than just 12 percent.

Mr. JORLING. Again, both the underground injection regulations and these regulations can affect drilling operations and the oil and

gas industry generally. From the figures that you have described, I believe they have been submitted to our rulemaking record and we will then be required to distinguish what our data is from those data. But I can assure you that it is our intention to implement these programs in a way that incorporates the experience of the State governments in regulating oil and gas production does not add unnecessary redundant or conflicting requirements and incorporates those regulations and activities at the State level as much as possible. I think in the end we will be successful in doing so.

Senator BENTSEN. Mr. Jorling, I agree totally with this statement that you have just made, if you can achieve it and if you can bring it about. But if these figures that they have provided to me approach being accurate, we are talking about an incredible impediment in our drilling operations at a time when we are desperately trying to stem the hemorrhaging of our funds through trade for the importation of great amounts of oil.

Mr. JORLING. Senator, we have received some estimates of cost from both the petroleum industry and others, chemical industry, which have projected what we think are outrageous costs. The concern I have with those costs is that they are introduced in a way to discredit the rulemaking efforts. I don't think they will be realized. I hope we can work, and we have worked very effectively in developing these regulations. We have had a task group with the oil industry in developing these regulations. We have had a task group with the chemical industry. They have now come to us after they participated in those activities in which they didn't raise any of these concerns and now have raised these concerns. I don't know why they do that. But I don't think we will be what you are suggesting, and that is irresponsible in this rulemaking activity.

Senator BENTSEN. Well, you certainly won't be as far as I am concerned, because I intend to follow the problem. I can't imagine that you would intentionally do so. But I want to be sure that we have fully checked out these concerns by those who are actually carrying on the operations out in the field and by those Commissions that have been at this business for a long time and have very substantial experience in that regard.

I would like to go on in this discussion of hazardous substance definition a little longer. A material either passes or fails one of several tests. Now, if it fails that test, it is considered hazardous, whether it exceeds the limit by 1 percent or by 500 percent. Once it exceeds the limit, it must meet the regulations, regardless of the degree of hazard. Is that correct?

Mr. JORLING. Yes, Senator. If a material is either listed or determined through testing to be hazardous, it must comply with the program. I must add that all that means is that it has to go either to an onsite or offsite permitted facility. It does not necessarily have other significance that has great economic impact.

Senator BENTSEN. My concern, Mr. Jorling, is if you have something that is an extreme violation that adds very substantially to the degree of hazard, that the correction should be substantially greater, it seems to me, and that there ought to be some means of variance in the application to the degree of hazard.

Mr. JORLING. Senator, I can understand that, and it is of concern to us. But what we are regulating here are thousands upon thou-

sands of chemical substances and mixed chemical substances of different order. The degree of toxicity, degree of hazard, is the function of circumstances under which they are managed. So you can understand if you begin to take thousands of chemicals, overlay the thousands of circumstances of management, of movement, of transport, of disposal practices over on that, coming up with any kind of indicator of degree of toxicity for purpose of regulation becomes an impossible task.

We do share, however, your concerns that some waste present inherent—kepone, dioxin, those kinds of materials present—because of the inherent nature of the chemical compound, there is very extreme risk. So we are evaluating our regulation to determine whether or not, with respect to those acutely toxic, extreme toxicity is a function of chemical compound, a different and more onerous requirement, such as required incineration, as was done in PCB under the Toxic Substances Control Act. But with respect to the great bulk of chemicals, the hazard is a function of how it is used. So it becomes very difficult to create a regulatory structure that anticipates that. We don't like complicated regulatory structures. They are hard to manage. We like simple regulatory structures.

Senator BENTSEN. I agree with that totally. But if you have something that varies over the line 1 percent and you put 100 percent application on it, you have serious problems in implementation, I believe.

Mr. JORLING. Let me also add in the regulations as proposed, there is special accommodation of certain waste streams because of basically your concern; that is, the degree of hazard. We have listed as special waste streams, I think, six categories of waste. Some of those that I can think of are the ashes and remains of combustion of coal, the cement kilns, the various types of mining operations. They contain heavy metals, they can leach, but we create a different regulatory structure for those. So we are recognizing that to the extent we can identify a manageable and administrable system. We are aware of that. Where there are great volumes of waste that are only hazardous in certain circumstances and they can be managed effectively through a different scheme, we are trying to adopt that.

Senator BENTSEN. The Resource Conservation and Recovery Act defined hazardous wastes based on its quantity concentration or infectious characteristics. One of the most frequent criticisms I have heard regarding the proposed regulations is the failure to include quantity in the definition of hazardous wastes. Why do these regulations, which can impose such significant burdens on those who meet them, limit the consideration of quantity? Has Congress failed somehow in providing guidance on this issue? How does the failure to include quantity affect material such as oil production waters?

Mr. JORLING. We have taken quantity into account in several different ways. First of all, one of the most criticized portions of the regulations is an exemption based on quantity. We have a hundred kilogram per month cutoff. If the generator of the waste, even though it be hazardous by the criteria, generates less than a hundred kilograms per month, it is outside the system. We have re-

ceived considerable criticism for that cutoff, that we should not have used that amount or any amount to determine whether a substance is in or out. An ounce of dioxin can destroy a city whereas a hundred kilograms of an oil brine may not cause a problem. We have taken quantity into account in the exclusion and also in the special waste streams where the quantities are high, the management systems are usually on site, and an alternative scheme of regulation can be established. We have used quantity in those two instances.

Senator BENTSEN. Without objection, I want the record kept open for several days for additional statements.

Mr. Jorling, in talking about the delayed reaction of some of these people in the industry, whatever that reason, I don't want it dismissed. I want some deep and careful research in regard to this, because the fallout on our production in this country, if their facts approach what they allege, could be an extremely serious problem to this country.

Mr. JORLING. Senator, we take these new figures very seriously, and we are evaluating them very seriously. I welcome your scrutiny of us and we will participate with you and your staff in assuring you we are evaluating them prudently and that our responses to them are responsible.

Senator BENTSEN. These hearings will continue tomorrow at 10 o'clock and we will recess until the morning.

[Whereupon, at 12:40 p.m., the subcommittee recessed, to reconvene at 10 a.m., Thursday, March 29, 1979.]

[Statements submitted for the record by today's witnesses and the material submitted by Mr. Clark follow:]

Testimony On Effect of Kepone On Fisheries

To: Joint hearings of the Resource Protection and Environmental Pollution Sub Committee of the Senate Environmental and Public Works Committee March 28, 1979.

By: W. Cranston Morgan-Pres. W. F. Morgan & Sons, Inc.
Neems, Va.

Mr. Chairman:

My name is Cranston Morgan, a former oysterman and now a seafood packer-processor, from Neems, Virginia. The products we handle are oysters and finfish from the Chesapeake Bay and its tributaries. I have been asked to talk about the effect Kepone has had on those people both directly and indirectly connected to this industry. One word describes it, "disastrous." The only exception being that Kepone was responsible for state and federal toxic substances laws being enacted. The problem has been recognized and the next decade will see the same efforts to curb toxics as has been seen in the curtailing of sewage discharges. Our industry must have clean water in order to survive. A great and successful fight has been fought to clean up our nations waters and in my opinion, with some exceptions, we are winning that battle. In toxics we are only seeing the "tip of the iceberg" at this time. With increasing ability, scientifically, the more sophisticated test equipment will point up many undesirable compounds in our streams and on land.

There are about 8000 watermen in Virginia who are licensed to fish commercially for oysters, crabs and finfish. There are many times this number who fish as a recreation. The closing

of 75 miles of the James River, Hampton Roads and the lower Chesapeake have seriously impaired the watermen's ability to make a living. Firstly, it has cut down on his harvesting area. For instance, when shad come in the Bay, they head for place where they were born. A great number, by far the majority, have their spawning area up the James River. Gill nets trap the shad, normally, in the Hampton Roads area and then they proceed to hang their nets in front of the shad until they reach their destination. This was a way of life to hundreds of gillnetters. Their boats and equipment were created for this type of harvesting. With the closure because of Kepone, they can no longer make a living in the traditional manner. Those who had larger boats went up the Bay crabbing and oystering. This, however, has narrowed down the harvesting capabilities of even the larger fishermen. The closed area before Kepone caught 18% of the crabs Virginia produced. This is now 0%. Bluefish, croaker, flounders and other species were a significant part of Virginia's total landings. I have a more precise statement from the Virginia Marine Resources Commission that will give some idea of the extent of the disaster. But even this statement is only a partial picture of the great loss suffered by the watermen and their on-shore support people. There has not been any way to record small fishermen's catches because many of them put their fish on small trucks and transport them to wholesale dealers.

VIMRC has projected in the governor's settlement with Allied Chemical there would be a \$2,000,000.00 loss per year for forty years. Two weeks ago the Virginia Institute of Marine

Sciences, Dr. Bender said that it may be 100 years. The first closure by the Governor covered all species. After 4 months oysters were released from this restriction when it was found that they were being used for seed and transplanted to other rivers where they cleansed themselves rapidly. Shad, catfish, striped bass, croaker, spot and flounders, as well as male blue crabs remained under the closure. Shad were released this year but all blue crabs were placed under restrictions. The loss of the crab catch is in excess of 1M-400 lbs. Striped bass amounted to 460,000 lbs. at 1.50 per pound. The alarming part of this is that licensed fishermen in the James dropped from 1012 in 1975 to 370 by November, 1978. This does not indicate the total loss to the industry. As indicated previously, the larger boats have moved to other areas where catches are not easy to extract from nature. The ability of VMRC to evaluate this shift in harvesting areas and its effect on the total industry will take time and further statistics.

This year Virginia Marine Resources Commission has devised a system that should record most commercial catches. The loss of fishing areas has not only been restricted by Kepone but also by other types of pollution over the years. For instance, we have lost about one-third of our oyster harvesting bottoms both in Virginia and the 28 producing states of our nation. Secondly, we have suffered economic losses because of the extraordinary news releases of the media. We have been bombarded locally, state-wide and nation-wide with stories about the contaminated seafood from Virginia. Actually after the closing

of the James River to the taking of fish, the Food and Drug Administration in three years of sampling have not found enough samples in excess of action levels to either seize or prosecute. I'm sure the members of this committee are highly aware of media capabilities--much more so than we in fisheries. But we have had an unbelievable indoctrination that has made believers of all of us. So much so that we created a state seafood marketing Commission runned with new taxes we voted upon our catches. We hope to begin this summer with releases and other marketing actions that will undo some of the damage inflicted upon us. Unfortunately we have found that this costs amounts of money we, alone, are not capable of raising with our taxes.

Lastly, and perhaps the most difficult of all, we have an industry comprised of the most independant and basic people in the country. I like to believe these are the same tough, hard-working and tenacious people that settled our country and made it great. To further indicate this, I would like to tell you about Gov. Godwin's effort to help these fishermen. He took exceptional action and bent regulations in order to make emergency funds available to help them through a desperate, kepone laden, 1976 cold winter. Three persons out of all the fishermen accepted these funds. While we think these qualities are fine, they lead to problems of what to do to help them make changes in their way of life to offset the disruption from pollution of the River. Incidentally, the Environmental Protection Agency has recently named the Hampton roads area as one of the four most polluted waters in the United States. and

our state continues to propose major siting such as a refinery, that will further pollute. Therefore, in our foreseeable future, hundreds of small rics must be converted to boats that will be able to harvest in rougher waters and farther away harvesting grounds than have been used in the past. The watermen also have to be educated to new methods, new equipment, and new specie. This will be difficult if not impossible.

In the broader aspects of obtaining clean waters for our fisheries, we are grateful for the efforts of Congress to create laws and agencies to bring about greater incentives and conditions that would increase harvesting for domestic fishermen. We have testified for the Clean Water acts from 1964 until now; the Coastal Zone Management and the 200 mile limit, the Environmental Protection Agency, the Management Councils (with reservations) and many other laws such as the Toxic Substances Act have given us tools to help fishermen. The mechanical execution and carrying out of these efforts is extremely difficult. In the state of Virginia, when the political world crashed into the scientific world, all the laws, agencies (both national & local), and even Article XI of the Constitution of Virginia did not persuade the political world from their proposed destruction of the environment and in the long run, the oystermen. Our long effort to adopt a Coastal Zone Management plan went by the board in the fight. The State Water Control Board, The State Health Department, and the Virginia Institute of Marine Sciences all became hit targets and have suffered many, in my opinion, indignities. Inflation has resulted in hypersensitivity to economics. The Toxic Substances battle will be the foremost pollution control

activity for at least the next decade and it will be harder to curb because of money. Run-off of pesticides, exotic compounds formed by chlorination in municipal and other point source discharges, the identification of non-point sources of discharge, will be investigated and will reveal startling facts. The forerunner of this, of course, is Kepone. A very large battle is now engaged and I hope you can help us win it because it encompasses all of us.

STATEMENT OF M. E. BENDER
BEFORE THE
JOINT HEARINGS OF THE RESOURCE PROTECTION
AND ENVIRONMENTAL POLLUTION SUB-COMMITTEES
OF THE U. S. SENATE ENVIRONMENT & PUBLIC WORKS
COMMITTEE
ON THE
THE GENERAL PROBLEM OF HAZARDOUS
CHEMICALS IN THE ENVIRONMENT

28 MARCH 1979

GOOD DAY. MY NAME IS MICHAEL BENDER AND I AM AN ASSISTANT DIRECTOR OF THE VIRGINIA INSTITUTE OF MARINE SCIENCE AND A PROFESSOR OF MARINE SCIENCE AT THE COLLEGE OF WILLIAM AND MARY IN VIRGINIA.

MY PROFESSIONAL EXPERIENCE IN POLLUTION MATTERS EXTENDS OVER A PERIOD OF 20 YEARS, DURING WHICH TIME I HAVE BEEN EMPLOYED IN VARIOUS CAPACITIES BY BOTH STATE AND FEDERAL GOVERNMENTS, PRIVATE INDUSTRIES, AND UNIVERSITIES.

FOR THE PAST TEN YEARS I HAVE BEEN INVOLVED IN STUDIES OF SEVERAL POLLUTION INCIDENTS AND RESEARCH PROJECTS DIRECTED TOWARD NATURAL RESOURCE DAMAGE ASSESSMENT. THESE STUDIES INCLUDE: 1) DETERMINING THE EFFECTS OF THREE OIL SPILLS IN CHESAPEAKE BAY; 2) EVALUATING THE EFFECTS OF KEPONE CONTAMINATION IN THE JAMES RIVER; 3) EVALUATING THE IMPACTS OF OFFSHORE OIL DRILLING AND PRODUCTION IN THE GULF OF MEXICO; AND 4)

AT PRESENT ASSESSING THE POTENTIAL DAMAGE TO THE CHESAPEAKE BAY WHICH IS POSED BY THE CRIPPLED ITALIAN FREIGHTER, MARIA COSTA, WHICH HAS BEEN ANCHORED OFF THE MOUTH OF CHESAPEAKE BAY FOR A MONTH WITH A RUPTURED HOLD CONTAINING APPROXIMATELY 140,000 POUNDS OF ORGANOPHOSPHATE PESTICIDE.

TODAY I WOULD LIKE TO MAKE SOME GENERAL COMMENTS ON NATURAL RESOURCE DAMAGE ASSESSMENT FROM MY OWN EXPERIENCES AND THEN MAKE A FEW SPECIFIC COMMENTS RELATIVE TO THE KEPONE PROBLEM IN THE SOUTHERN CHESAPEAKE BAY.

TO BEGIN WITH, I WOULD LIKE TO EMPHASIZE THAT THE EFFECTS OF CHEMICAL CONTAMINATION ON MARINE LIFE AND ITS IMPACT ON MARINE RESOURCE UTILIZATION ARISE FROM TWO QUITE DIFFERENT AVENUES: THE BIOLOGICAL EFFECTS ON THE RESOURCE AND THE EFFECTS OF THE CONTAMINATED RESOURCE ON MAN.

EFFECTS ON THE GROWTH AND REPRODUCTIVE ABILITY OF MARINE AND FRESH-WATER FISHES AND INVERTEBRATES (CRABS, OYSTERS AND OTHER IMPORTANT FOOD CHAIN ORGANISMS) CAN OCCUR AS THE RESULT OF EXPOSURE TO CHEMICALS.

UPTAKE OF CHEMICALS BY THESE ORGANISMS CAN OCCUR FROM THE WATER THEY LIVE IN OR FROM THE FOOD THEY EAT AND CERTAIN OF THEIR VITAL BIOLOGICAL FUNCTIONS CAN BE ADVERSELY AFFECTED AS A RESULT OF EXPOSURE. THIS MAY CAUSE LOWERED POPULATION LEVELS AND THEREFORE FEWER ANIMALS AVAILABLE FOR HARVEST, OR A LOWERED STABILITY OF THE ECOSYSTEM.

THE SECOND MAJOR AVENUE BY WHICH CHEMICALS CAN AFFECT NATURAL RESOURCES IS BY LIMITING THEIR UTILIZATION. THIS IS DUE TO THE FACT THAT A NUMBER OF SPECIES HAVE BEEN FOUND TO CONTAIN RESIDUES OF CHEMICALS WHICH ARE OVER ESTABLISHED "ACTION LEVELS".

ACTION LEVELS ARE ESTABLISHED BY THE FOOD AND DRUG ADMINISTRATION

WHEN FOOD PRODUCTS ARE INADVERTENTLY CONTAMINATED WITH HARMFUL MATERIALS. IN THE CASE OF PESTICIDES, THE ENVIRONMENTAL PROTECTION AGENCY HAS THE RESPONSIBILITY TO RECOMMEND TO FDA WHAT LEVELS OUGHT TO BE SET FOR VARIOUS FOODSTUFFS, BUT FDA HAS THE FINAL LEGAL AND REGULATORY RESPONSIBILITY.

DURING THIS LEVEL SETTING PROCEDURE, EPA REVIEWS STUDIES CONDUCTED BY OTHER GOVERNMENT AGENCIES (SUCH AS THE NATIONAL CANCER INSTITUTE) TO DETERMINE IF A SIGNIFICANT RISK TO HEALTH CAN BE EXPECTED TO ARISE FROM THE INTAKE OF A SUBSTANCE. IN RECOMMENDING AN ACTION LEVEL, EPA CONSIDERS THE NATURE OF THE HAZARD, FOR EXAMPLE, IS THE SUBSTANCE A CARCINOGEN? IF IT IS, A LARGE SAFETY FACTOR, I.E. A MULTIPLIER, USUALLY $1/100$ OR $1/1000$, IS APPLIED TO THE LOWEST LEVEL FOUND NOT TO HAVE AN EFFECT ON EXPERIMENTAL ANIMALS.

THE MAXIMUM ALLOWABLE INTAKE OF A SUBSTANCE IS THEN DETERMINED BY SCALING UP THE INTAKE FROM THE SMALLER EXPERIMENTAL ANIMALS TO AN AVERAGE MAN. THIS RESULTS IN THE PREDICTION OF A QUANTITY OF THE SUBSTANCE WHICH MAY BE SAFELY CONSUMED BY HUMANS, E.G. ONE OUNCE PER YEAR.

THE NEXT STEP IS TO DETERMINE HOW MUCH OF A GIVEN TYPE OF FOOD AN AVERAGE PERSON CONSUMES. WITH THIS INFORMATION, A CONCENTRATION OF THE CONTAMINANT IN A FOOD CAN BE ASSIGNED SO THAT THE TOTAL DIETARY INTAKE FROM ALL SOURCES, E.G. FISH, CRABS, ETC. CAN BE LIMITED TO THE PREDICTED SAFE LEVEL. SINCE PEOPLE CONSUME DIFFERENT QUANTITIES OF VARIOUS FOODS, DIFFERENT ACTION LEVELS FOR DIFFERENT FOODS MUST BE ESTABLISHED. THE HIGHER ACTION LEVEL SHOULD BE ASSIGNED TO THOSE FOODS WHICH ARE EATEN IN SMALLER QUANTITIES.

ANOTHER GENERAL POINT WHICH NEEDS TO BE CONSIDERED, AND OFTEN IS NOT WHEN ASSESSING DAMAGE TO NATURAL RESOURCES, IS THE RATE AT WHICH THE SYSTEM AND/OR POPULATIONS AFFECTED RECOVER. THIS ASPECT IS MOST IMPORTANT WHEN ONE CONSIDERS THE LEVELING OF FINES FOR DAMAGES. AT PRESENT, FINES ARE USUALLY BASED ON "BODY COUNTS" IN THE CASE OF SINGLE EVENTS, I.E. SPILLS, OR STANDARD CHARGES PER DAY FOR EFFLUENT VIOLATORS. NEITHER SYSTEM PROVIDES AN ADEQUATE OR EQUITABLE MEANS FOR ENVIRONMENTAL PROTECTION. IN MY OPINION THE SYSTEM IS MOST FREQUENTLY UNFAIRLY APPLIED TO SUCH EVENTS AS OIL SPILLS WHERE A RESOURCE MAY BE DAMAGED BUT RECOVERS QUITE RAPIDLY. IN FACT SOME STATES, CALIFORNIA FOR EXAMPLE, ASSESS FINES OF OVER 50¢ FOR EACH BARNACLE KILLED. IN THE CHESAPEAKE BAY REGION BOAT OWNERS USUALLY PAY BOAT YARDS TO KILL BARNACLES, AND I WONDER IF THE BOAT YARDS IN CALIFORNIA ARE FINED FOR CLEANING BOATS.

ALTHOUGH THIS EXAMPLE MAY SEEM LUDICROUS, HEAVY FINES ARE OFTEN IMPOSED ON SUCH A BASIS. TAKE FOR EXAMPLE THE RECENT SETTLEMENT IN THE CASE OF THE ZOE COLOCOTRONIS OIL SPILL NEAR CABO ROJO, PUERTO RICO. IN THIS CASE MILLIONS OF DOLLARS IN FINES WERE ASSESSED FOR THE TEMPORARY DESTRUCTION OF BOTTOM DWELLING ANIMALS, MANY OF WHICH WERE ALMOST MICROSCOPIC IN SIZE AND OF LITTLE OR NO DIRECT ECONOMIC SIGNIFICANCE. PERHAPS SUCH FINES WOULD BE JUSTIFIED IF THE DAMAGE WERE PERMANENT OR EVEN IF THE RESOURCES COULD BE REPLACED, HOWEVER, NEITHER IS USUALLY THE CASE AND AS USUAL THE PUBLIC PAYS IN THE END.

KEPONE IN THE JAMES RIVER

KEPONE ENTERED THE JAMES RIVER ESTUARY FROM A POINT SOURCE AT PRODUCTION SITES OF ALLIED CHEMICAL CORPORATION AND LIFE SCIENCE PRODUCTS IN HOPEWELL, VIRGINIA, U.S.A. APPROXIMATELY 1.5×10^6 KG WERE PRODUCED BETWEEN 1966 AND 1975. AT PRESENT AN ESTIMATED 0.5 TONS OF KEPONE RESIDE IN THE SOURCE AREA (BATTELLE, 1978). REPORTEDLY KEPONE WASTES WERE DUMPED BOTH AS SOLID AND IN SOLUTION. IT ENTERED THE ESTUARY BY DISCHARGE THROUGH A MUNICIPAL SEWAGE SYSTEM AND BY LEACHING OF CONTAMINATED SOILS AND SOLID WASTES WHICH IN TURN WERE FLUSHED THROUGH SMALL TIDAL TRIBUTARIES BY RUNOFF. LITTLE IS KNOWN HOWEVER ABOUT THE RATES OF INTRODUCTION. NONETHELESS, RECEIVING WATER IS WELL-MIXED BY THE TIDE AND CONTAINS SUBSTANTIAL AMOUNTS OF RIVER-BORNE SUSPENDED MATERIAL, 20 TO 200 MG/L, WHICH HAS A CAPACITY TO ADSORB KEPONE FROM FRESH WATER AND TO SERVE AS A HOST CARRIER.

ALTHOUGH CONTAMINATION OF THE ESTUARY WAS NOT RECOGNIZED UNTIL 1975, ARCHIVED SAMPLES OF SHELLFISH AND SEDIMENTS DATED 1967 REVEALED SUBSTANTIAL CONCENTRATIONS OF KEPONE. THEREFORE, CONTAMINATION OF THE ESTUARY BEGAN SHORTLY AFTER PRODUCTION STARTED AND CONTINUED TO THE PRESENT SPANNING AT LEAST 12 YEARS.

THE DATA PRESENTED IN TABLE 1 SHOW KEPONE CONTAMINATION AT ALL LEVELS OF THE FOOD CHAIN IN THE JAMES RIVER. PLANKTON AND DETRITUS CONCENTRATIONS ARE EXPRESSED ON A DRY WEIGHT BASIS WHILE THE REMAINDER OF THE SAMPLES ARE CALCULATED ON THE BASIS OF WET WEIGHT. PHYTOPLANKTON AVERAGED 1.3 UG/G OF KEPONE, A LEVEL AT LEAST 10^4 TIMES THAT ESTIMATED IN SOLUTION. ZOOPLANKTON HAD SOMEWHAT HIGHER LEVELS AVERAGING 4.8 UG/G. DETRITUS,

TABLE I
KEPONE RESIDUES (UG/G) IN BIOTA FROM THE JAMES RIVER

	\bar{X}	N	STD. ERROR OF \bar{X}
<u>SESTON*</u>			
PHYTOPLANKTON	1.30	4	0.30
ZOOPLANKTON	4.80	8	1.60
DETRITUS	.67	7	.20
<u>LONGTERM RESIDENTS</u>			
SPOTTAIL SHINER (<u>NOTROPIS HUDSONIUS</u>)	0.08	6	0.02
CHANNEL CATFISH (<u>ICTALURUS PUNCTATUS</u>)	0.04	45	0.004
WHITE CATFISH (<u>ICTALURUS CATUS</u>)	0.25	14	0.06
AMERICAN EEL (<u>ANGUILLA ROSTRATA</u>)	0.64	15	0.15
BLACK CRAPPIE (<u>POMOXIS NIGROMACULATUS</u>)	1.0	10	0.13
LARGEMOUTH BASS (<u>MICROPTERUS SALMOIDES</u>)	2.4	14	0.54
WHITE PERCH (<u>MOCCUS AMERICANUS</u>)	2.7	20	0.39
BAY ANCHOVY (<u>ANCHOA MITCHILLI</u>)	0.65	13	0.15
ATLANTIC SILVERSIDE (<u>MENIDIA MENIDIA</u>)	1.6	15	0.43
HOGCHOKER (<u>TRINECTES MACULATUS</u>)	0.94	22	0.13
GRASS SHRIMP (<u>PALAEONETES PUGIO</u>)	0.60	8	0.15
SAND SHRIMP (<u>CRANGON SEPTEMSPINOSA</u>)	2.0	3	0.09
XANTHID CRABS	0.27	3	0.03
BLUE CRAB (<u>CALLINECTES SAPIDUS</u>) FEMALE	0.19	180	0.02
BLUE CRAB (<u>CALLINECTES SAPIDUS</u>) MALE	0.81	43	0.07
OYSTER (<u>CRASSOSTREA VIRGINICA</u>)	0.16	140**	0.01
HARD CLAM (<u>MERCENARIA MERCENARIA</u>)	0.09	12**	0.009
<u>SHORT-TERM RESIDENTS</u>			
AMERICAN SHAD (<u>ALOSA SAPIDISSIMA</u>)	0.03	50	0.004
ATLANTIC MENHADEN (<u>BREVOORTIA TYRANNUS</u>)	0.05	8	0.02
SPOT (<u>LEIOSTOMUS XANTHURUS</u>)	0.81	40	0.13
CROAKER (<u>MICROPOGON UNDULATUS</u>)	0.75	60	0.16
BLUEFISH (<u>POMATOMUS SALTATRIX</u>)	0.29	30	0.20

*SESTON SAMPLES REPORTED ON DRY WEIGHT BASIS, ALL OTHERS ARE AS WET.

**BLENDS OF 12 INDIVIDUALS.

UNIDENTIFIABLE FRAGMENTS OF ORGANIC MATTER RETAINED BY A 110 U MESH NET, AVERAGED 0.7 ug/g.

KEPONE LEVELS IN MIGRATORY SPECIES, E.G. CROAKER, SPOT, BLUEFISH, AND SHAD INCREASED AS THEY STAYED LONGER IN THE ESTUARY. THEREFORE, THE RESIDUE LEVELS FOR THESE SPECIES REPORTED IN THE TABLE ARE AVERAGED OVER THEIR PERIOD OF RESIDENCE. RESIDUE LEVELS IN LONG-TERM RESIDENTS, E.G. HOGCHOKERS, WHITE PERCH AND CATFISH, DID NOT FLUCTUATE SEASONALLY. ALTHOUGH THE DATA ARE LIMITED, NO TRENDS IN RESIDUE LEVELS IN THE JAMES RIVER COULD BE DETECTED AS A FUNCTION OF DISTANCE FROM THE KEPONE SOURCE AT HOPEWELL, EITHER FOR ESTUARINE SPECIES OR FOR THE FRESHWATER RESIDENTS.

CONSIDERABLE VARIATION IN KEPONE RESIDUE OCCURS BETWEEN SPECIES (TABLE I). FRESHWATER SPECIES, WHICH ARE RESIDENT THEIR ENTIRE LIVES, VARY IN AVERAGE KEPONE RESIDUES FROM 0.04 ug/g TO 2.4 ug/g. OF THE TWO SPECIES OF CATFISH IN THE RIVER WHICH ARE OF MAJOR COMMERCIAL IMPORTANCE, THE CHANNEL CATFISH (ICTALURUS PUNCTATUS), AND THE WHITE CATFISH (ICTALURUS CATUS), THE FORMER EXHIBITED LOWER LEVELS BY ALMOST AN ORDER OF MAGNITUDE.

LONG-TERM RESIDENT ESTUARINE (BRACKISH WATER) FIN FISH VARIED LESS THAN THE FRESHWATER SPECIES IN THEIR KEPONE RESIDUES, WITH AVERAGE LEVELS BETWEEN 0.6 AND 2.7 ug/g.

SHORT-TERM MARINE FISH SPECIES, E.G. AMERICAN SHAD AND MENHADEN, EXHIBITED LOW LEVELS OF KEPONE AVERAGING LESS THAN 0.1 ug/g WHILE SPOT AND CROAKER, WHICH USUALLY RESIDE IN THE RIVER FOR SOMEWHAT LONGER PERIODS, HAD RESIDUES AVERAGING 0.81 AND 0.75 ug/g, RESPECTIVELY.

BLUE CRAB RESIDUES AVERAGED 0.19 ug/g FOR FEMALES AND 0.81 ug/g

FOR MALES. THE MALE CRABS SPEND A GREATER PROPORTION OF THEIR LIVES IN THE RIVER SYSTEM THAN DO THE FEMALES, AND THIS HABIT PROBABLY ACCOUNTS FOR THE OBSERVED DIFFERENCE IN KEPONE BODY BURDENS.

STATIONS IN CHESAPEAKE BAY WERE SAMPLED FOR FIVE FIN FISH SPECIES DURING APRIL, JUNE AND SEPTEMBER. OUR MOST COMPLETE SET OF DATA IS FOR THE 21 JUNE 1976 SAMPLING PERIOD, WHEN AT LEAST 10 AND USUALLY 20 FISH OF EACH SPECIES WERE OBTAINED. THE RESULTS OF THIS SURVEY SHOWED SIMILAR RESIDUE PATTERNS FOR CROAKER, SPOT, TROUT, AND FLOUNDER WITH RESIDUES DECLINING AS ONE MOVES UP-BAY FROM THE KEPONE SOURCE IN THE JAMES RIVER. BLUEFISH, HOWEVER, DID NOT EXHIBIT THIS PATTERN--THEIR RESIDUES WERE ESSENTIALLY THE SAME REGARDLESS OF SAMPLING LOCATION. THE BLUEFISH, BEING HIGHLY MOBILE, MAY MOVE INTO THE JAMES FOR A TIME AND THEN MIGRATE TO OTHER AREAS OF THE BAY, MIXING WITH POPULATIONS WHICH HAVE NOT STAYED IN THE LOWER JAMES RIVER FOR AN EXTENDED PERIOD OF TIME. AS A CONSEQUENCE, THE RESULTING POPULATION SAMPLED AT A GIVEN STATION WOULD BE COMPRISED OF FISHES WITH BOTH HIGH AND LOW RESIDUE LEVELS.

AT PRESENT WE DO NOT HAVE ANY DIRECT EVIDENCE THAT TOXIC EFFECTS DUE TO KEPONE EXPOSURE ARE OCCURRING IN THE BIOTA OF THE JAMES RIVER. HOWEVER, LABORATORY STUDIES TO DETERMINE THE POTENTIAL IMPACT OF KEPONE CONTAMINATION ON SOME ESTUARINE ORGANISMS HAVE BEEN CONDUCTED. HANSEN, ET AL. (1977) HAVE SHOWN THAT THE GROWTH OF MYSID SHRIMP AND SHEEPSHEAD MINNOW WAS REDUCED BY EXPOSURE TO 0.07 UG/L AND 0.08 UG/L, RESPECTIVELY. BLUE CRAB MORTALITY WAS OBSERVED BY SCHIMMEL ET AL. (1977) DURING A 28 DAY FEEDING EXPERIMENT WHEN THE ANIMALS WERE FED FOOD CONTAMINATED WITH KEPONE AT LEVELS OF 0.15 AND 1.9 UG/G. DUPUY (1976) FOUND SETTING SUCCESS OF LARVAE

PRODUCED BY KEPONE-CONTAMINATED OYSTERS TAKEN FROM THE JAMES AND SPAWNED IN THE LABORATORY TO BE EQUAL TO CONTROL GROUPS.

THE RESULTS OF TWO OF THE ABOVE STUDIES INDICATE THAT TOXIC EFFECTS ON POPULATIONS OF SOME SPECIES MAY BE OCCURRING IN THE JAMES RIVER. THE STRONG PROBABILITY THAT BLUE CRAB MORTALITIES ARE RELATED TO INGESTION OF KEPONE IS INDICATED BY THE FACT THAT KEPONE RESIDUES IN MOST JAMES RIVER FISH, A PRIMARY FOOD OF THE CRAB, ARE EQUAL TO OR EXCEED THOSE WHICH PRODUCED MORTALITY IN THE LABORATORY. IN ADDITION, KEPONE RESIDUES IN JAMES RIVER FISH ARE FREQUENTLY HIGHER THAN THOSE REACHED BY LABORATORY FISH POPULATIONS WHICH WERE DELETERIOUSLY AFFECTED BY KEPONE EXPOSURES (HANSEN, ET AL., 1977).

THE RELATIVE IMPORTANCE OF BIOTIC COMPONENTS AS KEPONE RESERVOIRS WAS DETERMINED FROM ESTIMATES OF THE DENSITY OF THE MOST NUMEROUS JAMES RIVER ANIMAL SPECIES. THE ABUNDANCE ESTIMATES WERE MADE FROM TRAWL AND BENTHIC SURVEY DATA AND FROM CATCH STATISTICS, AND AS SUCH, PROBABLY UNDERESTIMATE THE BIOMASS OF MOST SPECIES. THE MASS OF KEPONE STORED IN EACH COMPARTMENT WAS DETERMINED BY MULTIPLYING THE AVERAGE KEPONE LEVEL TIMES THE BIOMASS ESTIMATE (TABLE II).

TABLE II

ESTIMATED MASS OF KEPONE CONTAINED IN BIOTA IN THE JAMES RIVER

<u>BIOTA</u>	<u>KEPONE (KG)</u>
BLUE CRABS	3
FRESHWATER FISHES	18
MIGRATORY FISHES	87
BENTHIC FAUNA (MOLLUSKS)	6
ZOOPLANKTON	1

CONTAMINATION IN BED SEDIMENTS

BED SEDIMENT CONTAMINATION EXTENDS FROM THE SOURCE AT HOPEWELL SEAWARD TO HAMPTON ROADS, A DISTANCE OF 88 KILOMETERS (55 MILES). AS SHOWN IN FIGURE 1, CONCENTRATIONS ALONG THE ESTUARY CHANNEL AVERAGED FROM THREE SETS OF SAMPLES COLLECTED DECEMBER 1976, MARCH AND JULY 1977, RANGE FROM 1.93 PPM TO LESS THAN 0.02 PPM. SANDY SEDIMENTS FROM 8 KM LANDWARD OF THE SOURCE AND FROM 88 KM SEAWARD FROM THE SOURCE IN HAMPTON ROADS AND LOWER CHESAPEAKE BAY, CONTAINED LESS THAN 0.016 PPM KEPONE. ALTHOUGH NEAR-SOURCE SEDIMENTS WITHIN 4 KM OF THE SITE, LOCALLY CONTAIN UP TO 4.5 PPM, MUDDY SEDIMENTS FROM THE MIDDLE REACHES ARE THE MOST WIDELY CONTAMINATED.

PATTERNS OF CONTAMINATION VARY Laterally across the axial channel and contiguous shoals. Concentrations are often high at the mouth of tributary creeks and marginal embayments as exemplified by the area north of Jamestown Island. Major Kepone sinks form in the Jamestown-Dancing Point reach and in Burnwell Bay. Sediments from these zones are generally finer-grained and more enriched in organic matter than elsewhere. At present we estimate that from 20 to 40,000 pounds of Kepone are in the bed sediments of the River.

Using this estimate for the Kepone reservoir and rate loss of dissolved Kepone from the Bay, we estimate that the problem will remain with us for between 50 and 100 years.

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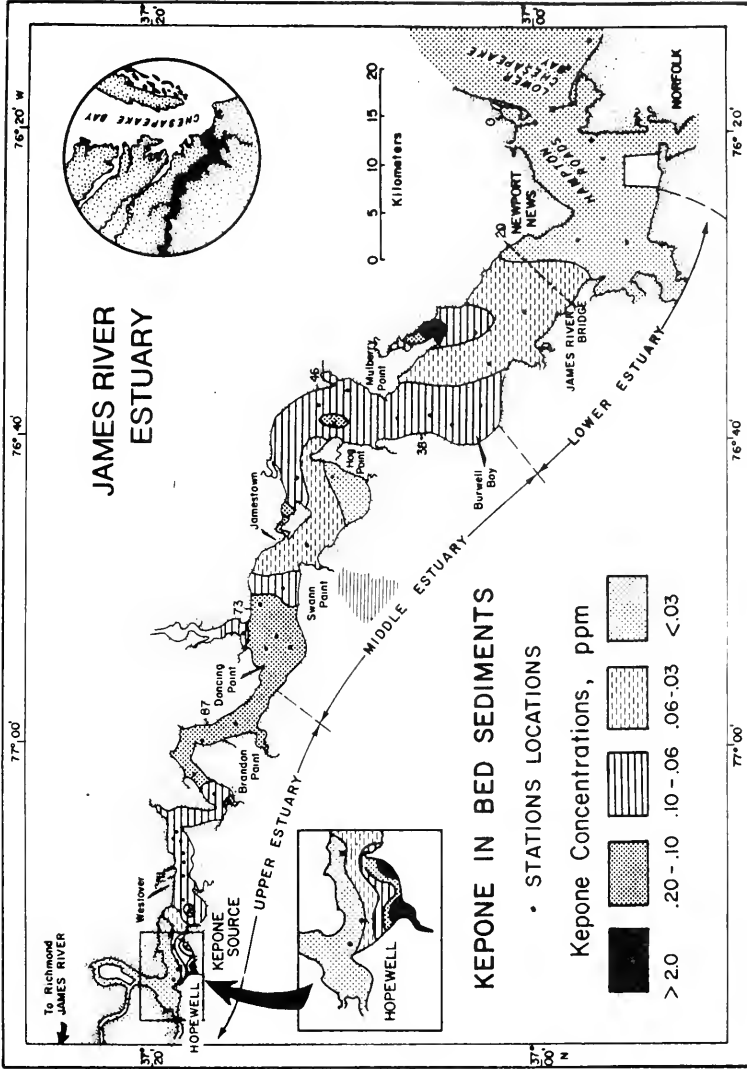


FIGURE 1.

Testimony on Hazardous Chemicals
in the Environment

before the
Senate Environment and Public Works Committee

Subcommittees on Resource Protection
and Environmental Pollution

March 28, 1979

David T. Allen, M.D., M.P.H.
Tennessee Department of Public Health

OVERVIEW AND CHRONOLOGY OF EVENTS:

The Velsicol Company plant in Memphis, Tennessee, disposed of its waste chemicals at the Hollywood Dump in Memphis on the banks of a watercourse leading to the Mississippi River until a major fish kill resulted in a change of disposal site in the mid 1960's to a farm in Hardeman County. Between 1965 and 1972, approximately 300,000 barrels of chemical wastes were buried in trenches over about one-half the acreage of the farm. A geological survey in 1967 indicated that the flow of the local water table aquifer was away from the homes to the west and north of the burial site. Velsicol continued dumping until Eugene W. Fowinkle, M.D., Commissioner of Public Health, issued an order in February 1972 to stop the dumping by September 1, 1972.

The first complaints of contaminated water were received by the local health department in November 1977, and water samples at that time revealed no measurable levels of chemicals. Surveillance was increased by the State, Local and Federal governments in late 1977 and 1978. In March 1978 the first measurable contaminants were found in two wells, and shortly thereafter three more wells were found to be contaminated. Residents were told not to drink the water or to use it for food preparation and a temporary clean water supply was provided.

In April 1978, a permanent, alternate water supply was suggested by the Water Quality Division of the Tennessee Department of Public Health. Plans were begun at that time to pursue the alternative of a water line from the town of Toone.

In May 1978, B. D. Hale, M.D., local health officer, initiated epidemiologic studies of the families in the area and continued to advise them not to drink any of the suspect water. He developed a list of symptoms experienced by any member of the families, and took blood and urine samples to test for various chemicals. Results were unclear since control persons not exposed to the contaminated wells had levels of chemicals equal to the levels in persons that were exposed. And symptoms did not correlate well with contamination levels.

Prior to September 1978, most of the action relative to the Hardeman County problem was initiated at the State and Local government levels due to the high level of demand from local citizens. In September 1978, the Federal government, i.e., EPA, greatly expanded its role, although the State is still in charge of local investigations and solutions for this specific problem. However, we appreciate all continuing assistance from CDC, EPA, and other agencies. We particularly need assistance in the establishment of guidelines at the Federal level for the thresholds of exposures that constitute realistic threats to human health. At this time no one in Tennessee knows when a specific exposure level of any one of thousands of chemicals should be expected to change from a contact which is an insignificant exposure to that level which constitutes a true health hazard. That responsibility is, I believe, one assigned by statute to EPA.

In October 1978, when the most recent groundwater studies showed the possibility of a flow from the burial site to the private wells to the north and northwest, the Velsicol Chemical Corporation joined in a vigorous pursuit of solutions, both temporary and permanent. The accomplishments realized to date have reflected coordination and cooperation among all levels of government and several private

entities. These successes would not have been possible if an adversary position had been maintained, or if no agreement had been reached on which steps were most important and which should come first.

Data available to date suggest that the concentration of contamination is increasing as a function of time, and that the low molecular weight solvents are migrating fastest and in highest concentrations. A summary of the EPA and State Health Department laboratory results of chemicals in wells is available in a letter dated March 8, 1979 from Kathleen Taimi, EPA Region IV to Mr. Terry Cothron. The most recent results show at least 13 wells contaminated with some carbon tetrachloride, and the range of contamination levels is wide. Well #5 was reported as 25 parts per billion carbon tetrachloride, while well #10 was reported as 18,700 parts per billion in the most recent analyses. Unfortunately, we have no way of knowing the level of contamination during the time of exposure before the people were told to stop drinking the water.

In other instances of accidental exposure to chemicals, all or nearly all damage, injury, and illness appears to be dose related. That is, the higher the exposure, the worse the illness and the lower the exposure, the less the illness.

SCIENTIFIC REASONS FOR ACTIONS TO PROTECT THE PUBLIC HEALTH:

Some of the chemicals found in the wells are known to be dangerous at higher concentrations. Some, like carbon tetrachloride, which is found in the highest concentration, can cause cancer. Low dose health effects of the chemicals are unclear but the potential for danger is real. Whether or not certain individuals received a high dose is unknown. The only prudent course of action for protecting the health of the public who may be exposed is immediate substitution of safe water for contaminated water. This was done as fast as could be done. There are no medical or surgical treatments for exposures to those chemicals found in the wells. Monitoring the area forever may be necessary to track future migration of these chemicals and to avoid any new exposure to contaminated water.

The testing of people can be valuable when there are problems that can be corrected if found, or if one wishes to document the negative effects of an experiment in nature. The risk one runs when extensive testing is done is that a false sense of security can be transmitted when the health effects of the chemicals have a long incubation period. Cancers are now showing up in certain factory workers who were exposed decades ago. Many of these had had extensive physical examinations and blood tests with no abnormalities noted. In the recent Kepone tragedy in Hopewell, Virginia, the incubation period between exposure and illness was very short and dramatic. However, exposures were very, very high and Kepone is the exception to the rule. While we applaud testing when it helps, we must remember that the important action to protect the public health is find out the source of contamination and in this case to substitute safe water for bad water.

MEDICAL TOXICOLOGY:

In the late summer, Dr. C. S. Clark from the University of Cincinnati Medical Center, a grantee of the EPA-Health Effects Research Laboratory, met with B. D. Hale, M.D. and his staff to discuss a health survey. Some samples and histories were obtained on October 2, 1978 by Dr. Clark's group but further studies were

postponed until November 6 through November 8, 1978. Additional health questionnaires were completed on December 4, 1978. On January 9, 1979 Dr. Clark met with members of the Tennessee Department of Public Health staff to discuss the protocol for a health survey to be done on January 13-14.

Dr. Clark has promised us a written report as soon as his data are analyzed. He has told us verbally that the tests done the first time in 1978 showed some abnormal liver functions, but that the results done in 1979 were less clear. We hope to see provisional laboratory results soon.

We wish to find out whether those individuals with high levels of contamination in their wells now are those with the most abnormalities found by Dr. Clark. B. D. Hale, M.D., has a complete list of the persons who may have been exposed to the contaminated wells and intends to keep their names and addresses current into the future so that long term follow-up can be done. The water in the wells may have to be monitored forever.

POSITION OF CERTAIN EXPERTS:

- 1) C. S. Clark, Ph.D., grantee of EPA-HERL suggests that careful testing and history taking will give all a good opportunity to answer the question of what the health effects of the unfortunate exposure to chemicals in well water might have been. He told us he believes the testing will be of great benefit to the persons who have had the exposure since they will know what the results of their tests are.
- 2) John C. White (Regional Administration EPA/Region IV) states in a letter (attached) to William H. Foege, M.D. (Director CDC), "I believe that it is absolutely imperative that some kind of study be performed if for no other reason than to allay the very high degree of anxiety currently being experienced by the affected residents." He goes on to say, "we believe the staff of CDC is most qualified to address this problem in Hardeman County and we have the highest degree of confidence in the medical expertise available to this agency through the Center for Disease Control."
- 3) R. J. Garner, Director, Health Research Effects Laboratory-EPA Cincinnati; in a memo to John White, Regional Administrator, EPA/Region IV dated December 21, 1978 (attached) states in the memo that the University of Cincinnati is conducting activities in Hardeman County and that "hopefully the medical results will indicate the type of effects resulting from human exposure to organic chemicals. This type of information can be used by EPA and other regulatory agencies in setting exposure limits for these chemicals and promulgate appropriate hazardous waste management procedures so as to avoid harmful effects."
- 4) The CDC response to John C. White, Regional Administrator EPA/Region IV, was written by Philip J. Landrigan, M.D., for William H. Foege, M.D. (attached). He points out the risk of doing health effects studies when he states, "if however there has been subtle damage done to residents of Hardeman County and we cannot assure you that damage has not been done, we would commit a considerable error in professional judgment if we were to do physical examinations, find nothing amiss, and then provide residents

with bland reassurances that all was well. A normal examination today provides no assurance that an adverse health effect caused by exposure to a chemical in contaminated water will not surface one year, five years, or ten years or more hence." He goes on to state the CDC's recommendation of finding out the names of all the chemicals that are in the Velsicol dump, to look for any chemicals not previously looked for but known to be in the dump, to continue sampling all the wells, and with that data collaborate with the Tennessee Department of Public Health in the next step.

- 5) The Tennessee Department of Public Health's position is in line with that of CDC. We recognize that the EPA needs data for regulations. But we believe that the individuals tested should be told the purpose of the testing. It would be unwise to mislead those citizens exposed to a potential physiologic insult into believing that the broad-spectrum search for symptoms which relate to a known exposure level would lead to a treatment for any condition found. Many professionals believe testing people is never hurtful - often helpful. Most medical schools do not. Harm can sometimes be done by the testing process itself.

However, since the individual clinical tests have been done, we are anxiously awaiting the report with the data. The Department will wait to initiate additional epidemiological studies of health effects until we have an opportunity to see these data and consult with the Center for Disease Control. We are prepared to undertake long term follow-up as indicated by the data.

STATEMENT OF
THOMAS C. JORLING
ASSISTANT ADMINISTRATOR FOR
WATER AND WASTE MANAGEMENT
ENVIRONMENTAL PROTECTION AGENCY
BEFORE THE
COMMITTEE ON ENVIRONMENT AND PUBLIC WORKS
UNITED STATES SENATE
MARCH 28, 1979

Good morning. I am here today to discuss what may well be the most serious environmental problem facing the nation today: the poor and/or illicit practices for handling and disposing of hazardous materials and wastes. I testified before this Committee last week on EPA's developing program to regulate hazardous waste management under the Resource Conservation and Recovery Act of 1976. Once in place, this program will control future hazardous waste management practices. Today I will focus on current and past hazardous materials and waste management practices, the problems these practices have caused, our existing legislative authorities to address the problems, and finally, our future plans to resolve the problems.

Recent months have brought to public attention a series of incidents of improper hazardous waste management. The tragedy at Love Canal has demonstrated all too clearly the unacceptable costs

of inferior hazardous waste disposal -- not only the pain and suffering borne by the more than two hundred families evacuated from the site, but also the staggering financial cost of containing and cleaning up the wastes. The illegal spraying of polychlorinated biphenyls (PCB's) along 210 miles of roadway in North Carolina; the discovery of up to 20,000 - 30,000 barrels of discarded, unlabeled wastes in the "Valley of the Drums" in Kentucky; and scores of other cases in states throughout the nation are revealing a pattern of current and past improper hazardous waste management which is both alarming and dismaying.

Why has it taken so long for government to recognize the hazardous waste problem? Unlike air and water pollution which are obvious to citizens, the problems of disposal of hazardous waste are not as apparent. It has largely occurred on private land -- literally out of sight. In addition, the pathways by which adverse effects become evident are generally indirect. For instance, the slow movement of leachate can contaminate groundwater where it reaches people through their water supply; or leachate can enter basements as in Love Canal. In fact, not until the last few years have we developed methodology to sample such leachate and trace groundwater contamination. Even now, these methods are expensive, difficult to apply and obtain precise results, and not widely used.

Most of the solid wastes, and in particular hazardous wastes, produced in the U.S. in the past have been disposed of using environmentally unsound methods. Given a relative surplus of land, an economic system which failed to incorporate environmental damages into product costs,

and ignorance of what was occurring underground at disposal sites, past disposal practices have created a large number of situations in which the environment and public health are threatened. These past practices include poorly designed and poorly sited landfills, industrial waste lagoons with leaking bottoms, uncontrolled incineration, and illicit dumping of waste materials. In summary, the standard practices were, and still are improper.

Landfills can be proper disposal sites. It is possible to retard or prevent the movement of wastes away from the fill using impermeable liners or systems to remove the leachate. However, the overwhelming majority of landfills built in the past have failed to incorporate these features. In areas of the country where some portion of the precipitation moves through the soil and enters the water table, a medium exists to transport hazardous materials underground. A 1977 EPA study of industrial waste landfills indicated that, in 47 of 50 cases studied, hazardous substances had migrated beyond the boundaries of the disposal area. Approximately one fourth of the incidents of reported damage from improper disposal are groundwater pollution cases of this type.

One fourth of the reported damage incidents are due to improperly designed industrial surface impoundments such as lagoons and ponds.

In those areas where precipitation exceeds evaporation (roughly all of the U.S. east of the 100th Meridian, plus the mountain and coastal areas of the west), surface impoundments will eventually either leak or overflow and discharge to surface waters. If the hazardous materials in the lagoons are not being removed, via biological action or filtration, then they are being discharged into the environment. During 1973-75, approximately half of the hazardous waste generated went into unlined surface impoundments - approximately 0.01% went to lined impoundments. After abandonment, surface impoundments frequently contain oily matter or tars or sludges consisting of concentrated hazardous materials. These may continue to discharge to the surface and subsurface environment long after they have ceased receiving waste materials.

Approximately 15% of hazardous wastes during the period 1973-75 were incinerated, two thirds by uncontrolled incineration. Air pollution problems occur during operation. After closure or abandonment, problems of spills, improper storage, and site contamination caused by wastes that were not incinerated are a common problem.

Illicit dumping, improper storage, or other haphazard land disposal accounts for approximately half the problem. This would include such practices

as dumping of residuals on land, haphazard dumping of drummed or liquid wastes, dumping into sewer systems, or dumping along roadsides. One very common problem at the present time is the operator who accumulates wastes in drums or bulk tankage and then abandons the site. After a period of time the barrels and tanks begin leaking, allowing contamination of surface and ground waters and frequently producing a severe fire or explosion potential. Under the present unregulated system, this practice can provide the operator with sizable profits.

The effects of the abandoned waste disposal sites are contamination of surface and groundwaters including drinking water supplies, fish and wildlife kills, vegetation destruction, threats to public safety because of fires or explosions, and direct exposure of people to hazardous substances as happened at Love Canal. Of 421 tabulated damage incidents, a total of 52 involved "direct contact poisoning."

The number of individuals exposed to hazardous materials through contaminated drinking water may be sizable. Last year Niagara Falls officials discovered that approximately 100,000 people were drinking water containing toxic chemicals at levels 4 times that recommended by EPA as a maximum safe limit. On Long Island 54 public water supply wells serving over 100,000 people have been found to be contaminated by chemicals. In Grey, Maine 750 families drank polluted groundwater for four years. In Hardeman County, Tennessee forty families drank from wells polluted with high levels of extremely toxic chemicals: In Grants, New Mexico 200 families drank radioactive water contaminated

by Uranium mining wastes. Illegal disposal of hazardous wastes near Byron, Illinois contaminated wells serving 68 families. A dump in Charles City, Iowa has been found to be polluting groundwater with arsenic and orthonitroaniline; the pollution threatens an aquifer serving 300,000 people. This is only a partial listing of the cases in EPA's files.

The types of hazardous waste which are being improperly disposed of include pesticides and highly toxic organic chemicals, other organic chemicals whose toxicity is unknown, inorganics, radioactive substances, and explosives and flammables. These wastes are capable of producing the full range of toxic effects in humans including acute poisoning and such chronic responses as carcinogenicity, mutagenicity, and promotion of miscarriages and birth defects. Personal injuries from fire or explosions are another threat. In addition to these health hazards, social damages such as property loss or devaluation and loss of economic livelihood are potential consequences of improper hazardous waste disposal.

It is extremely difficult to estimate the full extent of the problem. Varying amounts of information have been accumulated by EPA on approximately 700 damage incidents. Many hundreds more are suspected but undocumented. Cleanup has been attempted in only a fraction of the reported cases and some remedial action may be necessary in a majority of the cases. Since there is little or no incentive, and considerable disincentive, for a site owner or operator to publicize his environmental problems, these reported damage incidents probably represent only a fraction of the problem sites.

Last fall the Agency conducted a very rough survey of hazardous waste sites. Each of EPA's ten regional offices was asked to provide information on those sites potentially containing hazardous wastes for which data on size, waste volume, site conditions, and related areas were available. Additionally each regional office was asked to estimate total numbers of sites containing some hazardous wastes and to estimate those with potentially significant problems. The combined responses from the Regions estimated over 32,000 sites with some hazardous wastes and over 800 sites with at least potentially significant problems. Varying amounts of information were provided on 103 specific sites. These estimates -- the 32,000 and 800 -- are very crude and are based on professional estimates and, in some cases, guesses. There currently is no available inventory or other basis on which to predict the number of hazardous waste sites created over the past several decades.

A recently completed EPA study, done under contract and based on the same rough data, has attempted to augment the regional estimates with some further analysis. The results are expressed as a range of total sites and sites with potentially significant problems. The study estimates a range of about 30,000 - 50,000 sites containing hazardous wastes, of which about 1200 - 2000 may present potentially significant problems. I want to re-emphasize that these figures are very rough and should only be used as "ballpark" estimates.

This study also attempted to estimate order of magnitude costs associated with remedying the situation at sites with potentially significant problems. Costs were estimated at two different levels of remedy. The first level estimated costs for measures taken on an emergency basis to contain the wastes to prevent existing problems from becoming worse. The second level reflected costs that would be associated with an ultimate remedy such as excavating wastes and contaminated soil and disposing of them properly. Cost estimates for both levels of remedy were made from data on over two hundred sites. An average cost per site for each level was derived taking into account size and type of facility. Based on the available data the average cost for the first level of remedy was estimated at \$3.6 million per site. The second level average was estimated at \$25.9 million per site.

Excluding cases for radioactive wastes and cases judged to have no costs, the range of costs for immediate remedy nationwide is estimated at \$3.6 - 6.1 billion. For permanent remedies, the nationwide range is estimated at \$26.2 - 44.1 billion. These estimates do not include compensation for property damage, direct or consequential economic losses, or personal injury costs. While these are the best estimates available at this time, they are very rough estimates. We believe, however, that they provide a reasonable order-of magnitude estimate of the minimum cost that the Nation faces in correcting past mismanagement of hazardous wastes.

I would like to turn now to the related problem of spills of hazardous substances and oil. From an effects or damages point of view, spills, especially of hazardous substances, can have consequences very similar to improper hazardous waste disposal practices. Environmental damage resulting from such spills can result in massive fish kills, destruction of wildlife, air pollution, and loss of livestock by contamination of drinking water. Spills have also resulted in loss of life and posed direct threats to human health. Most frequently, spills have caused the temporary contamination of municipal drinking water and the long-term contamination of wells. On several occasions, accidents involving freight carriers have resulted in the sudden or potential release of pollutants, requiring evacuation of populated areas.

Concern with hazardous substances discharges is not limited to transportation accidents but also includes spills originating from processing, manufacturing, storage, consumption and disposal activities. Each year new commercial chemicals are developed and millions of tons of hazardous substances which could cause a serious pollution problem are manufactured and entered into commerce. The entire growth rate of the chemical industry is on the order of six percent per year, and that of the transportation industry is of equal magnitude. Transportation spills data developed by a contractor in 1970 for the Council on Environmental Quality, predicts that 2000 tank truck spills, 1000 railroad spills and 500 barge or tanker spills will be occurring each year by 1980.

Sources of hazardous substance spills include both transportation and non-transportation facilities, such as vessels, tank trucks, rail cars, storage tanks, pipelines, holding lagoons and chemical manufacturing and processing plants. The number of spills resulting from fixed facilities and the various transportation modes is not available since mandatory reporting of such incidents, as required by Section 311 of the Clean Water Act, is not yet in effect. Numerous independent data sources exist which may be used to characterize the occurrence of hazardous chemical spills. However, these sources are of limited value since some only address particular types of spill sources, while others combine statistics for oil and related material spills with those for hazardous substances spills.

An analysis of the various reporting systems indicates that there are about 3,500 incidents involving chemicals per year from sources which have the potential of releasing significant quantities of hazardous substances either onto land or into water. Of these, it is estimated that about 50 percent or 1,700 spills would reach navigable waters. The Agency estimates that for 299 hazardous substances designated in accordance with the requirements of Section 311, there are about 700 to 1,200 significant spills per year.

In the absence of mandatory reporting and an operational hazardous substances program, there are no reliable data available on the removal, treatment, disposal and restoration costs for hazardous substances incidents. A 1978 report, prepared by A. D. Little, on the "Estimation of the Frequency and Costs Associated with the Cleanup of Hazardous

Materials Spills", states that the most probable annual cost for Federal cleanup of chemicals is \$13.0 million.. Cleanup costs may range from \$6.5 million to \$26.1 million per year.

There is considerable disagreement relative to the above cost estimate because it was based on the assumption that 90 percent of the cleanup will be performed by industry. A slight decrease in industry participation could easily result in a two to three fold increase in the annual cost for Federal cleanup of chemicals. In addition, the annual cost figure above did not include: administrative costs, long-term environmental restoration, third party damages, evacuation and public safety costs, some deliberate dumps of hazardous chemicals, and especially leaching from abandoned disposal sites, which as I have indicated, may require billions.

In the Agency's judgment, the estimated annual cost figure in the A. D. Little report appears to be too low. First, the assumption of 90 percent industry participation was made in the absence of an operational National Hazardous Substances Program which would subject a discharger to notification, cleanup liability and penalties. Second, until now the estimated unit costs for cleanup per chemical have been derived from existing data which do not reflect a minimum standard or safe concentration level. When statutory authorities under Section 311 of the Clean Water Act go into effect shortly, the Agency can then insist on a minimum cleanup effort to insure the adequate protection of public health and the environment. Third, the projected costs excluded spills of less than 100 gallons. It is generally accepted that hazardous

substance spills in the most toxic category, such as pesticides, can cause severe environmental emergencies in less than 100 gallon quantities.

What legislative authorities do we presently have and how effective are they in solving hazardous waste and materials problems? With regard to hazardous waste management, I have pointed out the nature of the problem of current or past incidents of improper disposal, especially those related to abandoned and inactive sites. Unfortunately, the magnitude of this problem was not well perceived by EPA or the Congress at the time that the Resource Conservation and Recovery Act, or RCRA, was enacted. As a result, RCRA is not well suited to remedying the effects of past disposal practices which are unsound.

RCRA does provide authority to deal with imminent hazards under Section 7003. Section 7003 authorizes EPA to bring suit in district courts to enjoin an owner or other responsible party of an active or inactive site to take remedial action to prevent or abate an imminent and substantial danger to human health or the environment. We can effectively exercise this authority where the owner or responsible party is identifiable and financially and otherwise able to remedy it. However, where these circumstances are not present, Section 7003 is not an effective tool. We also can take similar actions under the imminent hazard authorities of the Clean Water and Clean Air Acts, as appropriate, and can take enforcement actions under various other authorities, where appropriate. The states also have various authorities to take enforcement and injunctive actions.

We are increasing our efforts to use Section 7003 and other authorities to control past and current problems. The Agency last November launched a campaign to evaluate the status of particular disposal sites which may pose an imminent hazard. On December 8, 1978, the Office of Enforcement established the Imminent Hazard Task Force. Three Evaluation Teams consisting of personnel from the Office of Enforcement, Office of Solid Waste, Department of Justice, and the National Enforcement Investigation Center (NEIC) visited five regional offices during December to review available data. EPA Regional Administrators have personally reviewed the site evaluation process in each region. These efforts have resulted in technical assistance and enforcement actions such as the following:

- Kin-Buc Landfill, Edison, New Jersey, where the U.S. Attorney for the District of New Jersey filed an action in U.S. District Court on February 7, 1979.
- Lee's Lane Landfill, Louisville, Kentucky, where NEIC and Region IV personnel have made an extensive investigation and determined that an imminent hazard does not exist but where continued surveillance has been established.
- Chemical Control Company, Elizabeth, New Jersey, where the State of New Jersey, with cooperation from EPA personnel, initiated a state court action on January 19, 1979.

- Sangamon Grain Company, Fort Worth, Texas, where EPA effected the proper disposal of a cylinder containing hydrogen cyanide prior to bringing suit against the recalcitrant property owner at a prehearing conference before filing of such an action in U.S. District Court.

Other cases are in preparation and will be filed as soon as they are completed, and still other sites are being intensively investigated for possible case preparation. Approximately 30 work years are currently being devoted to these efforts. In addition, EPA is closely monitoring the status of the 103 sites identified last fall. Corrective action on some of these has already been taken and State or Federal action is underway on the remaining.

The problem of improper disposal is made more difficult by the fact that many former waste disposal sites have now been abandoned. In many cases the property used for waste disposal has changed hands; in other cases the companies responsible for the problems are either no longer in business or do not have the resources to pay for cleanup of the sites. As I mentioned earlier, Section 7003 is often not effective in these situations. Further, certain of the sites operating today may very well be abandoned in the future.

With regard to discharges of hazardous substances and oil, Section 311 of the Clean Water Act establishes a control program for certain of these incidents. For discharges into navigable waters,

Section 311 provides for reporting of discharges, establishment of penalties, and liability limits, mitigation by the Federal Government, and a revolving fund to pay for mitigation. There are, however, limitations to the use of Section 311. First, Section 311 is limited to a discharge or substantial threat of such discharge into navigable waters. Thus, spills which threaten or contaminate, for example, soil or air, but not surface water, are not addressed by Section 311. This jurisdictional limitation prohibits the application of Section 311 to most hazardous waste disposal sites and all spills into other than navigable waters. Second, Section 311 is only applicable to designated hazardous substances. A discharge of a substance not designated under Section 311 would not be covered by the section's revolving fund.

A second limitation relates to the size and nature of the 311(k) fund. The 311(k) fund was established at \$35 million and currently has approximately \$5 million. It is appropriated originally and maintained by any funds received by the Government under Section 311 and additional appropriations. As I described earlier, estimated costs for remedy of hazardous waste problems range from \$3.6 - \$44.1 billion. Even if the fund were somehow applicable to the bulk of hazardous waste disposal sites, the size limitation on the 311 fund would preclude its use in most cases.

The emergency powers provision of Section 504 of the Clean Water Act is another relevant authority for addressing hazardous materials and waste. Although it does not have the jurisdictional

problems associated with Section 311, Section 504 is authorized at only \$10 million, which might be inadequate for even a single abandoned site. Furthermore, Section 504 has no cost recovery provision. It must rely totally on appropriations. The Administration has not requested funds, and the Congress has not funded this section.

In summary, there are existing provisions of statutes which EPA administers which apply to parts of both the hazardous waste and hazardous substances and oil spill problems. Taken together, however, these provisions are inadequate to solve the environmental and social problems caused by improper hazardous substances and waste management.

EPA is presently working with other Federal agencies on an approach to solving hazardous materials management problems. Our current thinking is that a comprehensive scheme to address environmental problems of hazardous wastes in abandoned sites, hazardous substances, and oil is necessary. We believe that to the extent feasible such a scheme should be compatible with the government's emergency response program under Section 311 of the Clean Water Act.

We believe that environmental problems from oil and hazardous substance spills and hazardous wastes from abandoned sites raise complex questions of cleanup, damages, compensation, and government response which are interrelated. In addition, these types of incidents

frequently occur together. As a result, we believe that the public interest would best be served by a comprehensive approach to the problem of hazardous materials incidents.

With regard to financing the fund, we believe that the burden of responding should be upon those who have benefited and those connected to commercial practices involving the substances in question. Difficult issues involving equitability among parties contributing to the fund and collection and administration of such a fund must be resolved. We expect to develop recommendations on how to establish and administer the fund and to forward a legislative proposal to Congress in May of this year.

MATERIAL SUBMITTED FOR THE RECORD BY MR. JAMES CLARK

OLD LOVE CANAL CHEMICAL LANDFILL
NIAGARA FALLS, NEW YORK

Information Dossier 78.1

November 1, 1978

Toxic Substances Coordinating Unit
Division of Pure Waters
New York State Department of Environmental Conservation
50 Wolf Road
Albany, New York 12233

Statement of the Problem

The Love Canal is a 16-acre below ground-level dump containing both municipal and chemical waste. It is located in the southeast corner of the City of Niagara Falls (Niagara County) close to the Niagara River. Houses built close to the dump site after dumping stopped are now suffering from chemical leachate intrusion into basements. A school has been built close to the site. In addition, chemical wastes, including the insecticide lindane, have been found exposed on the surface of the dump. Both the leachate intruding into home basements and exposed chemicals on the land surface are a potential public health hazard.

Extent of the Problem

During the 1890's the dump site was excavated as part of a proposed canal linking the Niagara River and Lake Ontario. When the canal was abandoned the excavation was used as a dump site for chemical wastes by Hooker Chemical and Plastics Corporation over a period of 25 to 30 years. Municipal wastes were also placed in the excavation by the City of Niagara Falls. After 1953 the dump was covered with earth and sold by Hooker to the City of Niagara Falls Board of Education. The ownership of the site is currently shared as follows: City of Niagara Falls - 6.58 acres; City of Niagara Falls Board of Education - 3.53 acres; and L.C. Armstrong - 5.98 acres. The southern and northern sections of the site are bordered by single family homes while the middle section is bordered by a grammar school.

The soil strata surrounding the wastes are roughly as follows:

- 0 to 4-6' silts and fine sands of low permeability
- 4-6' to 19-26' silts and clays of very low permeability
- 40' + limestone bedrock

An excavation that does not reach bedrock in such soil will act like a bathtub and gradually fill with water. When chemical waste is present the water dissolves or solubilizes some of these chemicals and floats others contained in oils to the surface. When the water eventually overflows (either over the surface or through the cracked and porous upper 6 feet of the ground) the chemicals are carried along with the water.

This is apparently what has happened at the Love Canal site. The water entering the dump has mixed with the chemical wastes and overflowed into adjacent property and around the basement walls of many homes. The chemicals, carried by the overflow waters, are drawn into basement sump pumps where chemical vapors then enter the basements or the contaminated water permeates the basement walls directly through cracks and pores. The contaminated water from the sumps is pumped into the storm sewer system where it is conveyed directly to the Niagara River.

During the period in which the canal was used by Hooker the original canal excavation was dug out in places to an unknown depth and expanded latterly in other places.

Measurement of the air in selected basements shows that numerous chlorinated organic chemicals and benzene are present in the basements at levels of $1 \mu\text{g}/\text{m}^3$ and higher. Ambient outside air near the landfill has been found to have levels of certain chlorinated hydrocarbons 80 times that in downtown Niagara Falls.

Although chemicals are known to be leaving the site via surface runoff and evaporation the possibility exists that they may also be contaminating the groundwater in the bedrock 40 feet below the surface.

Health Effects

The NYS Department of Health has carried out epidemiological studies of Love Canal area residents as well as extensive analysis of air in basements of homes in the inner and outer ring of houses. The evidence of a significant excess of miscarriages in residents living in certain places near the Canal together with other health-related findings led the Commissioner of Health to proclaim a health emergency on August 2, 1978.

Environmental Effects

The primary environmental concern is the extent and pathways of leachate escape from the Canal. In addition to bearing on the extent of health-related problems in the Love Canal area, leachate leaving the site either through natural or man-made paths such as sewers, culverts, or road beds, will eventually end up in the Niagara River where chemicals could, as happened with mirex, accumulate in the Lake Ontario biota.

The near-surface movement of leachate has been documented but the extent of this movement has not yet been completely established. The possibility that chemicals are leaching into the deep groundwater in the bedrock has been investigated by DEC. Analyses of the deep groundwater suggest that such contamination has not occurred.

Management Status

The Commissioner of Health's August 2, 1978 order declaring a health emergency also required, among other things, that the remedial action for the southern section of the Canal proposed by Conestoga-Rovers Inc., consultants to the City of Niagara Falls, be implemented under the supervision

of DEC but only after the plans had been approved by the Commissioner of Environmental Conservation. Such approval has been given and actual construction of the leachate drainage system for the southern section has started. The remedial action consists basically of a French drain system to intercept leachate, a granular carbon treatment system to remove toxic chemicals from the leachate before it is discharged to the Niagara Falls sewer system, and a clay cover over the site to cut down further water infiltration. After the remedial action has been completed on the southern section, construction will move to the central and northern sections.

The following actions have taken place:

1. Most of the residents have been evacuated from the inner two rings of houses and relocated.
2. The area has been fenced, and on the southern-third, haul roads have been constructed, test holes are being dug along the proposed drain lines, and a ground radar and magnetometer survey to better define the extent of the fill has been completed.
3. An extensive soil and sump sampling program is underway to define more precisely the extent of leachate migration from the site.
4. The EPA portable activated carbon treatment unit and portable laboratory are at the site to treat leachate produced during construction and until a more permanent treatment system can be built.
5. Epidemiological testing is continuing.
6. The groundwater levels in the three deep wells will continue to be monitored, and a fourth well will be placed so that groundwater movement under the site can be better defined.

Congress has appropriated \$4 million in funds to be matched by the State for a demonstration grant that will pay for remedial actions, field studies

related to the remedial actions, and a monitoring program to evaluate the effectiveness of the remedial actions.

For more information, contact:

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LOVE CANAL

PUBLIC HEALTH TIME BOMB

A SPECIAL REPORT
TO THE GOVERNOR AND LEGISLATURE
SEPTEMBER, 1978



Report prepared by:

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GOVERNOR'S LOVE CANAL INTER-AGENCY TASK FORCE

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David Gaskell, Executive Director

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State of New York

Hugh L. Carey

Governor

Department of Health

Robert P. Whalen, M.D.

Commissioner

To Governor Hugh L. Carey and Members of the New York State Legislature

In accordance with Chapter 487 of the New York State Laws of 1978, I hereby submit to you a Special Report on the Love Canal crisis.

The profound and devastating effects of the Love Canal tragedy, in terms of human health and suffering and environmental damage, cannot and probably will never be fully measured.

The lessons we are learning from this modern-day disaster should serve as a warning for governments at all levels and for private industry to take steps to avoid a repetition of these tragic events. They must also serve as a reminder to be ever watchful for the tell-tale signs of potential disasters and to look beyond our daily endeavors and plan for the wellbeing of future generations.

We must improve our technological capabilities, supplant ignorance with knowledge and be ever vigilant for those seemingly innocuous situations which may portend the beginning of an environmental nightmare.

The issues confronting our citizens and their elected and appointed leaders in the Love Canal situation are unprecedented in the State's health annals. We can be proud of the swift and compassionate response to the crisis by our leaders and the agencies they direct in easing the plight of those affected and removing the hazards to their health and safety.

Under Governor Carey's personal direction, State agencies moved with dispatch to deal with a variety of complex problems associated with the Love Canal. The Governor asked President Carter to declare the area eligible for Federal disaster assistance — a request which was granted — and enlisted and received the support of Senators Daniel Patrick Moynihan and Jacob Javits, Congressman John LaFalce and others in Washington in expediting the approval of Federal assistance.

Assemblymen Matthew J. Murphy and John B. Daly of Niagara Falls and their colleagues in the New York State Legislature richly deserve the praise of New Yorkers for their bipartisan efforts in passing legislation proposed by Governor Carey authorizing \$500,000 for the State Health Department to conduct long-range health studies and in granting me the additional authority necessary to direct local governments to correct the problems in a timely fashion.

This report embraces the major activities of the various government entities involved in identifying and dealing with the problems encountered.

It also describes in some detail the findings of intensive health studies.

As we proceed, we will be continually asking ourselves if we are following the right course. Yet, history will be our judge as future scientists and government leaders, armed with better information and greater technological know-how, will assess the fruits of our endeavors, benefitting from our precursor experience, to deal more effectively with future potential Love Canals.

For the present we must continue to pursue with the same vigor and dedication that has prevailed over the last several months, the long-range health studies necessary to learn more about the risks associated with human exposure to toxic chemicals.

We cannot undo the damage that has been wrought at Love Canal but we can take appropriate preventive measures so that we are better able to anticipate and hopefully prevent future events of this kind.

With these observations in mind, I respectfully submit this report to you.

Robert P. Whalen, M.D.
Commissioner of Health



Robert P. Whalen M.D.

Love Canal: A Brief History

In 1836, a U.S. Government engineer surveyed the Niagara County area, looking for a possible site for a ship canal to connect the lakes Erie and Ontario. He reported that Lewiston, New York, by virtue of its location on the Niagara River at the base of a 300-foot escarpment, not only was an excellent place for a ship canal, it also had excellent potential as a source of cheap water power.

Despite many public pronouncements over the years, nothing came of the engineer's report until May of 1892, when a man named William T. Love arrived in Niagara Falls. Love came to town with a long-held dream: to build a carefully planned industrial city with convenient access to inexpensive water power and major markets.

Mr. Love proposed to construct a navigable power canal between the upper and lower Niagara Rivers which would service a massive industrial complex and thereby provide the matrix for his dream city. The site he chose is approximately seven to eight miles northeast of Niagara Falls. Water transportation was afforded directly to the site by the lower Niagara River and Lake Ontario. Within a radius of one-hundred miles there was a population of over two million people.

The heart of Love's plan was a power canal that would connect the upper and lower levels of the Niagara River. With a canal only six or seven miles in length, water could be conveyed to the Niagara Terrace, from which there was a drop of over 300 feet to the lower level.

He could create immense water power on his townsite by virtue of the fall the water would take, and water power was the cheapest available means of power generation. At the time, it was essential that power users be located near the source as it was virtually impossible to transmit electricity over any great distance.

By January of 1893, Love felt he had enough prominent people in favor of his idea to publicly announce his plan for a model city which would accommodate up to 600,000 people. He claimed before he could advance his plan further he would need control of 10,000 acres. Over the space of a few months, he managed to buy or secure options on 20,000 acres and began actual detailed laying out of the site.

Obviously a man of considerable energy and charisma, Love came to Albany, where he personally politicked for a law that would charter his newly founded company. He became only the second private citizen in history to address a joint session of the State Senate and Assembly. After his bill passed, Love met privately with Governor Roswell Flower, who not only signed the legislation but also issued glowing testimonials about the project.

The charter granted to Love's company, appropriately dubbed the Modeltown Development Corporation, stands today as one of the most liberal ever granted any private developer. He had the authority to condemn properties and to divert as much water from the upper Niagara River as he saw fit, even to the extent of turning off Niagara Falls!

• • • Love extensively promoted his model city through ads, circulars and even brass bands playing his "original" ditty.

THE MODEL CITY
(Tune of Yankee Doodle)

<p>Every body's come to town, Those left we all do pity, For we'll have a jolly time At Love's new Model City.</p> <p>(Chorus) If you get there before I do Tell 'em I'm a comin' too To see the things so wondrous true At Love's new Model City.</p> <p>(Chorus) They'y building now a great big ditch Through dirt and rock so gritty, They say 'twill make all very rich Who live in Model City</p>	<p>(Chorus) This tale I tell is no less true Though in a silly ditty, They give free sites and power too In Love's new Model City.</p> <p>(Chorus) Our boys are bright and well-to-do Our girls are smart and pretty They can not help it nor could you If you lived in Model City.</p> <p>(Chorus) Then come and join our earnest band All who are wise and witty, Here's our heart and here's our hand To build the Model City.</p>
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Armed with his newly won charter, Love quickly lined up backing from financial giants in New York City, Chicago and England. In October of 1893, the first factory on the townsite was opened for business. In May of 1894, work on the canal was begun. Steel companies and other manufacturers lined up for the chance of opening plants along the Love Canal.

Everything was looking extremely good for Love and his project when the country suddenly found itself in the middle of a full-scale economic depression. Money and backing began to slip away from William Love and his Model City.

Louis Tesla delivered the coup-de-grace. Tesla discovered a way to transmit electrical power economically over great distances by means of an alternating current. No longer was it necessary for industry to locate near the source of electrical power. Love's project was dealt a death blow.

His backers deserted him, and the last of the property owned by his corporation was subjected to mortgage foreclosure and sold at public auction in 1910.

The sole surviving monument to William Love and his Model City was a partially dug section of canal in the southeast corner of the City of Niagara Falls. For several decades of the Twentieth Century, this portion of the canal reportedly served as a swimming hole for children living in the LaSalle section of the city.

But in the 1920's the excavation was turned to a new and ominous use. It became a chemical and municipal disposal site for several chemical companies and the City of Niagara Falls. Chemicals of unknown kind and quantity were buried at the site for a 25-30 year period, up until 1953. After 1953, the site was covered with earth.

In the late 1950's homebuilding began directly adjacent to the Love Canal landfill. Over a period of time about 100 homes were built and an elementary school was opened.

Thus were sown the seeds that became the human and environmental disaster we know today as Love Canal.

And Then The Rains Came . . .

Love Canal is a name which until recently was relegated to the back pages of history along with the unspent dreams of a visionary for whom it is named.

Today, more than three-quarters of a century later, this 16-acre rectangular piece of land, located only a few miles from the world-famous waterfall which each year attracts thousands to the honeymoon mecca of Niagara Falls, has again become the focus of international attention, but not as the centerpiece for a dream city.

Instead the center of attention is an ominous array of chemicals buried within the boundaries of the unfinished canal for more than 25 years - toxic ingredients which are infiltrating scores of nearby homes, posing a serious threat to human health and upsetting the domestic tranquility of hundreds of families living in this middle class community.

Situated only a few blocks from the Niagara River in the residential southeastern section of the highly industrialized but tourist-oriented city, the Love Canal problem began to surface in recent years as chemical odors in the basements of the homes bordering the site became more noticeable. This followed prolonged heavy rains and one of the worst blizzards ever to hit this section of the country.

Thus began a series of events and momentous decisions involving city, county, State and Federal governments to cope with what can only be described as a major human and environmental tragedy without precedent and unparalleled in New York State's history.

Described as an environmental time bomb gone off, Love Canal stands as testimony to the ignorance, lack of vision and proper laws of decades past which allowed the indiscriminate disposal of such toxic materials.

The consequences of these transgressions are mirrored by the planned exodus of 235 families and the public monies and herculean efforts which now must be expended to contain the disaster and restore a degree of normalcy to the lives of those affected.

For those responsible for containing the problem and for government leaders in New York State and throughout the nation, Love Canal represents what may very well be the first of a new and sinister breed of environmental disasters.

• • • *advances in electrical technology ended Love's dream.*

• • • *toxic chemicals dumped in the Canal begin invading homes*

Demographic Data

- The Love Canal is a rectangular, 16-acre, below-ground-level landfill located in the southeast corner of the City of Niagara Falls, Niagara County, about one-quarter mile from the Niagara River.

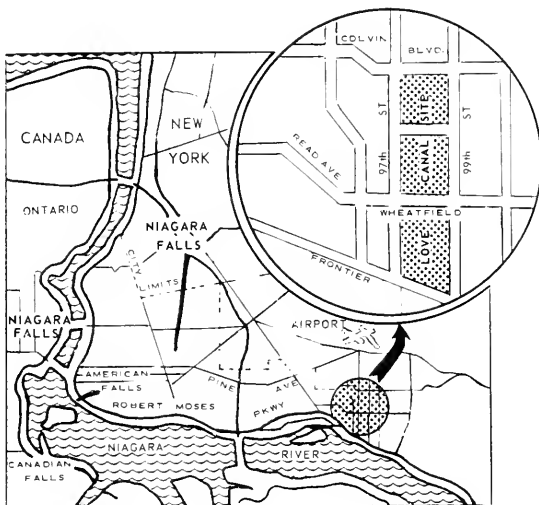
- In 1970, the population of Niagara Falls was 85,615.

- Manufacturing, particularly of chemical and allied products, is the major industrial enterprise of the county and city. According to 1970 data of the New York State Department of Commerce, nine major chemical-producing companies employing a total of 5,267 people were then located in the county.

- The Love Canal landfill is bordered on two sides by single family homes with a public elementary school separating the northern and southern sections of the landfill.

- In July, 1978, in the homes immediately adjacent to the landfill there were resident 97 families composed of 230 adults and 134 children. During the 1977-78 school year, 410 students were enrolled at the school.

- At this writing, scientific analyses have identified 82 different chemical compounds at the landfill, of which one is a known human carcinogen and 11 are known or presumed animal carcinogens.



Infra-red aerial photo of Love Canal area, showing elementary school in center and two rings of homes bordering the landfill site. White patchy areas visible in photo indicate barren sections where vegetation will not grow presumably due to leaching chemical contaminants.



Environmental Sampling

The State Departments of Health and Environmental Conservation in the early spring of 1978 launched an intensive air, soil and groundwater sampling and analysis program following qualitative identification of a number of organic compounds in the basements of 11 homes adjacent to the Love Canal.

The new data collected by the two agencies confirmed not only the presence of a variety of compounds but established precise levels for many of the chemical constituents. It became immediately apparent from the data that the problem was not limited to a few homes and that a potential health hazard existed from long term exposure to the chemicals.

Based on this latest information, the Commissioners of Health and Environmental Conservation instructed their respective staffs to explore every remedy available to the State to protect the public's health and safety.

The two commissioners along with local officials inspected the site on April 13, 1978. Based on their personal observations and the recommendations of public health specialists in the Health Department, Dr. Whalen, on April 25, 1978, officially termed the Love Canal "... an extremely serious threat to the health and welfare..." and ordered the Niagara County health commissioner to immediately undertake remedial measures to remove visible chemicals and restrict access to the site and initiate health and engineering studies.

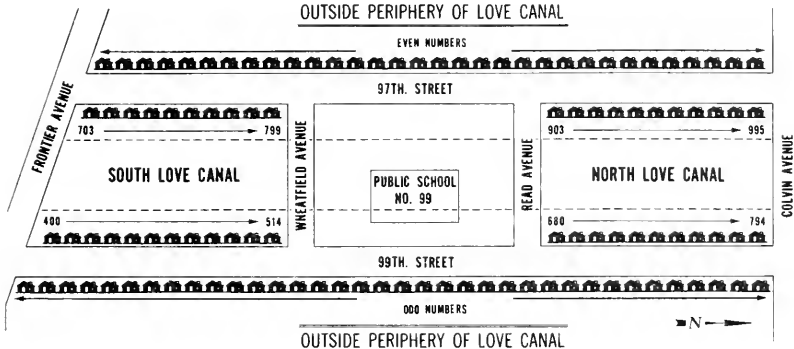
Commissioner Whalen's order set into motion a coordinated plan of attack by local, State and Federal agencies to further delineate the nature and extent of environmental and public health hazards.

Public health concerns prompted the Health Department to give priority to evaluating basement air samples from all homes contiguous to the Canal, before ground and surface water samples, to minimize the risk of chemicals entering the human body by inhalation.

As data flowed in, it became evident that unacceptable levels of toxic vapors associated with more than 80 compounds were emanating from the basements of many homes in the first ring directly adjacent to the Love Canal. (See Figure 1) Ten of the most prevalent and most toxic compounds - including benzene, a known human carcinogen - were selected for evaluation purposes and as indicators of the presence of other chemical constituents.

• • • priority given to testing basement air samples

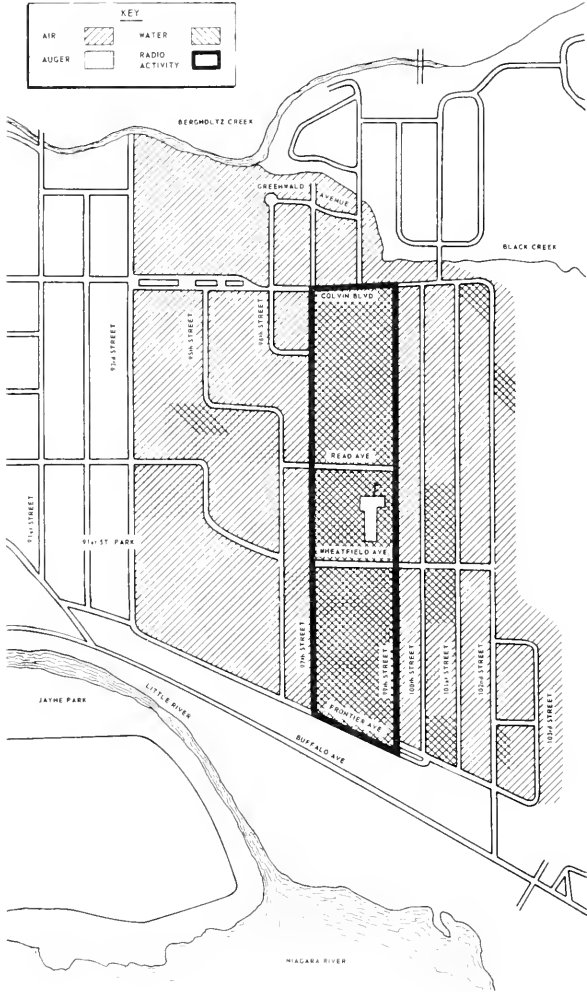
FIGURE 1
OUTSIDE PERIPHERY OF LOVE CANAL



ENVIRONMENTAL SAMPLING

TYPE AND LOCATION OF SAMPLES TAKEN

AS OF AUGUST 1978



Air samples were taken in rooms on the first floor of several homes in the first ring. The data showed, however, that vapors had infiltrated beyond the basement in only one case (the residence which had the highest readings of all basements tested)

Scientists concluded:

1) Outside surface contamination and overt signs of basement contamination were greater in the southern portion of the landfill site, but air quality data suggested no such clear distinction.

2) Although homes with a poured concrete foundation had lesser contamination than homes with block foundations, no correlation between air quality and the use of sump pumps, with or without covers, was apparent.

Armed with additional information showing the extensive contamination of homes directly adjacent to the Canal, Commissioner Whalen ordered an extension of basement air sampling to include homes across the street from the Canal – approximately 138 residences. The preliminary basement air data indicate much lower levels of selected contaminants compared to the first ring, both in the number of compounds and the concentrations present. (See Table 1)

A further comparison of air samples from the first two rings of homes indicates that:

- * 55 percent of ring 2 homes were free of chemical contamination as compared to only 5 percent of homes in ring 1;

- * 30 percent of ring 2 homes showed the presence of only one chemical as compared to 16 percent for ring 1;

- * 15 percent of ring 2 homes showed the presence of only two chemicals as compared to 40 percent for ring 1;

- * 3 percent of ring 2 homes showed the presence of three chemicals as compared to 30 percent for ring 1;

- * Only ring 1 homes showed the presence of more than three chemicals – 7 percent had 4 chemicals and 5 percent recorded 5.

The five chemicals monitored were chloroform, trichloroethene, tetrachloroethene, chlorobenzene and chlorotoluene.

The full extent of migration of chemical leachate is being determined (as this report is being prepared) by extensive analyses of soil samples, shallow wells and sump drains at intervals extending in all directions beyond the Canal. A review of results for a small number of soil samples taken in mid-August from areas near 93rd and 95th Streets suggests migration of chemicals, including lindane and toluene, outside the immediate Canal area. This information was transmitted to the Chief of Toxic Substances for Region II of the U.S. Environmental Protection Agency on August 23, 1978, reiterating our recommendation that remedial action be undertaken immediately to prevent future contamination of private property and additional human exposure to unacceptable health risks.

It should be restated that basement air samples taken from homes in the outlying area have thus far shown significantly lower levels of contaminants as compared to the first ring of homes, both in numbers of compounds and concentrations present.

As part of the State Health Department's investigation, radiological health specialists conducted a scan of the Canal surface for radioactivity and found three spots – all within the Canal's boundaries – where radiation levels slightly exceeded normal background radiation activity. Additional samples were being taken at various depths to ascertain the source of the radioactivity. It should be emphasized that the radioactive readings found did not exceed safe levels and are not hazardous to health.

Hydrogeological analyses of deep groundwater aquifers are being conducted in the Canal area but sufficient information is not yet available to permit any definitive conclusions.

An agreement also has been worked out with Environment Canada – Canada's national environmental protection agency – to bring in its air sampling field laboratory. The unit, the most sophisticated mobile system available for air evaluation, has a 50-foot detector which can be brought into each home and provide on-the-spot results.

• • • air contamination
greater in first
ring of homes

• • • tests indicate
further migration
of chemicals

TABLE I
 ORGANIC COMPOUNDS IN AIR SAMPLES LOVE CANAL,
 JUNE—AUGUST, 1978 (micrograms/m3)

Chemical Compound	Location	No. Houses	Lowest Value	Highest Value	Median	Mean	% with Measurable Level
Total of 5 chemicals	Ring 1						
	North 97th	25	0	393	17	67	92%
	Ring 1						
	North 99th	28	0	142	9.5	29	89%
	Ring 1						
	North, Total	53	0	393	.12	47	91%
	Ring 1						
	South 97th	22	0	3616	53.5	427	95%
	Ring 1						
	South 99th	24	0	6944	24	356	96%
	Ring 1						
	South, Total	46	0	6944	28	390	96%
	Ring 2						
	North 97th	22	0	43	0	6	41%
	Ring 2						
	North 99th	25	0	149	0	12	48%
	Ring 2						
	North, Total	47	0	149	0	9	45%
	Ring 2						
	Central 97th	15	0	69	3	10	67%
	Ring 2						
	Central 99th	13	0	170	0	13	15%
	Ring 2						
	Central, Total	28	0	170	0	12	43%
	Ring 2						
	South 97th	21	0	63	8	13	62%
	Ring 2						
	South 99th	28	0	37	0	4	43%
	Ring 2						
	South, Total	49	0	63	2	8	51%
	Ring 1						
	Total	99	0	6944	17	207	93%
	Ring 2						
	Total	124	0	170	0	9	47%



Governor Hugh L. Carey discusses Love Canal problems with Lois Gibbs, president of the Love Canal Homeowners Association, during the first of several visits the Governor made to the site.



Karen Schroeder, who lives in the first ring of homes bordering the landfill, pours out black chemical sludge taken from ground surface near the 99th Street Elementary School.

At the direction of Dr. Robert P. Whalen, State Health Commissioner, the Health Department's Bureau of Occupational Safety and Chronic Disease Research dispatched teams of investigators to the Love Canal area on June 19, 1978 to begin a house-to-house health survey of the 97 families living immediately adjacent to the landfill. A 29-page questionnaire, seeking information on present and past health status, family, social, occupational and residential history, was developed for use by health department interviewers.

Based on preliminary analysis of data collected from these families, the survey was expanded to include all residents living within a four block radius of the landfill site. As of August 20, 1978 medical investigators had spent 13,000 man-hours interviewing residents and had obtained detailed health histories from all persons residing in 250 houses in the Love Canal area.

To contact persons who once lived on the Love Canal but subsequently moved to other areas, a nation-wide toll-free hotline was established on August 14 and publicized in major news media outlets throughout the country. During the first four days of the hotline's existence 256 calls were received from people now living in 30 different states, 100 of whom identified themselves as prior Love Canal residents.

In addition, with the assistance of technical staff from Roswell Park Memorial Institute (the Health Department's cancer research and treatment center in Buffalo), blood samples were drawn from more than 2,800 persons living in the Niagara County area. Due to public interest and concern, additional blood sampling clinics were scheduled for various locations throughout Niagara County to assure that samples were obtained from all persons with past associations with the Love Canal who wished to be tested.

The ultimate goal of the Health Department's long-range epidemiologic investigation is to obtain a detailed health profile of all persons who presently or ever lived near the Love Canal landfill to determine whether these individuals are at higher risk for acute and/or chronic health disorders.

HUMAN TOXICITY OF CHEMICALS: To date, more than 80 chemical compounds have been identified in the landfill by the Health Department's Division of Laboratories and Research and the U.S. Environmental Protection Agency (EPA). Eleven of these are known or suspected of causing cancerous growth in laboratory animals, and one — benzene — is a well-established human carcinogen.



Epidemiologic Investigation

• • • nation-wide hotline to contact former residents

• • • 2,800 blood samples taken

Following is a list of some of the more important chemicals identified at the Love Canal site and the human biologic hazards associated with them.

<u>COMPOUND</u>	<u>ACUTE EFFECTS</u>	<u>CHRONIC EFFECTS</u>
benzene	Narcosis Skin irritant	Acute leukemia Aplastic anemia Pancytopenia Chronic lymphatic leukemia Lymphomas (probable)
toluene	Narcosis (more powerful than benzene)	Anemia (possible) Leukopenia (possible)
benzoic acid	Skin irritant	
lindane	Convulsions High white cell counts	
trichloroethylene	Central nervous depression Skin irritant Liver damage	Parelysis of fingers Respiratory and cardiac arrest Visual defects Deafness
dibromoethane	Skin irritant	
benzaldehydes	Allergen	
methylene chloride	Anesthesia (increased carboxy hemoglobin)	Respiratory distress Death
carbon tetrachloride	Narcosis Hepatitis Renal damage	Liver tumors (possible)
chloroform	Central nervous narcosis Skin irritant Respiratory irritant Gastrointestinal symptoms	

As can be seen from this list, virtually all of man's physiologic systems can be pathologically influenced by exposure to chemicals identified to date at the Love Canal site -- a list which must be viewed as incomplete since the types of chemicals dumped into the landfill and the chemical reactions which may have occurred over time cannot be fully documented.

• • • four health indicators selected for initial study

PRELIMINARY DATA ANALYSIS: Based on current knowledge about the effects of certain chemical agents on the human body, Health Department researchers initially selected four health indicators for assaying potential human toxicity in the Love Canal area: miscarriages, birth defects, liver function and blood mercury levels. Complete blood counts also were performed because of the established chronic toxic effects of benzene on blood cells.

Miscarriages and birth defects are considered prime indicators of human toxicity since recent studies in developmental pharmacology establish that the prenatal period is characterized by a unique susceptibility to certain chemical agents. In addition, several known or suspected teratogens (producers of physical defects in fetuses) have been identified among the chemicals dumped in the Love Canal area.

Liver function, as determined through blood analysis, was chosen as a factor for immediate investigation because current experimental studies suggest that many of the chemical agents identified at the site may play a role in development of cancer or direct injury to the liver. Analyses of the 2,800 blood samples taken to date have been completed and all individuals have been notified of test results via their private physicians. No conclusions relative to residence on the Canal can be drawn at this time with regard to the significance of minor abnormalities detected. Efforts will be made to confirm and more fully investigate abnormal test results.

Since mercury is an established teratogen and is readily identifiable in blood samples, blood mercury determinations were conducted on some area residents during the early investigative stage. Results of all mercury tests performed were within normal limits.

The initial epidemiologic investigation was based on historical information and blood test results from the ninety-seven families in the first ring of homes bordering directly on the Love Canal site. The families comprised 230 adults (18 years of age or older) and 134 children. General health information was obtained from 97 percent of the adults and 92 percent of the children.

MISCARRIAGES AND BIRTH DEFECTS: For the purposes of the analysis all women in the study population who had ever been pregnant were categorized as to their present area of residence on the Love Canal (northern or southern section), and the pregnancy histories of these women were compared prior to and following their move to the Canal area.

All reported birth defects were confirmed through medical records, and the past medical and drug histories of the mothers were evaluated for possible confounding influences. Reported miscarriages also were confirmed through private physicians' and hospital records.

Miscarriages per 100 pregnancies and birth defects per 100 live births were calculated. As indicated in Table I, the percentage of miscarriages and birth defects was higher for pregnancies occurring on the Love Canal, particularly among women living in the southern Canal section

• • • pregnancy history of women compared before and after moving to site

TABLE I
Pregnancy History of Females
Prior to and During Residence on the Love Canal

	History on Canal		Prior History	
	Present Resident Area South	Present Resident Area North	Present Resident Area South	Present Resident Area North
Number women ever pregnant	17	24	35	44
Total number pregnancies	38	43	97	117
Number women with miscarriages	6	6	7	6
Total number miscarriages	9	8	9	10
Total number live births	30	35	89	109
Total number stillbirths	0	0	0	0
Children with malformations	4	1	2	2
Sets of twins	1	0	2	2
Mean Age at first pregnancy	27.9	28.0	20.8	21.8
Percent women with miscarriages	35.3	25.0	20.0	13.6
Miscarriages per 100 pregnancies	23.7	18.6	9.3	8.5
Children with malformations per 100 live births	13.3	2.9	2.2	1.8
Expected number of twins	0.3	0.4	1.0	1.2

Because maternal age and birth order (1st, 2nd, 3rd pregnancy etc.) can influence the frequency of miscarriages, Health Department researchers calculated the expected number of miscarriages among pregnancies occurring on the Love Canal, based on the women's ages and number of pregnancies reported. As

indicated in Table II, the relative odds ratio for miscarriages among women living on the Canal was 1.49, or nearly one and one-half times the expected rate within the general population.

TABLE II
Maternal Age and Number of Miscarriages (Observed and Expected*)
Among Residents of the Love Canal

Maternal Age	Number of Pregnancies	Number of Miscarriages		Relative Odds Ratio Observed/Expected
		Observed	Expected	
< 20	2	0	0.212	0.00
20-24	13	0	1.852	0.00
25-29	28	3	3.550	0.85
30-34	19	6	2.677	2.24
35-39	15	8	3.104	2.58
All Ages	77	17	11.395	1.49

* Based on Warburton and Fraser: "Spontaneous Abortion Risks in Man: Data from Reproductive Histories Collected in a Medical Genetics Unit." *Human Genetics* Vol. 16, No. 1, 1964, Page 8.

A more detailed breakdown of this data by residents of the northern and southern Canal sections indicated that the highest frequency of miscarriages (up to 3.45 times the expected frequency for women ages 30-34) occurred among residents of the southern Canal section.

Investigators next examined groups of women living in the four naturally defined geographic sections of the Canal: 99th Street north, 99th Street south, 97th Street north and 97th Street south. As indicated in Table III, more than twice the anticipated number of miscarriages (2.08) occurred among women living in the 99th Street *south* section. There were no significant differences between the observed and expected distributions for the other sections.

To examine the possibility that women living on 99th Street south might have more frequent miscarriages for reasons unrelated to their residence on the Canal, Health Department investigators examined the observed number versus the expected number of miscarriages (by maternal age and birth order) for this group prior to moving to the Love Canal area. No significant differences were observed.

If the higher frequency of miscarriages is related to chemicals leached from the Canal over a period of many years, researchers hypothesized that women living in older homes or those living on the Canal for the longest time period might represent the highest risk population. Investigators therefore examined the age of houses, the age of women who had ever been pregnant since living on the Canal, and their duration of residence at the site.

This analysis showed that the average age of pregnant women was comparable for residents of both 99th and 97th streets. However, the houses located on 99th Street, especially those in the southern section, were found to be the oldest and the average duration of residence on the Canal was longer for 99th Street women.

These findings led investigators to compare the average duration of residence on the Canal for all women with and without miscarriages. They found that women with miscarriages had resided on the Canal an average of 18.58 years versus an average length of residence of 11.52 years for those without miscarriages. The difference between these two means is statistically significant, representing a chance occurrence probability of 4 in 1,000. The data also indicated that this occurrence was not apparently due to differences in age or number of pregnancies reported by the women.

Table IV provides information on the documented birth defects of five children born on the Love Canal. As was true for miscarriages, there appears to be a concentration of malformations on 99th Street.

• • • women living in southern section show highest risk for miscarriages and birth defects

Although further investigation obviously will be required, data analyzed to date seems to suggest that the risk for miscarriages and birth defects might be localized in 99th Street, particularly the southern section. Researchers are now examining the possibility that this phenomenon may be related to the higher concentration of benzene (a known inhibitor of cell division) found in the southern Canal section.

Based on preliminary epidemiologic investigations, the Commissioner of Health recommended immediate relocation of all pregnant women and all children under two years of age from the Love Canal area. He also ordered delayed opening of the 99th Street elementary school which is situated in the central Love Canal section

TABLE III
Maternal Age and Number of Miscarriages (Observed and Expected*)
Among Residents of Four Specified Areas of the Love Canal

Maternal Age	99th. South			99th. North			97th. South			97th. North		
	Obs.	Exp.	O/E	Obs.	Exp.	O/E	Obs.	Exp.	O/E	Obs.	Exp.	O/E
20	—	0.106	—	—	—	—	—	—	—	—	0.106	—
20-24	—	0.710	—	—	0.290	—	—	0.571	—	—	0.281	—
25-29	2	1.090	1.83	1	0.972	1.03	—	0.524	—	—	0.968	—
30-34	3	0.860	3.49	2	1.132	1.77	1	0.294	3.40	—	0.391	—
35-39	3	1.084	2.77	3	1.554	1.93	—	0.272	—	2	0.486	4.12
All Ages	8	3.850	2.08	6	3.948	1.52	1	1.661	0.60	2	2.232	0.90
Chi Square: P=	0.022			> 0.05			> 0.05			> 0.05		

* Based on Warburton and Fraser: Spontaneous Abortion Risks in Man: Data from Reproductive Histories Collected in a Medical Genetics Unit, *Human Genetics* Vol. 16, No. 1, 1964, page 8.

obs — observed

exp. — expected

O/E — Observed/expected
Relative Odds Ratio

TABLE IV
Documented Congenital Malformations Among Children
From the Love Canal

Type of Malformation	Sex	Date of Birth (month/year)	Location (North, South Canal)	Medication, Radiation during pregnancy
Cleft palate, deformed ears and teeth, hearing defect, mental retardation, heart defect	F	11/68	99th Street (South)	No
Abnormalities of renal pelvis and reflux ureters	F	4/75	99th Street (South)	No
Mental retardation (autistic)	F	1/66	97th Street (South)	No
Congenital deafness	M	2/66	99th Street (South)	No
Club foot	M	1/58	99th Street (North)	No

Relocation of Residents



William Hennessy, Commissioner,
Department of Transportation
Chairman, Governor's Love
Canal Task Force

Well before completion of the Department of Health's preliminary assessment of the scope of the health hazard posed by the Love Canal leachate, the Governor's Office began making preparations to mobilize the expertise and resources of key State agencies, including the Departments of Transportation, Health, Environmental Conservation, Housing, Social Services, Banking, Insurance, Office of Disaster Preparedness and Division of Equalization and Assessment. An initial step was a market survey by Department of Transportation real estate experts to determine availability of temporary and permanent replacement housing and to estimate the cost of relocating Love Canal residents and purchasing their homes.

The day after Commissioner Whalen's August 2 declaration that a medical emergency exists, interviewers from the regional offices of the Department of Transportation and the Department of Social Services opened a relocation assistance office at the 99th Street School — center of the stricken area.

Priority was given to securing temporary housing for families with children under two years of age and pregnant women. Some 41 top priority families were identified in the first two "rings" of homes — the 235 properties nearest the former canal bed.

Following Governor Carey's visit to the area on August 7, teams of interviewers began visiting homes to expedite the process of gathering the personal information needed to match families with available housing. By August 10, the scope of the relocation effort reached its present dimension with the decision to offer to relocate and purchase the homes of all 235 families in the first two rings.

Appraisal of properties which the State will offer to purchase, was begun August 15 by a team of Department of Transportation real estate appraisers, with purchase negotiations expected to begin within two weeks. The Urban Development Corporation will become the owner of the properties.

At this date, the relocation effort is well advanced with some 136 families having accepted alternative housing. Of these, about 85 have already moved out of their canal area homes.

Following issuance of Health Commissioner Whalen's August 2 order, the Department of Environmental Conservation (DEC) assumed overall responsibility for reviewing remedial engineering plans at the Love Canal.

Specifically, DEC would:

- Provide onsite supervision of construction activity at the Love Canal site;
- Assist the Niagara County Board of Health in its mandate to abate the public health nuisance at the site;
- Consult with the Niagara County Health Department, the State Department of Health and the U.S. Environmental Protection Agency (EPA) to develop a long-range engineering solution;
- Review the cleanup actions proposed by the county in the consultant report by Conestoga-Rovers & Associates, which proposed the construction of a tile drainage system in the southern section of the Love Canal site; DEC also must give final approval to the detailed design and engineering plans;
- Review and approve plans to minimize hazardous exposure during construction;
- Conduct additional studies, in cooperation with the State and County Health Departments and the City of Niagara Falls, to define the boundaries of the Love Canal landfill; to measure, through continued air, water and soil sampling, the extent to which contaminated waters have moved away from the site; to determine the extent of groundwater aquifer contamination; and to determine the effectiveness of the proposed drainage system to contain and remove the contaminated groundwater from the site.

WORK UNDERWAY: Since August 2, 1978, DEC engineers and geologists have worked with representatives of the City of Niagara Falls and Conestoga-Rovers & Associates to review and improve the proposed short-term cleanup plans.

The major changes made in the plans were to dig the proposed drainage trench in

Environmental Cleanup

the backyards surrounding the chemical disposal site rather than into the landfill site itself, and to extend the tile drains to include the northern and central sections of the Canal as was suggested in the plan first submitted to the city on June 13. The Department of Environmental Conservation wanted to avoid disturbing the buried chemicals and accidentally releasing toxic substances into the environment, to protect the health and safety of workers and area residents.

EARLIER INVOLVEMENT: The Department of Environmental Conservation's concern over the Love Canal situation dates back to September of 1976 when DEC engineers visited the site to investigate the Hooker Chemical and Plastics Corporation's suspected discharge of the chemical nurex. Through the fall of that year, basement sumps and storm sewer water samples were taken and discussions were held with the chemical firm about previous dumping at the site.

In January 1977, at the strong urging of DEC, the City of Niagara Falls hired a consultant to conduct a hydrogeological investigation of the site and to develop a conceptual pollution abatement system. The report was completed by Calspar Corporation of Buffalo in August 1977 and was reviewed by DEC staff.

Preliminary work indicated the need for more intensive investigations. In October 1977, DEC sought the assistance of the U.S. Environmental Protection Agency in conducting an expanded study of the groundwater pollution. In February 1978, the City of Niagara Falls hired the consulting firm of Conestoga-Rovers to develop the groundwater pollution abatement plan.

SOILS AND GROUNDWATER. A cross-section of soils at the site shows that the top 4 to 6 feet of soil is moderately permeable; beneath that is 30 to 40 feet of highly impermeable clay; and 40 feet below the surface is limestone bedrock. The pollutants move easily through the top layer of soil, which has allowed the contamination to infiltrate the basements. Although the pollutants probably don't move in the lower tight clay soils, the pollutants may be leaking to the bedrock, which contains a supply of groundwater.

INTERIM CONSTRUCTION PLAN: The proposed interim plan is designed to prevent more water from soaking into the chemical waste disposal area, described as an overflowing bathtub; halt the outward flow of chemicals seeping into the upper groundwaters around the landfill; and reverse the flow of these groundwaters away from the surrounding basements and back toward the Canal.

The project consists of a drain tile collection system and a new, impervious clay cover which will prevent any more surface water from entering the Canal. (see Figure 2). This will accomplish two things: lower the groundwater levels in the area and prevent further precipitation from entering the Canal. In this way, the present surface runoff and leachate, which is in the upper soils, will be contained, and the contaminated waters will flow back to the drain system.

The underground tile drainage system will be put through the adjacent backyards to collect the contaminated groundwaters. To avoid disturbing chemicals in the landfill, the trench lines will be dug in the backyards about 40 feet from the houses and well away from the Canal edge and waste disposal area. The drain tile system consists of an 8 inch perforated pipe surrounded by gravel.

The drains will be 7 to 12 feet below the surface sloped to drain to pumping stations. From there, the leachate will be pumped into a holding tank, then to a special treatment system on the site. This treatment is expected to remove more than 99 percent of all the organic chemicals of concern from the leachate, and produce a high quality water before it is discharged to the city's sanitary sewers and then to the City of Niagara Falls treatment plant. As a backup, a tank truck loading station will be built so that leachate can be hauled to another treatment facility.

The trenches will be dug using a trench hox or sleeve, which will hold the sidewalls in place. Only enough trench to install a length of pipe will be opened at any one time, and then will be backfilled when the pipe and graded porous fill are in place. This will minimize the amount of contaminated soil exposed to the atmosphere.



Peter A.A. Berle, Commissioner,
Department of Environmental
Conservation

Soils excavated during construction will be handled as if they are highly contaminated. The soils will be covered immediately with a plastic sheet to prevent vaporization of gases from within the soils. After construction of the leachate collection system, the site will be covered with at least three feet of highly impervious clay. The clay cover will be contoured to direct all rainfall into surface drains leading away from the site. In this way, only a small amount of rainfall will percolate through the chemical waste and become contaminated.

The work, described here, involves the southern third of the Canal site. While this work is being done, engineering plans for continuing the tile drain system along the other two-thirds and for building the clay cover will be prepared. These plans also will be reviewed by DEC staff, other agencies involved and concerned citizens.

LONG-TERM REMEDIAL PLANS: Critical to the design of long-term remedial plans will be the test results from three monitoring wells which are now being drilled into the bedrock in the land adjacent to the canal. The wells will be sampled to determine whether contamination has spread to the deep groundwater aquifer. Once the aquifer has been sampled and the effectiveness of the drain tile system is measured, DEC engineers will determine if additional steps are necessary for long-term cleanup of the canal.

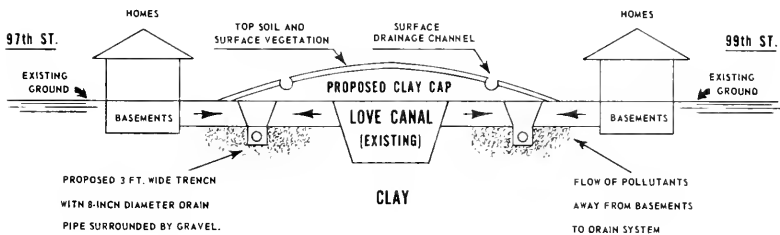
OTHER INVESTIGATIONS: Environmental Conservation Commissioner, Peter Berle, also has initiated an investigation of the wastes in the Love Canal, and other disposal sites in Erie and Niagara Counties to find out what chemicals are buried, who is responsible for dumping the wastes, and whether other closed chemical landfills pose potential hazards to human health or the environment.

The investigation will be carried out jointly by staff of the State Departments of Health and Environmental Conservation, under the direction of a hearing officer with the power to issue subpoenas and require disclosure of relevant documents.

HAZARDOUS WASTE LEGISLATION: New York State adopted legislation in July, 1978, giving the Department of Environmental Conservation full regulatory authority over the generation, transportation, treatment and disposal of hazardous wastes in the state. While DEC had the solid beginnings of such a program, the "cradle-to-grave" provisions of the Industrial Hazardous Waste Management Act enable the State to control hazardous wastes from their generation to their disposal, and thereby prevent the creation of future "Love Canals".

FIGURE 2

LOVE CANAL REMEDIAL CONSTRUCTION PLAN



Construction Safety Plan

A comprehensive safety plan is being developed to protect workmen, residents and the public during construction at the Love Canal site. The plan will be designed to guard against and provide emergency procedures for all possible hazards incident to the construction project, such as gas leaks, chemical spills, fires and dust.

An onsite safety officer, representing the State Commissioner of Health, will have final responsibility for safety at the worksite and initiation of protective measures in the surrounding community.

Development and implementation of the safety plan is being coordinated by the New York State Department of Health with the advice and assistance of numerous governmental agencies and community groups, including the Love Canal Homeowners Association, the State Office of Disaster Preparedness, State Departments of Transportation and Environmental Conservation, American Red Cross, Niagara County Civil Defense unit, state, county and city police departments, Niagara County Fire Department, local hospitals and ambulance services.

While the plan is still in the preliminary stages and subject to modification, the provisions outlined below will provide some indication of the scope of safety precautions to be taken during the construction period.

SECURITY & COMMUNICATIONS: Two-way radio communications will be maintained at all times between the worksite and the safety command post to be established at the 99th Street school building. A direct hotline to the fire dispatch office at the Public Safety Building will be installed at the command post.

All vehicular and pedestrian traffic to the worksite will be restricted, with twenty-four hour patrols to maintain security. Contractor personnel will sign in and out daily, and all visitors will be required to check in at the command post to receive identification, safety indoctrination and equipment. The immediate work area will be fenced and posted at all times.

PERSONAL HYGIENE & SAFETY: Prior to commencement of duties at the worksite, all workmen, site representatives and emergency personnel will receive a physical examination and an intensive safety indoctrination program. Washing facilities will be provided at the worksite and all personnel will be required to shower and change clothing before leaving the work area.

Workmen will wear safety glasses and protective clothing, including rubber gloves and boots which must be washed daily to remove chemical residue. If necessary the safety officer may mandate use of special equipment such as plastic face shields and respiratory protection. Rotation of workmen may be necessary to avoid excessive or prolonged exposure to contaminants.

MONITORING: The State Health Department will establish an onsite monitoring and sampling program to assure that workmen are not exposed to unacceptable levels of contamination. On-line analytical equipment will be installed to detect flammable concentrations of gases and toxic concentrations of specific chemicals known or believed to be present. The monitoring system will be equipped with an alarm which must be audible throughout the work area.

EMERGENCY EVACUATION: In the unlikely event of such need arising, a comprehensive evacuation plan is being developed to provide maximum protection for the resident population adjacent to the worksite. The area and distance out from the worksite to be evacuated will be determined by periodic readings and evaluations of wind/weather data. The evacuation plan will be coordinated by the New York State Office of Disaster Preparedness and the Niagara County Civil Defense unit with the cooperation of the American Red Cross and state and local police, fire, and medical services. The onsite Health Department Safety Officer will have final authority to initiate an evacuation order.

Household surveys will be conducted by the Red Cross and the Love Canal Homeowners Association to determine any physical limitations of the approximately 500 people living in the four block area surrounding the work area.

• • • *access to worksite
will be restricted*

• • • *numerous agencies
to cooperate in
safety program*

Homes with occupants who are other than fully ambulatory will be identified with a front door marker, and a "Neighbor Help" program will be developed to assure evacuation assistance to physically disabled residents.

Buses will be used for evacuation, with pickup locations clearly marked throughout the evacuation area. Evacuation maps and instructions will be distributed to all residents and media outlets in the vicinity.

Detailed plans for traffic control, fire support and emergency medical care will be developed and coordinated with state and local service units including police, fire departments, ambulance services and hospitals. Four police vehicles equipped with public address systems, an ambulance and a fire pumper with crew will be stationed at the worksite during all work hours.

Congressman John LaFalce, who has spearheaded efforts on the federal level to deal with the Love Canal problem, answers reporters' questions at the 99th Street School.



One of hundreds of Love Canal families begin packing their belongings in preparation for evacuation to other housing.



April 13— Health Commissioner Robert P. Whalen and Environmental Commissioner Peter A.A. Berle personally inspect Love Canal site after State Health Department ascertained a potential health hazard may exist.

April 25— Dr. Robert P. Whalen, State Health Commissioner, says conditions at site represent serious threat to health and welfare and orders county health commissioner to remove exposed chemicals, install fence to restrict access, initiate immediate health studies and take other appropriate measures to protect health of residents and correct the environmental problems.

April 26— Top staff of State Health and Environmental Conservation Departments meet in Albany with U.S. Environmental Protection Agency representatives to map out a plan to attack the Love Canal problems in terms of protecting the public's health and removing the environmental hazards.

May 11— Commissioners Whalen and Berle convene meeting to explain State's plans for Love Canal to elected officials and representatives of State legislative leaders in anticipation of proposed legislation.

May 15— U.S. Environmental Protection Agency concludes from air sampling of basements that levels of toxic vapors suggest a serious health threat.

May 15— State officials meet with Love Canal residents at 99th Street School to provide them with information on the state's plan.

May 19— Health Department toxicologist meets with residents to explain hazards from exposure to toxic chemicals.

May 21— State Health Department reveals plan to conduct short and long-term medical studies involving residents of the Love Canal area.

June 13— State officials meet again with residents and local officials to discuss implementation of the Conestoga-Rovers engineering plan as an interim corrective measure.

June 15— State Budget, Health and Environmental Conservation officials and the Niagara County health commissioner meet with representatives of the U.S. Environmental Protection Agency and Research Triangle Institute, consultants to the E.P.A., to share information and obtain advice relating to environmental health studies at the canal.

June 19— State Health Department medical investigators begin house-to-house health survey of residents living in first ring of homes and also collect blood samples for laboratory analysis.

Week of June 25— State Health Department's Division of Laboratories and Research collects air samples outside the homes contiguous to the Love Canal site.

June 28— Pentagon officials repeat their denial of any knowledge of records pertaining to possible disposal of U.S. Army wastes in the Love Canal at a meeting in Washington.

July 7— Health Department researchers issue results of analysis of air samples collected from basements and other rooms of homes showing high level of toluene, chlorotoluene and chloroform.

July 14— Commissioner Whalen convenes meeting in Albany of all interested parties to report on epidemiologic findings and air sampling and to discuss the various engineering studies proposed. Attending were representatives of the State

Chronology

Health and Environmental Conservation Departments, State Division of the Budget, Niagara County health department, City of Niagara Falls, Hooker Chemical Company, Congressman LaFalce's office and Fred Hart Associates and Conestoga-Rovers Associates, consultants to EPA and Niagara Falls City respectively.

July 19— State health officials conduct public meeting at 99th Street School to keep residents informed of State findings and actions to date.

July 20— Governor Carey signs legislation granting additional emergency powers to the State Health Commissioner to deal with the Love Canal problem and appropriating \$500,000 in State funds to conduct long-range health studies.

July 31— Commissioner Whalen convenes six-hour meeting at LaGuardia Airport of nationally prominent experts in toxicology, epidemiology, and industrial hygiene to present State's findings and seek recommendations and review of further actions to protect the public's health and correct the environmental problems.

August 1— Commissioner Whalen orders extension of house-to-house health survey to include residents within surrounding blocks and also announces plans to trace individuals who had lived in the area over the last 30 years.

August 2— Representatives of interested parties who met July 14 called to Albany by Commissioner Whalen for further update of State's actions.

August 2— Commissioner Whalen, acting under additional authority granted him by the new legislation, declares a state of emergency exists at the Love Canal site and issues order to Niagara County, City of Niagara Falls, and Niagara Falls School District reaffirming previous directives, issuing new orders including closing of 99th Street school pending completion of corrective construction, and making a series of recommendations including evacuation of pregnant women and children under two years of age living in homes in the first two rings.

August 2— Governor Carey directs his staff to explore what means of assistance may be available to help individuals affected by Commissioner Whalen's August 2 order and appoints an inter-agency task force to assist residents under the personal direction of William Hennessy, State Commissioner of Transportation.

August 3— Governor Carey directs his staff to explore all forms of possible Federal assistance and telegraphs President Carter requesting Federal aid; enlists support of Senators Jacob Javits and Daniel Patrick Moynihan and Congressman LaFalce for legislative action to deal with the Love Canal situation.

August 3— Thomas Frey, Director of State Operations, Commissioner Whalen, and other State officials meet with 600 homeowners at Governor's request and assures those forced to evacuate that State will pay for their housing.

August 3— Governor Carey directs his special inter-agency task force to find housing for families immediately affected by Dr. Whalen's order; directs that State Banking Department work with local banks to prevent foreclosure on homes and calls on banks to be flexible in their policies to help affected homeowners meet unforeseen financial responsibilities. The Governor also directs the State Division of Equalization and Assessment to prepare emergency legislation which would allow for evaluation and reduction of property taxes until the health emergency has been resolved; the State Insurance Department is directed to provide technical assistance to the homeowners to help assure they receive full benefits from their insurance policies.

August 4— Governor's Task Force opens relocation and health offices at 99th Street School seven days a week to assist residents.

August 5— William H. Wilcox, director of the Federal Disaster Assistance Administration, accompanied by State officials, tours Love Canal site and promises an array of Federal assistance.

August 7— Governor Carey goes to Niagara Falls and tells residents that State Government will purchase homes identified by the task force as affected by the Love Canal chemicals.

August 7— President Carter approves emergency financial aid for Love Canal area.

August 7— U.S. Senate approves by voice vote a "sense of Congress" amendment saying a serious environmental disaster had occurred and that Federal aid should be forthcoming.

August 9— State officials meet at the White House with representatives of the President, Congress, and Federal agencies to discuss aid for Love Canal.

August 9— Love Canal residents at a meeting in the 99th Street School receive message from Governor Carey that State has decided to evacuate all 236 families living on both sides of 97th and 99th Streets.

August 10— State Health Department's chief medical investigator meets with group of Niagara Falls physicians to outline medical findings and assist the physicians in evaluating their patients' conditions.

August 14— State Health Department installs nationwide toll-free hotline to trace former residents of the Love Canal area.

August 15— Governor Carey visits the Love Canal site to assure residents that a safety plan will be in place for the residents as well as the workers.

August 18— State Health Department medical investigators and technicians from Roswell Park Memorial Institute in Buffalo complete two weeks of drawing blood samples from more than 2,200 area residents, bring the total to more than 2,800 persons since testing began in June.

August 22— Installation of an 8-foot high chain link fence around the second ring of homes begins, preparatory to the start of corrective construction.

August 29— 98 Love Canal families have been evacuated as of this date while 46 others have found suitable temporary housing and are ready to move. Task Force relocation staff is working with 91 remaining families.

STATE OF NEW YORK

13149

IN ASSEMBLY

June 22, 1978

Introduced by COMMITTEE ON RULES—read once and referred to the
Committee on Ways and Means

**AN ACT to amend the public health law, in relation to the study and
alleviation of the hazard of toxic substances from certain landfill sites and
making an appropriation therefor**

*The People of the State of New York, represented in Senate and Assembly, do
enact as follows.*

1 Section 1 Article thirteen of the public health law is hereby amended by
2 adding a new title twelve, to read as follows:

3 **TITLE XII**

4 **TOXIC SUBSTANCES**

5 Section 1385 Legislative intent

6 1386. Duties of the commissioner.

7 1387. Contracts.

8 1388. Powers of the commissioner, emergencies

9 1389. Reports.

10 § 1385. Legislative intent. Sites formerly operated as landfills to dispose of toxic
11 substances are exposing the citizens of the state to unnecessary hazards, the duration
12 and extent of which is unknown. To develop a plan for the alleviation of these
13 conditions, it is necessary to conduct a study to determine the extent of such hazards.
14 The potential hazard believed to exist at a specific landfill site in the county of
15 Niagara, has precipitated the need for immediate action to authorize the department
16 of health to undertake such study and to conduct a pilot program to evaluate the effect
17 of individual corrective systems in affected residences.

18 § 1386. Duties of the commissioner. The commissioner of health shall conduct a
19 study of both the long and the short term effects of health hazards associated with
20 exposure to toxic substances emanating from certain landfills.

21 § 1387. Contracts. The commissioner of health is authorized to enter into
22 contracts and agreements with individuals, corporations and municipalities to
23 perform the study herein directed to alleviate the specific hazard to which the general
24 public or members thereto may be exposed as the result of toxic substances emanating
25 from landfills.

26 § 1388. Powers of the commissioner, emergencies. In case of great and imminent
27 peril to the health of the general public from such hazards as may be identified as

A. 13149

1 resulting from exposure to toxic substances emanating from landfills, the
2 commissioner may declare the existence of an emergency and take such measures and
3 do such acts as he may deem reasonably necessary and proper for the preservation
4 and protection of the public health.

5 § 1389. Reports. The commissioner of health shall make an initial report to the
6 governor and the legislature on or before September fifteenth, nineteen hundred
7 seventy-eight of his progress and a further report to the governor and the legislature on
8 or before September fifteenth, nineteen hundred eighty-one.

9 § 2. Appropriation. The sum of five hundred thousand dollars (\$500,000), or
10 so much thereof as may be necessary, is hereby appropriated to the department
11 of health from any moneys in the state treasury in the general fund to the credit
12 of the state purposes fund not otherwise appropriated, for its expenses, including
13 personal service, maintenance and operation, in carrying out the provisions of
14 this act. Such moneys shall be made payable out of the state treasury after audit
15 by and on the warrant of the comptroller upon vouchers certified or approved
16 by the commissioner of health.

17 § 3 This act shall take effect immediately.

EXPLANATION—Matter in italics is new, matter in brackets [] is old law to be omitted

STATE OF NEW YORK : DEPARTMENT OF HEALTH

IN THE MATTER

OF

THE LOVE CANAL CHEMICAL WASTE LANDFILL SITE
LOCATED IN THE CITY OF NIAGARA FALLS,
NIAGARA COUNTY

ORDER

I, ROBERT P. WHALEN, M.D., Commissioner of Health of the State of New York, pursuant to the statutory authority conferred upon me, having conducted or caused an extensive investigation to be conducted in relation to that certain site known as the "Love Canal Chemical Waste Landfill" located in the City of Niagara Falls, County of Niagara, and State of New York, and having determined, by previous orders made and issued by me in this matter, that said site constitutes a public nuisance and an extremely serious threat and danger to the health, safety and welfare of those using it, living near it, or exposed to the conditions emanating from it, consisting, among other things, of chemical wastes lying exposed on the surface in numerous places and pervasive, pernicious and obnoxious chemical vapors and fumes affecting both the ambient air and the homes of certain residents living near such site and having directed that certain remedial action be taken with respect thereto and, pursuant to my order and direction, further inquiry and investigation of the said Love Canal Chemical Waste Landfill site having been made;

NOW, THEREFORE, based upon epidemiological studies made by personnel of the State Department of Health and air quality sampling and studies made by personnel of both the State Department of Health and the United States Environmental Protection Agency of both the ambient air and selected homes at or near the site, and upon a review and examination of matters contained in Calspan Report No. ND-6097-M-1 prepared for the City of Niagara Falls by the Calspan Corporation of Buffalo, New York; a review and examination of the Conestoga-Rovers and Associates proposal, entitled "Proposal—Love Canal Chemical Landfill—Niagara Falls, New York—Site Study and Preliminary Design of Ground Water Pollution Abatement Plan," commissioned by and presented to the City of Niagara Falls; and a review and examination of a report entitled, "Phase I—Pollution Abatement Plan—Upper Groundwater Regime" prepared by Conestoga-Rovers & Associates, Waterloo, Ontario, Canada, jointly commissioned by the City of Niagara Falls, the City of Niagara Falls Board of Education and the Hooker Chemical Corporation; and, further, upon a review and due consideration of discussions held and reports submitted at a meeting held in the Conference Room, Division of Laboratories and Research, State Health Department, on June 15, 1978, attended by representatives of the State Health Department, the State Department of Environmental Conservation, the United States Environmental Protection Agency, the State Division of the Budget, the Commissioner of Health of the County of Niagara and by representatives of the Research Triangle Institute, consultants to the United States Environmental Protection Agency, which such meeting was convened to share information and obtain advice in relation to environmental health studies planned by the Department of Health with respect to the Love Canal Chemical Waste Landfill site; and, further, upon a review and due consideration of discussions held and reports submitted at that certain meeting held on July 14, 1978 in the 14th floor conference room, Empire State Plaza Building, Albany, New York, attended by representatives of the State Department of Health, the State Department of Environmental Conservation, the United States Environmental Protection Agency, the Board of Health of Niagara County, including the Niagara County Health Commissioner, the City of Niagara Falls, Conestoga-Rovers & Associates, Fred Hart & Associates, consultants to the United States Environmental Protection Agency, and by representatives of United States Congressman John LaFalce, and New York State Assemblymen Matthew Murphy

**Health
Department
Order**

• • • *serious threat and
danger to residents*

and John Daly; and, further, upon a personal visit made to the Love Canal Chemical Waste Landfill site on April 13, 1978 by me in company with Peter Berle, State Commissioner of Environmental Conservation, and others, and upon all other proceedings, reports and discussions heretofore held herein and considered with respect to the Love Canal Chemical Waste Landfill site, including information that between the period 1940 and termination of the Korean War, that the Department of Army deposited chemical wastes in said Love Canal landfill site.

I DO HEREBY FIND, CONCLUDE, RECOMMEND AND ORDER, as follows:

FINDINGS OF FACT

1. The Love Canal is a rectangular, 16 acre, below ground level landfill site located in the southeast corner of the City of Niagara Falls, Niagara County, New York, known as the "La Salle" area, with the southernmost portion of the site about 1/4 mile from the Niagara River near Cayuga Island.

2. The site is bordered on the north by Colvin Boulevard; on the south by Frontier Avenue; on the west by 97th Street; and on the east by 99th Street.

3. The southern and northern sections of the site are bordered by single family homes on 97th and 99th streets, while the middle section is bordered by a grammar school.

4. In the late 19th Century the site was excavated as part of a proposed canal project linking the Niagara River and Lake Ontario.

5. The Love Canal project was abandoned and never completed and the abandoned canal subsequently was used as a chemical and municipal waste disposal site.

6. The Hooker Chemical Company, Niagara Falls, New York, used the site for the disposal of drummed chemical wastes, process sludges, fly ash, and other wastes, for a period of nearly 25 years, from on or about 1930 to on or about 1953.

7. The City of Niagara Falls, New York, also used the site for the disposal of municipal wastes for many years prior to and including 1953.

8. In or about 1953, the site was covered with earth and sold by the Hooker Chemical Company to the Board of Education of the City of Niagara Falls, New York.

9. The City of Niagara Falls Board of Education subsequently sold part of the site to others.

10 Ownership of the site is currently shared as follows:

City of Niagara Falls	-	6.58 acres
City of Niagara Falls - Board of Education	-	3.53 acres
L.C. Armstrong	-	5.98 acres

11. There are presently 97 families with 230 adults and 134 children living in the houses adjacent to the northern and southern sections of the Love Canal.

12. The basements of homes bordering the site are now suffering from toxic chemical waste leachate intrusion from the site.

13. The grammar school on the site has no basement, but a crawl space only, however, the possibility of standing water next to classroom windows provides a mechanism for the transportation of and exposure of the school children to toxic vapors.

14. The soil strata surrounding and underlying the wastes, generally, consists of silts and fine sands of low permeability in the levels 4 to 6 feet below the surface; in the next levels 19 to 26 feet below the surface, the soil is silts and clay of very low permeability; the next level to about 40 feet below the surface consists of compact loamy glacial till of low permeability; and the level 40 feet more or less below the surface consists of limestone bedrock.

15. The clay strata acts as a barrier and creates a perched groundwater condition.

16. Leachate containing both halogenated and unhalogenated organic compounds migrates in the top soil layer and is the conduit by which it reaches the basements of homes adjacent to the site.

17. More than 80 chemical compounds have been identified at the site itself.

• • • *Commissioners of
Environmental Conservation
and Health visit site*

• • • *used for disposal of
chemical wastes for
25 years*

• • • *97 families living in
houses adjacent
to site*

18. Air samples taken in the basements of 14 houses adjacent to the site by the United States Environmental Protection Agency in February 1978 resulted in the identification of 26 organic compounds.

19. Air samples to monitor 10 selected compounds were taken by the Division of Laboratories and Research of the State Health Department in July 1978 from the basements of 88 houses peripheral to those built adjacent to the landfill site with the following results.

COMPOUNDS	NO. OF TIMES FOUND IN HOUSES	PERCENT OF TOTAL HOUSES SAMPLED	HIGHEST VALUE OBSERVED
Chloroform	23	26	24 ug/m ³
Benzene	20	23	270 ug/m ³
Trichloroethene	74	84	73 ug/m ³
Toluene	54	61	570 ug/m ³
Tetrachloroethene	82	93	1140 ug/m ³
Chlorobenzene	6	7	240 ug/m ³
Chlorotoluene	32	36	6700 ug/m ³
m+p xylene	35	40	140 ug/m ³
o-xylene	17	19	73 ug/m ³
Trichlorobenzene	11	13	74 ug/m ³

20. Seven of the chemicals identified in the air samples taken by the Division of Laboratories and Research are carcinogenic in animals and one, benzene, is a known human carcinogen.

21. In one home, in particular, the concentration of organic chemicals in the living space was well beyond the concentrations measured in the basement of any other house.

22. An epidemiologic study to determine whether residents presently living adjacent to the Love Canal are at increased risk for certain disorders was conducted by the Bureau of Occupational Health of the State Health Department in June 1978, utilizing spontaneous abortions and congenital defects as indicators of potential toxicity.

23. Based upon information obtained relating to maternal age, pregnancy order, and number of spontaneous abortions observed and expected among females residing in different sections of the Canal, the mean ages of females ever pregnant at the Love Canal, the duration of residence, and the mean age of the houses, the following was determined.

- A slight increase in risk for spontaneous abortion was found among all residents of the Canal and for the northern and southern sections, with the overall estimated risk 1.5 times greater than that expected.
- A significant excess of spontaneous abortions was localized among residents of 99th Street South.
- The miscarriage experience in the 99th Street North and 97th Street North and South sections approximated that which could be expected.
- A significant excess of spontaneous abortions occurred during the summer months of June through August.
- Congenital malformations were found among 5 children of adults presently residing on the Love Canal, with the distribution being 3 children from 99th Street South, 1 child from 99th Street North, and 1 child from 97th Street South.
- The mean ages of females ever pregnant on the Love Canal were comparable for 97th and 99th Streets.
- The average duration of residence on the Canal for 99th Street females was 16.5 years and 10.8 years for the 97th Street females.
- The mean ages of the houses located on 99th Street South was 26 years, for 99th Street North 21.6 years, for 97th Street North 18.6 years, and for 97th Street South 13.6 years.

• • • air samples reveal
high level of toxicity
in basements

• • • increased risk of
spontaneous abortion and
congenital malformations

CONCLUSIONS

1. A review of all of the available evidence respecting the Love Canal Chemical Waste Landfill site has convinced me of the existence of a great and imminent peril to the health of the general public residing at or near the said site as a result of exposure to toxic substances emanating from such site and, pursuant to the authority conferred upon me by Public Health Law section 1388, enacted by Chapter 487 of the Laws of 1978, the existence of an emergency should be declared by me.

2. That the Conestoga-Rovers report, subject to appropriate modification and approval by the State Department of Environmental Conservation, represents a feasible plan to halt the migration of toxic substances through the soil of the Love Canal site to the houses at or near such site.

3. That the orders and directions heretofore given by me to the Niagara County Board of Health, and its Health Commissioner, to take certain remedial actions to alleviate the hazards emanating from the Love Canal site were reasonable and should be reaffirmed.

4. That further studies should be made to:

(a) delineate chronic diseases afflicting all residents who lived adjacent to the Love Canal landfill site, with particular emphasis on the frequency of spontaneous abortions, congenital defects, and other pathologies, including cancer;

(b) delineate the full limits or boundaries of the Love Canal with respect to possible toxic effects;

(c) determine, by continued air, water and ground sampling, the extent that leachate has moved out of the site to the surrounding neighborhood;

(d) identify which groundwater aquifers, if any, have been contaminated by leachate;

(e) determine the possibility of minimizing the introduction of noxious odors and chemicals by way of drainage from outside the homes and to consider the utility or feasibility of installing customized fans or the special venting of sumps.

RECOMMENDATIONS

1. That the families with pregnant women living at 97th and 99th Streets and Colvin Boulevard temporarily move from their homes as soon as possible.

2. That the approximately 20 families living on 97th and 99th Streets south of Read Avenue, with children under 2 years of age, temporarily move from the site as soon as possible.

3. That residents living in the vicinity assist local and State agencies in defining and abating hazardous conditions arising from the Love Canal landfill site.

4. That residents living on 97th and 99th Streets avoid use of their basements as much as possible, thereby reducing their exposure to elevated levels of organic compounds present in the air of their basements.

5. That consumption of food products home-grown by residents of 97th and 99th Streets and Colvin Boulevard be avoided.

6. That the Department of the Army continue the investigation initiated by it to determine the extent to which the United States Army was involved in chemical waste disposal at the Love Canal landfill site and inform the New York State Department of Health of significant findings obtained through its search of army archives and records, on-site inspections, or other sources utilized.

7. That the Niagara County Medical Society cooperate with staff of the State Health Department and the Niagara County Health Department in any study undertaken to identify former residents of the Love Canal area to determine what, if any, chronic or adverse health effects they now exhibit; further that private physicians and the hospitals of Niagara County also cooperate with such staff; the physicians to assist in identifying and obtaining the necessary consents from such former residents and the hospitals with respect to supplying the necessary medical records.

• • • *indepth health and environmental studies ordered*

• • • *pregnant women and small children recommended to vacate site as soon as possible*

I DO HEREBY ORDER AND DIRECT:

1. AND DECLARE, pursuant to the authority conferred upon me by Public Health Law, Section 1388, enacted by Chapter 487 of the Laws of 1978, the EXISTENCE OF AN EMERGENCY and direct that the measures herein ordered are deemed reasonably necessary and shall be taken for the preservation and protection of the public health, and by virtue of the limited emergency nature of the action immediately necessary, which is herein directed to be taken, that the requirements of the State Environmental Quality Review Act are not applicable, except that neither any long-range plans to decontaminate the site, nor the implementation thereof, shall be exempt from the requirements of such Act.

2. The Niagara County Board of Health and the Niagara County Health Commissioner to take the following definite actions:

(a) Take adequate and appropriate measures to cause the removal from the Love Canal Chemical Waste Landfill site of all chemicals, pesticides and other toxic material which lie exposed or visible on the surface of the site.

(b) Take appropriate and adequate measures to limit accessibility to the site by the installation of suitable fencing or other effective means, together with periodic surveillance and monitoring, to assure that access to the site is properly restricted or limited.

(c) Take all other appropriate and necessary corrective action to abate the public health nuisance now existing at the Love Canal Chemical Waste Landfill site, including immediate steps to determine the feasibility of lowering the elevated levels of organic compound contamination in the air of basements by the moisture-proofing and venting of such basements in cooperation with the New York State Departments of Health and Environmental Conservation.

(d) Take all appropriate and necessary steps to undertake necessary engineering studies to provide a long-range solution to decontamination of the site. In connection therewith, that consultation and cooperation of the United States Environmental Protection Agency, the New York State Department of Environmental Conservation and the New York State Department of Health be sought, and approval of the New York State Department of Environmental Conservation be obtained.

(e) Initiate, and periodically repeat, in collaboration with the State Department of Health such epidemiological studies as may be required to determine any excess morbidity or school absenteeism associated with proximity to the landfill site.

(f) Make an initial report to me not later than 30 days from the date of service of this Order, concerning the progress made in implementing the orders and directions herein given, and thereafter report on the monthly basis as to such progress.

3. The City of Niagara Falls and County of Niagara Board of Health shall forthwith take all appropriate steps to implement the Conestoga-Rovers report entitled "Phase I Pollution Abatement Plan Upper Groundwater Regime," subject, however, to the approval of the Commissioner of Environmental Conservation, and they are hereby directed to respond to requests made by the Department of Environmental Conservation for additional information in relation to said report.

4. The City of Niagara Falls and County of Niagara Board of Health to report monthly as to progress in implementing the Conestoga-Rovers report.

5. That the City of Niagara Falls and Niagara County Board of Health, provided they receive approval of the Commissioner of Environmental Conservation for the implementation of the Conestoga-Rovers report, shall develop suitable plans for the safety of the workers employed to do the necessary work to implement the plan and to minimize hazardous exposure to residents that may occur during the course of the work, including appropriate steps to maximize dust control and minimize airborne pollution; such plans shall be submitted to the State Department of Health for its review.

6. That the City of Niagara Falls Board of Education temporarily delay opening the elementary school on the Love Canal site to minimize exposure of school age

• • • *Niagara County Board of Health ordered to take remedial action.*

• • • *progress report ordered in 30 days.*

• • • *delay opening of school*

children to waste chemicals while corrective construction activities at the school take place.

7 The Niagara County Department of Health and the City of Niagara Falls, in cooperation with staff of the State Department of Health, to undertake additional studies to:

(a) delineate chronic diseases afflicting all residents who lived adjacent to the Love Canal landfill site, with particular emphasis on the frequency of spontaneous abortions, congenital defects, and other pathologies, including cancer;

(b) delineate the full limits or boundaries of Love Canal with respect to possible toxic effects;

(c) determine, by continued air, water and ground sampling, the extent that leachate has moved out of the site to the surrounding neighborhood;

(d) identify which groundwater aquifers, if any, have been contaminated by leachate;

(e) determine the possibility of minimizing the introduction of noxious odors and chemicals by way of drainage from outside the homes and to consider the utility or feasibility of installing customized fans or the special venting of sumps.

8 That if monitoring shows that the levels of organic compounds in homes are not reduced to ambient levels at the expiration of 12 months following corrective construction, that a complete re-evaluation of the health hazards at the site shall be made by the Niagara County and State Health Departments agencies at that time.

9. That this Order supercedes all other previous orders and directions heretofore made and issued by me in connection with this matter, except as may otherwise be specified herein.



ROBERT P. WHALEN, M.D.
Commissioner of Health

DATED: August 2, 1978

● **LCVE CANAL – PUBLIC HEALTH TIME BOMB**
A Special Report to the Governor and Legislature, September 1978

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ROSWELL PARK MEMORIAL INSTITUTE
BUFFALO, NEW YORK

MEMORANDUM

Date: Dec. 19, 1978

To: Lois Gibbs, Love Canal Homeowners Association
Elena Thornton, Love Canal Renters Association

From: Dr. Beverly Paigen

Subject: Miscarriages in Love Canal residents

The State of New York Health Department examined the miscarriage rate in residents who lived along 97th and 99th Sts. and found a significantly elevated rate of miscarriage in those women. The State also examined the rate of miscarriage in women who lived between 93rd and 103rd Sts outside of the evacuated area and found no evidence of increased rate of miscarriage in these women.

An examination of the data on which the State based its conclusions indicates that the miscarriage rate increased in both sets of women. For those who lived on 97th and 99th, the miscarriage rate before moving to Love Canal was 8.9%; the miscarriage rate after moving to Love Canal was 21%. For women outside the evacuated area the miscarriage rate before moving to Love Canal was 8.5%; the miscarriage rate after moving to Love Canal was 16.5%.

The State made 3 errors in its examination of the data. First they failed to notice an apparent miscarriage rate lower than the expected rate calculated by the State in these women before they moved to the Canal.

Table 1. Women living between 93-103rd excluding 97th & 99th

	PRIOR TO MOVING TO CANAL*		AFTER MOVING TO CANAL	
	<u>observed</u>	<u>expected</u>	<u>observed</u>	<u>expected</u>
miscarriages	61	98	37	34.4
no miscarriage	<u>653</u>	<u>616</u>	<u>187</u>	<u>189.6</u>
total pregnancies	714	714	224	224
% miscarriages	8.5%	13.7%	16.5%	15.4%

*probability that the difference between observed and expected could have occurred by chance is less than 1/2 chance in 100 ($p < .005$, chi square analysis)

The difference between 37 observed miscarriages and 34.4 expected miscarriages is not statistically significant. This is the information the State used to say that there was no increase in miscarriage rate. However, the observed 61 miscarriages before moving to the Canal is very significantly different from the expected rate of 98 miscarriages and indicates that women who had a significantly lower than expected miscarriage rate before moving to the Canal suddenly had an increased rate of miscarriage after moving to the Canal. Any scientist would have said that there was definitely a change in the pattern of miscarriage rate before and after living on the Canal. At this point, a scientist should have questioned whether the calculations for expected rate of miscarriage were correct.

The second error the State made was that they did not calculate the expected rate of miscarriages correctly. They used data from a Montreal population (Warburton and Fraser, 1964). This data base included miscarriages which were self-diagnosed by women and never reported to a doctor, yet the State counted only miscarriages that could be confirmed by physicians. The fact that the Montreal population is not appropriate for comparison should have been immediately apparent to a biostatistician since the miscarriage rate in Montreal was 14.7% and the miscarriage rate for Love Canal residents prior to living on the Canal was 8.5%, a statistically significant difference.

The third error the State made was to ignore a striking piece of information in their data base. Women who have miscarriages in 3 or more pregnancies are very rare in the general population. The Montreal study quotes two other studies which give frequencies of 0.4% and 0.5%, although this will vary depending on the average family size in the population. Information gathered by Love Canal residents on women living from 100th to 103rd Sts. indicate that there are 7 women with 3 or more miscarriages out of 187 women (3.7%) currently living in this area. (The percentage is actually higher since the homeowners counted all women and not just women who have had a pregnancy while living in the Canal area.) This number of women with 3 or more miscarriages is very high, much higher than expected. If the State had been carefully looking for evidence of increased miscarriage rate, they would have seen this striking fact immediately.

Even more striking is that all 7 of these women who have had several miscarriages live along a swale. The State has said that it finds no evidence of increased miscarriage rate along swales. The data backing up that statement is not available to me so I cannot evaluate it. However, the information gathered by residents indicates that miscarriage is increased along the swales and is probably even higher than the miscarriage rate in women living on 97th and 99th Sts.

Reference: Warburton, D., and Fraser, F. C. Spontaneous abortion risks in man: Data from reproductive histories collected in a medical genetics unit. *Am. J. Human Genetics* 16: 1-25, 1964.

Appendix: Statistical Notes

It would have been more appropriate to use the women as their own control and compare miscarriage rates before and after moving to the Canal as follows:

	<u>before</u>	<u>after</u>	
miscarriages	61	37	98
no miscarriages	653	187	840
	<hr/>		
	714	224	938

chi square = 180

p < .001

The only disadvantage to the above method is that miscarriage rate does depend to some extent on the age of the mother and the number of previous pregnancies. To overcome this problem the State could have: 1) compared age and number of pregnancies before and after to determine if a correction was important, or 2) used the Warburton and Fraser data but adjusted it for the very different miscarriage rates between the 2 populations. To correct for a small difference (the age at pregnancy) by introducing a large difference (the miscarriage rate between the 2 groups) is simply not good science.

BP:nh

HEALTH HAZARDS AT LOVE CANAL

Testimony Presented to the House Sub-committee on Oversight & Investigations

March 21, 1979

by Dr. Beverly Paigen

Roswell Park Memorial Institute

Introduction

My name is Beverly Paigen. I am a cancer research scientist at Roswell Park Memorial Institute in Buffalo, New York. Roswell Park is part of the New York State Department of Health. I have a Ph.D. in biology and my research interest is genetic susceptibility to environmental toxins. I served on the Environmental Protection Agency's Toxic Substances Advisory Committee from 1977-1979. I currently serve on an Environmental Protection Agency group (the Carcinogen Assessment Group) that makes quantitative risk assessments of hazards from cancer-causing chemicals.

Summary of Health Effects

The studies that I will present concern the health hazards experienced by the people still living from one to five blocks from the Love Canal dump site. I will present information that leads me to conclude that toxic chemicals are presently migrating through the soil along the paths of old streambeds that once criss-crossed the neighborhood. Families whose homes border these old streambeds show an increase in several health problems including miscarriages, birth defects, nervous breakdowns, asthma and diseases of the urinary system. These studies have led me to conclude that a minimum of 140 additional families should be evacuated immediately and evacuation may need to be extended to as many as 500 more families. In addition, the results raise questions about whether the presently planned remedial construction to prevent further outflow of toxic wastes is adequate.

Methodology

Originally, the State of New York investigated miscarriages and birth defects in the residents living in rings 1 and 2 immediately surrounding the Love Canal and concluded that both were increased. On the basis of this they declared a health emergency and evacuated 239 families from rings 1 and 2. The residents left behind living in the area from one to five blocks from Love Canal also felt that birth defects and other diseases were higher than should be expected in their neighborhood. These residents began collecting information in an informal way on diseases in the neighborhood and plotting these on a map. The diseases seemed to cluster in particular areas of the neighborhood.

Older residents suggested that the clusters seemed to follow the path of old streambeds that had intersected the Love Canal many years ago and had been filled when houses were built. At this point the residents contacted me for help since I am known locally as an environmental scientist. I discussed with area residents how to collect health information in a scientifically acceptable way. They put aside all the information they had gathered and started making a systematic phone survey to each home, collecting information about the number of persons in each family, the length of time they had lived in the Love Canal area, and the health problems experienced by the family. More than 75% of the homes cooperated in the survey. This information provided the data base I used. I should point out that this survey suffers from several problems. First, a layperson reported diseases to a layperson and some of the people involved may not understand the true nature of their illnesses. Second, both the people reporting and the people collecting the information have a vested interest in the outcome and there may be over-reporting of disease. And third, I did not have any resources so I could not verify independently the reports of disease with physician records. To overcome these problems I concentrated primarily on those health effects that are diagnosed by a physician and that the layperson knows by name. To correct for over-reporting I used internal controls in the neighborhood. I will present the health effects in 3 categories of confidence: the first are those diseases for which there is clear and convincing evidence of an increase; the second category are those diseases that are probably elevated but which have some problems with the data; and the third category includes health problems for which there is suggestive evidence, but which I was not able to evaluate for lack of sufficient information.

The Swales

The first step was to locate the old stream beds. This was done by examining old aerial photographs and geological survey maps, obtaining photographs from residents' family albums, and talking to older residents. In addition, the State of New York sent interviewers from home to home to determine which houses had been built in historically wet or swampy areas. During this process we discovered that in addition to the streams, there had been a lake and several swamps in the neighborhood. I have here, for instance, a photograph of the Love Canal area (Figure 1) taken in the early 1950's at the time that Hooker Chemical was still dumping toxic waste. The canal is partially filled. Here is the path of a stream bed that intersected Love Canal. Area residents tell us that this could flow in either direction. When the Niagara River flooded in early spring it flowed to the north. At other times of the year it flowed to the south. Here is an old family photo from 1958 which shows two children playing in the stream bed (Figure 2). It appears to be about 10 feet deep and more than 20 feet wide. The soil in this area is clay and is relatively impermeable to the flow of liquids. When the area was developed, the streams were filled with building rubble through which water flows easily. The result is that today, even though there is no surface evidence of these old streams, liquid contaminated with toxic chemicals is migrating along them underground. The next photograph has on it in red the stream beds that were

present in a 1938 aerial photograph (Figure 3). In yellow are the stream beds present in a later aerial photograph indicating that some relocation of streams occurred during the construction period. The yellow dots in this photograph indicate each home that lies along a stream bed or in a historically wet place, that is where a lake or a swamp was. In the health studies which I will be showing you, I have compared the disease incidence in these homes on historically wet areas with the disease incidence in homes in dry areas. The collection of health data to the west of the canal are still not complete.

The data I will show you are limited to this area (indicate on photograph). The first map (Figure 4) shows the homes in the study area; each home that cooperated in the study is covered by a dot. More than 75% of the homes participated in the survey and the homes which did not are randomly scattered through the neighborhood. At some points the study area was divided for statistical purposes into north and south along this line (indicated on map).

It is important to keep in mind that the health effects I will be presenting are probably serious underestimates of the true health effects. One reason is that I don't have a normal control population. I am comparing a heavily exposed population - those in wet homes - to a moderately exposed population - those in dry homes - and I don't have any unexposed population. A second reason is that my data usually do not include the evacuated families who were the most heavily exposed. A third reason is that people with no health problems readily cooperated in the survey, but some families with serious health problems did not wish to participate in a survey conducted by their neighbors.

Toxicity to the Very Young

One of the most susceptible groups in the general population to the toxic effects of chemicals are the very young. In the Love Canal area, miscarriages, still births, and crib deaths are increased. This table (Table 1) indicates total pregnancies and miscarriages verified by physicians in these women before they moved to the Love Canal and after moving to wet areas in Love Canal. The frequency of miscarriages before moving to Love Canal was 8 1/2% and this increased to 25% for women when living in Love Canal homes in wet areas. This is a risk 3 times greater for women living in the wet areas.

This map (Figure 5) indicates each miscarriage, still birth, or crib death with a blue dot. I have omitted the houses and streets to protect the identity of the individuals who gave confidential medical information, but I have indicated the stream beds and have outlined the swampy areas. Each dot is about the width of a house lot. The stream beds are indicated by a line even though they have considerable width. Miscarriages are more frequent in homes lying in wet areas than in the homes in dry areas.

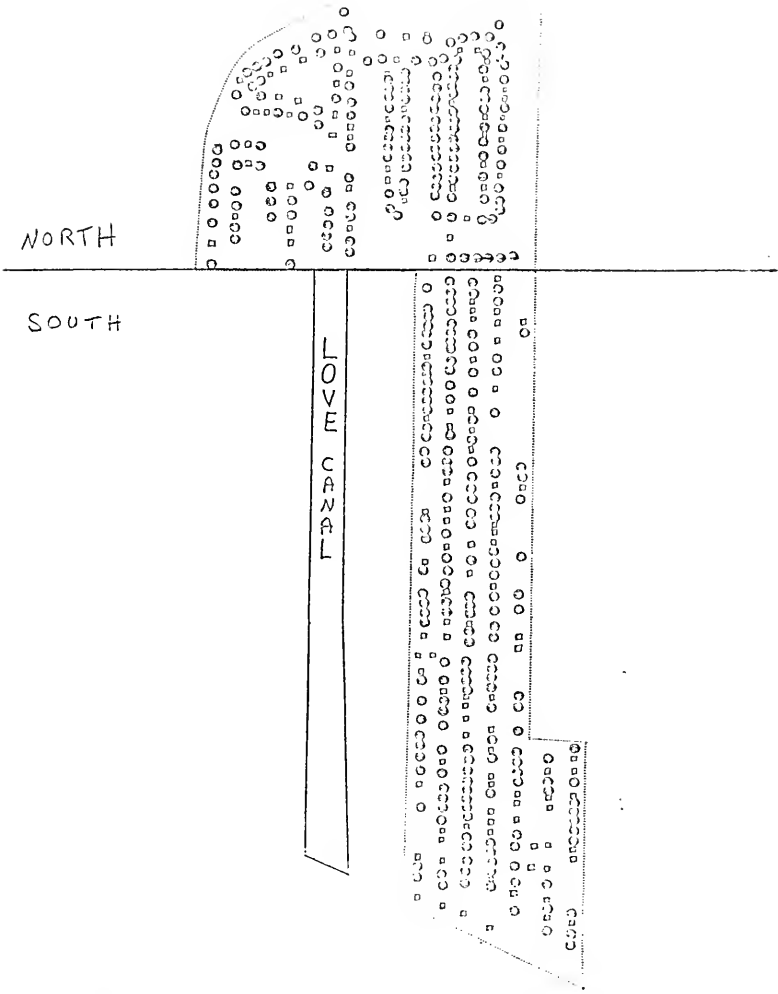


FIGURE 4. Study Area. Each home that participated in survey is covered with a circle.

Table 1

MISCARRIAGES IN WOMEN LIVING IN LOVE CANAL AREA

	<u>Number of pregnancies</u>	<u>Number of miscarriages</u>	<u>%</u>
Before moving to Love Canal	714	61	8.5%
After moving to wet area of Love Canal	155	39	25.2%
Relative risk	3.0		
chi square 35; probability that difference is due to chance is much less than .0005			

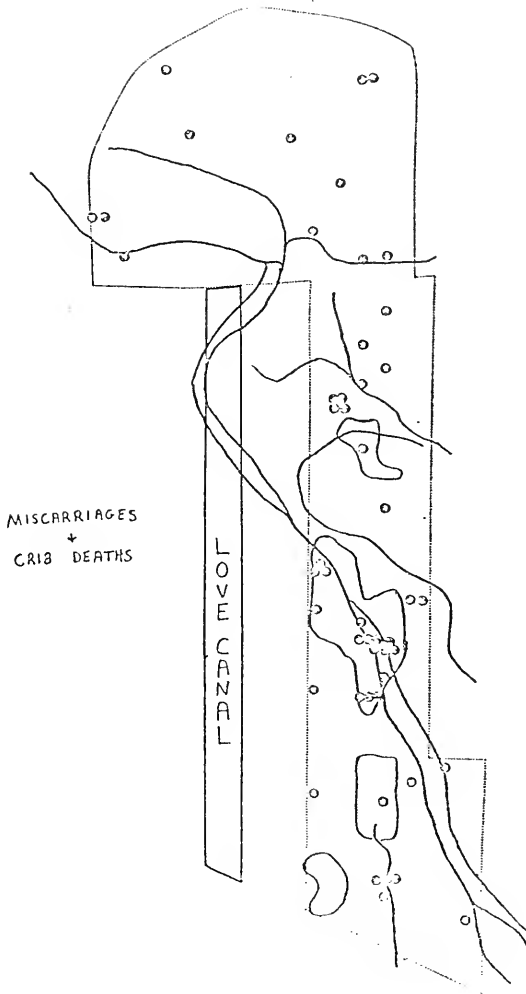


FIGURE 5.

A number of women have had multiple miscarriages; these women live in or very near the wet places. This woman, for instance, had 2 normal pregnancies resulting in healthy children before moving to the Love Canal. When she moved to Love Canal she had 4 miscarriages in a row; the last miscarriage occurred at 6 months and the child was deformed so the distraught woman decided not to have any more children. This woman had 3 miscarriages; one of the children she managed to have was born with 3 ears, and another has deformed ears.

Within the last month, the Environmental Protection Agency halted the use of herbicide containing dioxin (TCDD) after 8 Oregon women wrote that they had 13 miscarriages among them. Two hundred tons of this banned herbicide are buried in Love Canal and the toxic contaminant dioxin has been found in the leachate migrating from the canal.

The presence of birth defects is another sign of chemical toxicity in the very young. In this map (Figure 6) each blue dot represents a child born with a birth defect. Again clustering occurs with more birth defects in those homes in wet areas as compared to homes in dry areas. This table (Table 2) indicates the percentage of birth defects in the official study by the New York State Department of Health. All these have been verified by physician records. Twelve percent of children born in the wet areas had birth defects compared to 5% of children born in dry homes. My own survey includes more birth defects than the official study by the State of New York. My information indicates that 20% of children born in the wet areas have birth defects compared to about 7% of children in the dry areas. I am currently corresponding with the State over the differences, and I believe the true incidence will lie somewhere between the incidence I have and the incidence that the Health Department has. I do not know whether the rate of birth defects for children in dry areas is higher or comparable to that expected for a normal control population.

Some of the birth defects in this survey were minor or easily corrected by surgery, such as webbed toes, an extra toe or extra or unusually spaced teeth. Others, however, were much more serious including a deaf child, 5 children with mental retardation, 6 with kidney abnormalities, and 3 with heart defects.

Most people believe that the flow of chemicals into the neighborhood has gotten worse in the recent past - perhaps because the drums containing the toxic wastes are rusting through and perhaps because we have had 2 winters of abnormally heavy precipitation. We therefore asked whether there has been a particularly noticeable increase in birth defects among the children born in the last 5 years to women living in wet areas. From 1974-1978, 16 children were born in homes in wet areas; 9 of these children had birth defects (Table 3). This gives an incidence of over 50%, clearly an unacceptable health hazard.

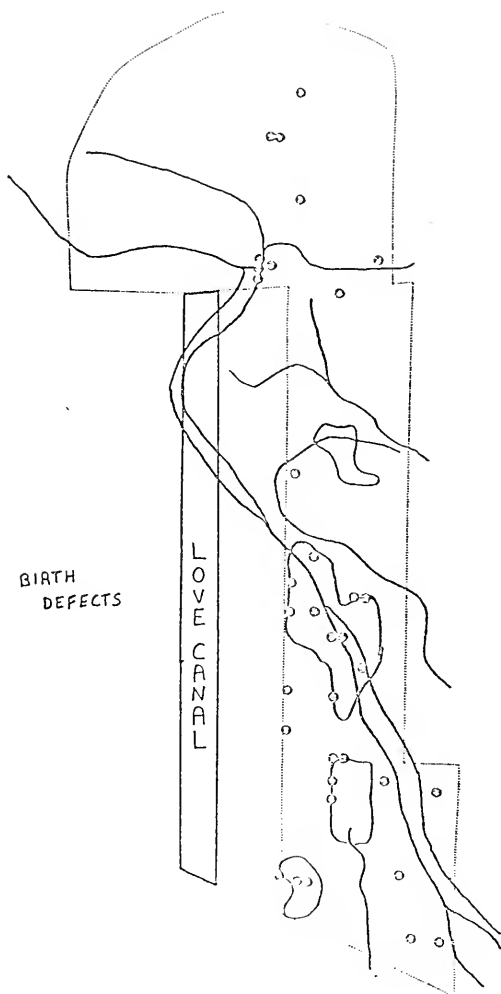


FIGURE 6.

Table 2

BIRTH DEFECTS IN CHILDREN BORN IN LOVE CANAL AREA

	<u>Wet areas</u>	<u>%</u>	<u>Dry areas</u>	<u>%</u>
Number of children born	120		176	
Number with birth defects (New York Health Dept. data)	15	12.5%	9	5.1%
Number with birth defects (residents' data)	24	20.0%	12	6.8%
Relative risk (residents' data)	2.9			
chi square 12; probability that difference is due to chance is less than .001				

Table 3

BIRTH DEFECTS IN CHILDREN BORN DURING
LAST 5 YEARS IN WET AREAS

Children born	16
Number with birth defects	9
Percentage	56%

Central Nervous System Toxicity

In addition to causing birth defects, some of the toxic chemicals found in Love Canal are known central nervous system poisons. Lindane is found in the yards and in 75% of the sump pumps of homes in wet areas. Lindane causes hyperirritability and convulsions. Three other central nervous system poisons have been measured in the air of these homes; tetrachloroethylene, chloroform and trichloroethylene.

Central nervous system poisons can produce convulsions, loss of coordination, headaches, insomnia, hyperirritability and psychological depression. There is strong evidence that symptoms of central nervous system poisoning are occurring in the population surrounding the Love Canal. Each dot on this map (Figure 7) represents a nervous breakdown - either a suicide attempt or an admission to a mental hospital. I did not place on this map the many reports of "nervous condition". Most of the nervous breakdowns occurred in homes in wet areas. Those that occurred in dry areas (indicate on map) are very close to wet areas. This table (Table 4) shows that almost 9% of adults living in wet areas have had a nervous breakdown compared to 2.2% of adults living in dry areas in the southern section and 0.7% of adults living in dry areas in the northern section. The risk of an adult in the wet area having a nervous breakdown is 7 times the risk of all adults in dry areas.

Table 4

NERVOUS BREAKDOWNS

	Number of <u>adults</u>	Number of <u>nervous breakdowns</u>	<u>%</u>
Living in wet areas	149	13	8.7%
Living in dry areas- south section	226	5	2.2%
Living in dry areas- north section	284	2	0.7%

Relative risk wet areas to all dry areas: 6.9

chi square wet/dry south 8

probability that difference is due to chance is less than .005

Other Health Effects

Several chemicals in Love Canal are known to be toxic to the kidney and urinary system. This table (Table 5) shows that urinary disease occurs in 7% of persons living in homes in the wet areas as compared to 2.5% for homes in dry areas. These represent a variety of disease

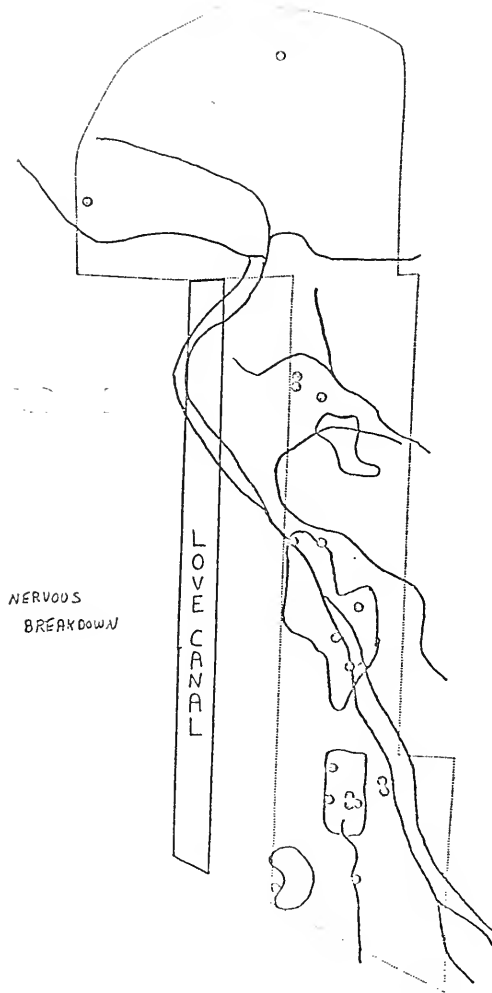


FIGURE 7.

including congenital malformations of the urinary system, loss of kidney function later in life, injured ureters or urethras leading to incontinence and severe, frequent bladder infections. Persons living in wet areas are 2.8 times as likely to have urinary disease as persons in dry areas. This map (Figure 8) shows the clustering of urinary disease in the wet areas.

Table 5

URINARY DISEASE IN LOVE CANAL AREA

	Number of <u>people</u>	Number with <u>disease</u>	<u>%</u>
Living in wet areas	314	22	7.0
Living in dry areas	826	21	2.5

Relative risk 2.8

chi square 13

probability that difference is due to chance is less than .0005

Respiratory disease of all types are common in the neighborhood. This table (Table 6) indicates that persons living in wet areas are 3.8 times as likely to have asthma as persons living in dry areas.

Table 6

ASTHMA IN LOVE CANAL AREA

	Number of <u>people</u>	Number with <u>asthma</u>	<u>%</u>
Living in wet areas	314	14	4.4%
Living in dry areas	826	11	1.3%

Relative risk 3.8

chi square 10

probability that difference is due to chance is less than .005

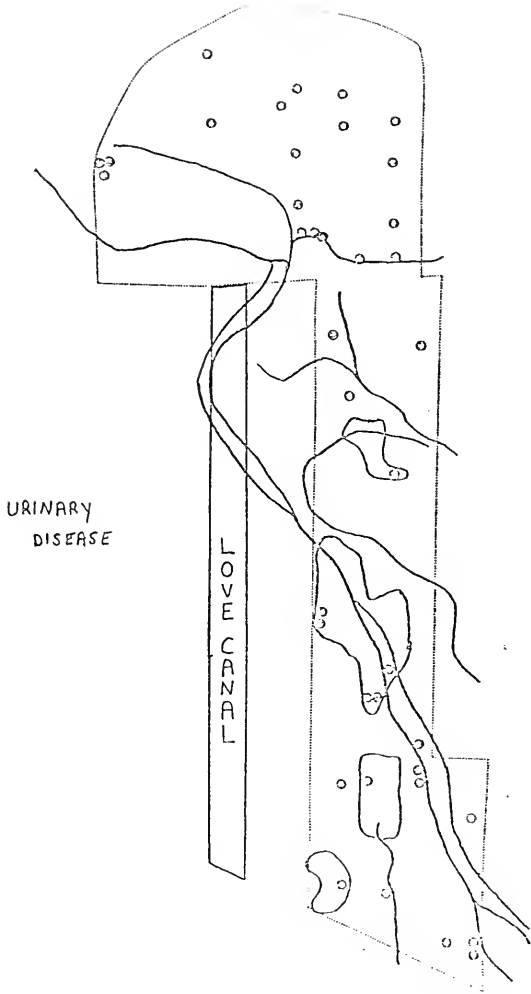


FIGURE 8.

Health Hazards for Which There is Probable Evidence

I would like to turn now to the health hazards that are probably present but for which the data are less certain. If there are central nervous system poisons in the Love Canal neighborhood, then other types of central nervous system effects would be expected. My data indicate that the frequency of suicides, convulsive disorders such as epilepsy, and hyperactivity in children are elevated. However, I have less confidence in these data due to the small number of cases or due to problems in diagnosis.

For instance, over the past 10 years 6 suicides have occurred in the Love Canal area when 1.7 would be expected for a population this size. Five of these 6 could be related to living in a wet area and the 6th may possibly be related. The 6th suicide occurred in a person who had lived directly along the canal for most of her life but had moved elsewhere in the neighborhood about a year before committing suicide. This increase in suicides is statistically significant; nevertheless a scientist feels uncomfortable working with such small numbers. Other medical studies have shown an increase in suicides in persons exposed to central nervous system poisons.

The data indicate an increased incidence of hyperactivity in children. I feel less confident about hyperactivity because this diagnosis can be misused but I think it is relevant that 11 of the 13 hyperactive children live in wet areas.

I also think it possible that chemicals in the Love Canal neighborhood may be causing convulsive disorders such as epilepsy. Twelve persons with a convulsive disorder live in the neighborhood. These are more likely to live in wet areas (chi square 3, probability that this difference is due to chance is less than 0.1). One.nine % of persons living in wet areas have epilepsy compared to 0.7% of persons living in dry areas, a relative risk of 2.7. Indeed one home whose basement air has one of the highest readings of tetrachloroethylene now houses 2 epileptics. This home is in a dry area but is obviously contaminated. It is also striking that most epilepsy has been diagnosed in the last 7 years, even in adults with no prior history of childhood convulsions and no other known medical cause of epilepsy.

Health Effects for Which There is Suggestive Evidence

In addition to these health effects, there are other health problems in the neighborhood that it has not been possible to evaluate statistically. These require further study. One is a very high frequency of skin disease. Second is a strong suggestion that the chemicals these people are exposed to may be interfering with their body's immune response. The residents report an unusual frequency of upper respiratory infections, pneumonia, and ear infections. In fact, several children have suffered some hearing loss due to constant ear infections. Third, there seems to be a definite impairment of the blood clotting system in these people. There are many reports of bleeding problems such as severe and frequent nosebleeds, unexplained uterine bleeding severe enough to require hysterectomy, and gastrointestinal or rectal bleeding for which physicians cannot find a cause.

Fourth, chemicals may be interfering with bone metabolism. Three persons have Paget's disease which is a demineralization of the bone. Other bone problems are not diagnosed at this time. Fifth, several carcinogens are in Love Canal and I suspect that cancer is elevated in the area. Sixth, I believe that heart disease may be elevated in the area.

In this last map (Figure 9) I have superimposed many of the diseases I have talked about including miscarriages, birth defects, nervous breakdowns, hyperactive children, epileptics, and urinary disease. The concentration of disease is very heavy in certain areas. These data have led me to strongly recommend that the 140 families living in wet areas be evacuated immediately.

All of this evidence is statistical. It's important in establishing the magnitude of the problem, but it does not convey the human dimensions of what is involved. For that, I would like to tell you briefly about the history of one house in a wet area. This house is rented and 4 families have lived there during a 15 year period. In family number 1 the wife had a nervous breakdown and a hysterectomy due to uterine bleeding. In family #2, the husband had a nervous breakdown, the wife had a hysterectomy due to uterine cancer, the daughter developed epilepsy and the son asthma. In family #3, the wife had a nervous breakdown and both children suffered from bronchitis. In family #4, who lived there less than 2 years, the wife developed severe headaches after moving in the house. She also had a hysterectomy due to uterine bleeding and a premalignant growth.

Health Studies of Evacuees

Epidemiological studies can never prove cause and effect; these studies only show an association of disease with geographical location. To obtain further information on whether these diseases are related to chemicals from Love Canal, we conducted a health survey on the people evacuated from rings 1 and 2 4 to 6 months earlier. I did not know what to expect since studies of people who have lived through disasters show an increased incidence of disease in the years following the disaster as a result of the stress. In addition, many toxic organic chemicals are stored in the body fat and tend to remain in the body for long periods of time.

As a result of these 2 factors, I did not expect much improvement in health after such a short time. One hundred and 1 families were surveyed. I was surprised to find that 67 reported a major improvement in health since moving (Table 7).

Table 7
HEALTH STATUS OF 101 EVACUATED FAMILIES

	<u>Number of families reporting</u>
Improved health	67
No change	34
Poorer health	0

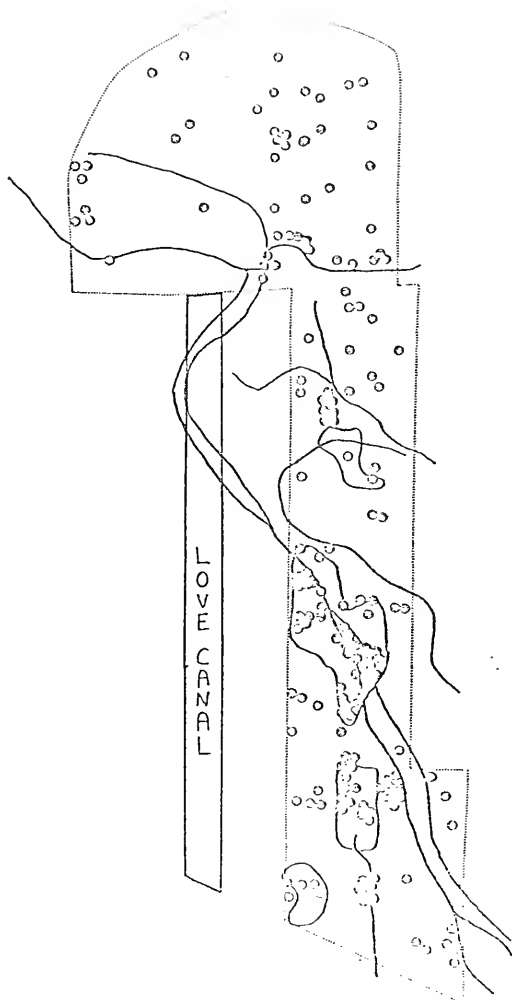


FIGURE 9. Miscarriages, still births, crib deaths, nervous breakdowns, hyperactivity, epilepsy, and urinary disease in Love Canal area.

Of the 9 families who reported that frequent ear infections was a major problem while living on the canal, all 9 reported a major improvement in this problem. Of the 50 families who reported that colds, pneumonia, bronchitis and sinus infections were a major problem while living on the canal, 49 reported an improvement. Of 12 asthmatics, 11 reported an improvement; some of these have not had a single attack since moving. Of the 17 families who reported skin rashes as a problem, 14 have experienced improvement since moving. Of the 12 families who reported that severe depression or a nervous condition were health problems, 11 have reported major improvements. Of the 39 families that reported migraine or frequent headaches were a problem, 38 have reported a major improvement.

Table 8

HEALTH STATUS OF EVACUATED FAMILIES

<u>Health Problem</u>	Number of Families Responding	
	<u>Improved Health</u>	<u>No Change</u>
Ear infections	9	0
Upper respiratory infections	49	1
Asthma	11	1
Skin rashes	14	3
Depression	11	1
Headaches	38	1

One individual case is illuminating. One child had been extensively studied at Buffalo Children's Hospital for severe growth retardation. At age 3, she had a bone age of 1 year. Her doctors told the parents that they didn't know the cause of the growth retardation but that the child would probably be a midget. Since leaving the canal this child has begun to gain weight and grow rapidly.

I believe that even this limited survey of people who have been evacuated indicates a major improvement in the health problems can be achieved by evacuation despite the stress of loss of home and community.

In contrast, the people who have been left behind, particularly those who live in wet areas, are still facing a serious health hazard which they are powerless to correct without governmental action.

Recommendations

Based on these studies, I have made several recommendations:

- (1) The 140 families living in wet areas in the section studied be evacuated immediately.
- (2) All women of childbearing age who wish to have more children should be evacuated. They should be advised to wait 6 months to a year before getting pregnant to allow chemicals to be excreted from the body.
- (3) Sick people who live in dry areas should be evacuated if they wish to move. There are some homes in dry areas with very high levels of chemical readings in their basement air and there are families in dry areas ill with multiple diseases. We do not know enough about what is occurring underground. Chemicals might be migrating along sewer pipes and service lines. Drums of toxic wastes may be buried in discrete areas separate from the Love Canal, as some truckers have claimed. Toxic wastes have migrated into the storm sewer system and these storm sewers back up and saturate yards with toxic chemicals.
- (4) Detailed studies must be initiated on the west side of the canal where I have not done any health studies. A major swale runs through a housing development known as Griffin Manor. It touches 15 apartments. In fact, the entire Griffin Manor area was once low and swampy. It is possible that the area has been heavily contaminated. If it is, more families would have to be evacuated.
- (5) The remedial construction work was planned before the importance of the stream beds was understood. It is important to modify the plan. Otherwise it may be that the construction of a drainage ditch parallel to the canal will simply lead to an increased flow of toxic waste down the stream beds.
- (6) The stream beds may be so contaminated that they will have to be dug out, contaminated soil on either side removed, and drainage tiles be placed in each one. However, it may be necessary to abandon the entire neighborhood.
- (7) Love Canal is as much a disaster as any hurricane, earthquake, or flood. The Federal government has accepted the responsibility of aiding areas hit by natural disasters. In 1977 our area in Western New York suffered a blizzard. Millions of dollars in aid were provided in response to the financial loss and inconvenience involved. Now we have a disaster that involves not only financial loss but also terrible health effects from a catastrophe that was totally beyond the control of the victims. They are trapped in a more serious and long-lasting way than any of us were by the blizzard. Their chemicals won't melt away in springtime. One of the neighborhood residents has expressed it very simply. He said, "I've been through a fire, I've been through a flood, and this is far worse".

MISCARRIAGES

wet areas

pregnancies	155	
miscarriages	39	25%
relative risk - State	2.0	
relative risk - Paigen	3.5	

BIRTH DEFECTS

1974 - 1978

live births	16	
birth defects	9	56%

BIRTH DEFECTS

	<u>wet area</u>		<u>dry area</u>		
live births	120		176		
birth defects-State	15	12.5%	9	5.1%	2.5
birth defects-Paigen	24	20.0%	12	6.8%	2.9

NERVOUS BREAKDOWN

south wet vs north dry

	<u>wet</u> <u>area</u>	<u>dry</u> <u>area</u>	
healthy	136	283	419
diseased	<u>13</u>	<u>1</u>	<u>14</u>
	149	284	433
	9.6%	0.4%	
Relative risk		27.1	

HYPERACTIVITY
north & south

	wet <u>area</u>	dry <u>area</u>	
healthy	116	314	430
diseased	<u>11</u>	<u>2</u>	<u>13</u>
	127	316	443
	9.5%	0.6%	
Relative risk		15.0	

URINARY DISEASE

RELATIVE RISK

south wet/south dry	2.8
south & north wet/south & north dry	2.9
south wet/north dry	3.3

URINARY DISEASE
south & north

	wet <u>area</u>	dry <u>area</u>	
healthy	292	805	1097
diseased	<u>22</u>	<u>21</u>	<u>43</u>
	314	826	1140
	7.5%	2.6%	

ASTHMA
south & north

	wet <u>area</u>	dry <u>area</u>	
healthy	300	315	1115
diseased	<u>14</u>	<u>11</u>	<u>25</u>
	314	826	1140
	4.7%	1.3%	
Relative risk		3.5	

ASTHMA

south

	<u>wet area</u>	<u>dry area</u>	
healthy	227	354	581
diseased	<u>9</u>	<u>4</u>	<u>13</u>
	236	358	594
	3.8%	1.1%	
Relative risk		3.5	

EPILEPSY

south

	<u>wet area</u>	<u>dry area</u>	
healthy	232	354	586
diseased	<u>4</u>	<u>4</u>	<u>8</u>
	236	358	594
	1.7%	1.1%	
Relative risk		1.5	

EPILEPSY

south wet vs north dry

	<u>wet area</u>	<u>dry area</u>	
healthy	232	466	698
diseased	<u>4</u>	<u>2</u>	<u>6</u>
	236	468	704
	1.7%	0.4%	
Relative risk		4.0	

URINARY DISEASE

south

	<u>wet area</u>	<u>dry area</u>	
healthy	220	349	569
diseased	<u>16</u>	<u>9</u>	<u>25</u>
	236	358	594
	7.3%	2.5%	

NERVOUS BREAKDOWN

south

	<u>wet area</u>	<u>dry area</u>	
healthy	136	221	357
diseased	<u>13</u>	<u>5</u>	<u>18</u>
	149	226	375
	9.6%	2.3%	
Relative risk		4.2	

News Release, December 11, 1978
Received at Buffalo Area Office
at 11:00 a.m., 12/11/78

NEW YORK STATE HEALTH DEPARTMENT

A Dayton, Ohio laboratory requested by the State Health Department to test leachate from a Love Canal trench for dioxin has detected minute quantities of the substance Dr. Robert P. Whalen, State Health Commissioner, said today. State Health Department scientists were working over the weekend to confirm the findings Dr. Whalen said. The sample was taken from a trench being dug in connection with remedial construction work at the Canal to halt the further migration of chemicals. "We selected the Ohio laboratory located at Wright State University because of its prior experience in testing for dioxin and because we wanted to utilize at least two laboratories, including our own facilities, to insure the highest degree of proficiency possible," the Commissioner said.

Dr. Whalen said there is no evidence to indicate that the trace amounts of dioxin found in the leachate pose an immediate health hazard to residents of the area. "We are naturally concerned over finding dioxin but it does not come as a surprise nor does it cause us to change our position or make any further recommendations at this time, particularly, in view of the small amounts found," he said. "However, we will continue to evaluate all of the evidence and now will begin testing additional soil and sump water samples for the presence of dioxin."

The Commissioner said the discovery of dioxin in amounts of between 4 and 17 parts per trillion "confirms our earlier assumption and public expression that we would expect to find it after detecting the presence of trichlorophenol, a substance used widely in the manufacture of herbicides." "Dioxin," he said, "is a contaminant by-product which has occurred in the manufacture of trichlorophenols."

" *Observations and Suggestions for Alterations in Safety Plan with the finding of Dioxin at the Love Canal*" T. Quinn
M. Cuddy
K. Aldous
Office file (5)

DATE: December 14, 1979

SUBJECT: Observations and Suggestions for Alterations in Safety Plan with the finding of Dioxin at the Love Canal.

FROM: Steve U. Lester

TO: Lois Gibbs and Robert Huffaker

It is unclear precisely where the dioxin is, i.e. What is contaminated with Dioxin. Therefore in order to ensure minimum spread of contamination, the following procedures are suggested:

1. All soil dug up from the excavated areas must be covered with plastic or clay to reduce possible spread of contaminated soils by winds over the soil. This practice was abandoned upon order by Dr. Huffaker who evaluated the circumstances at the time and concluded that covering of this soil was no longer necessary. With the finding of Dioxin this situation no longer exists.
2. All trucks coming to and leaving from the site area, as defined by the snow fence, must be monitored each day to ensure that trucks are minimumly exposed to contaminated soil.
3. 97th Street represents a greater area for exposures due to continued movement of trucks from within the snow fence to other areas of the work site (i.e. the loading truck and vacuum trucks carrying leachate to the Calgon Unit). Therefore no clean trucks or cars should be using this street south of Wheatfield.
4. Procedures should be implemented to provide access to the truck wash area for all trucks which may be exposed to contaminated soil upon entry of the site area.
5. All excavated holes or areas which expose contaminated soil to open air must be covered each night or whenever work is not proceeding i.e. Sundays. As with the covering of the excavated soil, this procedure once abandoned must be re-instated and enforced to ensure minimal exposure to contaminated soil.
6. All excavation work which takes soil across the haul road should proceed with plastic sheeting to protect the haul road from dirt falling upon it.
7. All trucks coming and leaving the work site should be directed to use 99th Street to minimize possible exposure throughout the neighborhood.

Circumstances regarding decisions to wash trucks should be evaluated on a daily basis to ensure minimal exposure in the area.

ANSWERS TO QUESTIONS RAISED BY HOMEOWNERS' ASSOCIATION IN MEMORANDUM OF DECEMBER 7, 1978 TO DOCTOR HAUGHIE

- SWALES: 1. Question: Are you confident of the exact location of the swales?

Answer: We are reasonably confident at the present time with regard to the location of historical swales. Our evidence is based on aerial photography, pictures and photographs.

2. Question: Are you going to complete the interview of area residents to locate historically wet areas? If so, will this be completed by the time the health data are entered into the computer?

Answer: Interviewing of area residents to locate historically wet areas has essentially been completed and this data is presently being analyzed. Only objective documentation has been accepted.

3. Question: Does the environmental data indicate that chemicals migrated beyond ring 2?

Answer: Yes, there is some indication. As more data are collected, a more definitive answer should be possible.

4. Question: Do you find any unusual patterns of chemical contamination?

Answer: Yes.

LIVER
FUNCTION
TESTS:

1. Question: At the meeting of November 21, you said that: 1) There was not an abnormal liver disease frequency in the area, but that 2) using "relaxed" standards, abnormal liver values were found in young boys concentrated along swales. May we see data and statistical analysis for these two points?

Answer: No. Further testing of young boys is presently underway which will hopefully more clearly establish the significance of preliminary findings.

BLOOD
TESTS:

1. Question: Have white blood cell counts, red blood cell counts and hemoglobin values been recorded for the blood samples? Could we see the results of these?

Answer: Yes. No. The results of tests on individuals are only being made available to the private physician of that individual.

Miscarriage Data

1. Question: For the miscarriage data previously given to Steve Lester and Bev Paigen, how did you calculate the "expected" frequencies?

Answer: Expected frequencies were calculated based on the distributions indicated in a paper written by Warburton and Frasier. These estimates take into account the potentially confounding factors of maternal age and parity.

2. Question: What are your conclusions concerning the miscarriage rates in the Love Canal area?

Answer: This question is too broad to answer at present. Available information indicates an excess of miscarriages along certain sections of the first ring and that no significant excess in miscarriages is present on other streets. However, we are presently analyzing the possibility that an excess of miscarriages might be present along the swale and other historical wet lands.

3. Question: May we see the data indicating that miscarriages do not occur more frequently along swales?

Answer: All summary data concerning studies on miscarriages and other biological markers will be made available upon completion of analyses.

Future Analysis of Health Effects

1. Question: What plans do you have to define a control group? When do you expect to collect health data on this control population?

Answer: We are presently developing a control group within the Canal area itself. We also expect to develop additional control groups in other areas over the next several months.

2. Question: What questions are being asked in the epidemiological study?

Answer: All epidemiological studies are designed to test specific hypotheses with regard to possible health hazards associated with residing on the Canal.

3. Question: What are the short term and long term goals of the State's epidemiological analysis?

Answer: Both the short- and long-term goals of epidemiological studies have as their central theme an effort to determine whether or not any biological effects are associated with residing on the Canal.

4. Question: Are the swales being considered in the data analysis? If so, how will this be done?

Answer: Swales are being considered in the data analysis and preliminary observations will probably be available by the end of January, 1979.

5. Question: Will you submit your experimental design to outside experts and to our consultants before you analyze the health and environmental data?

Answer: As has always been the case, the study design and results of all epidemiological studies are reviewed by outside experts.

Relocation of Families

The identity of the "expert committee" who evaluated families requesting relocation was kept secret from our consultants.

1. Question: Could you tell us the specific reason why?

Answer: The names of consultants are not made available inasmuch as we sought their expert clinical advice with this assurance.

2. Question: Do these experts have special expertise in the health effects of toxic chemicals?

Answer: All experts have special expertise with regard to specific issues that might be relevant with regard to Love Canal studies.

3. Question: What questions were these experts asked to answer?

Answer: This question is too general to be answered specifically. All relevant issues pertaining to specific studies are discussed with qualified experts who have a particular expertise with regard to the subject matter under consideration.

4. Question: What information were these experts given in addition to the health records?

Answer: All available information is given to the experts in asking them to render opinions (e.g., environmental data, histology slides in certain instances).

ANSWERS TO QUESTIONS ASKED BY LOIS GTBBS AT DECEMBER 11, 1978 MEETING:

1. QUESTION: Since Dioxin is being found in the trench does that mean it has migrated?

ANSWER: It has not been established whether dioxin has migrated beyond the trenches being dug in connection with remedial construction. Further soil testing outside the immediate Canal area for dioxin is underway.

2. QUESTION: What are the health effects of dioxin on the human body?

ANSWER: World literature on the effects of dioxin on the human body is scarce. Attached are papers which should shed light on the subject.

3. QUESTION: Is there an antidote to dioxin?

ANSWER: There is little known about the short- and long-term toxic effects of dioxin on the human body. Thus the question of an available antidote cannot be adequately addressed.

4. QUESTION: Have the soil samples taken several weeks ago been checked for dioxin? If not, will they be?

ANSWER: Soil samples are being collected and analyzed for dioxin but the process is a difficult and long one.

5. QUESTION: Can dioxin be airborne? From the trench and/or surface of the Love Canal?

ANSWER: Airborne dispersal of dioxin resulted from an atmospheric explosion involving between 2 and 11 pounds in Seveso, Italy (see attached paper). Because of its very low vapor pressure it is unlikely that amounts found in the Love Canal trench leachate would become airborne. Furthermore, 90 percent of the dioxin residue on the ground at Seveso dissipated after three weeks. Scientific studies indicate that dioxin is highly susceptible to photo-oxidation.

6. QUESTION: Is dioxin being carried about through the streets on the tires of the trucks working on and at the construction site?

ANSWER: Unknown, but steps taken as a result of the stringent construction safety plan minimize this possibility.

7. QUESTION: Why does the State say that the presence of dioxin is not significant when other credible people say it is?

ANSWER: The State has said that amounts found in the trench leachate was barely detectable (4-17 parts per trillion) and cannot be compared in any way to the Seveso or St. Louis incidents in terms of human exposure. The State has expressed concern over finding dioxin and said it would conduct further tests but did not view its discovery in amounts stated in trench leachate as posing an immediate health hazard. The State has never minimized the danger of dioxin in low concentrations.

8. QUESTION: How long does it take before the effects of dioxin on the human body show up? Or produce death?

ANSWER: Best available answers are contained in world literature which is attached.

9. QUESTION: Trichlorophenol was found on the surface of the Canal fill as it was in the trench. Does that mean that dioxin is on the surface of the Canal as well?

ANSWER: There is no definitive answer to this question. It would depend on the amounts of trichlorophenol found, the extent of contamination during its production and the effects of photo-oxidation on dioxin as previously mentioned.

10. QUESTION: Does dioxin produce genetic effects that may show up in the children or their children?

ANSWER: Best available answers are contained in world literature, some of which is attached.

11. QUESTION: Has the Department tested the filtered leachate for dioxin prior to flushing the treated leachate down the City sewer system?

ANSWER: No.

12. QUESTION: Can the Calgon machine filter out dioxin?

ANSWER: The Calgon water treatment will effectively reduce the trace levels of dioxin by many orders of magnitude.

2-22-79

SOIL DATA	(+)	(-)	N. R.	LD	
93-96	9	15	4	5	33
97th	14	7	17	10	48
canal	1	2	4	0	7
99th	15	10	5	0	30
100th	4	2	0	0	6
101	14	3	1	8	26
102	1	4	1	1	7
103	1	0	0	1	2
North of colvin	1	3	0	2	6
	$\overline{60}$	$\overline{46}$	$\overline{32}$	$\overline{27}$	$\overline{165}$ total

(+) = Positive data

(-) = Negative data

NR = No Results

ld = Less than the level of detection

32 Samples are not in set, so $165-32 = 133$

133 samples are the data base

over all data

Positives $60/133 = 45\%$

Negatives $46/133 = 35\%$

Not Detective $27/133 = 20\%$

LOOKING AT MAIN SWALE DATA

A. Main swale has 18 samples

(+) 12

(-) 1

(+) $12/16 = 75\%$

LD 3

NR 2

B. All swales has 28 samples

(+) 18

(-) 1

(+) $18/26 = 70\%$

LD 7

NR 2

Generalizations (1) all samples taken east of canal (99th Streetside) on main swale are positive with 1 exception.

(2) trends indicate that positive values follow the swales

(3) west side of canal (Griffin Manor) shows much less contamination away from the canal, even along the swales

(4) of the samples found along the main swale 12/18 are (+) with one exception the remaining 6 are either not completed (2) distance from the canal(1) or at the northern edge of the canal (2)

Remember, this data means little by itself in terms of trends or patterns. Not enough data is available to draw any conclusions or make any recommendations. However, upon gather the incomplete data, further analysis of the "historically wet" areas and addition of the newest soil tests, maybe certain trends or patterns can be estimated. The extent of the migration of the chemicals found in the canal is a question that has yet to be answered, and this information is helping.

The same qualification mentioned above also hold for the sump data. In fact, it is possible that the sump data maybe less representative of contamination. Sumps work during time of flooding due to rains. This leaves open the possibility that contaminants from anywhere maybe carried along with the overflow from rain fall and settle in homes as a transient event. (ie it only occurs during the rainfall) If this is true, it does not mean that the homes in which BHC (hexachlorocyclohexane is it's real name) are found represent continuous migration of chemicals. Some homes may have chemicals washed in during a storm while it's neighbors do not. This is just one factor, there are others which might alter the "expected" pattern of contamination.

(street))	SUMP DATA				
	(+)	(-)	LD	NR	TOTAL
93-96	0	8	0	0	8
97 th	3	27	0	1	31
canal	4	0	0	1	5
99th	3	1	1	3	7
100	0	3	0	2	5
101 st	2	6	0	4	12
102nd	4	5	0	4	13
103rd	2	1	0	2	5
North of Colvin	2	9	0	5	16
TOTAL	20	60	1	22	102

102 samples-22 = 80 samples (4 in canal)

excluding canal positives (all four)

(+) 16/76 = 21%

(-) 60/76 = 78%

On the swale:

A. main swale 8 samples 5 (+) 2 (-) 1 NR

B. all other swales 16 samples 1 (+) 10 (-) 5 NR

C. together 24 samples 6 (+) 12 (-) 6 NR

Generalization- main swale appears contaminated - or as an avenue for water/leachate movement as reflected in a paragraph listed above.

STATE OF NEW YORK : DEPARTMENT OF HEALTH

IN THE MATTER :
 OF :
 THE LOVE CANAL CHEMICAL WASTE LANDFILL SITE :
 LOCATED IN THE CITY OF NIAGARA FALLS, :
 NIAGARA COUNTY :

SUPPLEMENTAL ORDER

Heretofore, by Order dated August 2, 1978, ROBERT P. WHALEN, M.D. my predecessor as Commissioner of Health of the State of New York, declared the existence of an emergency, pursuant to Public Health Law § 1388, because of a great and imminent peril to the health of the general public residing at or near the Love Canal Chemical Landfill site in the "La Salle" section of the City of Niagara Falls, New York, resulting from exposure to toxic substances emanating from such site and by said Order directed that certain corrective action be taken including, among other things, that the City of Niagara Falls and the Niagara County Board of Health take all appropriate steps to (1) implement the Conestoga-Rovers Report, entitled "Phase I- Pollution Abatement Plan - Upper Groundwater Regime," subject, however to an approval of a detailed safety plan for workers and persons living near the site, including monitoring and evacuation contingencies, which was required to be in place before the beginning of any

corrective construction work; and to (2) undertake additional studies in cooperation with staff of the State Department of Health and the State Department of Environmental Conservation to (a) delineate chronic diseases afflicting all residents who live adjacent to the Love Canal site with special emphasis on the frequency of spontaneous abortions, birth defects and other pathologies, including cancer; (b) delineate the full limits or boundaries of the Love Canal with respect to possible toxic effects; (c) determine by continued air, water and ground sampling the extent of lateral migration of toxic chemicals from the site to the surrounding neighborhood; and (d) identify which groundwater aquifers, if any, have been contaminated by leachate; such measures directed to be taken were, of course, only a part of the massive total effort undertaken by both State and Federal officials to assist affected families and residents of the area in dealing with their evolving health, environmental and social problems, as more particularly exemplified by a grant of disaster assistance monies by the Federal Disaster Assistance Administration upon the application of Governor Carey on August 2, 1978, with the support of President Carter, Senators Javits and Moynihan and Congressman La Falce following the issuance of the aforesaid Order; by the appointment on August 2, 1978 by Governor Carey of an interagency Love Canal Task Force headed by State Transportation Commissioner Hennessy; by the several public and group meetings held by State officials with residents of the Love Canal area, including several visits by both Governor Carey and variously,

by Commissioner Whalen and by me during the months of August, September and December; by the appropriation of more than \$18,000,000 in the Supplemental Budget by the New York State Legislature to deal with the problems arising from the Love Canal Chemical Waste Landfill site, including relocation where deemed necessary; by additional grants for similar purposes forthcoming from the Environmental Protection Administration; and it appearing, further, that the State Department of Health has obtained invaluable additional epidemiological and environmental information through its institution of a comprehensive medical survey and testing program to evaluate the health of residents of the Love Canal area by the establishment of blood clinics and house-to-house surveys, where necessary, resulting in the taking, completion and review of more than 4,000 medical questionnaires and blood samples; through the creation of a nationwide hotline to search out former residents of the Love Canal area to determine what, if any, illnesses or conditions they might have developed in connection with their exposure to toxic chemicals emanating from the Love Canal Chemical Waste Landfill site, with the result that more than 400 phone calls from former residents living in 31 states were received within a few short weeks of the hotline's creation; through the taking of air, sump water and soil samples to determine the presence of chemicals in the homes and soils of the Love Canal area; and through a request made of staff of the Cornell University NASA-sponsored Remote Sensing Program

to interpret extensive aerial and infra-red photographs of the area to obtain information on the hydrogeology of the Love Canal Landfill site and an assessment of potential sites of leachate contamination, including locating any existing or formerly existing ponds, swamps, drainageway or stream bed sites; and further, upon a review and due consideration of discussions had and reports submitted at those certain meetings convened, respectively, on November 10, 1978 at La Guardia Field, New York, on January 16, 1979 at the Empire State Plaza Tower Building, Albany, New York, and on February 7, 1979 at La Guardia Field, New York, separately and variously attended by several of the nation's leading experts in pediatrics, epidemiology, toxicology and various other scientific and medical fields, including clinical experts involved in the treatment and pathology of liver disease, which said meetings were convened for the purpose of obtaining expert advice relating to the health hazards associated with the Love Canal Chemical Landfill site and surrounding areas;

NOW, THEREFORE, based upon the foregoing and, more particularly, upon the additional epidemiological and environmental information obtained since the issuance of the Order dated August 2, 1978, and the right and power specifically reserved in said Order to completely reexamine and reevaluate any of the health hazards that might exist at the site if new evidence of hazards of a serious nature previously unrecognized should be forthcoming at any time, and to amend such Order or issue additional or supplemental Orders and public health advisories, where necessary, I, DAVID AXELROD, M.D. as Commissioner of Health of

the State of New York, do hereby reaffirm said Order and make the following Supplemental Findings of Fact, Conclusions, Recommendations, Orders and Directions:

FINDINGS OF FACT

1. Following the issuance of the August 2, 1978 Order in this matter, all residents residing in homes on 97th Street near the Love Canal site were relocated as well as most residents on 99th Street and on Colvin Avenue between 97th and 99th Streets.

2. To date, the New York State Department of Health, Division of Laboratories and Research, has carried out analyses of 656 air samples, 143 sump samples and 138 soil samples.

3. In response to a request from the Interagency Task Force on Hazardous Waste, the Hooker Chemical Company submitted a declaration of estimated disposition of chemical wastes in Niagara County. Portions of the declaration which may be pertinent to the Love Canal site are attached hereto as Appendix A.

4. The City of Niagara Falls hired the Newco Chemical Company as its contractor to implement the Conestoga-Rovers Report entitled "Phase I - Pollution Abatement Plan - Upper Groundwater Regime," as modified after consultation with appropriate Federal and State Officials.

5. Construction to implement the Conestoga-Rovers Report, as modified, was begun on or about October 10, 1978, by Newco Chemical Company after a detailed safety and emergency evacuation approved by the State Commissioner of Health was put into place.

6. Remedial construction in the southern third of the Love Canal utilizing a tile drain system designed by Conestoga-Rovers, and as modified by the New York State Department of Environmental Conservation has begun the process of lowering the water level within the canal.

7. About 20,000 gallons of leachate are collected, treated by an on-site treatment plant, and released into the sanitary sewers each day, the partial chemical composition of which is shown on Appendix B.

8. The tile drain system is controlling lateral migration not only by lowering the water level in the canal but also by intercepting chemical migration from the canal.

9. Installation of a clay cap to control surface water infiltration is scheduled for completion in the spring.

10. Preliminary specifications for remedial construction in the middle third of the Love Canal have been submitted for review with construction scheduled to begin this spring.

11. Three deep wells have been sunk in the Love Canal area to obtain chemical data relating to the deep aquifers.

12. During the trenching for the tile drain system, an east-west sand lense present on both sides of the canal was found.

13. Leachate collected from a hole dug in said lense, in what was the backyard of 775 97th Street, has shown the presence of trace amounts of 2, 3, 7, 8-tetrachlorodibenzodioxin as well as the presence of at least 200 different organic compounds.

14. Such extremely permeable sandy soil is characterized by qualitatively obvious chemical contamination both to the east and to the west.

15. Borings in the sand lense to the west of the Love Canal between houses at 771 and 775 97th Street revealed that qualitatively obvious chemical contamination had reached the eastern edge of 97th Street.

16. Holes dug on the westerly side of 97th Street did not indicate obvious chemical contamination.

17. Chemical tests are now underway to quantitate the level of chemical contamination in such soils.

18. Examination of a series of aerial photographs of the Love Canal taken during the period 1938 - 1953 indicates that the process of filling the Canal was carried out by damming small sections of the canal starting from the south and from the north.

19. Displaced water in the dammed areas apparently flowed along existing surface drainage pathways to locations outside the Canal proper.

20. New York State Department of Transportation topographic maps made in 1956 show the existence of a 20-foot hill in the southern portion of the Love Canal and two slightly smaller hills in the northern portion of the Love Canal.

21. Examination of aerial photographs made in the 1960's shows the absence of such hills.

22. Utility conduits underlie both Read Avenue and Wheatfield Avenue where they traverse the Love Canal and provide a possible channel for migration of chemical contamination.

23. Toxic chemicals have been found in the storm sewers draining to the south of the Love Canal and into the 102nd Street storm sewer which drains into the Niagara River.

24. Toxic chemicals have also been detected in sewers draining to the north into Black Creek.

25. During times of high water the 102nd Street storm sewer backs up and floods portions of 102nd Street and Frontier Avenue.

26. An area between 96th Street and 97th Street directly north of Read Avenue is also subject to flooding from backed up storm sewers draining north to Black Creek.

27. Directly north of Wheatfield Avenue between 100th Street and 101st Street is an area approximately 12 lots in extent which was a topographically low spot that was filled with various waste materials, mainly asphalt shingle clippings, before houses were constructed on the site.

28. The area presently known as Griffen Manor formerly was a low lying swampy area requiring filling before dwelling construction.

29. Blood samples of Love Canal area residents show a rate of abnormal combinations of liver tests which variously exceed an expected rate of 2.7% based on a survey of laboratory records for 26,000 persons tested at a Rochester hospital.

30. Liver tests relating to residents of the 1st and 2nd rings, to wit, those residing, respectively, in homes directly adjacent to the Love Canal and those residing in homes located across the street therefrom on the average reverted to normal ranges after relocation from the Canal site area.

31. Repeat blood samples of residents of the 1st and 2nd rings show that initial normal liver test levels on the average remained normal after relocation from the Canal site area.

32. Children residing in homes in an area bounded by 100th Street, 103rd Street, Frontier Avenue and Colvin Avenue whose initial liver tests were in some instances abnormal, upon repeat examination had liver test results in normal ranges.

33. Spontaneous abortion or miscarriage rates are higher than expected among female residents of homes located in an area bounded by 97th Street, 103rd Street, Frontier Avenue, and Colvin Avenue and built on historically "wet" properties (that is, homes built on former drainageways, stream bed sites, swales, ponds or historical wetlands), adjusted for age and parity, compared with actual rates occurring among female residents of homes in the same neighborhood built on historically "dry" properties.

34. In addition, infants born to female residents living on historically "wet" properties had a higher rate of occurrence of congenital defects as compared with children born of female residents of historically "dry" properties, with such congenital defects among the former group constituting about 13% of live births compared with a rate of about 5% among the latter group.

35. In addition, the percentage of infants of low birth weight born to mothers living on historically "wet" properties was significantly different from that of infants born in New York State (excluding New York City); in contrast there was no significant difference noted between infants born to mothers living on historically "dry" properties and infants born in New York State (excluding New York City).

36. Chemical studies of air samples collected in the basements of homes in the Love Canal area, to date, generally show no consistent correlation between concentrations of chemicals identified and the occurrence of birth defects, liver test abnormalities and spontaneous abortions.

37. Chemical studies of soil samples collected from various sites in the Love Canal area and samples of water collected from basement sumps show the presence of various isomers of hexachlorocyclohexane.

CONCLUSIONS

1. Review of the approximately 1000 environmental samples corroborates the August 2, 1978 conclusion that there is substantial chemical contamination in houses in ring I and evidence of some chemical contamination of basement air, soil, sump water, and storm sewer waters collected from homes and properties beyond the 1st ring of homes of the Love Canal site.

2. Examination of the declaration of estimated disposition of chemical wastes submitted by the Hooker Chemical Company indicates the deposition in the Love Canal of many hazardous and toxic substances in large amounts.

3. Remedial construction when completed should provide an effective means of controlling lateral migration of toxic chemicals from the Love Canal site.

4. If downward migration of toxic chemicals into the deep aquifer is occurring the presently proposed remedial construction will not control this vertical migration.

5. Special soil conditions (i.e. sand lenses), surface drainage of displaced water contaminated with toxic chemicals, relocation of contaminated soil from the Love Canal, manmade paths of high permeability and transport and flooding of contamination storm sewer waters represent actual and potential mechanisms for movement of Love Canal chemicals to the surrounding area.

6. Liver test abnormalities alone, in the absence of other clinical signs and symptoms of liver disease, are not diagnostic of liver disease per se but may reflect varying levels of exposure to chemicals in the environment over relatively short periods of time.

7. The consistency of observations relative to the outcomes of pregnancies of residents of historically "wet" properties when compared to pregnancy outcomes of (a) residents of historically dry properties, (b) residents of New York State excluding New York City, and (c) subjects studied and reported by Warburton and Freser, as reported in "Human Genetics," Volume 16, No. 1, 1964, together greatly strengthen the hypothesis of past adverse health effects resulting from residence in such homes likely contaminated by chemicals.

8. That there is no generally consistent correlation, to date, between concentrations of chemicals identified in air, soil and sump water samples and the occurrence of birth defects, spontaneous abortions and liver test abnormalities is not surprising inasmuch as the occurrence of birth defects and spontaneous abortions extends over many years, the availability of environmental samples is limited to samples collected at a single point in time within recent months and the extent of chemical analyses of environmental samples is limited to nine chemicals.

9. While remedial construction is designed to contain any future lateral migration of chemicals, the mass of previously transported toxic chemicals outside the boundaries of the remedial construction is not known.

10. An estimate of the mass of toxic chemicals, and their location is required to evaluate the need for additional remedial construction outside the immediate vicinity of the Love Canal.

11. Presence of chemicals to the east and west of the Love Canal may be due to separate and discrete dumping of contaminated wastes and/or transport through natural or manmade hydrogeologic pathways in the area.

12. A review of all the available evidence respecting the Love Canal site shows that the health emergency declared by the August 2, 1978 Order should be continued.

13. Remedial construction in the middle and upper third of the Love Canal, subject to approval by the New York State Department of Environmental Conservation and the Environmental Protection Agency of preliminary specifications submitted for review, should be undertaken.

14. While a great deal of environmental and epidemiological information has been obtained since the August 2, 1978 Order, further studies must continue to obtain additional information to delineate the full limits or boundaries of the Love Canal with respect to possible toxic effects; to determine by continued sampling, the extent to which toxic chemicals have migrated from the site to the surrounding neighborhood; to identify which groundwater aquifers have been contaminated by leachate, if any; and to identify adverse health effects and the presence of toxic chemicals and their masses located outside the Love Canal in the area bounded by 93rd Street on the west, 103rd Street, on the east, Frontier Avenue on the south, and Black Creek on the north.

RECOMMENDATIONS

1. Based on the best available data, that pregnant women and children under two years of age presently residing in homes between 97th and 103rd Streets bounded by Colvin Boulevard and Frontier Avenue and in those homes which abut Colvin Boulevard on the north between 97th Street on the west and 100th Street on the east, temporarily move from such homes.

2. The Niagara County Medical Society and private physicians and hospitals in Niagara County should continue their cooperation with staff of the State Health Department and the Niagara County Health Department in studies undertaken to identify former residents of the Love Canal area exhibiting chronic or adverse health effects.

3. That the Commissioner of the Department of Environmental Conservation continue on-site supervision of the on-going remedial work at the Love Canal Chemical Landfill site.

4. That appropriate public officials diligently pursue and explore all avenues or sources of potential funding to assist those affected by toxic hazards emanating from the Love Canal Chemical Landfill site and to develop procedures for abating confirmed exposure to chemicals in the environment.

5. That studies undertaken to estimate the mass and location of toxic chemicals in the Love Canal area be continued.

6. That geological and engineering studies be undertaken to assess the feasibility of corrective action.

ORDERS AND DIRECTIONS

I DO HEREBY ORDER AND DIRECT:

1. That the emergency declared by the August 2, 1978 Order issued by former Commissioner Whalen, shall continue in full force and effect.

2. That the on-going remedial corrective work be continued and the the tile drainage system installed to implement the Conestoga Rovers Report entitled "Phase I - Pollution Abatement Plan - Upper Groundwater Regime" be extended to the central and northern sections of the Love Canal site, subject to approval of the New York State Department of Environmental Conservation.

3. That the Niagara County Department of Health and the City of Niagara Falls in collaboration with the staff of the Department of Health and Department of Environmental Conservation continue studies to:

- (a) delineate the full limits or boundaries of the Love Canal with respect to possible toxic effects;
- (b) determine by continued sampling the extent that toxic chemicals have migrated from the Love Canal site to the surrounding neighborhood;
- (c) identify which groundwater aquifers may have been contaminated by toxic chemicals; and
- (d) to identify adverse health effects and the presence of toxic chemicals and their masses located outside the Love Canal in the area bounded by 93rd Street on the west, 103rd Street on the east, Frontier Avenue on the south, and Black Creek on the north.

4. This Order supplements the previous Order issued on August 2, 1978 and periodic reevaluation of the situation at the Love Canal shall be made with further additional orders and public health advisories to be issued by me as I deem necessary.

DAVID AXELROD, M.D.
Commissioner of Health

DATED: February 1979

APPENDIX A

Section IV

2. Products (1930-1975)

Over 250 chemicals, many with numerous variations, were produced between 1930 and 1975. We have therefore grouped the products into 28 categories which are the most meaningful for determining the types of hazardous* materials produced.

These categories do not include landfilled wastes which are considered to be nonhazardous.* Specifically, the excluded wastes were:

Fly Ash
General Plant Refuse
Gypsum
Slag
Construction debris
Cell Components
Brine Sludge (except from mercury abatement)

Some hazardous*wastes produced were by necessity classified into a miscellaneous category. This category was developed in order to account for such items as:

1. Off-grade material from processes not normally producing wastes.
2. Materials from processes which never became commercial in size (pilot plant and semi-commercial quantities, however, are included in the figures for those processes which became commercial).
3. Operating materials such as transformer oils and cleaning solvents.
4. Byproducts, if any, from defense projects during WW II (no records exist).

It is estimated that the 27 major categories represent over 90% of the total amount of hazardous*wastes generated.

The waste categories developed and the approximate dates are:

1. Benzylchlorides - includes benzal chloride, benzyl alcohol, benzyl thiocyanate (1930-1967).
2. Thiodan (Endosulfan) (1958-1975).
3. Sodium sulfides/sulphydrates (1939-1975).
4. Hexachlorocyclopentadiene (C-56) (1949-1975).
5. Hexachlorocyclohexane (Lindane/BHC/HG1) (1946-1975).
6. Chlorobenzenes (1930-1974).

APPENDIX A

7. Benzoyl chlorides (1930-1975) and benzotrichlorides (1930-1967).
8. Benzotrichlorides (1968-1975).
9. Liquid disulfides (LDS/LDSN/BDS) and chlorotoluenes (1930-1967).
10. HCl purification and chlorotoluenes (1967-1975).
11. Metal chlorides (1930-1967)
12. Benzotrifluorides - organic residues (1960-1975).
13. Calcium fluorides (from benzotrifluorides) (1973-1975)
14. Benzotrifluoride derivatives (1965-1975)-
15. Dodecyl (Lauryl, Lorol) mercaptans (DDM), chlorides and misc. organic sulfur compounds (1940-1975).
16. Trichlorophenol (TCP) (1949-1972).
17. Thionyl chloride and misc. sulfur/chlorine compounds (1930-1975)
18. HET acid, anhydride and HETRONS (1953-1975)
19. Misc. chlorination - includes waxes, oils, naphthalenes, aniline.
20. Misc. acid chlorides other than benzoyl - includes acetyl, caprylyl, butyryl, nitro benzoyls
21. Dechlorane (Mirex)
22. C-56 Derivatives - includes Dechlorane Plus, Dechlorane 602, Dechlorane 604, Pentac.
23. Phenol tars (from Durez)
24. Organic phosphorus compounds - includes phosphites, phosphonates, acid phosphates, thiophosphates.
25. Phosphorus and inorganic phosphorus derivatives other than sodium hypophosphite - includes chlorides, sulfides
26. Sodium hypophosphite
27. Brine sludge - mercury abatement process
28. Misc. unidentified materials.

*The word "hazardous" as used throughout this report should be read as "potentially hazardous" and is not intended to signify any actual or observed hazard and is used without reference to any laws or regulations wherein that term is defined.

APPENDIX A

4. Once the quantity of waste was derived for a given year, it was then necessary to allocate this waste to specific disposal sites. Again, a great deal of judgment was required. This judgment was based upon the type of residue, the time it was generated, which disposal sites were possibly in use, and an assumed philosophy of disposal operations for the period under study.

The net result, as explained earlier, is that the results of the calculations should not be construed to have a high degree of accuracy. They should only be interpreted as our best efforts to describe what might have occurred in the distant past.

In responding to this section a number of symbols were used which require further explanation. These are:

- L liquid waste under normal conditions
- S solid waste under normal conditions
- L,S sludge or a combination of liquid and solid wastes
- B bulk shipment of residues
- D drum shipment of residues
- C nonmetal containers of residue
- < "less than", used whenever the quantity was estimated to be less than 100 tons, but where there was some degree of certainty that a specific residue was at that site

Also note that the number following the name of the type of waste, refers to the class of waste listed in Section IV-2.

APPENDIX A

Section IV-5

- a. Name: Love Canal
- b. Location: 97th - 99th Streets, Niagara Falls
- c. Owner: Hooker - until 1953
- d. Time Used: Approximately 1942 to 1952

<u>Type of Waste Category</u>	<u>Physical State</u>	<u>Total Estimated Quantity - Tons</u>	<u>Container</u>
Misc. Acid Chlorides (20)	L, S	400	D
Thionyl Chloride (17)	L, S	500	D
Misc. Chlorinations (19)	L, S	1,000	D
DCM (15)	L, S	2,400	D
TCP (16)	L, S	200	D
Benzoyl Chloride (7)	L, S	800	D
Metal Chlorides (11)	S	400	D
LDS/MCT (9)	L	700	D
BHC (5)	S	6,900	D, C
Chlorobenzenes (6)	L, S	2,000	D, C
Benzyl Chloride (1)	S	2,400	D
Sulfides (3)	S	2,100	D
Misc. 10% of above		<u>2,000</u>	
TOTAL		21,800	

- f. Wastes were land disposed
- g. No records exist as to waste haulers used, other than Hooker
- h. Other than the City of Niagara Falls, no Hooker records exist as to the use of this site by others

Note that the above tabulation is based on a very limited amount of documented information. Many estimates, as outlined in other sections of this report, were required in order to derive the information listed.

APPENDIX A

APPENDIX BLove Canal Confirmed Compounds:

Methane-
dichloro
trichloro
tetrachloro

Ethane-
trichloro
tetrachloro

Ethylene-
trichloro
tetrachloro

Benzene

Toluene

Benzene-
chloro
dichloro
trichloro
tetrachloro
hexachloro

Toluene-
chloro
dichloro
trichloro

Napthalene-
chloro
dichloro

Xylenes

Alpha benzene hexachloride

Beta benzene hexachloride

Delta benzene hexachloride

Lindane

Phenol-
dichloro
trichloro
ethyl

APPENDIX B

Decane

Nonane

Eicosane

Methyl naphthalene

Dimethyl naphthalene

Hexamethyl cyclotetra siloxane

Benzaldehyde-
chloro
dichloro

2,3,7, 7, tetrachlorodibenzodioxin (TCDD)

Diisobutylphthalate

Anthracene

Phenanthrene

APPENDIX B

COMMENTS ON THE LOVE CANAL POLLUTION ABATEMENT PLAN

by Charles H.V. Ebert

The following observations are made to possibly point out some inherent weaknesses in the proposed pollution abatement plan with particular reference to horizontal leachate migration and soil drainage. These comments are offered to any persons who are interested in making the abatement plan as realistic and effective as possible under the circumstances.

The abatement plan, with the suggested modifications, can be divided into three major components: (1) containment, (2) removal of toxic materials, and (3) continued monitoring.

A. Containment

I am of the opinion that the overall plans for preventing additional toxic materials from spreading from the Love Canal into surrounding areas probably is the best under the existing circumstances.

B. Removal of Toxic Materials

The removal of toxic materials can be divided into two major problems: (a) the removal of both liquid and solid materials from the Love Canal itself, and (b) the extraction of polluted soil water and ground water from the area beyond the canal borders. While the plans for removal and/or containment of toxic waste from the canal itself appear to be realistically perceived, I am of the opinion that the second aspect, i.e. the leaching of soils beyond the canal border, is more questionable and should be carefully reviewed.

The following points are made to stimulate such a review and to suggest appropriate modifications:

1. A thorough surface and subsurface survey, preferably to bedrock, should be made at increasing distances and in all directions from the canal to

determine, as quickly as possible, the geographical extent of the toxic diffusion. This survey should not be restricted to superficial soil tests but must include water sampling from the water table. Care must be taken to identify perched water tables [at times produced by underlying clay strata] and to distinguish them from the permanently saturated soil and/or rock zone.

2. Before installing the drainage pipes a careful soil texture analysis must be made in order to determine (a) soil permeability and capillary conductivity, and (b) the depth and spacing of drainage pipes since soil characteristics largely dictate the depth, length, and spacing of both pipes or ditches. For example, an extra 3 or 4-foot depth that terminates in layers of lower permeability than those above lowers the effectiveness of such installations.
3. A major problem in unsaturated soil systems is the fact that capillary water will not, or insignificantly so, move from fine-textured soils into coarser media. This is true for vertical capillary conductivity where the height of capillary rise is mostly determined by pore size. The smaller the pore size [as in the silty clay loam bordering the canal] the greater the capillary rise because of the greater tension [negative pressure] in such soil. However, water under high tension, in unsaturated soils, will not easily be drawn out of such soil. These two relationships are expressed in the a) basic capillary rise equation, and b) in the capillary pull equation:

a) $h = 2T/rdg$

b) $p = 2T/r$

h = height of rise in cm

r = radius of capillary pore

T = surface tension

d = density of soil solution in grams/ cm³

g = acceleration constant

In other words, the smaller the radius of the capillary system the greater a) capillary rise and b) the force that is needed to remove [pull] the water from the soil pore.

If a drainage pipe is installed in a fine-textured soil only a specific amount of water will drain out. The amount declines with declining texture size, i.e. with smaller pore space and increasing tension. Some clay soils actually have a drainage capacity of zero.

Once drainage sets in, i.e. the drying process begins, water tends to be held back in the pores until the capillary potential, or tension outside this soil, exceeds the tension of the narrowest parts of the pore passage since water will only move from zones of low tension to zones of high tension.

Since soil pore tension declines sharply as a soil becomes saturated with water, and all water-air interfaces are removed, it is recommended that water will be introduced into the border zone of the polluted area to leach toxic materials both out of the ground water zone and the soils. To avoid the spreading of toxic materials beyond the point of water introduction, i.e. into non-polluted soil, a second drainage interceptor system should be installed along the margin.

COMMENTS ON THE LOVE CANAL POLLUTION ABATEMENT PLAN (No. 2)

by Charles H. V. Ebert

The first set of comments were submitted in September. Since then the actual work on the Abatement Plan has started. Additional information items became available, such as aerial photographs, infrared photographs, field data, and anecdotal information.

Of particular interest was the identification of narrow drainage swales, mostly located to the east and southeast of the Canal. These swales, now filled in or obscured by construction, unfortunately were first identified, although not by this writer, as "streams", as published prematurely in the Buffalo Evening News of October 18, 1978. Moreover, it was implied that "canal-related illnesses" correlated with the location of these "streams." While such a correlation is potentially possible neither the exact location of the swales had been positively ascertained, nor had there been any positive identification of toxic materials in such swales.

The following set of comments is to offer my own opinion about the location of these swales and the implications thereof. Furthermore, additional observations will be presented concerning other points, such as the nature of the subsoil properties, aspects of the clay cap now being installed, the main drainage pipe system, and some thoughts concerning future work in the remaining sections of the Canal.

A. The Drainage Swales

The soils in the Love Canal Region are very complex and are a mixture of lacustrine, glacial outwash, and alluvial materials. Thus it is to be expected that vertical and lateral changes are numerous and often unpredictable.

Throughout the area, as clearly indicated on aerial photographs in the late 1930's, when most of the Love Canal Region was still rural, one recognizes linear and dendritic sub-surface drainage patterns marked by darker colors. The darker shades are the result of higher soil water content and the accumulation of organic materials. Some of these drainage arteries took on the form of more-persistent swales which, in contrast to streams, do not necessarily show a consistent flow direction and may even be dry during parts of the year.

The swales are of particular significance to the Canal Problem because they could, potentially, represent narrow areas in which toxic material could migrate both faster and further from the Canal than in adjoining areas. Since these swales have been filled in over the past decades, as the area became built up, it was quite difficult to pinpoint their specific location. This investigator attempted to locate two of the more pronounced swales by using a) an aerial black and white photograph taken in 1938, (b) infrared photographs taken this year in connection with the preliminary investigation of the Canal Problem, (c) independent field investigations on site, and (d) anecdotal data from residents in the area. As a result of these efforts it is the opinion of this writer that the two major swales, originally cutting across the site of the Canal, are approximately located as indicated on the attached map. Whether or not Swale A originally linked up with Black Creek is not certain, but is of no particular significance at this time.

The presence of these swales, particularly on the eastern side of the Canal, could be critical in the extent of diffusion of toxic materials from the Love Canal. The following aspects should be carefully considered:

- (1) Even before they were filled up the swales represented natural drainageways, i.e. low points, attracting runoff from all higher sections.

(2) The bottom of the swales allowed water, depending on the water level in the Canal, to move either into or out of the Canal.

(3) After the swales had been filled in, water would still tend to collect, and to move, more effectively in the former swale beds. The reason for this is that secondary fill material usually is less compacted and cemented than the original soil material on either side. Furthermore, the heterogeneous nature of the fill material may result in open spaces and cracks. This is particularly true of fill which contains garbage items (glass, pottery, bricks, plastics, cans, etc.) which degrade only very slowly or not at all. Consequently both air and water may migrate quite readily in such fill.

(4) Since the toxic materials of the Love Canal were raised, as a result of hydraulic pressure in the Canal itself, as it filled up with surface runoff and seepage, it can be stipulated that such materials, if they did this at all, diffused more readily, and further, within the swales than in the low-permeability silty clay loam soils underneath. For the above stated reasons it is recommended that:

(a) Test wells are to be drilled across suspected swale areas to pinpoint their exact location, to examine the nature of the fill, and to test the soil and water for the possible presence of toxic materials.

(b) If the swales, indeed, contain significant toxic accumulations, one should consider placing a drainage pipe into the swales to effectively connect them to the main pipe drainage system now being constructed parallel to the Canal.

(c) A study should be made whether the swales intersect utility ditches (gas lines, cable channel, storm sewers, etc.) which would make for further diffusion of toxic materials.

B. Subsoil Characteristics

The subsoil properties around the immediate Canal area are presently being investigated by Donal Owens, soil scientist and head of Earth Dimensions, a private firm. These investigations include drillings along the sections slated for the installation of the drainage pipe system parallel to the Canal.

It is not surprising that the clayey subsoil, containing Montmorillonite and Illite clays, has a tendency to form dehydration cracks which tend to impart a polygonal structure to some of the soil sections. Since the soil properties apparently vary considerably over short distances, due to the heterogeneous nature of the parent materials and depositional processes, the extent of such dehydration cracks cannot be accurately estimated. However, close attention should be paid to them, particularly when they indicate (a) coatings by substances not indigenous to the soil, and (b) when they intersect utility channels of the nature indicated above.

These dehydration cracks may lead to an erratic pattern, both as to direction and distance of diffusion of subsoil water and potentially that of toxic materials.

C. The Clay Cap

The clay cover, primarily designed to form an impervious cover over the Canal surface, should be carefully monitored since its presence means an addition to the entire system. Main items to be monitored must include:

(1) The extent to which the clay, presently deposited in masses of multi-sized clods, can be compacted to eliminate air spaces through which both air and water can pass.

(2) The extent of natural settling within the mass of the clay cap which may indicate its ability to maintain its designed shape and dimensions.

(3) Erosion along its sides which may deposit thin layers of eroded materials over the adjoining areas. This may extend the runoff beyond the location of the main drainage pipes.

(4) The extent to which the entire mass of clay may depress the Canal surface and thus exert pressure on the system. If the weight appears to be excessive it may be necessary to reduce the amount of clay when the central and northern sections will be capped.

D. The Main Pipe Drainage System

According to the Abatement Plan the Canal will be flanked by drainage pipes running parallel to the Canal and under the adjoining backyards of the evacuated houses. Some of my comments in the first report (9/28/78) addressed themselves to the effectiveness of this system and to some of the potential problems with it. These comments are not repeated here; however, the following additional suggestions are being made:

(1) It is strongly recommended, if feasible from a technical point of view, that these main pipes are installed before the completion of the clay caps. This should increase the system's ability to contain liquids which may be moving out of the Canal proper due to pressure exerted by the clay cover.

(2) Since the subsoil does contain a considerable amount of clay it is possible that the infiltration holes of the pipes (perforations), and possibly the pipes themselves, could become clogged which will sharply reduce their effectiveness. This should be monitored at some control points which should be designed in such a way as to easily reopen for sporadic inspection.

(3) If at all possible, i.e. if the drainage gradient permits this, the pipes should be placed on top of the densest clay layer so that they can effectively intersect the perched water table.

E. Central and Northern Sections

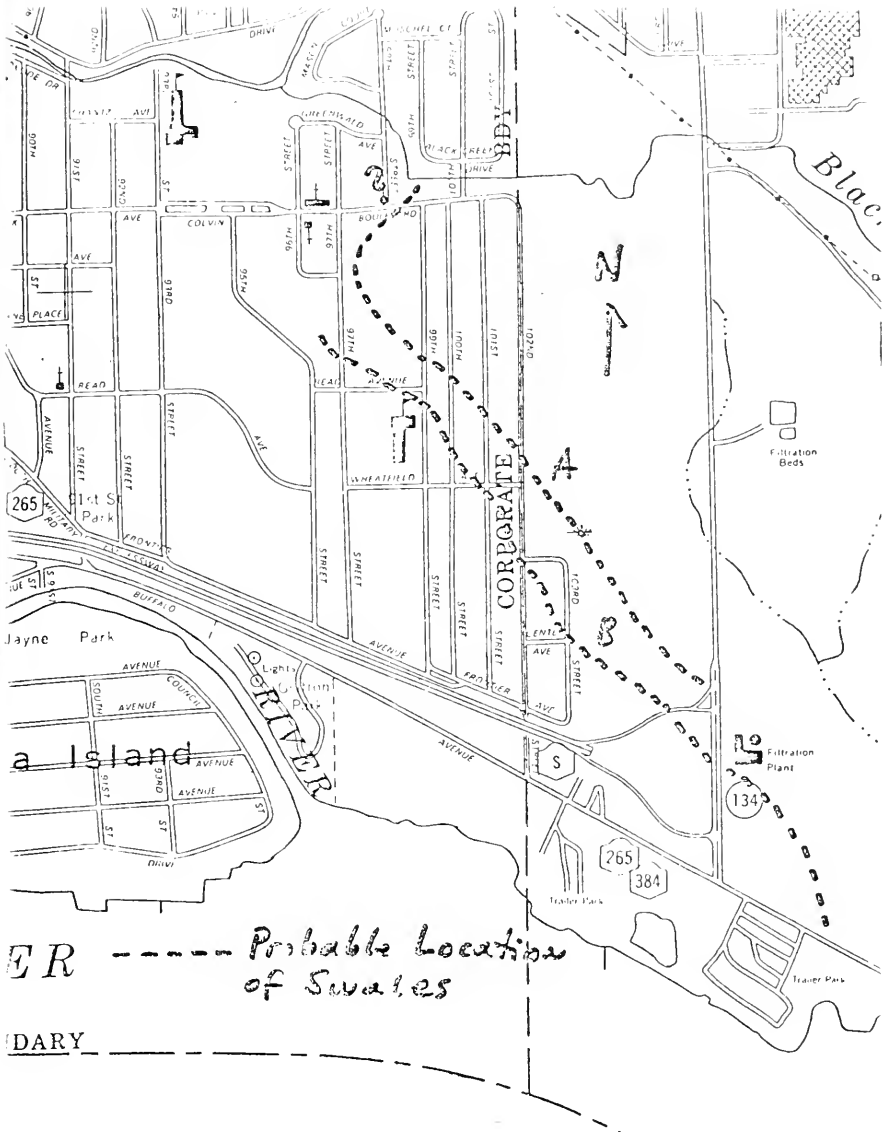
A general, though urgent, suggestion is to evaluate thoroughly the procedures and experiences in connection with the work done, or in progress, in the southern section of the Canal. In addition the following ideas are presented for consideration:

(1) As indicated previously, all major drainage pipes should be installed before capping loads are placed on the remaining sections.

(2) It may be possible, especially for the central section, to work with a sharply reduced clay capping load, or to leave it out altogether to allow natural leaching and drainage processes to drive toxic materials into the drainage pipe system. Whether or not this should be considered depends, in part, on what kind of materials are contained in the central section. In any way, this aspect will have to be discussed further and carefully evaluated since there may be highly undesirable aspects connected with it.

(3) The storm sewers, and other potential drainage ways, at the northern end of the Canal, and to the north-end sides of it, should be monitored now and in the future. It is potentially possible that fluids from the Canal area may find their way into these storm sewers. This may become a possibility if we get heavy amounts of precipitation before all sections can be capped and all drainage pipes are installed.

11/13/78



ER ----- Probable Location of Swales

DARY

11/12/77 6 12, 1977

COMMENTS ON THE LOVE CANAL POLLUTION ABATEMENT PLAN (No. 3)

by Charles H.V. Ebert

Two sets of comments have been submitted on September 21, 1978, and on November 13, 1978, respectively. Since then the first phase of the Abatement Plan, dealing with the installation of the parallel drainage pipes and with placing a clay cap on the southern section of the Love Canal, has been completed. Furthermore, additional soil test drilling was carried out and, in more recent weeks, short exploratory trenches were dug in several locations, to ascertain whether or not water and/or toxic materials had migrated away from the Love Canal proper in random fashion or in restricted areas.

The following observations and recommendations will deal with three general areas: (1) Comments on the Suspected Migration of Toxic Materials; (2) Recommendations for Specific Test Drilling Locations; and (3) Suggestions as to Additional Tests for the Summer of 1979.

A. Migration of Toxic Materials

From various reports and discussions it can be concluded that the migration of toxic materials from the Love Canal, wherever it did occur, took place in highly erratic and mostly unpredictable patterns. The difficulty in predicting the pattern, in terms of distance and direction, did not come as a surprise in view of the great complexity of the overburden: soil layers of variable permeability, disturbed soils, backfill material, old seepage ways [swales], and the density, or lack thereof, of the soil testing pattern. While all who are concerned with soils research agree that there exist at least three major soil layers, mostly composed of lacustrine materials underlain by glacial till, there is also agreement that within the soil proper are

a great number of local, and suspectedly unique, variations in texture to complicate the picture further. Particularly the occurrence of isolated, and apparently discontinuous lenses of sandy material, could add new dimensions to the direction and distance over which groundwater, and potentially chemicals also, could migrate. The definite identification of desiccation cracks in the subsoil clays was discussed in previous reports. Mr. Don Owens has repeatedly commented on these phenomena, and I referred to them in my second report [11/13/78].

Disturbed soils, and backfill materials, are mostly found in the so-called swales. This material is not homogeneous and consists of trash, surplus soil from previous excavations, and possibly fill material that was brought to the site from other areas in the Niagara Falls region. Some of this backfill, therefore, could contain contaminants [not necessarily toxic in nature] reflecting urban and industrial waste.

Some of the trenches dug across suspected swale areas showed, apart from smell, very little chemical contamination. I am referring to the west-east trench dug across 99th Street south of Wheatfield, where only the western side of the trench revealed strong chemical odors, and the trench dug near the intersection of Read Avenue and 99th Street. However, since the trenches were dug in the middle of the winter, when little subsoil water migration takes place and the rate of evaporation of chemicals [odors!] is very low, it seems advisable not to jump to rash conclusions as to the complete absence of chemicals in said areas. Nevertheless, the level of contaminants seemed to be low at that time.

B. Additional Test Drilling and Excavations

From additional studies of aerial photographs and U.S.G.S. maps, dating

back to 1948, additional information concerning the largest swale, cutting across the northern section of the Love Canal, came to the surface:

(1) This swale did form a gully-type cut on both the western and eastern side of the Love Canal. The depth of this gully did not exceed 10 feet below the original soil surface and its width, at the original soil surface must have been about 40 feet near the Canal and probably not more than 20 feet immediately west of 99th Street which it intersected at a distance of about 728 feet north of Wheatfield. The edge of the swale coincides with the 570-foot contour, the same contour which surrounds the Love Canal. Since the 560-foot contour does not show in the gully bottom the depth of the swale, at that location, did not exceed ten feet. Two small mounds of spoil material can be seen on the contour map rising above the 580-foot contour. This material could have been used to fill the swale between 99th Street and the Love Canal and, therefore, should be composed mostly of natural soil materials.

(2) On the west side the swale first maintained the appearance of a gully having roughly the same dimensions as on the east side, as shown by the contour depression symbol [see attached map]. Subsequently, the swale swung back eastward, in a crescent shape, and narrowed substantially before it reached Colvin Boulevard. The swale then linked, apparently by going through a culvert underneath Colvin Blvd., with Black Creek. The original passageway of the swale was about 145 feet west of 99th Street on Colvin Blvd., while the junction between the swale and Black Creek was about 160 feet NNW of the culvert. It should be determined whether drainage from the Love Canal moved northward along this drainageway or whether the construction of Colvin Blvd., and the west-east utility ditches, presented an effective barrier

against such migration. It is therefore strongly recommended that test drillings, to a minimum depth of 14 feet, be carried out along 30-foot transects between 99th Street and 98th Street immediately to the north and south side of Colvin Boulevard.

C. Additional Testing

With the advent of a new summer season, the first after the completion of the clay cap covering the southern section of the Love Canal, it appears necessary to conduct a number of additional tests which may confirm: a) the effectiveness of the clay cover already installed, and b) the possibility that groundwater, including chemical pollutants, may still be engaged in active migration away from the central and northern sections. The following suggestions are made:

(1) Under the influence of melting snow and spring precipitation the soils on the eastern and western side of the north-to-south drainage ditches should be checked for water content and leachates. This should be correlated with as many water sampling tests in sump pump holes along 99th Street and 97th Street so that the new tests can be compared to the ones made last year. The soils, very soon, should reach their maximum saturation before higher seasonal temperatures increase evaporation from the surface materials.

(2) The sides of the clay cap should be inspected for seepages and erosion. Water samples should be collected at the surface where the clay cap intersects the natural surfaces. In addition the surface of the clay cover should be inspected for major cracks developing during the drying period over the summer months to determine whether contaminants are escaping in vapor form in harmful concentrations. [The latter is unlikely.]

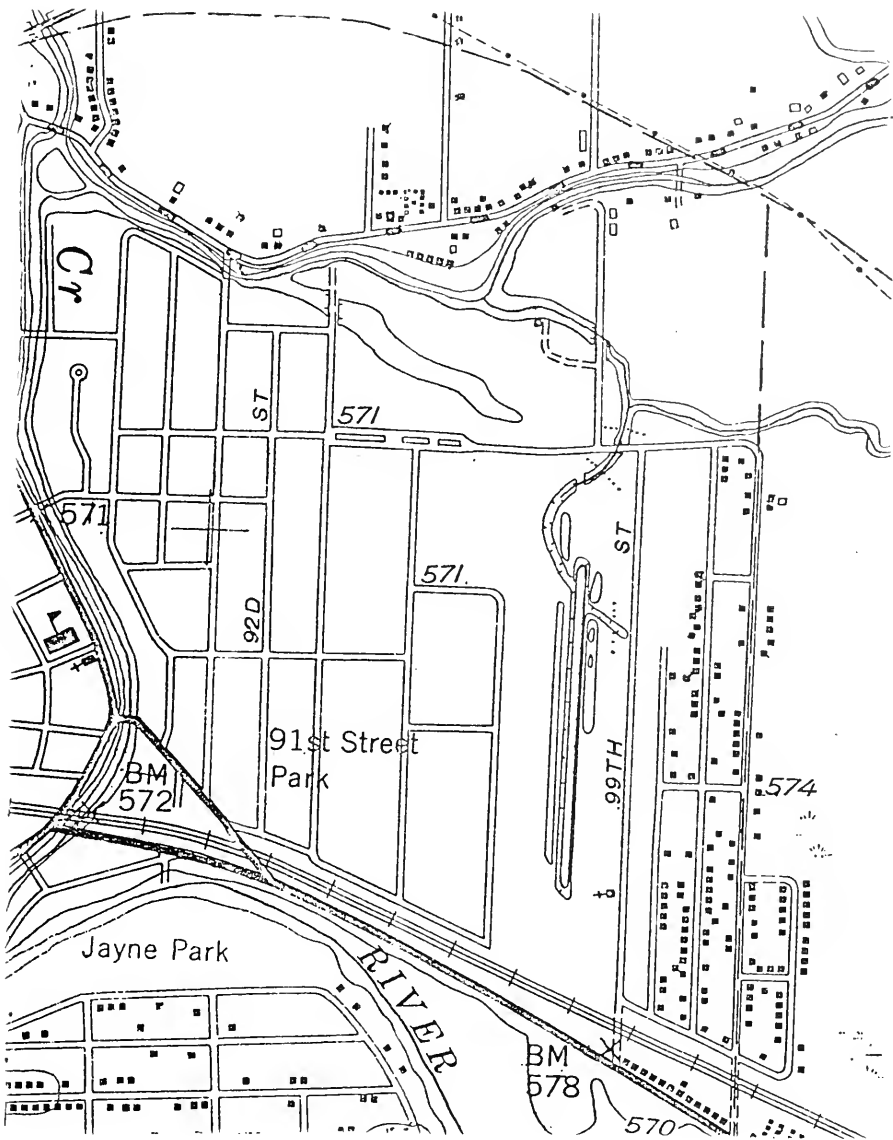
(3) If it is decided to plant vegetation on the clay cover it is strongly

recommended to: a) place at least a foot of loamy soil on top of the clay cap to fill all surface cracks and even out the surface, and b) use a grass cover only. Trees should not be planted at this stage. Their roots could create root channels at undesirable depths, particularly should the trees die after a certain time, which may induce water to enter the canal proper or may allow water to rise up. In addition, the cost factor of planting trees at this time, facing the possibility of later removal, appears unwise. A grass cover would help to prevent erosion and will absorb precipitation more uniformly.

(4) It may be possible to detect chemical migration by examining tree wood cores and sap samples. Plants, including trees, have a tendency to incorporate materials which are not necessarily plant nutrients. Older trees have a root system of considerable depth, extending readily into the suspected soil layers and cover an area roughly corresponding to the diameter of the tree crown. Thus it would be possible to test tree sap, and plant fibers, for trace elements which could possibly be helpful in tracing contaminants without doing constructional damage to real estate. This problem should be discussed by chemists and plant physiologists. Infrared photographs may indicate trees having abnormally low metabolic activity which may be caused by harmful chemicals.

(5) The last suggestion is simply another appeal to check out the inner coatings of storm sewers and the outer coatings on utility installations around the northern section east of 96th Street, south of Greenwald and generally the area between the now straightened course of Black Creek and Colvin Blvd. Similar tests are recommended in the area east of 99th Street, south of Wheatfield, in a general southeasterly sector extending to 102nd Street.

3/7/79





STATE OF NEW YORK • DEPARTMENT OF HEALTH

TOWER BUILDING • EMPIRE STATE PLAZA • ALBANY, N.Y. 12201

ROBERT P. WHALEN, M.D.
COMMISSIONER

DIVISION OF LABORATORIES AND RESEARCH

DAVID AXELROD, M.D.
DIRECTOR

September 20, 1978

Mr. John McColf
799 101st Street
Niagara Falls, NY 14301

Dear Mr. McColf:

After considering the problem you outlined, the best solution seemed to be to advise you of the limits for chemicals in workroom air adopted by the American Conference of Governmental and Industrial Hygienists (ACGIH). The limits for the chemicals that were detected in your house are as follows:

Chloroform	50,000 $\mu\text{g}/\text{m}^3$
Trichloroethene	535,000 $\mu\text{g}/\text{m}^3$
Toluene	375,000 $\mu\text{g}/\text{m}^3$
Tetrachloroethene	670,000 $\mu\text{g}/\text{m}^3$

We would not recommend these limits for a person exposed to these chemicals 24 hours/day, 365 days/year. The limits quoted are intended for use in the practice of industrial hygiene. The ACGIH states "they are not intended for use: (1) as a relative index of hazard or toxicity, (2) in the evaluation or control of community air pollution nuisances, or (3) in estimating the toxic potential of continuous, uninterrupted exposures or other extended work periods."

I hope this information will help you; if I can be of further assistance, please feel free to contact me.

Sincerely yours,

Nancy K. Kim
Research Scientist

NKK:rf

NEW YORK STATE DEPARTMENT OF HEALTH

Air Samples

ADDRESS

799 - 101

COMPOUNDS	$\mu\text{g}/\text{m}^3$ (micrograms per cubic meter)
Chloroform	<u>7</u>
Benzene	<u>-1</u>
Trichloroethene	<u>2</u>
Toluene	<u>20</u>
Tetrachloroethene	<u>4</u>
Chlorobenzene	<u>-1</u>
Chlorotoluene	<u>-1</u>
m+p xylene	—
o-xylene	—
Trichlorobenzene	—
TOTAL	<u>34</u>

NEW YORK STATE DEPARTMENT OF HEALTH

AIR RESULTS

ADDRESS

799-101ST ST

SAMPLE TAKEN

11/28/78

COMPOUNDS	$\mu\text{g}/\text{m}^3$ (micrograms per cubic meter)
Chloroform	<u>-</u>
Benzene	<u>20</u>
Trichloroethene	<u>3</u>
Toluene	<u>28</u>
Tetrachloroethene	<u>5</u>
Chlorobenzene	<u>-</u>
Chlorotoluene	<u>-</u>
TOTAL	<u>56</u>



STATE OF NEW YORK • DEPARTMENT OF HEALTH

TOWER BUILDING • EMPIRE STATE PLAZA • ALBANY, N.Y. 12237

ROBERT P. WHALEN, M.D.
COMMISSIONER

OCCUPATIONAL HEALTH AND CHRONIC DISEASE RESEARCH

NICHOLAS J. VIANNA, M.D.
DIRECTOR

October 11, 1978

Mr. James L. Clark
736 101st. Street
Niagara Falls, NY 14304

RE: Review of Medical Records

Dear Mr. Clark:

All of your medical records submitted to my office have been thoroughly examined. Our review of this information and all currently available data relating to the Love Canal, the planned remedial construction and associated evacuation and safety programs has resulted in the decision that temporary relocation is not warranted at present. If you have any additional information you wish to present, please do not hesitate to write me. Meanwhile, we will continue to monitor and evaluate the progress of remedial work at the Love Canal site for potential hazards.

Sincerely,

Nicholas J. Vianna, M.D., M.S.P.H.
Director

NJV/pl



STATE OF NEW YORK • DEPARTMENT OF HEALTH

TOWER BUILDING • EMPIRE STATE PLAZA • ALBANY, N.Y. 12237

OCCUPATIONAL HEALTH AND CHRONIC DISEASE RESEARCH

NICHOLAS J. VIANNA, M.D.
DIRECTOR

ROBERT P. WHALEN, M.D.
COMMISSIONER

October 12, 1978

Mr. and Mrs. James L. Clark
736 101st. Street
Niagara Falls, NY 14304

RE: Edmund Clark

Dear Mr. and Mrs. Clark:

All of your medical records submitted to my office have been thoroughly examined. Our review of this information and all currently available data relating to the Love Canal, the planned remedial construction and associated evacuation and safety programs has resulted in the decision that temporary relocation is not warranted at present. If you have any additional information you wish to present, please do not hesitate to write me. Meanwhile, we will continue to monitor and evaluate the progress of remedial work at the Love Canal site for potential hazards.

Sincerely,

Nicholas J. Vianna, M.D., M.S.P.H.
Director

NJV/pl

NEW YORK STATE
DEPARTMENT OF HEALTH

For release: EMBARGO: For
Release after
7 p.m.
Feb. 8, 1979

• NEWS RELEASE •

DAVID AXELROD, M.D.
Commissioner

CONTACT: MARVIN G. NAILOR, DIRECTOR OF COMMUNICATIONS (518) 474-5422

ALBANY, Feb. 8--A recently completed State Health Department study suggests a higher than expected frequency of miscarriages, birth defects and lower infant birth weight among residents living in homes located on former ponds, stream beds and other historically "wet" areas near the Love Canal section of Niagara Falls.

Dr. David Axelrod, State health commissioner, released the information today after receiving the recommendations of an outside panel of scientific experts at a day-long meeting yesterday in New York City.

The Commissioner said the incidence of miscarriage among women living in the former "wet" areas between 97th and 103rd Streets and Colvin Boulevard and Frontier Avenue was about twice as high as that of residents of "dry" areas in the same neighborhood and that of a control group in a similar study of miscarriage frequency in Toronto. He noted the miscarriage rate for the "wet" area residents was slightly lower than that found among residents living in the Love Canal area along 99th Street.

The frequency of birth defects among families in the "wet" areas was more than twice as high as that of families living on "dry" properties and the number which would be expected for the general population, Dr. Axelrod said.

Dr. Axelrod also expressed concern over preliminary data showing a higher percentage of low birth weight babies being born to women living in "wet" areas as compared to women living in New York State, exclusive of New York City. "Low birth weight (under 5 1/2 pounds) is a broad indicator of a greater susceptibility to a variety of health problems during childhood," he said.

"We cannot say with certainty that the higher rates found in each of the categories are directly related to chemical exposure but the data do suggest a small but significant increase in the risk of miscarriages and birth defects," he said. "Although the magnitude of the additional risk to this population is indeed small, prudence dictates that we take a most conservative posture to minimize even that small additional risk," he added.

Dr. Axelrod said that the studies to date did not document any increased incidence of liver disease, except among residents of the first two rings of homes which have been evacuated, nor was an increase noted in abnormal blood problems, except for some cases of iron deficiency anemia which he described as being fairly prevalent among the general population. He also said there was no evidence of toxicity related to exposure to benzene, a known human cancer-causing agent. The data also failed to produce evidence of excess neurological disorders, including epilepsy, or cancer among current residents of the Love Canal area.

Dr. Axelrod said his agency would continue to monitor the area for health problems by refining existing data and conducting additional studies, including one which will concentrate on respiratory illness with a particular emphasis on asthma, and another, already under way, which expands the current Love Canal study to include homes north of Colvin Boulevard.

"In the meantime, I am recommending that all pregnant women who live between 97th and 103rd Streets, and including several homes abutting the north side of Colvin between 97th and 100th Streets, consider temporarily relocating because of the potential effects on the fetus, particularly during early pregnancy," the Commissioner said.

"I am also recommending the temporary relocation of children under two years of age who live in these same areas. While we have no direct evidence to indicate a problem with children under two, our recommendation for relocation includes this group because of scientific data that toxic exposure can interfere with the development of the nervous and immunological systems in the very young," he stated.

Dr. Axelrod said, "These concerns for the child and the potential increased risks of miscarriage, birth defects and low birth weight, prompt me to make these recommendations even though the total additional risk for residents of 'wet' properties is, in fact, small."

He said the evidence is not sufficient to warrant a total evacuation of the area, and does not establish a direct cause-effect relationship between chemical exposure and illness. "I am making the recommendation as a conservative and reasonable measure and I am directing the advisory at all pregnant women and children under two -- not just those living in the 'wet' areas -- because the environmental data have not been sufficiently refined to the point where we can clearly distinguish 'wet' and 'dry'."

The Commissioner said miscarriages were selected as a focus for the study because of the known sensitivity of the human fetus to toxic exposure and environmental insult. He noted that there is a growing body of knowledge about fetal pathology, and that behavioral and other factors, such as cigarette smoking and drug usage during pregnancy, can also have deleterious effects on fetal development.

The former "wet" areas, which include swales or former stream beds, marshlands and seasonal ponds, were identified through interviews with longtime residents, maps, aerial infra-red photographs and personal snapshots.

The Health Department observations are based on a study of 155 pregnancies in so-called contaminated areas, including 99th Street in Ring I and purported "wet" areas between 93rd and 103rd Streets in which medically-confirmed miscarriages were reported. Thirty-nine miscarriages were reported as compared to an expected 19 miscarriages, based on studies of pregnancies and miscarriages in "dry" areas and in the Toronto study, Dr. Axelrod said.

The Commissioner pointed out most of the miscarriages (16) occurred among residents living in homes on former swampy areas as compared to 9 occurring among residents living in homes along former stream beds or swales. The study also showed that 15 persons living in "wet" areas were reported to have birth defects as compared to nine reported among residents of "dry" areas.

A public health emergency was declared in the Love Canal area by the State Health Department on August 2 of last year. In the intervening period, the State has undertaken remedial construction, including removal of 20,000 to 30,000 gallons daily of chemically contaminated liquids from the landfill site, building of a tile drain system to lower the water level of the former canal site, and installation of a clay cap to control surface water infiltration.

Dr. Axelrod said these measures would continue. He said his department and the State Department of Environmental Conservation will continue to perform environmental sampling in the Love Canal area until such time as they are convinced that health and environmental hazards have been lowered to acceptable levels.

RESULTS OF MASS SPECTROMETRY ANALYSIS BY THE
 NEW YORK STATE DEPARTMENT OF HEALTH
 ORGANIC COMPOUNDS IDENTIFIED IN THREE TYPES
 OF SAMPLES AT THE LOVE CANAL SITE

	(Air) School and Basement	Basement Sumps	Solid Surface Samples
Toluene	x	x	x
*Benzene	x	x	x
Chlorobenzene	x	x	x
Chlorotoluene	x	x	x
Dichlorobenzenes	x	x	x
Trichlorobenzenes	x	x	x
Trichlorotoluenes	x	x	x
Tetrachlorobenzenes	x	x	x
Tetrachlorotoluenes	x	x	x
Pentachlorobenzene	x	x	x
Hexylbenzoate		x	
Hexachlorobicycloheptadiene		x	
Chlorobenzoic Acid		x	
**B.H.C. Acid	x	x	x
**B.H.C. Beta	x	x	x
**B.H.C. Delta	x	x	x
**Lindane	x	x	x
**Chloroform	x	x	
**Tetrachloroethylene	x	x	x
**Trichloroethylene	x	x	x
Eromodichloromethane		x	
**Tetrachloroethane (1,1,2,2)			x
Tetrachlorobutadiene			x
Trichlorophenol			x
5-Methyl Benzacradine			x
**Dichloroethylene	x		
Methylene Chloride	x		
1,1,1 Trichloroethane	x		
**Carbontetrachloride	x		
Pentachlorobutadiene	x		
**1,3 Hexachlorobutadicne	x		
1,2 Dibromoethane	x		
1,2 Dichloropropane	x		
1,2-bis-(trifluoromethyl)benzene	x		
Chlorobenzotrifluorides	x		
Bromotoluene	x		
Chlorobenzodichlorofluorides	x		
Chlorobenzaldehydes	x		
Dichlorotoluenes	x		
Bromochlorotoluenes	x		
Dichlorobenzaldehyde	x		

*Associated with cancer or leukemia in humans

**Evidence of carcinogenicity in experimental animals only

	(Air) School and <u>Basement</u>	<u>Basement Sumps</u>	<u>Solid Surface Samples</u>
Chloronaphthalene	x		
Methyl Formate	x		
Ethyl Acetate	x		
Isopropyl Acetate	x		
N-Butyl Acetate	x		
Benzyl Acetate	x		
Methyl Salicylate	x		
Alkyl Butyrate	x		
Vinyl Acetate	x		
Methyl Furan	x		
2,5 Dimethyl Furan	x		
Furan	x		
Di-n Butyl Ether	x		
Acetaldehyde	x		
Isobutyraldehyde	x		
Butenal Isomer	x		
N-Butanal	x		
N-Pentanal	x		
N-Heptanal	x		
Furfural	x		
Acetone	x		
Methyl Vinyl Ketone	x		
Methyl Ethyl Ketone	x		
Methyl Isopropyl Ketone	x		
C ₁₂ H ₁₈ O Ketone	x		
2-Pentanone	x		
4-Methyl-2-Pentanone	x		
Methanol	x		
Ethanol	x		
TButanol	x		
Isopropanol	x		
(2-Butoxyethoxy) Ethanol	x		
Acetic Acid	x		
Heptanoic Acid	x		
Methoxy-Di-T-Butylphenol	x		
Benzothiazole	x		
Dichloronaphthalene	x		
Pentachlorotoluene	x		
Hexachlorotoluene	x		
Pentachloropropane	x		
Dichlorophenol	x		

MEMORANDUM

Form DSS-524 (Rev. 11/79)
Formerly BOA-100

TO: Residents of Love Canal Area DATE: February 9, 1979

FROM: Temporary Relocation Intake Staff SUBJECT: Eligibility Requirements for Temporary Relocation

The following information is provided to help you understand who is eligible for temporary relocation, and how you can apply for these benefits.

1. WHO IS ELIGIBLE?- CATEGORIAL REQUIREMENTS

- Families with children under the age of 2 years of age.
- Pregnant women.

- RESIDENCE REQUIREMENT

- Family applying must live in the area bounded by 93rd Street on the west, 103rd Street on the east, Colvin Boulevard on the north, (including several homes on the north side of Colvin between 97th Street and 100th Street), and Frontier Avenue on the south;
- Must have been a resident on February 8, 1979.

2. HOW DO YOU APPLY?

- Call 283-8713 for an Intake appointment.
- New York State Dept. of Social Services staff will interview you to get needed information about eligibility and housing needs.
- When you go to the appointment, take the following documents with you:
 1. Proof of pregnancy (if there is a pregnant woman in your home). A simple note from your doctor is all that is needed, stating date baby is due.
 2. Proof of age for all your children, for example, birth or baptismal certificates.
 3. Proof that you live in the Love Canal Relocation Area, for example, current mortgage or utility receipts, rent, etc...
- New York State Dept. of Social Services staff will interview you and get all the information necessary to determine:
 1. If you are eligible, and
 2. What your housing needs will be.
- The Intake interviewer will photocopy the documents needed to verify your eligibility.
- If you have any special needs for financial, marital, or other counseling, the Intake interviewer will assist you in obtaining these services.

3. WHY DO YOU NEED THE DOCUMENTS?

- We must verify all eligibility requirements in order to meet the audit requirements of the State Comptroller, and also to protect residents from allegations of wrongdoing at a future time.

4. WHAT HAPPENS AFTER CERTIFICATION?

- If you are found to be eligible for relocation, your case will be assigned to a New York State Dept. of Transportation Relocation worker.
- You will be working with the same DOT Relocator in order to minimize confusion and provide you with the best



[The following articles are from the Niagara Gazette]

[Dec. 3, 1978]

PHOTO SHOWS LOVE CANAL CHEMICAL BURIAL

(By Mike Brown)

An aerial photograph taken at least 25-years ago of the Love Canal and the nearby Upper Niagara River shoreline reveals nearly as much fill in northern part of the old dumpsite as the more-often-cited southern end of the residential area.

And the photograph, purportedly taken in 1953 by a local resident when the canal had not been totally backfilled, clearly shows how close wastes were buried to homes on 99th Street. White areas indicating backfill are located very near back property lines.

Included also is a line curving around the northern part of the canal, just the backfilled area and onto homes to the southeast, that may be a swale. It roughly fits descriptions by the state of an old drainage area.

But the photograph has not yet been interpreted by experts. The state plans a close review of it during the coming week.

Especially interesting is the area alongside the Niagara River, including the 102nd Street dump and Griffon Park, as well the extreme southern end of the canal. If the white area represents chemical landfill area—and that appears to be the case at other sections of the canal—the photograph means that the riverside contains more contaminants than has been previously described.

Those white portions, near the residential areas peripheral to the canal, perfectly match earlier definitions of where the chemicals were buried, except for the fact that the north end appears to contain more than officials thought.

Under magnification, a cylindrical darkened area at the northern end looks like a tank truck pushed into the fill.

There are similarly interesting dark areas near the river that have not been defined. They look like stacks of chemical drums but could also be isolated vegetation.

About a quarter of a mile above the mouth of the Little River, a white area is clearly shown in the water. It is not clear if that represents algae, a peculiar current, other natural phenomena, or chemical leachate surfacing from the Love Canal.

The photograph clearly shows that, before the area was completely filled in, there were residential neighborhoods to the east and west, as well as rows of vegetation resembling orchards.

Part of the parcel on which the 99th Street School playground now rests appears to have been filled with chemicals while the other stretch behind the school was a waterway.

Just south of where Wheatfield Avenue is now located is a square darkened area that has not yet been identified. There are also a number of what appear to be bike paths or small creeks to the west of the canal's middle portion.

A white area similar to the canal blotches is also located on Cayuga Island and various smaller spots east of the canal.

The photograph is owned by Mr. and Mrs. Ralph Hillis of 432 102nd St.

Officials have a 1951 photograph of the Love Canal, and there are also graphics predating chemical burials. But they do not illuminate the problems as well as the 1953 photograph.

For months investigators have wondered why a certain section of the southern residential area of the canal had a 20-foot hill at one time.

They speculate that it was either a random piling of material or that there was something below that those who backfilled the canal were taking special measures to protect from the environment.

The state is only now collecting aerial photographs of other parts of the city. There are dozens of suspected disposal sites throughout the municipality and the county in general, most of which have not been positively identified and their contents inventoried.

What may lie underground between the 47th and 60th Street area is an especially irksome question.

[Aug. 15, 1978]

LANDFILL RULING HAILED

(By Jerauld E. Brydges)

A judge's ruling that the owner of a disposal site near St. Louis, Mo., must close the landfill and remove the dangerous liquids was hailed today as a "landmark in environmental law."

Macoupin County Circuit Court Judge John W. Russell Monday ruled in favor of the residents of the tiny community of Wilsonville, Ill., all of whom sought to get rid of a 130-acre disposal site owned by the Earthline Corp.

The 700 Wilsonville inhabitants were joined in a law suit by the Macoupin County attorney and Illinois State Attorney General William J. Scott.

Scott said Monday that Russell's decision "can help protect the basic human right to food and water that is not contaminated."

Attorneys for Earthline said they will ask for a delay of the ruling while they appeal the decision. Scott said he expected the ruling to be upheld.

Russell ruled that Earthline must shut down the disposal site, remove the discarded chemicals "and all contaminated soil to be found on the site."

A spokesman for the Illinois attorney general's office told the Niagara Gazette this morning that Scott's complaint was filed under three sections of law.

He charged that Earthline was in violation of the Illinois Environmental Protection Act of 1970 and that it was contributing to the pollution of land, water and air.

Furthermore, he acted under the attorney general's statute that permits seeking injunctions where allegations of pollution are involved.

He also acted under a "common law" which permits him to investigate "public nuisances."

Earthline is a division of SCA Services Inc., Boston, Mass. SCA is also the parent firm of Chem-Trol Pollution Services Inc., which operates a waste disposal plant in the Town of Porter.

The landfill was opened in November 1976 and Wilsonville residents began their fight to have it closed in April 1977 when they learned that polychlorinated-biphenyls were being deposited there.

Exposure to PCBs can cause liver damage and skin ailments, and poses dangers to fetuses as well as the possibility of stillbirths.

A source familiar with the Wilsonville case said, however, that no sicknesses have been found related to the deposits at the landfill.

Unlike the Love Canal situation here, there was no evacuation of residents in the tiny town. The dump is located just outside the community limits.

Nearly 60,000 gallons of the chemical waste was sent to Wilsonville under federal auspices. The U.S. Environmental Protection Agency supervised trucking of the waste material after ordering the wastes removed from an unregulated landfill near Dittmer, Mo.

Missouri officials had found evidence that the seepage from the Dittmer dump had killed fish in a tributary of the Meramec River. Chemicals there had been disposed of by a nearby salvage firm.

The Wilsonville site was licensed as a "hazardous waste disposal area" by the federal government and the state of Illinois, and is one of just a few sites in the Midwest.

The Wilsonville residents were led in their fight by a Roman Catholic priest, the Rev. Casimir Gierut.

They held several meetings protesting the use of the disposal site and were later joined in their fight by Scott.

Pending a full hearing of the case, Russell's ruling will not take effect until the judge signs an order. That order is being drafted today.

Meanwhile, the New York State Farm Bureau has called for a moratorium on proposed dredging of the Hudson River, charging that a state plan for disposing of PCBs may endanger surrounding farmlands.

Private Farmers' Organization President, Richard McGuire, said plans to deposit the dredged mud containing PCBs contains "too many similarities to the process used by a chemical company in creating the so-called Love Canal in Niagara County."

McGuire said the Department of Environmental Conservation plans to dump the dredgings on 75 to 175 acres of land offered by two Washington County farmers.

The DEC is seeking \$25 million in federal funds to remove the most highly concentrated deposits of PCBs.

[Nov. 3, 1978]

ADJACENT CANAL HOMEOWNER GOING TO GIVE HIS HOUSE AWAY

Declaring that "the mental anguish is just not worth it," James L. Clark, of 736 101st St. has decided he is going to give his home away.

Clark, one of 20 homeowners whose pleas for evacuation from their property bordering the Love Canal site were rejected by the state, said today he is "not going to wait seven years while they decide" whether more homes should be evacuated.

Claiming he and his family suffer from a "multitude of health problems" including kidney ailments, Clark said he could no longer bear the uncertainty of living in the area.

Clark, a Union Carbide Corp. employee, said, "I went for three blood tests. The state told me something was wrong. Now they say they don't have evidence."

He said his family is "more important than anything else," and he wants to get out as soon as he can. He has a wife and three sons, aged 15 to 19.

So, Clark said he plans to give away the house Saturday to anyone who will assume the mortgage. He said he has arranged with his attorney to transfer the title at 10 a.m. It only has to be notarized, he said.

Clark said his family has lived in the home, a raised ranch, for seven years. He said the remaining mortgage on the home is "around \$19,000," at monthly payments of \$214. He said the home includes a new garage and is "probably worth \$48,000."

"I'm not a radical," Clark said, "It's just the only alternative. I can't walk away, or my credit's no good. I can't rent—I'd face a pile of lawsuits. So I'm going to give it away."

He said he hoped his action would call attention to the plight of the homeowners he feels have been neglected. But Clark said he was not doing it for personal gain.

"I don't represent anybody," he said, "I just represent Mr. Clark with common sense, and he wants out."

Clark said he was unsure whether he would donate the home to a charity or raffle it off.

He said he and his family would not be prepared to move out until they find another place to live.

[Nov. 5, 1978]

HOME GIVEAWAY MAKES MAN "LOSE FAITH"

(By Eric Stutz and Francine Delmonte, staff writers)

A Love Canal area resident who offered to give his house away as a public protest Friday found a buyer, but said the episode made him "lose faith in the American people."

James L. Clark of 736 101st St., said his offer "worked" but would not identify the buyer except to say that he lives outside the Niagara Falls area.

Clark said he received about 20 calls for the home, but said most of the callers missed the point of his effort.

Clark, one of 20 homeowners whose pleas for evacuation were rejected by the state, said the giveaway was not a gimmick.

"Somebody had to make a sacrifice to bring national attention to the plight of these people," he said, "Somebody had to be a martyr. I'm giving up everything to make the world realize what's happening here."

But he didn't get quite the response he expected, he said.

"I've lost faith in the American people," he said. "I'm trying to make a point, and the ones who called just wanted to profit from it. They just asked if they could have my refrigerator and stuff."

A unique legal stipulation is attached to the deal. "He (the new owner) has got to live in the house," Clark said, "That's what's so beautiful. He thinks he got a deal."

Clark, a former Green Beret and demolitions expert, has a medical disability. His kidney is failing, he said, and doctors for years had been unable to figure out the cause. He said he first got sick a year after moving into the house seven years ago.

He said Gov. Hugh Carey had reneged on his pledge to get 23 seriously ill people out of the Love Canal area. "We have stood back and watched the bureaucratic machine run over us," he said. "Getting the sick people out is the first thing they should have done."

Clark, his wife, daughter and two sons plan to move to Montgomery, Alabama, after the deal closes next month. He admitted his family was upset about his decision, but added, "I'd be remiss as a parent if I didn't get them out, and who'd ever buy a house out here?"

The home, which is a raised ranch, has a remaining mortgage of about \$19,000 at monthly payments of \$214, he said. He estimated its market value at about \$48,000.

Clark is certain the city and the state will never help any of the families located in the outside "rings" adjacent to the canal.

"The city has closed its mind to what's happening," he said. "The New York State Health Department only cares about numbers, when they should care about people."

He said his neighbors think he is either crazy or scheming, but he denied doing it for personal gain. "The only thing I want out of this deal is out of this deal," he said. "I told my wife if we get the 23 people out of here it'll be worth it. If not, at least we'll be out."

"It's funny, I used to hate the young people of this country for protesting the things I believed in," Clark said. "Now I'm a protester I've never been a radical. The only thing I'm crusading for is common sense."

[Nov. 22, 1978]

PUBLIC BIAS AGAINST EPA, PLANTS CITED

(By Mark Francis)

The public's prejudice against the chemical industry and federal environmental officials will make the selection of an impartial jury in the Olin Corp. criminal trial "troublesome," a federal judge has written.

Federal Judge John T. Elfvin, in a six-page written decision, said the Love Canal situation in Niagara Falls and other recent environmental developments have resulted in "bias and prejudice" among potential Olin jurors.

"Love Canal and its problems will be before the public and in the minds and hearts of the local citizens for a substantial period of time due to ongoing remedial efforts, the private lawsuits, the criminal investigations, and the state and federal legislative inquiries," Elfvin wrote.

"It will continue to be troublesome insofar as securing an unbiased and unprejudiced jury. The bias and prejudice, while mainly directed towards the chemical industry, also bears against the prosecution and particularly against the Environmental Protection Agency. It probably will require at any reasonably foreseeable future time a tedious and time-consuming jury selection process."

Elfvin's statements were contained in a decision granting a request by the Olin Corp. and three former employees to delay the start of their trials because of recent environmental developments, particularly the Love Canal.

Their trial had been scheduled to begin next week. They now are scheduled to begin early next year.

Failure to delay the trial, Elfvin said, "would seriously impede the trial of this case and would result in a miscarriage of justice."

Olin and its three former employees were indicted in March on federal charges of falsely reporting the discharge of mercury into the upper Niagara River from the company's Buffalo Avenue plant from 1970 until 1977. The indictment charged the four with reporting far lesser amounts than were actually discharged into the river.

Elfvin said attorneys for the defendants submitted about 750 articles published since Aug. 1 in the Niagara Gazette and two Buffalo newspapers. Those articles dealt mainly with the Love Canal.

Other articles were published regarding environmental problems in other states, criminal charges brought against three Jamestown men for allegedly violating North Carolina anti-pollution laws, and chlorine leaks at Olin's Niagara Falls plant.

[Nov. 22, 1978]

200 CHEMICALS FOUND IN CANAL

(By Mike Brown, Staff Writer)

State health officials have now indentified about 200 chemical compounds in the Love Canal, including what one researcher described as "organic curiosities."

That figure is more than double the 82 chemicals originally identified at the old Hooker Chemical Co. dumpsite, but it remained unclear today whether the number represents distinctly different substances of simply means the wastes dumped there years ago have degraded into variations and melded together.

Dioxin, the extremely potent chemical that usually accompanies 2,4,5-trichlorophenol, has not yet been singled out of the landfill, although officials consider it highly likely that the by-product is in the canal. Up to 200 tons of trichlorophenol was dumped there.

Dr. Glenn Haughie, director of public health, said he doesn't believe the list of new substances contains repetitions of what was previously listed.

Dr. Robert Huffaker, the state's safety officer for cannal remedial work, said 80 to 85 percent of the chemicals are chlorinated hydrocarbons of some sort. But unlike Dr. Haughie, he said he believes "there are some repetitions."

"In the event we find it (dioxin) we'll tell you," Dr. Haughie, said. Dr. Huffaker added that "it is very likely" that dioxin, described as one of the most dangerous substances created by man, exists somewhere in the leaching.

Steve Lester, consultant for the Love Canal Homeowners Association, said he doesn't know if any carcinogens are contained in the revised list of chemicals. "What you have, because of the combinations in the canal, are a bunch of organic curiosities," he said, referring to the blending of substances.

Meanwhile, at a raucous meeting with about 190 residents of the area, Dr. Haughie said there is some evidence of soil contamination along routes that served as drainage points for the former canal.

But he said there is no evidence, at this point, backing the theory that those who live along former swales and stream beds suffer an unusually higher number of various illnesses.

The meeting, held in 99th Street School's auditorium Tuesday night, was frequently interrupted by shouting citizens who accused the state Health Department of covering up the full picture of the Love Canal and its health effects.

At one point early in the session, a group of about 40 people left the auditorium to protest that homes in outlying neighborhoods have not been evacuated.

There were also several moments when residents began to argue among themselves, shouting and refusing to yield the floor to the experts they came to hear.

Even the credentials of those who spoke were questioned. When Dr. Huffaker explained that he was a veterinarian, the auditorium erupted into derisive laughter.

"It's a complex situation and the people don't understand much of it," said one official, looking on from the audience. "Now they're going too far."

State officials gave a slide presentation showing the results of sump-pump, basement air, and soil tests. It took about three hours for Dr. Haughie to finish the display.

The slides showed several points to the north, east and west of the landfill where swales once ran. In an area east of the canal's middle portion, Dr. Haughie said there was once a pond that probably carried contamination.

While overall health effects are not higher, Dr. Haughie said children, especially boys, appear to have indications of abnormal liver functions along formerly wet areas. "But there is no more epilepsy or asthma," he said.

Whether those blood samples that show abnormalities are representative of significant liver disorders has not been determined, Dr. Haughie said.

[Dec. 12, 1978]

DIOXIN IS CONFIRMED

The presence of dioxin, perhaps the worst of the poisonous by-products of chemical manufacturing, has at last been confirmed at the Love Canal.

Yet state officials, hitherto so cautious, are proceeding with remedial work there as though there were no dioxin.

When residents of the area picketed the work site to prevent vehicles from carrying out mud that might be contaminated with dioxin, state officials kept the trucks going, so city police had to arrest six of the demonstrators immediately after the picketing began.

State officials say the dioxin discovered at the Canal does not present a health hazard, since it was measured only in extremely small quantities—parts per million.

But it seems to us the presence of any dioxin at all ought to call for the imposition of the most stringent security measures until the extent and danger of the contamination can be thoroughly assessed. It is not known how extensive the dioxin contamination is at the Canal or how far it may have leached out of the

Canal. It is not known whether the dioxin is concentrated in one or a few places, or whether it is widespread. It is not known whether vehicles and workers at the site may be carrying away dioxin in the mud that clings to their wheels and boots as they leave the Canal. It is not known what sorts of solutions or compounds the dioxin is in, or how it will react when exposed to air, rain cold, or heat.

In short, so little is known besides the fact that dioxin has had terrible effects in other places and other circumstances, that it seems to us quite foolhardy to carry on as before at the Love Canal.

We have been disturbed by some of the things residents of the area have been saying lately.

At a meeting last week, one resident said he would try to keep workmen out of the site "even if it causes a riot." Another said, "If our lives aren't worth \$150 a day to the construction workers, then their lives aren't worth a nickel to the residents of the Love Canal area."

We try to understand the fears and tensions that afflict residents of that area. But we don't think anything justifies that sort of inflammatory talk. We hope Love Canal people will make a special effort to avoid any more of it.

Nevertheless, we think the Love Canal people are right to be deeply perturbed about the apparently casual response of state officials to the presence of dioxin. We think they are right to picket and we think they performed an important public service when they tried to tell workers at the site about the dangers of dioxin.

They were also right to try to prevent vehicles from entering or leaving the site. This is what they were arrested for, and probably the police had no choice since this was a clear violation of the rules that generally apply to picketing. But the possible danger of spreading even tiny quantities of dioxin around the city is so great that it justifies the picket's civil disobedience.

Their disobedience would not have been necessary if the state officials in charge at Love Canal had treated the dioxin discovery as seriously as it deserves.

[Mar. 10, 1979]

CLEANUP ORDERED FOR CANAL LEAKAGE

(By Thad Komorowski, staff writer)

While others may be welcoming the recent mild weather, the intrusion of Mother Nature into the cleanup operations at the Love Canal has caused headaches for officials and has stirred concern among residents there.

Immediate cleanup operations were ordered by state officials Friday when it was noticed that unidentified liquids were leaking from the canal site near the 99th Street School and flowing onto Read Avenue and into the city's storm sewers. The recent spring thaw and rains were blamed for the unexpected flow.

Michael Cuddy, on-site director for the state's Love Canal Task Force, had workers on the scene Friday, containing the escaping liquids by blocking the flow with soil and then vacuuming the liquid into a tank truck. Workers dug a drainage ditch to contain the liquids.

The liquids will be treated at the on-site filtration system.

Lois Gibbs, president of the Love Canal Homeowners Association, said today that "this is only the beginning." She said the situation will worsen when warmer weather arrives.

"It's going to be a disaster," Mrs. Gibbs said of the problem. "It (the leachate) was black, smelly and appeared to have oil slicks. . . . some of the workers said it might be C-56."

C-56, a chlorinated hydrocarbon, was found to be one of the chemicals buried by the Hooker Chemical Co. during its operation of the former landfill in the 1950s. This chemical has been linked to nervous-system disorders in humans.

According to Mrs. Gibbs, the state officials "stood there and shook their heads in disbelief" when they investigated reports of the problem. Mrs. Gibbs said she didn't know if the problem was related to the remedial work being conducted at the site.

Both Cuddy and Joseph McDougall, city project manager, could not be reached Saturday for comment.

Gibbs said some residents said the leaking has been going on since Wednesday. Mrs. Gibbs said she expected to meet with state officials Monday to discuss more efficient monitoring of the remedial work and related problems.

Cuddy compared the situation to original problems last spring at the southern portion of the Love Canal when rains caused chemicals to ooze from the soil.

For the time being, workers appear to have the problem under control, but officials are worried that some of the chemicals may have flowed through the sewers and into the Niagara River. The association and the state have taken samples of the leachates for analysis.

[Mar. 13, 1979]

STATE MAY SUE HOOKER FOR CANAL COST

\$20 MILLION SPENT ON CLEANUP EYED

ALBANY (AP).—The state may sue the Hooker Chemicals and Plastics Corp. and possibly other industries for the \$20 million it has spent to contain toxic chemicals leaking from the Love Canal area of Niagara Falls.

Gov. Hugh Carey's office announced Monday that the governor has written to Attorney General Robert Abrams asking him to prepare for legal action in toxic pollution cases.

And Abrams indicated that he would quickly do so.

Neither man made any public statement about the form the lawsuits could take, or even about who might be sued. Staff aides were to meet later this week to map strategy.

But one obvious potential target is Hooker, which owned the canal site until selling it to the Niagara Falls Board of Education in 1953. Hooker buried chemical wastes in the Love Canal in the 1940s and early '50s.

The site was covered with dirt and clay before being sold. The 99th Street School was later built over part of the canal, while more than 200 homes were erected immediately adjacent to the site.

The Niagara Gazette reported in 1976 that chemicals from the site were leaching into nearby homes, creating a potential health hazard. State officials agreed last August to purchase 239 adjacent homes prior to the start of remedial work.

Carey said the state has already spent more than \$20 million on clean-up costs and on buying the homes of the evacuated families, and that more would have to be spent before the problem is solved. He asked Abrams to consider a suit "to protect both the public health and the pecuniary interest of the state."

The attorney general is an independent office-holder and does not have to do what the governor requests.

But in this case, Nathan Reilly, a spokesman for Abrams, said that "this is a matter of great personal concern to the attorney general."

If the lawsuit is filed and is successful, it could set a precedent under which the state could collect the clean-up costs of future toxic pollution problems from the industries which caused them.

Estimates of the potential sites for such problems in the state range into the hundreds, although the survey information on them is acknowledged by state officials to be inadequate.

The Carey administration has appeared in the past to be reluctant to sue Hooker over the Love Canal problem.

The governor has been anxious for Hooker to continue operating in New York. His aides have said that assigning full legal blame for this and similar problems could prove difficult. And he was hoping to recover the clean-up costs from the federal government.

But in recent months it has become clear that the federal government does not intend to pay the clean-up costs. Homeowners outside the evacuated area also are demanding that the state buy their houses. And there have been promises that some of the homeowners in the area would sue Hooker if the state did not.

All those factors, sources said, led state officials to give new consideration to the idea of suing to recover the costs.

Hooker recently completed a \$60 million modernization of its Buffalo Avenue production facility in Niagara Falls. It is now building a \$70 million steam production plant and has plans to erect a \$12 million office building in downtown Niagara Falls.

Although Hooker officials were not immediately available for comment this morning, Stanley Smith, president of the Rainbow Center Development Corp., said he did not believe legal action by the state against Hooker would affect the firm's building plans.

Smith said there has been "absolutely no discussion" linking those plans with Hooker's environmental problems.

"I don't think it (legal action) would have any adverse effect for Hooker to develop," Smith said. "They are moving along in a positive fashion continuously."

Hooker officials offered last August to pay \$280,000 towards the cleanup of the south end of the canal, while denying any legal responsibility of the problem. At that time the cleanup cost was estimated at \$840,000. State officials reportedly declined the offer because of the possibility of later legal action.

[Mar. 23, 1979]

AXELROD TELLS OF KIDNAP THREAT

WASHINGTON.—State Health Commissioner David Axelrod said Thursday that the emotionally charged situation at the Love Canal in Niagara Falls, N.Y., has produced at least one serious kidnapping threat.

"There was a threat to kidnap one of the members of our task force; it was not an idle threat," Axelrod said in testimony before a congressional subcommittee. He apparently was referring to the governor's Love Canal Task Force.

Axelrod would not publicly identify who had made the threat. He also did not identify the person intended for kidnapping.

The commissioner's comments came in response to questions from Rep. Bob Eckhardt, D-Texas, as to why the state refused to publicly identify a "blue-ribbon" panel of experts advising the state Health Department on health issues involved in the Love Canal controversy.

Eckhardt heads the House commerce Committee's subcommittee on oversight and investigations, which is holding hearings on hazardous waste disposal.

Axelrod said that medical experts might be unwilling to get involved if they were identified, because of the "notoriety" of the situation and the emotional intensity of the residents of the area. He then related the kidnapping threat, and noted there is a state law that protects the identify of the blue-ribbon panel.

That, however, failed to satisfy Eckhardt. "It really astounds me that is contained in New York law," he said, questioning whether the state is properly interpreting the law.

"I'm concerned about any citizen of New York having the right to know under whose advice the public decision is being made," he said.

Much of the questioning of Axelrod by the subcommittee involved his differences with Dr. Beverly Paigen, as research scientist at Roswell Park Memorial Institute, Buffalo, who has recommended that at least 140 more families be evacuated from the Love Canal area.

Paigen, testifying before the committee Wednesday, had contended that there was an unusual incidence of miscarriages and various physical ailments in the so-called "wet areas" of the Love Canal neighborhood.

The wet areas are along old stream beds, which Paigen said facilitated the flow of dangerous chemicals from the old dump site.

Axelrod, however, questioned the validity of Paigen's studies because "the data she provided is not data she personally collected." He noted that Paigen's conclusions were based on surveys taken by residents of the neighborhood.

"It has not been validated by examining the child or discussing the claim with the physician responsible," he said, noting that the state Health Department's data had been validated in that manner "in 90 percent of the cases."

Under close questioning by Eckhardt, Axelrod said some of the data provided by Paigen had been investigated for validity.

"We have not been able to substantiate the health risks she says exists in these areas," he said.

He said he questioned her findings concerning respiratory and blood diseases in the wet areas.

However, in his prepared testimony, Axelrod told the committee that a higher incidence of miscarriages and birth defects in the wet areas had led to his order of Feb. 8 recommending that pregnant women and children under 2 be relocated.

Axelrod also said he has reservations about Paigen's "swale theory:" that those living along the old streambeds, or swales, are more susceptible to medical problems.

"The area is hydrologically very complex; the swales are not the only source of migration of chemicals from the canal," he said. He added that there are sandy fissures underground that may be a greater source of migration of chemicals than the swales.

[The following articles are from the Buffalo Evening News]

[Aug. 9, 1978]

53 DUMPS TO BE TESTED FOR TOXINS

STATE PROBING SIX SITES IN NIAGARA NOW

(By Paul MacClennan, News Environmental Reporter)

The state's regional environmental director said today that each of the 53 Niagara County dump sites listed in Tuesday's Buffalo Evening News will have to be tested to determine if they contain toxic chemicals or hazardous wastes.

William M. Friedman, the regional director for the state Department of Environmental Conservation, said the state already is testing or monitoring six of them.

Sampling or remedial work is currently under way at three Hooker Chemical and Plastics Corp. sites in Niagara Falls, a former Olin Corp. site along the Niagara River near Griffin Park, an E.I. Dupont De Nemours site on Pine Avenue, a Van De Mark Chemical Co. site in Lockport and an abandoned Stauffer Chemical Corp. dump on the Artpark grounds.

The latest wave of concern has been generated by the contamination of homes and the underground movement of highly toxic chemical wastes out of the abandoned Hooker dump site in the Love Canal section of Niagara Falls that has forced evacuation of 100 families and led to the declaration of state and national emergencies.

Several federal and state officials voiced surprise at the number of dump sites and said they had been unable to determine the exact extent of the problem until they saw the list and map in Tuesday's News.

A number of top government officials over the past two weeks have used the figure of 38 sites, but the up-to-date listing obtained by the News indicates that there are 40 abandoned dump sites and 13 disposal areas still in use.

Disclosure of potentially toxic dump sites in Niagara County has led to demands by Erie County legislators and the Erie County Department of Environment and Planning that the state do a similar survey of dumping areas in Erie County.

The DEC Tuesday disclosed a score of companies in the six-county area that are heavy users of toxic and hazardous substances and an inquiry is underway to determine the exact method the companies use to dispose of waste materials.

Records obtained by The News indicated that more than half of the 40 abandoned dumps in Niagara County apparently contain industrial wastes, and a state official said "historically everyone had access to any disposal area, so you can't say what will be found."

Regional DEC Engineer John C. McMahon said: "We're concerned about these chemicals escaping and possibly entering the river. Many of the chemicals involved are carcinogenic (cancer causing) to animals, and some have been identified as carcinogenic to man.

State-federal studies already have determined that the toxins in the Love Canal have migrated two blocks west to 95th Street, and the U.S. Environmental Protection Agency announced that it is more than doubling a \$20,000 contract to widen the boring of test holes to pinpoint where the chemical has gone.

A second EPA study will start deep-well tapping into bedrock groundwater to determine if the canal wastes have leaked deep underground. An EPA team from Rochester also is scheduled to start sampling storm sewers to see if chemicals are flowing into the system, which in many cases feeds directly and untreated into the Niagara River.

Mr. Friedman said that during a closed-door working session, officials agreed that engineering plans to excavate and install a special sewer system to catch toxic chemicals moving out of the canal dump site will be submitted Friday to state DEC officials in Buffalo and Albany.

Exactly when work will start depends on state approval of the plans, a determination of how many residents will be evacuated and from how wide a distance, and working out details such as safety of workmen and inspectors. He said a meeting with potential contractors was held Tuesday.

Contracts will be awarded on a cost-plus-profit basis, without bidding.

While the focus continues on serving the 100 or more residents being moved from the Love Canal site, federal, state and local officials continued to scramble today on an everwidening set of remedial measures, including:

An engineering plan for containing toxic chemicals at the canal site is scheduled for completion Friday, and officials hope actual work can start in a week to 10 days.

Area communities are calling on the state to hold public hearings before allowing Chem-Trol Pollution Services Inc. in Porter to divert treated wastes into Twelve Mile Creek.

The Love Canal emergency has focused new attention on the fact that while Congress in 1976 passed sweeping legislation for control and safe disposal of toxic chemicals, none of the machinery for carrying out the program is yet in place.

Regional Director Friedman of the DEC said today "as we bring the Love Canal situation under control, and as resources permit, DEC will look at each and every one of the abandoned dump sites in Niagara County.

"Were stuck now on the Love Canal an remedial work here, but we'll expand our work taking them in order of priority."

Raymond P. Griffin, chairman of the Erie and Niagara Counties Regional Planning Board Utilities committee, said the unit has asked Niagara County communities to join with the board in asking a public hearing on proposals by Chem-Trol to divert part of its flow of wastes from Six Mile Swail into Twelve Mile Creek.

[Aug. 27, 1978]

1954 ALARM IGNORED ON CANAL SITE

(By Agnes Palazzetti)

NIAGARA FALLS.—Records uncovered by The Buffalo News show the Niagara Falls School Board was advised against continuing construction of the 99th Street School early in 1954.

The problem below the surface of the Love Canal came to light some 24 years ago, when contractors building the school had to stop work and pour a new foundation away from the soggy chemical dump site.

The school site was moved 85 feet and the building constructed. The school was closed this summer in the wake of the Love Canal contamination crisis.

The land where the work started was so full of soft spots and holes that one workman actually had to be rescued from the site with a crane.

And in January 1954, when construction of the school first got under way, workmen discovered strong chemical fumes sifting out of the ground.

School records show the Albert Elia Construction Co. made contact with a pit "filled with chemicals" early that month.

The records show the Falls School Board was aware of the existence of a chemical dump on the site they had chosen for their elementary school designed by the architectural firm of Cannon, Thiele, Betz and Cannon.

They also show the School Board was advised against continuing construction at the site.

"We believe it is poor policy to attempt to build over this soil, as it will be a continuous source of odors, and until more information is available regarding the materials dumped in this area, we must assume that it might be a detriment to the concrete foundations," Charles I. Thiele, architect for the school, told Wesley L. Kester, chairman of the board's education committee.

The board responded by ordering the building moved 85 feet north.

As it turned out, the school was built with a crawl space instead of a basement.

The chemicals beneath the surface presented school officials with problems even after the school site was shifted and the foundation pillars were sunk into the Niagara Frontier rockbed.

Mr. Thiele said at the time that the chemical dumps "present an unattractive nuisance with a number of definite hazards to adjacent property owners and neighborhood children."

Mr. Thiele, who today believes the school board was primarily concerned with saving taxpayers' money, recommended that the contractor "clean up and bury as much of the debris as possible.

"Fill up the two open chemical pits toward the north end of the southerly section of the property but it should be pointed out that when fill is placed in these pits, the liquid is then likely to overflow and cover adjacent areas . . ." he warned at the time.

Mr. Thiele called his proposal a "relatively minor effort" that would help limit the hazardous conditions at the site but would fall short of placing it "in satisfactory shape."

The building records for the school indicate the school board subsequently ordered drain tiles for any runoff to channel into city storm sewers.

[Oct. 1, 1978]

AIR SAMPLES FIND HAZARDOUS TOXINS BEYOND CANAL AREA

(By David Shribman)

Elevated levels of benzene, which is known to cause leukemia in humans, have been found in basements as far as three blocks outside the Love Canal hazard zone.

Results of air samples obtained by The Buffalo News confirm that benzene and six other chemicals suspected of causing cancer are present in basements within a seven-block area, posing a possible health threat to families whose homes are not covered by the state's relocation and purchase program.

The chemicals also are known to cause a wide range of liver and blood diseases as well as nervous system and gastro-intestinal disorders, skin and respiratory irritations.

The air samples suggest that the toxic chemicals leaking out of the old Hooker Chemical and Plastic Corp., dump may have drained farther than earlier believed, or possibly that the homes are being contaminated by another toxic source.

The chemical readings turned up in a survey of the basements of 40 homes beyond the fences of the Love Canal hazard zone.

Although state health officials have maintained that the presence of more than three toxic chemicals is confined to 97th and 99th Streets, the air sample results demonstrate for the first time that four toxins—and, in some cases, more—are present as far east as 102nd Street.

The amount of benzene found in the homes ranges from none to 82 micrograms per cubic meter, more than 400 times the suggested limit for 24-hour exposure over the course of a lifetime.

State scientists minimize the danger of exposure to the levels of benzene found in the homes, but independent environmental health scientists and a spokesman for the National Institute of Occupational Safety and Health have expressed alarm at the findings.

"It's an absolute health hazard," said one scientist involved in advanced research in human responses to toxic chemicals.

"I'd advise pregnant women and children to stay away from that," said Robert Delmage, a technical information specialist with the National Institute of Occupational Safety and Health in Cincinnati. "There could be real problems."

The air samples also showed high readings of toluene, which is not regarded as a major threat to health but which is nearly always contaminated with benzene, one of the first compounds scientists linked to cancer.

Benzene posed a particularly strong threat to pregnant women because the compound is known to travel across the placenta and into the bloodstream of growing infants, possibly affecting the infant's bone marrow.

It is also known to cause aplastic anemia, the failure to produce bone marrow, in humans. Aplastic anemia has been reported to precede leukemia in humans by as many as 15 years.

Hazard levels of toxic chemicals such as benzene, chloroform, trichloroethene and the other toxins found in the air samples are a matter of considerable controversy within the scientific community.

The Occupational Safety and Health Administration has set hazard levels of 30,000 micrograms per cubic meter for benzene and 535,000 micrograms per cubic meter for trichloroethene but these are workplace standards based on males working only eight hours per day.

Dr. Stephen Kim, a research scientist with the state laboratories in Albany, set 0.2 micrograms per cubic meter as the suggested lifetime exposure limit based on 24-hour exposure.

The amounts found in the Niagara Falls homes fall well below thresholds established by OSHA, but above those set by Dr. Kim and well above limits recommended by other scientists in the environmental health sciences field.

Most of the studies on toxin chemical exposure have focused on the workplace conditions, but it is known that health risks rise with exposure inside homes particularly when pregnant women, young children and the elderly are involved.

[Feb. 20, 1979]

RESEARCHER WARNS STATE ON HEALTH RISKS

(By Paul MacClennan)

Citing abnormally high health risks, a medical researcher at Roswell Park Memorial Institute today called for evacuation of 236 more families from contaminated areas near the Love Canal.

Dr. Beverly Paigen, who based her evaluation on interviews with 1,140 residents—75 percent of those still living near the canal—said families face these risks:

A 3½ times greater chance of women having miscarriages during pregnancy.
A 20 to 50 percent chance of birth defects in children born to parents living in the most seriously chemically polluted areas.

A 27-fold increase in the prospect of nervous breakdowns including suicide attempts and admission to mental hospitals.

A fourfold increase in the chance of epilepsy.

A 3½ times greater risk of asthma.

A 2.9 times greater chance of contracting urinary disorders, including kidney and bladder problems.

A 15 times greater chance of experiencing hyperactivity in children.

Dr. Paigen said she plans to detail the risks at a community meeting this evening in the 99th Street School that lies within the boundaries of the old Hooker Chemicals and Plastics Corp. dump site.

The researcher said the state Health Department's decision to move only pregnant women and children under two years old is "scientifically not acceptable.

"I will stress to families that until they leave the canal they should avoid pregnancies," she said.

Given the high risk, she argues against a proposal of some canal area residents that wives become pregnant so the state will relocate the families.

Dr. Paigen attacked another state contention that the risks of birth defects among mothers living in the contaminated areas are no greater than those among mothers who smoke or take drugs during pregnancy.

She said that is based on minimized risk evaluations and not on evidence she developed that shows risk levels ranging from 20 to 50 percent.

Asked about the long-range state plan to dry up the flow of chemicals out of the Hooker dump, Dr. Paigen said she thinks the present construction won't do the job.

Dr. Paigen contends that the present trench—10 to 12 feet deep—is too shallow and that the chemicals may continue to flow out of the area under the state's trench system and into homes along underground streambeds believed far deeper.

Dr. Paigen said any woman of child-bearing age who intends to become pregnant should be moved out of the area at least six months in advance to enable the individual's body to rid itself of harmful chemicals.

"To wait until a woman is pregnant to have the family move is wrong because the first weeks of pregnancy are the time when the fetus must be protected, and it is often past the time of greatest risk when the persons becomes aware of the pregnancy," she said.

Dr. Paigen said health data released thus far by the state "tends to minimize the risks" and ignores some of the data.

She said, for example, that four children have been born with birth defects since the state Health Department began its studies in the canal area, and the state data upon which its evaluates health risks does not include a dozen children who have birth defects.

Dr. Paigen said the state estimates that the families in the canal area face twice the risk of miscarriage, but her evidence supports a risk rate of 3½ times.

In the area of birth defects, she said the state projects a rate of 5 percent among those living in non-contaminated areas and a rate of 12.5 percent in wet or contaminate areas.

Dr. Paigen said the rates based on her interviews set rate of 6.8 percent for those in dry or non-contaminated areas and 20 percent in the wet or contaminated areas.

Examining the data in five-year blocks on the assumption that chemical leaking has increased in the past few years, Dr. Paigen said the risk rises dramatically—one out of two sufferend from birth defects in recent years.

She said the evidence for those families living on or along underground stream beds where chemicals are believed to flow that nine out of 16 children born in the last five years have suffered from birth defects.

Dr. Paigen said she has asked Dr. Axelrod, the state health commissioner, to reexamine the state data in terms of five-year blocks.

Dr. Paigen—the first person to call for evacuation of canal residents in August said the state should relocate immediately 136 more families and offer relocation to 100 other families who live in an area bounded by 100th and 103rd streets from Frontier to Colvin, plus those living north of Colvin from 96th Street to 101 Street south of Bergholz Creek.

Her proposal would double the present relocation program that has seen the state offer to evacuate and buy homes of 239 residents along 7th and 99th streets.

“There are some residents on portions of some blocks in the southern area where there has not been much disease who might prefer to stay, but I think everyone who lives along a streambed or wet area or who wishes to move should be given the opportunity to get out,” she said.

Dr. Paigen said residents of Griffon Manor, a housing project, currently are being interviewed, and results of those findings could lead to a further call for evacuation. The state has offered relocation to about 100 families in the apartment areas, plus 30 homeowners.

She said she intends to hand out a list of homes with addresses of those residents she feels should be evacuated immediately.

“There is enough evidence of disease in other homes and enough uncertainties about the flow of chemicals in soils . . . so the entire south area should be evacuated,” she said.

Dr. Paigen said the homes may not be livable again until the state constructs another trench system along a major east-west stream bed leading from the canal to the home area.

That trench is necessary, she said, to collect contaminated groundwater leaking from the canal and entering area basements.



March 21, 1979

To Whom It May Concern:

The tragedy of Love Canal with all of its attendant personal, health and social costs has dramatized the necessity for finding some other way of disposing of toxic wastes than placing them in landfills. Preferably, as many of these chemicals as possible should be recovered at the manufacturing site and recycled to become a raw material in appropriate production processes. That still will leave some wastes that must be disposed of and we urge that further research be conducted to find a completely safe method for disposal.

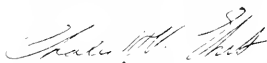
While that search continues, we should move quickly to study and adopt a high temperature incineration method which already is in operation, or under construction at six major sites in Europe. The best known of these sites is at Nyborg in Denmark. That plant is called Kommunekemia and it is jointly owned by the National Association of Municipalities in Denmark, the City of Copenhagen, the Borough of Frederiksberg, and the Danish Gasworks Tar Company at Nyborg. These plants generate electricity and provide district heating from the heat value in the toxics as well as provide a reasonably secure method for disposal of residue.

This technology has been known in the United States for some time but has not been widely adopted because it is more costly than disposal in landfills. The tragedy of leaching landfills has demonstrated graphically that it would have been much better to dispose of the toxics properly and safely in the first place even if the initial cost had been higher than placement in landfills.

Experience in Europe has shown that these plants must be fairly large to achieve adequate economy of scale and also to derive the benefits of district heating. In order to receive a sufficient load of toxic materials, countries such as Denmark and Sweden have passed laws requiring that all toxics generated in the country be disposed of through the plant in that country. Similar laws must be passed in the United States. It would make sense for example that all of the toxics generated in the State of New York be disposed of through some central high temperature incinerating plant. Such a plant could be owned jointly by relevant industries and state and local governments.

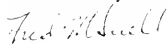
March 21, 1979

The undersigned concerned faculty members at the State University of New York at Buffalo strongly urge speedy and thorough investigation looking to the establishment in the United States as soon as possible of district high temperature incineration toxic disposal plants. We believe that this will require enabling and supporting legislation by federal, state and local governments and urge speedy action in that respect. We believe it also will require disposal of all appropriate toxins through such a plant once it is in operation and this should be enforced through law. Since it will take some time to get this new infrastructure in place, we urge that initiating steps be taken with all due haste.

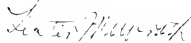


Charles H.V. Ebert
Prof. of Geography

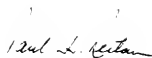
Sincerely,



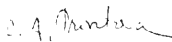
Fred Snell
Prof. of Bio-physics



Lester W. Milbrath
Director



Paul H. Reitan
Prof. of Geology



Carmelo Privitera
Prof. of Biology



Peter Gold
Acting Master
Rachel Carson College

State University of New York at Buffalo



OFFICE OF THE DEAN

FACULTY OF ENGINEERING AND APPLIED SCIENCES

March 27, 1979

MEMORANDUM

TO: Mr. James Clark

FROM: George C. Lee *George C. Lee*

With respect to the questions on toxic waste disposal in your recent letter, I am happy to supply you with the following information.

1. Regarding the feasibility of constructing toxic waste facilities, a prospectus on this issue has been prepared by our environmental engineering faculty members. I believe it summarizes the fundamental issues of dealing with the various types of toxic wastes, and for each different type a different approach and different consideration must be given. In general, it may be stated that such a development is an extremely costly project but the possibility exists for developing some of these special types of waste treatment facilities. It would be difficult to assess the problems that may arise if such a facility is in operation because the state-of-the-art of knowledge is such that there are definitely many unknown factors associated with such a development.

2. You have requested a map which identifies the potential landfill sites containing hazardous wastes. As you know, publication of the New York State Task Force Report has been delayed. Therefore, I could not receive a copy of the map in advance. On the other hand, based on the presentation of the Task Force Chairman, Mr. Peter Millock, at our recent seminar, he has clearly stated that there are many additional dumping sites in Western New York which have been uncovered and of these, several can be as severe or more severe than the Love Canal problems. I believe we can take that statement seriously. For details, we will have to wait until the Task Force officially releases the report.

3. A set of cassettes recordings from the toxic waste seminar are enclosed at your request. Please note that a portion of the recordings was missing because the original tape did not function at the seminar.

I hope this material can provide some assistance to your efforts. Please do not hesitate to contact me if I can help generate additional information for you.

LD

Attachments

NOTICE OF CANCELLATION OR NONRENEWAL
(New York)

INSURANCE COMPANY: Republic Insurance Company
129 Fulton Street
New York, New York 10038

NAME AND MAILING ADDRESS OF INSURED: Edmund A. & Marie A. Pozniak
10002 Colvin Blvd.
Niagara Falls, New York 14304

KIND OF POLICY:
Homeowner
POLICY NO. 245 30 33
DATE OF MAILING 11/17/78
ISSUED THROUGH AGENCY OR OFFICE AT:
New York

P T Carella Agency
529 Cayuga Drive
Niagara Falls, N.Y. 14304

(Applicable item marked (X)).

CANCEL
LATION

Effective _____, at noon/ 12:01 A.M. (Standard Time), we hereby cancel the above mentioned policy issued to _____ on _____ in accordance with the terms and conditions of the policy and, if applicable, the provisions of the Plan of Operation of the New York Property Insurance Underwriting Association.

Effective 12/17/78 at noon/ 12:01 A.M. (Standard Time), we hereby cancel the above mentioned policy issued to Edmund A. & Marie A. Pozniak on 12/15/78 in accordance with the terms and conditions of the policy, New York law and, if applicable, the provisions of the Plan of Operation of the New York Property Insurance Underwriting Association.

Reason(s) for cancellation. See statutory reason(s) designated by Code No(s) _____ on the reverse side hereof.
Reason(s) for cancellation other than statutory reason(s): "Increase in Hazard."

IF THIS CANCELLATION IS DUE TO NONPAYMENT OF PREMIUM AND YOU HAVE ALREADY MADE PAYMENT OF PREMIUM OR WILL MAKE PAYMENT WITHIN 15 DAYS AFTER THE MAILING OF THIS NOTICE, PLEASE CONTACT THIS COMPANY OR YOUR AGENT OR BROKER IMMEDIATELY. (Section 167-a of the New York Insurance Law states that "nonpayment of premium" means the failure of the named insured to discharge any obligation in connection with the payment of premiums on a policy of insurance or any installment of such premium, whether the premium is payable directly to the insurer or its agent, or indirectly under any premium finance plan or extension of credit. The law further provides that payment to the insurer, or to an agent or broker authorized to receive such payment, shall be timely if made within 15 days after the making to the insured of a notice of cancellation for nonpayment of premium.)

Premium Adjustment

Please return the policy to us with remittance of \$ _____ being the amount of earned premium for time it has been in force at date of cancellation

As the premium due has not been received by this Company for this insurance, there is none to be returned

Enclosed is \$ _____ being amount of return premium at pro rata rate for the unexpired term of this policy.

The excess of paid premium, if any, above the pro rata premium for the expired time, (if not tendered) will be refunded upon demand

NON-
RENEWAL

We hereby notify you in accordance with New York law that the above mentioned policy will expire effective _____ at noon/ 12:01 A.M. (Standard Time) at the location of the property involved, and the policy will NOT be renewed.
Reason(s) for nonrenewal: _____

IMPORTANT
NOTICE

Consumer Report. Pursuant to fair credit reporting laws, you are informed that the above action is taken wholly or partly because of information contained in a consumer report, copy of which you may inspect and receive by contacting the following consumer reporting agency: _____

(NAME)

(ADDRESS)

SEE REVERSE SIDE FOR IMPORTANT INFORMATION

C 35g (Ed 1-78) - 17788 PRINTING & SUPPLY DIV

INSURED'S COPY

John J. Zahn
AUTHORIZED REPRESENTATIVE

REASONS FOR CANCELLATION

Cancellation is based on one or more of the following which are reproduced from Section 167 a of the New York Insurance Law

Code

- 1 nonpayment of premium;
- 2 conviction of a crime arising out of acts increasing the hazard insured against;
- 3 discovery of fraud or material misrepresentation;
- 4 discovery of wilful or reckless acts or omissions increasing the hazard insured against;
- 5 physical changes in the property insured occurring after issuance or last annual anniversary date of the policy which result in the property becoming uninsurable in accordance with the insurer's objective, uniformly applied underwriting standards in effect at the time the policy was issued or last voluntarily renewed, or
- 6 a determination by the superintendent that the continuation of the policy would violate or would place the insurer in violation of this chapter.

IMPORTANT INFORMATION PERTAINING TO THE PROCUREMENT OF**FIRE, EXTENDED COVERAGE, VANDALISM AND MALICIOUS MISCHIEF, SPRINKLER LEAKAGE AND TIME ELEMENT INSURANCE**

You have been notified herewith that this Company does not desire to carry your insurance any longer. If you wish to replace your policy you should make an effort to obtain insurance through another company in the normal market. If you have difficulty in procuring replacement coverage in the normal market you possibly may obtain FIRE, EXTENDED COVERAGE, VANDALISM AND MALICIOUS MISCHIEF, SPRINKLER LEAKAGE AND TIME ELEMENT insurance through the New York Property Insurance Underwriting Association. For further information please contact your agent or broker or the following office of the Association.

110 William Street
New York, New York 10038

IMPORTANT INFORMATION PERTAINING TO THE PROCUREMENT OF CRIME INSURANCE

If the policy being cancelled or not renewed provides crime insurance, such insurance may be available through the Federal Insurance Administration of the Department of Housing and Urban Development. This insurance may be purchased through any licensed agent or broker.

The following petition was accompanied by 6,500 signatures:

We, the undersigned, hereby petition the Town of Porter, Niagara County, and all levels of State and Federal government to take immediate action to terminate the dumping, storing, and burial of all lethal and toxic wastes in the Town of Porter.

We also petition the State of New York Department of Environmental Conservation to assume the cost of perpetual care of those landfills already in existence under prior DEC permits.

A Message From The Industrial Chemicals Group

Executive Vice President

BRUCE D. DAVIS

PUBLISHED BY

HOOKER CHEMICALS & PLASTICS CORP.

On landfills and the environment . . .

In view of the amount of public attention that continues to be focused on our company's operations in Niagara Falls and Montague, it might be well to review these situations and discuss with you how your company is dealing with them.

As a concerned and responsible corporate citizen, Hooker Chemical intends to continue to obey the law and all regulatory guidelines, edicts, and orders, including those dealing with employee health and safety and the protection of the workplace and the environment. Both Hooker and its parent company, Occidental Petroleum Corporation, are committed to this principle in formal, written policy statements. There can be no deviation from this commitment.

The difficulties receiving wide attention at Niagara Falls and Montague are largely linked to former landfills that were used and closed down before present-day regulations and the proposed new Federal Resource Conservation & Recovery Act (RCRA) were even drafted, let alone made the law of the land. The remedial work now underway at Love Canal, as well as the programs we have adopted and are implementing for former company landfills at Hyde Park Boulevard and Montague, utilize the very latest in technology, in keeping with regulations as proposed under RCRA.

Many people date the nation's first general awareness of the environmental movement to the publication in 1962 of Rachel Carson's "Silent Spring." Even then — just 16 years ago — the analytical capabilities of the most advanced laboratories were somewhere in the range of 10 parts per million. Now, through the development of highly sophisticated instrumentation and improved techniques, it is possible to detect trace quantities of chemicals in the range of parts per billion and even parts per trillion.

To really understand and appreciate what our scientists are talking about when looking for compounds in those amounts, it becomes a little mind-boggling. Perhaps these examples might help: one part per billion is akin to locating one bad apple among 2,000,000 barrels of apples; one part per trillion is the equivalent of mixing the world's driest martini by following this formula — shake together 520 30,000-gallon tank cars of gin and add one drop of vermouth!

In interpreting the discovery of a highly toxic substance in very low concentration, one must take into account the quantity found and the means of exposure before determining the degree of hazard. A substance, such as carbon monoxide, may be classified as toxic, but this doesn't necessarily mean that its sheer presence in the atmosphere creates a hazardous situation. If it did, automobiles would have been banned long ago. By the same token, Hooker makes products intrinsically toxic, but they are beneficial to mankind when used properly. We attempt to make absolutely sure that all of our plant practices in handling and disposing of toxic materials do not present a hazard to our people or to the surrounding communities.

Should any evidence arise to the contrary in any of our plant communities, we will move promptly to eliminate the problem.

Even under today's best technology and landfill management, highly impermeable clay is the recommended material of containment for landfilled substances. The restoration of the clay cap at Love Canal, plus the installation of other remedial work as recommended by the city's *Planners* consultants, should restore and ensure the integrity of this site. As many of you are aware, your company has worked closely with city and county officials over the past 18 months when the Love Canal problem first was brought to public attention.

At Montague, we have been working diligently and cooperatively with the Michigan Department of Natural Resources to resolve solid waste and groundwater problems associated with our operations and past practices. It is our intent to continue to work closely with the official agencies in all our plant communities while reserving our right to question, within the framework of the regulations, rulings or decisions which we may deem to be unfair, unreasonable, unworkable or demonstrably not cost effective.

In summary, let me say that your company is dedicated to doing whatever has to be done to protect the health and safety of workers and the total environment. Along with many others, we are committing large sums for capital projects and operating expenses to meet rapidly proliferating regulations in the face of advancing knowledge and technology. Our goal is total excellence in everything we do, in every product we make, in every practice, in every management decision. This is the Hooker way.

COLEMAN'S HONORABLE RECORD

Every one of man's activities produces waste of one kind or another. Whether we are drilling an oil well, a cable or mining down a coal mine, we produce waste that is polluting our air, our water, our land. The production of chemicals is no exception.

Solving the industrial disposal problem isn't simple. Hooker has been working for many years at the Niagara plant in ways to handle chemical wastes without harming or damaging the environment.

HERE'S WHAT WE'RE DOING.

1. Reducing the volume of wastes. We have been doing this by redesigning our chemical processes to improve efficiency and produce less waste. We are also recycling materials to extract more chemicals the second time around. This also reduces waste.

The second concern is to destroy our waste in ways to incineration. This has the advantage of being an immediate solution as it does not involve later moving bulk materials to another land disposal site.

2. As far back as 20 years ago, Hooker realized that burning liquid wastes was not the ideal method of disposal. If it appeared that the only ways to break down some chemicals was with heat, but the problem was that many of these chemicals were so stable even when heated, that they were used to make fire-resistant fabrics and plastics. The Hooker engineers persisted, however, and eventually developed a high-temperature incinerator that could burn even the toughest plastics. This move to high-temperature incineration has been used by others as well as Hooker.

3. Some of the materials we put into operations are that more than 100,000 tons of our incinerator has been destroyed, but reducing the burden being placed on chemical landfills. Over the years, many improvements have been made and we are now working on a process to destroy toxic wastes.

4. These programs have achieved dramatic reductions in volume over the past few years. Of course, we must be careful to ensure that we do not create an air pollution problem when we incinerate solid or liquid wastes.

5. This is an important part of our "product independence" in which we manage to become self-sufficient in all aspects of our supply chain. The importance of this subject can be judged from the fact that chemical disposal from our Niagara plant alone costs us \$200,000 each month. Some landfills exist, however, will still be needed. Some chemicals are materials which are as stable as they can be made, destroyed by a heat and must be burned and electricity to reduce the amount of waste and as a further indication of Hooker's concern for the environment and the need to conserve energy, we are building the largest privately owned energy-from-waste plant in the USA. With an investment of more than \$75 million, the plant will produce municipal garbage from Niagara and Erie counties and convert it into steam and electricity for our own manufacturing operations. As a side venture, the company will also recycle its own waste. The plant is scheduled to begin operating in the spring of 1980.

CHEMICALS & TOXICITY.

Normal everyday activities expose people to many chemicals which could

be considered toxic. The harmful components of cigarette smoke have been shown to be a kind of cumulative poison, so that you are being breathing the air in a large room previously used by smokers. Nail polish remover and many household cleaners produce vapors that could present a risk to some people.

One of our major programs is our total chemical capability to detect minute quantities of toxic substances. For example, we can now detect trace quantities of elements as small as part per billion. In other words, we can identify and measure them even from a single drop of gasoline in a space the size of a full stadium.

This will give you some idea of the magnitude of the task facing the New York Health Department. In one hour they face more than 100,000 samples of chemicals. This is why they are bringing scientists to the plant to research into the elements and why it is necessary to send these statements with copies to the State.

We cannot avoid with certainty that the higher doses found are directly related to chemical exposure but the data do suggest a small but significant increase in the risk of skin cancers and birth defects. Although this magnitude of the additional risk to the population is a solid number, it is a product of data that we take a most conservative position to estimate even the smallest additional risk.

The State Department said that studies done did not document any increased incidence of liver disease except among residents of the first two miles of homes which have been evacuated. Now we are concerned not in abnormal blood problems, except that there was no evidence of toxic metals being present among the general population. The Department also said there was no evidence of toxic metals related to exposure to benzene, a known cancer-causing agent. The data also failed to present evidence of cancer, leukemia or other diseases.

The Department is continuing to collect and evaluate data.

THE LOVE CANAL.

The Love Canal residents considered an ideal site for chemical residues and other wastes when it was used. It was a property purchased by Hooker and the site was impervious clay. All the time it was not anticipated that the main rain pipe did not seal. The water table rose. Today, this anthology shows us how to make such a site even better. In addition, an impervious seal can be applied over the site to keep out rain and snow, a drainage hole system is installed around the site to collect any water that might otherwise seep out and a monitoring system to warn of any potential hazard.

The Love Canal situation has been preceded by other examples in an example of corporate disregard for the environment. In this case, the company stood up to the Love Canal.

When Hooker acquired the Love Canal as a landfill site, it had "no ideal" characteristics. The ground was impervious clay, which prevented the chemicals from draining away and the whole area around the canal at the time Hooker began using it was sparsely vegetated. The center of the canal was used as a landfill. The chemical waste that had been hauled to the site in drums were then placed either

in the canal bed or in new excavations. All of the drums were sealed with the Love material.

In 1973, a group of educators of the City of Niagara Falls, wanted the site as a school. As a result of the School Board's persistence, Hooker developed property in 1973 in connection that the deed include a clause warning of the past use and under which the School Board assumed the risk for any hazard that might result from the buried chemicals.

The site was built adjacent to the central portion of the canal, the northern part was divided to the left, and the southern portion was divided to the right. The water table rose and seepage to a private developer in a site a warning by Hooker management against construction on the site. It is the water table that has risen and the whole area had been dug out, but no homes were built directly on the Love Canal property.

Someone at the site, an architect, decided to use the property for a new, concrete-walled apartment during the construction of homes or in the area. Water seeped into the canal and gradually leaked up until like a bathtub and overflowed. The water mixed with chemical wastes, producing a liquid called leachate which seeped into some basements of houses built on adjacent properties.

Engineering consultants were called in and a plan of remedial work was established by the U.S. government in the southern section in cooperation with the City. The program was to install a hole collection system to catch all of the canal and to channel it into an underground tank near the Love Canal.

Although the property was sold under a Hooker contract for 25 years, the company committed to help fund the engineering studies and also offered to contribute up to one-third of the original estimated total cost of the remedial work on the southern section. Hooker is continuing to provide financial assistance on these projects.

The State authorities were concerned that this chemicals may have leaked out through the bottom of the canal into the groundwater. To back this up, they have drilled on each side of the canal down into the bedrock.

To date, no traces of chemical residues have been detected. But the water was found to contain sulfide which has, in fact, naturally, throughout the area and makes the water unfit for drinking.

THE HYDE PARK PROGRAM.

Another area that has become a great deal of attention is the Hyde Park landfill site. It is an industrial site and was used for the disposal of waste materials throughout the area. The site was acquired by Hooker in 1973 and received this chemical and other wastes from the Niagara plant after the Love Canal site was closed.

During 1974 and 1975, the project was developed as a pilot program in accordance with plans approved by the State. A city about two blocks away installed a new local fire collection system. Leachate has collected in a holding lagoon for off-site disposal. The State and federal regulations were introduced will require a thick clay cap and an impervious drainage system to collect any leachate that will be collected. The project is now in progress. Hooker already

has voluntarily acquired the Hyde Park site at the request of the State. In 1976, additional city was placed over the entire site and a more extensive drainage system installed. This program also included improved pumping stations and a rain collection pond. To date, building permits authorizing us to complete these facilities have not been granted by the Town of Niagara.

Another part of the Hyde Park program was to determine if any homes are being attacked by an underground leak. In this monitoring, we have been installing a chemical detector and a monitoring system to detect an operation on the New York Department of Environmental Conservation (DEC) and Department of Health.

The natural drainage channel in this area is called "Blackby Run." There are several chemical plants in Blackby Run that have led us into a sophisticated program to determine their impact on the water and to control leachate. The program developed with various agencies is expected to provide additional data on the quality of the water.

The program also includes sampling and contour mapping and the identification of pollutants that may be present in sediments. Soil samples at various depths will take a new soil area. The company already has installed a hole collection system to catch all of the canal and to channel it into an underground tank near the Love Canal.

In addition, we have sampled the water from the wells of the three new homes in the area. High sulfide levels in the water are well below the levels which are considered to be healthful.

What's at 102nd Street? The Hooker site known as the 102nd Street Landfill. The property, acquired by Hooker in the 1940's, is south of the Love Canal and adjacent to the Niagara River. When we first acquired the "Niagara Allot" and Old Run, Electric, thermal components in the mid 1960's, we also acquired this landfill operation in the same area. Hooker has many properties in the area.

The site was used for a former time as a landfill and is being converted to another industrial landfill site. This site includes a hole collection system to catch all of the canal and to channel it into an underground tank near the Love Canal.

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the plant to vary, different from what it used to be. The water was land was reclaimed from the river by the use of a dyke, dike and treatment water. This land was purchased by Hooker in 1962 and became known as the "N" and "S" areas. The sites were used by Hooker for the disposal of chemical wastes and afterwards as a staging area for the disposal of wastes since it had been found to be a better quality of land than the Love Canal.

The "S" area is located across the street from the City's water treatment plant. It should be a high-quality area that the water distributed to the homes in Niagara Falls is regularly tested by City and State agencies and has been found to be a better quality than most in the U.S.

In the Summer of 1978, the City sent divers down into the short shaft of the water treatment plant on a routine inspection and maintenance check. A sediment sample brought to the surface was analyzed and found to contain various chemicals, some of which are made by Hooker. The problem then was to identify how the chemicals could have reached the treatment plant.

Recent excavations at the water treatment plant were examined but no trace of chemical contaminants was found. We are now in the process of drilling and installing test holes around the Niagara plant and the water treatment plant in an effort to determine the flow of groundwater and to discover the possible source and route of the chemicals. Even other unexcavated sections of the water treatment plant have been tested, but no more chemicals have been discovered. Again it should be pointed out that the water supply is being regularly tested and analyzed to maintain a high level of quality and purity.

3,500 GROUNDWATER SAMPLES. Testing samples of water is a complex time-consuming operation. There are very few laboratories in the country with the equipment to do the analytical and rigorous analytical work. Our own test laboratories are working at capacity. So to keep the program moving, we are using other qualified laboratories as well as Westcott, Tean and Columbia to do the analytical work.

In the first quarter of 1979, alone we will analyze over 3,500 samples of groundwater from 200 disposal wells. During 1979, we estimate that we will be spending \$5 million for sample analysis. The higher the quality, the only test at the landfill sites, but also the regular testing of the water discharges into the river. The water is being regularly tested at our Niagara plant.

THE WAY AHEAD.

The program that we have undertaken is vast and complex. In fact, it is the most complex we have ever undertaken. It is a program that we have undertaken in the past few years. It is a program that we have undertaken in the past few years.

WHAT ELSE NEEDS TO BE SAID?

We have given you the substance of what we told in all reports from March 1976 to March 1978. We have given you the substance of what we told in all reports from March 1976 to March 1978.

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incidents are only now being sorted out on the whole, some subject and are not expected to be adopted until 1980. Meanwhile, we are moving ahead with programs designed to meet the standards of the future.

One of the first future programs was the National Pollution Discharge Elimination System (NPDES) under the Clean Water Act. This is a permit system governing the discharge of effluents into navigable waters. Our Niagara plant is periodically examined by State officials and pollution control devices and elaborate monitoring aids are installed to ensure that the discharge limits of specific chemicals named in permits is not exceeded.

As an example, the cooling water used on the plant is discharged at four locations. The permit not only regulates properties such as temperature and suspended solids, but also limits the quantity of specific organic chemicals. Individual chemicals of special concern are limited to about 2 lbs. total solids a day, except for the occasional "leak" in the more than 100,000 gallons of water used in our plant every year.

MULTI-MILLION DOLLAR POLLUTION CONTROL PROGRAMS. A spill control program is designed not only to prevent spillage of dangerous chemicals but to contain any spills until they are cleaned up. Dikes are built around all possible spill locations and pumps are being used to collect the chemicals that might accidentally leak out. The chemicals are then pumped out to proper disposal. This has been accomplished with an extensive relocation program at the workplace to prevent spills and a stepped-up equipment maintenance program. The total cost is about \$3 million and is being spread over a three year period. About one-half of the work has already been done.

New equipment and equipment are constantly being developed to be more energy efficient, cleaner to operate, more maintenance and to improve the product quality and so help maintain Hooker's competitive position.

There were, however, some chemical programs that could not be installed voluntarily to meet the more stringent quality requirements. Matters would be permitted to occur only in the marketplace, and these have been closed down.

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Hooker's
Niagara Plant.
Listen to the people who know.

HAZARDOUS AND TOXIC WASTE DISPOSAL

THURSDAY, MARCH 29, 1979

U.S. SENATE,
COMMITTEE ON ENVIRONMENT AND PUBLIC WORKS,
SUBCOMMITTEES ON ENVIRONMENTAL POLLUTION
AND RESOURCE PROTECTION,
Washington, D.C.

The subcommittee met at 10 a.m., pursuant to recess, in room 4200, Dirksen Senate Office Building, Hon. Quentin Burdick presiding.

Present: Senators Burdick, Chafee, and Simpson.

OPENING STATEMENT OF HON. QUENTIN N. BURDICK, U.S. SENATOR FROM THE STATE OF NORTH DAKOTA

Senator BURDICK. Good morning. As a concerned member of the Subcommittee on Environmental Pollution, I am pleased to welcome you to the second day of our joint hearings with the Resource Protection Subcommittee on the issue of hazardous wastes and toxic chemicals.

Recently we have seen rise before us from the accumulations of past neglect a grim specter that threatens our future across the entire Nation. Poisons in our land, our water, threaten the health of all. These problems present a challenge both vast and complex. To remedy the situation, if, where, and however possible, will require solutions that may be costly and controversial. Nonetheless, we must begin now the search for the best answers we can find.

Therefore, in these hearings we hope to learn more about the nature and the extent of these problems so that our decisions may be informed and wise.

This morning, in addition to the distinguished Senator from New York, Jacob Javits, and Representative LaFalce, we will hear from some of the industries that have been involved recently in significant and dramatic incidents that have in no small measure brought us to this room today.

Gentlemen, we will be pleased to hear first from the Senior Senator from New York, Senator Javits.

STATEMENT OF HON. JACOB JAVITS, U.S. SENATOR FROM THE STATE OF NEW YORK

Senator JAVITS. Thank you, Mr. Chairman.

May I express my deep appreciation for taking me promptly. I am due before the Appropriations Subcommittee in 25 minutes.

I also want to thank you for having this hearing. It is very important to us.

Mr. Chairman, I ask unanimous consent that my statement may be made a part of the record.

Senator BURDICK. Without objection, it is so ordered. [See p. 283.]

Senator JAVITS. As the Chair knows, we have a very sick situation in the Niagara Falls area, with the remains or seepage of chemicals which come from, we think, the operations of the Hooker Chemical Co., which was a fixture in Niagara Falls for many years, so much so when I was in the Army, which goes back 34 years, I was in the Chemical Corps and a good deal of our business was done with Hooker, so I know something about the situation.

Also, I have been up on the grounds and it is really a mess. The area is probably a couple of miles square, but no one knows what the seepage is, and will be.

The area has been evacuated. The houses are boarded up and the ground is very soft. You can actually put a stick down in a hole and come up with a stick full of pollutants. It is that close to the surface. So it is very, very serious.

We, of course, have a State problem, we understand. Collaboratively with the Federal Government, we hope that we can be helped to help ourselves.

The three major points which emerge from my statement are these:

One, that we need to identify first and foremost where the problems are, and also where it is indicated they will be.

The grave problem with Love Canal is before we began to do something about it, we had already had many problems and for a time nobody knew what it was all about, except for the smell, which, by the way, was clear when I went in there. When you go into any basement—and they are all pretty much one-story houses—you had the chlorine and other chemical smells hit you very hard.

So, one, the abandoned sites need to be abandoned, and we need to do something about them.

Second, there need to be some guidelines on an interstate commerce basis to deal with the sealing up and cleaning up of these abandoned sites. I think that would be a responsibility of the Federal Government because it relates not only to a particular site and place, but it relates to this same problem everywhere.

As we all know, this pollution is by no means confined by State lines or confined to an individual State.

Then, comprehensive liability and compensation legislation needs to be considered by the Congress.

By the way, there is some analogy here, Mr. Chairman, which might be useful to the committee. With the problem we had with oil spills and cleanups, that might be an analogy as to the legislative technique with which this particular problem, which is a first impression, might be approached.

Those are the essential elements of my testimony.

The Federal Government has given us a little bit of assistance with the Love Canal, a few million dollars which we managed to get for the purpose of helping us with this rather huge problem, but there is available a section of the Water Pollution Control Act

amendments, section 504, which has never been funded, which could be considered for this purpose, because that section provides assistance, and I quote: "Provide assistance in emergencies caused by the release into the environment of any pollutant anticipated or presenting potential danger to the public health."

That is in the amendment, but has never been implemented.

We have a projected cleanup cost of \$25 million, an emergency \$4 million, which was the particular approach which Senator Moynihan and I sought and received from the Congress and \$2 million from the Federal Disaster Assistance Agency when the President declared a state of emergency in the Love Canal area.

Aside from the section 504, which I mentioned, there apparently is no specific law on the subject. The most that we could get with the Federal Disaster Assistance Agency was \$2 million for certain remedial construction, to deal with what they were permitted to help under their law, "Chronic Health Problem."

When we remonstrated, we were advised the Federal Disaster Assistance Agency deals with immediate emergency situations, and the Administrator told us, "If the FDAA were to continue to provide emergency assistance over a period of years, we would be operating outside the restraints intended for this program."

To show this is quite a widespread problem, it is our understanding from the Environmental Protection Agency that there are some 32,000 landfills containing hazardous materials in the United States, and as many as 1,200, the EPA estimates, may be imminently hazardous to the public and, of course, the range of costs is astronomical, if you are going to look for complete reconstruction as a solution.

So it is a very serious matter, as far as we are concerned, and it is very serious as far as other States in the United States are concerned, and, therefore, deserves fully the attention of this committee, which is what I am here urging today.

Senator BURDICK. Thank you, Senator, for your contribution this morning.

To what extent has the State of New York committed itself financially to the problem?

Senator JAVITS. The State has put up \$15.5 million and has evacuated the area, and really has knocked itself out in the process. I think you know the problems of States, Mr. Chairman, which are now in a declining rather than ascending curve. I think that is a very fair assessment on the part of the State. I am sure with the Federal Government the State would be prepared to go further, but really we ought to see a little light at the end of the tunnel, and that is the reason I am here today.

Senator BURDICK. Senator Chafee?

Senator CHAFEE. Senator, you mentioned the Federal Disaster Assistance Group had put in \$2 million to assist here. I have some qualms as to whether that is really the correct way to proceed. I wondered if you had any thoughts on this. It seems to me it goes quite beyond the charter, as we traditionally think of the Federal Disaster Assistance Group Agency.

Senator JAVITS. As far as they went, I think they are OK. One cannot often say that. We are not miracle men, but it just happens

that Love Canal is such a shocking thing and physically, on the ground, it is such a deplorable situation, it is a mess.

For example, I wore a pair of loafers. I walked across a field and that was the end of the loafers because they shriveled on my feet.

I can see within their mandate a chronic health problem. I was literally assaulted by a group of 50 women because everybody knew I was coming up, or at least the papers told them so. They lived a mile away, and they were having fumes and skin irritants and nasal congestion. True or not, I think it qualified for an immediate emergency health problem, which they are mandated to do something about. It is not a great sum of money, as these things go.

Senator CHAFEE. But the real long-term solution, as you pointed out, as you referred to the oil spillage legislation, and restricted funds, are you suggesting something like a specialized tax on the producers, or transporters involved in the whole area?

Senator JAVITS. And if liability is to be fixed, how far back should it go, and would proof be required? I think it is a matter of first impression for the law, and I think a statute is so much better. These litigations will take 20 years in the sense that they are very, very difficult to prove that buried drums were the cause of a public nuisance, et cetera, et cetera. I think law is essential in this matter.

Senator CHAFEE. Yesterday, we had two of the residents of the area come and testify, Mrs. Hillis and a gentleman who lives right in the area. They indicated that the State of New York had suggested that as far as they were concerned, one of them was not in the immediate area that was evacuated—I think there were 337 families evacuated in the immediate area—they indicated the State of New York suggested these were things that just happen, these miscarriages, these abnormal youngsters who were born, all the problems that came with those births, and with the children there, and they quoted that the health director had said, "Well, you get dangers just crossing the street, or flying in an airplane."

Was it your impression that New York treated that quite as cavalierly as that?

Senator JAVITS. No, and these are hearsay statements. You never know who said what, or why he said it. Authoritatively, Senator, there is no control group to go by. All you can go by is the fact that there was a greater incidence, significantly greater incidence in this area than in contiguous areas.

That is the best you can do. States are very jittery about State liability, too, being sued by citizens for negligence, or allowing a public nuisance to maintain.

I just cannot speculate.

Senator CHAFEE. But New York stepped in with \$17 million.

Senator JAVITS. \$15 million.

Senator CHAFEE. New York did purchase these houses?

Senator JAVITS. That is right. They bought them all.

Senator CHAFEE. The people indicated the price was fair, plus the moving expense. I am not suggesting that that fully compensates anybody for moving.

What we have here, as you well know, Senator, is an incredible problem of difficulty. We had testimony yesterday on the James River, and the Kepone incident, the lasting effects that come from

these, and in the attempting to clean them up, you are talking about millions for one incident. They had some cost analysis yesterday to disclose the situation, such as in Love Canal. If they had taken modern precautions to prepare the site as it should have been prepared, the cost was minuscule compared to cleaning up when it gets out of control.

So, we are going to require the sympathetic understanding, I believe, of the whole Senate when we come up with a program here.

Senator JAVITS. I think, Senator Chafee, you are absolutely right. We need a program for the past and for the future, also. I think that is essential in the legislation. We do require today, for example, when you are dealing with chemicals, which are the subject of this kind of disaster, that you take certain given precautions when you transport them in interstate commerce. We require certain precautions respecting nuclear waste today.

I think that has to be analogized with this situation. I think personally if an agency is put in charge of what you do with some guidelines, that you will find this happens in so many of these situations, that the cost tends to settle down in terms of the practicality of what you are facing and what you can really do about it in terms of the past.

It may very well be that some of these areas have to be permanently abandoned for at least a good, long time. It is a question which I cannot answer, and which I think the committee will, through its own good resources, and through our Government agencies, have some options as to what you can or cannot do.

All that I can say is that experience has indicated that these estimates of billions for doing something generally tend to fade when you get down to the reality and practicality of what you can do within a reasonable, at reasonable cost, as well as to prepare against any future neglect, which is what it is, as of this time, for which nobody can be blamed, because ours has been a new country and we have not heeded what we can do with our land.

I wish I could help. If I were on this committee, I would work diligently to try to guide the Senate to choose the right option.

I am sure that your staffs and the Government departments can place the proper options before you.

Senator CHAFEE. It is interesting that in this mood in the country, when everyone is portraying themselves for less regulation, when we get to the specifics, it turns out here is an area where there has been an absence of regulation, and look at the results.

Senator JAVITS. I don't want to delay you or myself—I have to get to another committee—but let me say this idea of Proposition 13 psychology assumes every morning you are going to die, you are not going to eat all day, there are no crooks on the street, and everybody is beautiful, and everything is child's play.

If you cut the whole deficit \$500 billion a year, it is a sum even impossible to imagine and that has to be spent somehow with some priority. It is just childish. We have to continue to do our business, and the people know that. They have the pleasure of amusing themselves thinking you can operate with no Government and for nothing. They know that is not true. We are here, and at least let's keep our feet on the ground and not go off on cloud nine.

Senator CHAFEE. I share those sentiments, Senator.

People rail against Government regulation, and then you ask them for specifics, "Are you for removing regulations on clean water?" "No." "How about the clean air?" "No, perhaps not there." They set a few minor examples under OSHA, but they don't deny that OSHA basically is saving lives, and here is another area where it seems to me we have had in the free market system work, let people dump where they want, and look at the results.

Senator JAVITS. May I call attention to the deregulation of trucking? Those small businessmen who were in here tearing us to bits and pieces because we were the devilish regulators are now going to tear us to bits and pieces if we take off the regulations.

Senator BURDICK. As I listened to your testimony, Senator, it is a very graphic description of a pretty bad situation. I think back to my law school days. Do we have a public nuisance here?

Senator JAVITS. I think so. I really can't define it legally off the top of my head, but certainly if you talk about public nuisances, that is what this is, in the colloquial sense.

Senator BURDICK. Has there been any attempt by the Attorney General to abate it?

Senator JAVITS. They evacuated the areas. The polluters are gone.

Senator BURDICK. Thank you for your testimony.

Senator JAVITS. I think you will find our Attorney General very diligent in anything we can do along that line.

STATEMENT OF BRUCE D. DAVIS, EXECUTIVE VICE PRESIDENT, INDUSTRIAL CHEMICALS GROUP, HOOKER CHEMICAL CO., NIAGARA FALLS, N.Y.

Senator BURDICK. The next witness is Bruce D. Davis, executive vice president, Industrial Chemicals Group, Hooker Chemical Co., Niagara Falls, N.Y.

Welcome to the committee. Your full statement will be made a part of the record, and you may proceed as you wish. [Statement appears at p. 288.]

Mr. DAVIS. Good morning, members of the Subcommittees on Environmental Committee and Resource Protection. I am Bruce Davis, executive vice president of the Industrial Chemicals Group of Hooker Chemical Co.

I am pleased to have this opportunity to appear before this joint subcommittee hearing and to share with you and your colleagues some facts and some of our views in the management of hazardous waste.

With your permission, Mr. Chairman, I would like to depart from the testimony which I previously submitted for the sake of brevity and also, for the sake of clarity, I would like to use these charts, and I would like to have my submitted testimony received for the record.

Senator BURDICK. It has already been received.

Mr. DAVIS. Hooker Chemical Co. is 75 years old. In 1907, it located in Niagara Falls because of the attraction of cheap hydroelectric power and available natural resources. At the turn of the century, an industrial entrepreneur named William Love envisioned a model city powered by a hydroelectric plant involving

substantial industry. He started to build a canal out of clay approximately 6 miles above Niagara Falls.

For economic reasons, and for financial reasons, his vision went bankrupt and he discontinued his project in 1910.

For 30 years a 3,000 foot by 60 foot by 10 foot deep excavation lay idle in the Niagara Falls area and it was called Love Canal.

In 1940, Hooker Chemical, who was manufacturing chemicals at its Niagara Falls plant, felt that the Love Canal site could serve as a very suitable area for disposal of residue of materials primarily because it was excavated with clay and the permeability of the canal made it ideal for the disposal of chemical materials.

From 1942 to about 1946, it disposed of the chemical materials in the northern end of Love Canal, with the permission of the owner at the time.

In 1947, it purchased the property but in 1946 it began to use the southern end of Love Canal for the disposal of chemicals. The practice that was employed was to take the chemical residue materials from the operation of the plant, place them in drums, store them on the property until there were sufficient drums, and then in a short period of time, move them to the Love Canal area. The clay in the canal at the bottom was excavated down to 20 or 25 feet. The drums were placed in miniclay vaults that were excavated. When the vaults were filled, they were covered over with approximately four feet of clay and compacted. Then at the next requirement for disposal, an additional minivault was built and covered over.

Gradually, the southern end of the Love Canal was filled with chemical residue material.

In 1952, the Board of Education of the city of Niagara Falls came to Hooker Chemical and said they wanted to purchase the Love Canal site for a school location. The management of Hooker Chemical at the time advised them of the nature of the chemicals that had been disposed of in the Love Canal site, and warned them of the dangers of any excavation or construction work anywhere on that landfill site. The board of education persisted and insisted upon the transfer of title to them.

In 1953, the company did transfer title, but incorporated in the deed of transfer was clear notification of the presence of these chemical wastes in that property, but it also clearly showed they advised the board of education of the nature of these materials. The board of education assumed full responsibility and full liability for any injury to persons or property that occurred from the chemical properties stored therein.

In fact, the center section of Love Canal was never filled in at the time of the deed, but it was subsequently filled in with flyash, municipal waste, and cinders. The property was then leveled and they were ready to build the school. The school was not built on the canal itself, but adjacent to it.

From 1953 to 1978, Hooker Chemical had no connection with this property, no ownership of the property. It was owned by the school board.

In 1976——

Senator CHAFEE. Mr. Davis, I wonder if I could interrupt 1 minute.

In the transfer to the school district in 1953, you indicated that there had been these warnings in the deed. Is that included in the record, the excerpts?

Mr. DAVIS. Yes; a quotation from the deed is incorporated in the testimony we previously submitted in the written statement.

Senator BURDICK. Did the school district get title to the whole area?

Mr. DAVIS. Yes; they got title to 3,000 feet, even though the canal site is only 60 feet wide, the property transferred to them was 200, which is the property we owned.

Senator BURDICK. That includes all the yellow matter on the map?

Mr. DAVIS. Yes; It is on page 6 of the submission.

In 1976, Hooker Chemical was advised by the city and the county of Niagara that there was a problem associated with the chemicals that had previously been stored in the landfill site. Prior to that time, we had not been aware of any problem. We felt we had built a secure and clean clay vault. That was called to our attention. We immediately assigned some of our technical and engineering people to work with the city and county to define programs to correct it.

Two engineering firms were brought in, the second one being Conestoga-Rovers & Associates. Finally, a plan was developed in 1978 to install a correction system to take care of the chemical leachate, which came out from the chemical landfill site. Sometime during this 25 years when Hooker did not have control or possession or ownership of this property, a portion of the clay cover we put on had been removed. This apparently allowed rainwater to get into the vault and mix and develop this chemical leachate material and cause the Love Canal to overflow into the adjacent property.

The plan, started in August and almost completed in February, involves installation of drain tiles and drain ditches about 20 feet from the canal site sloping to the center, where collection tanks are located, which collect the leachate.

The leachate is pumped through carbonate absorption beds and the water is sent to the sewage treatment plant where it is further processed before it is discharged.

Senator CHAFEE. Are you suggesting because of the removal of the cap that you had over it, that water then seeped in and because of the clay base, it was rather like filling up a bathtub? There was no way for the water to get out of there, just like there is no way for the chemicals to get out of there.

Mr. DAVIS. That is correct.

The clay was very permeable. Its rated permeability is one-third of water for 25 years.

Senator BURDICK. Was there reason for removing the cap?

Mr. DAVIS. There was construction of homes alongside the canal. When we deeded it, it was a rural area at the time. Subsequent to that, approximately 200 homes were built in that area. Apparently during the construction of either roadways or homes adjacent to the property, some of this covering and clay cap has been removed. We do not have concrete evidence of that, but the clay cover is in a different form from what it was when we completed the closing.

Finally, the clay can is being renewed, sloped, 6 inches of soil and gas will be put on it according to prescribed State regulations

with respect to solid wasteland refills. This should secure the landfill site and prevent the chemical migration of any further leachate from the canal and prevent any going to the adjoining homes, and to date it seems to be working very well.

For a few minutes, I would like to address myself to the landfill sites that we used subsequent to Love Canal. When we closed Love Canal, in 1952, we had to find another place to store our materials.

Senator CHAFEE. You are moving away from Love Canal?

Mr. DAVIS. Yes.

Senator CHAFEE. I would like to ask a few questions here.

I have a clipping here from the Times dated February 11, where it says 100 Love Canal families are urged to leave the area. This is in addition to the 239 that left previously.

As I understand, what has happened is they have built a fence. Were the 239 houses within the fence?

Mr. DAVIS. Yes; with a few exceptions.

Senator CHAFEE. This indicates that 100 more are being asked to leave. The State will pay for moving costs and rent or hotel bills for any family living between 93d and 103d Streets and Frontier Boulevard. In the drawing you show of the new cap plus the drainage, you said it was apparently working, the drainage not only from the area, but you indicated it was also draining from the materials—go to your next slide—that were going into the basements?

Mr. DAVIS. Yes; it appears to be working satisfactorily to date.

Senator CHAFEE. If so, why are they going way over to 93d Street and 103d Street? And 93d Street is pretty far away, and 103d gets you pretty far over. If it is working, why are they evacuating more homes?

Mr. DAVIS. The project was just completed in February. It will take some time to recollect any leachate that got out previously.

We ourselves in the data provided by the State have not seen evidence it has migrated beyond 103d Street. The New York Department of Health Commissioner apparently has evidence that beyond the 93d-103d periphery, for the sake of conservatism on his side, he evacuated pregnant women and any children under 2 years of age.

He gave that order February 8, 1979, and included in my written submission, on page 11, is an excerpt from the press release he made at the time he made that announcement.

This is the health commissioner of the State of New York, Dr. David Axelrod.

Senator CHAFEE. Thank you.

Mr. DAVIS. Returning to the Hyde Park landfill site, this site was used from 1953 until approximately 1974. It also was constructed from clay. It was an ideal clay location—bedrock underneath the clay, consisting of approximately 16 acres. At the interface between the town of Lewiston and the town of Niagara, the chemical residue materials were installed in the center section of the property, excavations were dug about 25 feet deep, and the drums were stored in that and then covered over with clay.

In the eastern end, flyash and rubble and so forth were installed. Then when the facility was closed up in 1974 in conjunction with the county health commissioner, a leachate tile system was in-

stalled around the landfill site very similar to that installed around the Love Canal. The purpose is to collect any material that might escape from the landfill and collect it in these leachate tiles.

Two sump pumps were installed, and a leachate lagoon was installed. Periodically it is pumped out and waste is placed in a disposal area which is monitored by State environmental authorities.

A clay cover was put over the top and at the time it was closed, it was fenced in.

Contiguous to the Hyde Park land area shown in blue, it shows where the runoff in that entire section flows down toward Niagara University. This is referred to as Bloody Run.

As you can see, around the Hyde Park landfill site, there are several industries.

From samples we have taken, and which the EPA has taken, some of those chemicals include products uniquely manufactured by Hooker Chemical. Other chemicals that have been found are fairly common chemicals used by many industries.

We have an extensive program under way at the present time which we have developed, and it has been approved by the State DEC to install wells adjacent to this landfill site. These lands are just below the surface, halfway down the bedrock, and into the bedrock. The purpose of these is to monitor the flow of water and determine if there is any chemical contamination in the ground water in that area.

I might point out evidence to date from homes which have well water for drinking purposes indicates there is absolutely no chemical contamination of those wells. The wells are safe for drinking.

As far as chemical materials are concerned, when in fact they have been condemned, it has been because of the presence of bacteria from nearby septic tanks.

We also have a program to sample and monitor the soil sediment of the area of Bloody Run to see the content of any contamination. This will be completed by the end of this year and if a corrective program is required, we will get the approval of the State in the second half of 1979.

Next, I would like to take a few minutes to talk about the landfill area at our Niagara Falls plant.

This is a busy chart. Notice the green line down at the bottom. This line shows the approximate configuration of the shoreline back in the 1920's. From the 1920's through the 1930's that was used as a landfill site by industry and by municipalities in the area and gradually the shoreline was built out.

In 1947, Hooker Chemical acquired that property, that reclaimed property and, first of all, in the so-called "N" area we provided inorganic primarily insoluble materials. In addition to that, we also saved drum material which we later moved to Love Canal.

In the next area, the "S" area, we disposed of chemical residue materials until about 1974. Until 1962 or 1963, we placed chlorinated hydrocarbons, residues, but prior to that, primarily insoluble materials.

Across 73d Street, we have an infiltration plant.

In 1978, through routine inspection, a diver went down in one of the sumps off the plant and found sediment. The sediment was

brought to Hooker Chemical for analysis. We identified certain chemicals that were unique to Hooker and found some that were fairly common.

We immediately alerted the city and together with the city we went over and examined their property. There was an excavation at one end, 20 feet deep.

That showed no sign of chemical contamination. We also took samples of water from an old pumphouse that had lain idle for many years and there was no evidence of water in that pumphouse.

Senator CHAFEE. I will be interrupting you on occasion here. Isn't it odd that the city worker who brought up the sediment takes it to Hooker to analyze it? Isn't that a conflict of interest there? Wouldn't Hooker tend to find as little as they could find?

Mr. DAVIS. On the contrary, I would like to think we found what we found was there.

Senator CHAFEE. I am not surprised at that, but it would seem to me bad practice for the city to bring sediment to be analyzed by the possible offenders since you are right next door. You must have a close relationship with the city.

Mr. DAVIS. I think they respect our technical capability. We also have a laboratory which is able to respond very quickly. They also did send out samples to other laboratories for verification, so they did not rely solely upon us, but I think they brought it to our attention because they felt we could provide them with very prompt analytical appraisal and feedback.

We immediately alerted them to the materials found in the sediment and then we began to develop a program to determine if there was any migration of landfill on our property.

That program has been implemented. We have drilled 70 monitoring wells around the entire perimeter of our plant, as well as 10 monitoring wells on the water treatment plant property. To date we have no evidence that there is migration from the chemical areas to the plant.

The data we have is preliminary and inconclusive and will take several more months before the data we are collecting from those wells is truly meaningful.

In summary, I would like to state we have a fairly complex, fairly extensive program for monitoring the various landfill sites we have in the Niagara Falls area. To point up the complexity, we will be taking 3,500 samples of water in the first quarter of this year, which will all require a very complex chemical analysis. There are only a few labs in the United States capable of handling these analyses. We are using labs in California, Texas, Nebraska, and Iowa in order to get these results as quickly as possible.

Because of the complexity of this, we have had to intermix the timetables for these programs at each of our landfill sites so that we can accomplish the more urgent analysis and results as quickly as possible.

Senator CHAFEE. How old is that "S" disposal site?

Mr. DAVIS. We stopped using it in 1974, and we closed it up at that point.

Senator CHAFEE. But you opened it when?

Mr. DAVIS. We began to use it about 1956.

Senator CHAFEE. So you were using the most up-to-date techniques at that time, I presume, and this plus the capping was just a couple of years old, so you have done what the technology permits you to do, but then suppose there are leaks. What can you do then?

Mr. DAVIS. There are a variety of engineering solutions to the problem, Senator—things like barrier walls, power grouting, and things like that. I am not a civil engineer, so I am sorry I cannot give you the details that could be employed to prevent any migration, if there were any migration from that site.

The most undesirable solution would be to remove the materials and relocate it somewhere else. That very likely would cause additional environmental problems through relocation.

Senator CHAFEE. Are the substances in drums?

Mr. DAVIS. The purpose of using these was merely to facilitate the collection of the material and then the ability to locate it within excavated landfill sites. There was no intention on anybody's part, I don't believe, that these containers would last forever.

I believe that constitutes the balance of my summary, sir.

Senator CHAFEE. You represent a major chemical company. We have a problem here in disposal. What do you propose? Do you think the current situation is adequate? Do you think there should be some law providing for an indemnification fund for victims of improper storage? What do you think? What are your suggestions to this committee?

Mr. DAVIS. Senator, this is an extremely complex matter, and I am sure you appreciate it. Our position is that the Resource Conservation and Recovery Act of 1976 does not adequately address the Nation's concerns relating to closed or abandoned landfill sites. Additionally, it is Hooker's view that additional protection will be required. Consideration of this matter shows the legislation might well consider a national inventory to identify closed or abandoned landfill sites known or believed to contain toxic materials. Many in the chemical industry and other industries are now giving consideration to the concept of a superfund. Hooker's management is addressing this question as well, and is working very closely with the manufacturing chemicals associations, the industry associations. It is fair to say to the committee that the superfund concept is one possible legislative solution.

Our management, however, is not prepared to say at this time that this is the best solution for the reason we have not completed our analysis, nor are we certain how the funding mechanism would work. Our management remains committed to responsible corrective action and is looking toward the drafters of any proposed legislation at the appropriate time.

Senator CHAFEE. Obviously that is your position for the future. Hooker, as you said, is not yet firm in what it wants to do.

Do you think Hooker has any liability in the Love Canal situation?

Mr. DAVIS. I think our position right from the start is we do not have any legal liability connected with the canal. That was clearly spelled out in the deed of transfer. We alerted the board of education at the time about the dangers in use of the property. On two separate occasions following the deed, they attempted to transfer

the property to others, and the management appeared before them and warned them about the chemical residues and the dangers associated with any excavation going on on that site.

Senator CHAFEE. Slow down 1 minute. That was the school board?

Mr. DAVIS. Yes; and we appeared before the school board at one of their monthly meetings, and advised them again of what we told them back in 1952. On the second occasion, they, however, proceeded to transfer property title to the northern section, transferred it to the city of Niagara Falls and in the southern section they transferred it to a developer, but nobody has built any homes on the old canal site to date.

Senator CHAFEE. The school board did not acquire this property by condemnation. Hooker sold it to them for a modest amount.

Mr. DAVIS. We sold it to them for a dollar.

Senator CHAFEE. In other words, they wanted it, and you, in effect, gave it to them.

Mr. DAVIS. They had begun condemnation proceedings against the owners of the property adjacent to the school, and they advised Hooker they would do the same if we did not transfer the property to them. So there seemed no point in exercising resistance, and the management deeded the property to them, but incorporated the caveat and the warning we gave them in letters previously.

Mr. TRUITT. I am Mr. Truitt. I am counsel the company had in condemnation proceedings. The fee would have passed automatically to the school board without the covenant in the deed setting up the facts as to what was in the property. It was in that context that it was determined wise to deed over so that the deed language would be clear.

Senator CHAFEE. When construction began on the site, did your company do anything, or was it the company's feeling that they had washed their hands of the affair?

Mr. DAVIS. Senator, there has never been construction on the site.

Senator CHAFEE. I don't mean on the site. But originally you mentioned this was rural land, and a school went up right next to it, and then a host of houses nearby, which had been affected. I don't think there is any dispute on that.

Mr. DAVIS. When we closed up the property, we closed it up in a manner so that we felt it would be closed for a long time. We felt we had no further responsibility for that property.

They talked about converting that property adjacent to the school to a park. This was all part of the plant at the time. We did not feel we had the responsibility to advise every buyer of property adjacent to the Love Canal about the properties stored therein.

Senator CHAFEE. At the time the chemicals were disposed of, neither the company nor the chemical industry as a whole, nor scientists appreciated the deadliness of the chemical dioxin, for example. Subsequently, it was discovered that this chemical is incredibly lethal, whatever it is. Where is the company's responsibility as regards former disposal sites that it has used for these deadly chemicals that are subsequently ascertained to be more deadly than originally anticipated? What do you do? You say, "It is not our worry because when we disposed of it, it was regarded at

that time, if not innocuous, nowhere near as lethal as subsequently discovered."

Mr. DAVIS. Senator, there are several parts to the answer to that question. As far as the answer to the question of toxicity and the lethal nature of the chemical, even though a property may be lethal or toxic, you have to have an exposure level to a human being or organism that would cause some injury.

Even though toxic chemicals may be disposed of in solid landfill sites, if those sites are kept secure, they do not constitute a hazard.

As far as the responsibility of a corporation to old landfill sites, Hooker's position on this can be clearly demonstrated by its actions in that where we own the property and where we have control of the property, we have continued to maintain that property and make sure there is no chemical migration to the best of our ability. We have just done some additional work at our Hyde Park site at the request of the State to improve that site. We are doing the same thing on our landfill sites at 102d Street and the Niagara Falls plant. It is a different situation where you have sold the property, lost control of the property, no longer have the ability to maintain and monitor what is going on on that property, and that is a different situation.

Senator CHAFEE. I just wonder, because of the discovery and developments of new information about chemicals, whether a company should ever be absolved of the responsibility for a fill in a disposal site. I have serious reservations about whether you should ever be changing title to property. When you do, you could then say, "We have done our part. It was all right when it left our hands." Then we get into this problem such as has come up here. I suspect if Love Canal had remained in the ownership of Hooker, this situation probably never would have developed.

Mr. DAVIS. I think that is a fair assumption, Senator.

Senator CHAFEE. But you left, maybe unwillingly. In retrospect, I think you could have done more. I am sure you are covered in the deeds and all that, but there has been testimony that the clay was hauled away. We had some testimony yesterday about some residents claiming there was further dumping there directly from tanks into the area—not Hooker, there was no suggestion it was Hooker—there is probably no question but that clay was taken off the top, which led to this whole problem developing.

You mentioned that you continue to monitor the other sites that you have. Is that true of all sites that you have, or are these they?

Mr. DAVIS. We have another site which I did not mention because it is not a large site, or one we consider a potentially serious problem, and that is the 102d Street site. We also have a program there where we will install monitoring wells and test to see if there is any chemical migration from that site, but basically the chemicals are insoluble inorganic materials and any leachate from those would be considered harmless, but we will install monitoring equipment later.

We are monitoring Hyde Park and the periphery of our Hyde Park plant. We have installed wells around Hyde Park and determine if there is any chemical migration from that plant. The evidence to date indicates there has not been such migration.

Senator CHAFEE. Have you transferred title to other sites?

Mr. DAVIS. I have no knowledge of the company having transferred any other landfill sites.

Senator CHAFEE. Could you provide that for the record?

Mr. DAVIS. Yes, we shall.

[The information requested by Senator Chafee was not received by time of publication.]

Senator CHAFEE. Do you have a company policy of not transferring title to disposal sites?

Mr. DAVIS. No, sir, we do not have a policy at this time, but I am sure we can put together a comprehensive policy that will be incorporated.

Senator CHAFEE. I think it would be wise.

Yesterday we had some testimony about what they called high-temperature incineration for disposal of waste. What do you think of that?

Mr. DAVIS. Hooker developed the technology for that. It is licensed technology which we licensed to others. We had a high-temperature incinerator put in operation in 1962. It was designed to destroy hydrochlorinated wastes which are fire-retardant materials, which are very difficult to burn.

It involves a chemical reaction, as well as high-temperature incineration. You have to make certain you don't create an air pollution problem when you are taking solid waste material. We burn these in the incinerators, and the materials break down to water, so we end up with basic innocuous materials as a result.

In the last 15 or 16 years since we put that in, we have disposed of over 200,000 tons of chlorinated hydrocarbon materials that would otherwise have gone to a landfill site. We think the technology is extremely good. We are disposing now of everything that we can through that means.

However, when you get to solid waste materials, I am talking about liquid waste now, when you get to certain chemicals or unique chemical characteristics, they cannot be incinerated, or some of them cannot be incinerated. Anything containing asbestos cannot be incinerated.

Senator CHAFEE. Do you incinerate everything that can be incinerated?

Mr. DAVIS. We incinerate all chemicals that we can. There is an awful lot of material that still goes to a secure landfill site which is monitored by the State and run by a private firm, but we have in the last 5 years reduced the volume of material that we are sending to fill sites by 50 percent. We have programs moving forward in an effort to eliminate almost entirely the materials we send to the landfill sites, but I would like to emphasize that—

Senator CHAFEE. You use what you called public disposal sites.

Mr. DAVIS. It is not a municipal landfill site. It is a site that conforms to the very rigorous New York State legislation, section 360, which is monitored by the DEC. It is in clay vaults, it has monitoring wells, and so forth. This is run by a private concern and we take our materials to them and they dispose of them, and they keep the necessary records.

To get back to the point I was making—

Senator CHAFEE. You are not using your own sites anymore?

Mr. DAVIS. No, sir, not on our land, or other landfill sites. They are closed up. We are using this private site for the disposal.

Senator CHAFEE. Do you think you can get your disposals down to—what do you say—zero?

Mr. DAVIS. No, sir, there is no way we can get to zero. There is no way all chemical residue materials can be completely eliminated from going to landfill sites. There will always be some materials that cannot be incinerated. Asbestos-containing materials are a good example. Other materials won't burn. If they are of a toxic nature, they will have to be placed in some sort of secure landfill area so we will always have to face the problem in our society and in the manufacture of chemicals to find a way to securely dispose of toxic chemical materials.

Senator CHAFEE. I thought you were saying you were getting this down—

Mr. DAVIS. We are working to get it down as low as we can. We are trying to approach zero and become completely independent from having to use a landfill site, but we can never reach that point.

Senator CHAFEE. I thought you previously indicated that you incinerated everything that could be incinerated, so aren't you as close to zero as you can get now?

Mr. DAVIS. No, sir. Perhaps I have not been as clear as I should be on this point. We are incinerating all of the liquid residue which is a lot different technology than solid chemical residue incineration. We are able to place and burn the liquid chemical residues in the incinerator, but you need an entirely different technology for the solid waste. So all the liquid chemicals that we manufacture we are currently incinerating.

Senator CHAFEE. Now you will move to the solid?

Mr. DAVIS. We are working on technology to allow us to do that. There is some technology already available and there are some incineration units in this country.

Senator CHAFEE. What are the economics of incinerating the liquid wastes versus disposing of them?

Mr. DAVIS. This incinerating is not a self-sustaining operation. You must provide additional heat to incinerate this material. We are currently sending some waste to disposal sites at our Niagara Falls plant.

We are spending approximately \$200,000 a month which is considerably more than we are spending to run our incineration operation.

Senator CHAFEE. Do the economics favor the incineration?

Mr. DAVIS. Yes, sir.

Senator CHAFEE. What is the capital investment in the incinerator or is that figured in your statistics that show it is less than the \$200,000 a month?

Mr. DAVIS. The only figures I have seen, Senator, and these are very crude and preliminary figures, the thought has been solid waste incineration units would cost between \$5 million and \$10 million for a plant of our size.

Senator CHAFEE. What about the liquid?

Mr. DAVIS. Approximately half a million dollars in 1982 to install the unit we currently have in place and operating.

Senator CHAFEE. It is my understanding that your parent company, Occidental, was attempting to take over Mead Corp. and in connection with that there are two environmental consulting firms, Howard Hart Associates and Barr Engineering that were hired to review your disposal sites and practices.

The committee has copies of those reports and Senator Stafford has and is going to submit them to you for comment and reply. Has that been done yet?

Mr. DAVIS. We have not had an opportunity to reply yet.

Senator CHAFEE. Can we expect your reply quickly because it would be Senator Stafford's intention to release those along with your reply?

Mr. DAVIS. We will make every effort to reply as quickly as possible and we will be in contact with his staff.

Senator CHAFEE. You can do that directly with Senator Stafford. Thank you for testifying. We appreciate it.

Mr. Beasley, you are vice chairman of the board of Velsicol Chemical Corp. in Chicago.

**STATEMENT OF W. HOWARD BEASLEY, VICE CHAIRMAN OF
THE BOARD, VELSICOL CHEMICAL CORP., CHICAGO, ILL.**

Mr. BEASLEY. We appreciate the opportunity to testify today concerning our efforts to rectify a situation where a former landfill appears to have been contaminating approximately a dozen wells adjacent to it.

With your permission, I would like to submit my written testimony and paraphrase it for the sake of brevity.

Senator BURDICK. That would be fine. [See p. 317.]

Mr. BEASLEY. My task and charter in coming to Velsicol 5 months ago is to devote substantially all of my time to bringing the company to the forefront of environmental security. We have been using some of the finest consultants in the country and have dedicated a substantial part of our staff to this effort.

The environmental security of Velsicol is considered our first priority before profits or growth. I think our expenditures and problem-solving approaches in Tennessee as well as other environmental matters reflect this commitment.

This landfill in Tennessee was used between 1964 and 1973. Approximately 45 acres of the 243-acre property were used to dispose of residues.

There is always a question as to whether or not a landfill could cause contamination of ground water. Soon after the landfill was started, the U.S. Geological Survey indicated that if this did happen, the slope of the ground water movement was away from the area where people were drawing their water. It concluded that:

There is, therefore, no possibility for any existing water-table wells to produce potentially contaminated water from the water-table aquifer. * * * the potential contamination hazard for such wells is nil.

I might also say that our own monitoring well has been clean since its inception.

I might digress a little bit from my statement to say that it is an interesting paradox that there are certain wells, some 50 feet apart, where one well is contaminated and one well is clean.

Senator CHAFEE. Could you tell us about the preparation of this site when it was built in 1964? I would be interested in that at this point because, as I look at your statement, you don't deal with the preparation of the site.

You heard the testimony of Mr. Davis about how Hooker prepares their sites. Tell us a little bit about how Velsicol prepares its sites.

Mr. BEASLEY. This is the only offsite disposal area Velsicol has ever had. I am not familiar with the history of it. It predates my joining the company by a substantial amount. I understand that drums were hauled from the Memphis plant, put in trenches approximately 15 feet wide and 40 feet long. The trenches were either 12 or 15 feet deep. Once the trench was filled, 3 feet of soil was placed back over it.

Senator CHAFEE. What was the makeup of the trench? Was it clay or did you take the regular soil that was there, scoop it out and bury the barrel?

Mr. BEASLEY. I am not familiar with any special preparation that was put on the bottom of the trenches. Whether or not there was, I don't know.

Senator CHAFEE. We will assume nothing special was done unless you submit something to us. That puts a burden on you. If the company did in fact make some special preparation, let us know. Otherwise, we will assume you scooped out the dirt and threw in the barrels.

Mr. BEASLEY. In the past 15 years, a number of families located on the property adjacent to the landfill, a few additional wells were added and certainly more water was drawn from the existing wells that were there.

Approximately a year ago, a few of the residents began to detect a funny smell in their water. The compounds were identified with our assistance, as being similar to the chemicals that were located in the landfill.

We immediately commenced a joint study effort with the State of Tennessee. We contracted with an independent hydrology company to determine how these chemicals got to the wells. Did they migrate directly from the landfill or did they get there through other means? This may have happened by rinsing a barrel in a well area 10 or 15 years ago, or by some other technique.

On October 6 of last year, which happened to be my first week of coming to Velsicol, a preliminary opinion from our hydrologist was that the landfill possibly could be the cause of the well contamination. We immediately set in motion a plan of action to rectify the situation. I went immediately that evening to the EPA in Atlanta and told them of the situation.

They gave me a briefing the next morning as to what they knew about the situation. They had some facts and figures that we had not been privy to before. We also told the press, and we told the local residents. We offered to pay a water connection hookup fee for these dozen families for a permanent water supply which was in progress. We also offered to reimburse the State of Tennessee for having provided freshwater to these people for the few preceding months.

I then went down and talked to the families involved, met with them, had dinner with them, and met in their house. I asked them what to do to rectify the situation. I even agreed to purchase their homes at the fair market value, by getting three appraisals and dropping the lowest one and averaging the top two. I also agreed to pay them for inconveniences of having to move. Their attorney turned this down the next day. By this time, it appeared that the permanent waterline that was coming through this valley would not be ready for a number of months. We started a construction effort of our own and started installing a temporary water supply for them. I use the word "temporary" guardedly. It is actually a permanent system but it will be replaced when the final waterline comes through. This happens to be costing us \$1,200 a week simply to truck the water from nearby Jackson, Tenn.

Furthermore, we went in and plumbed all of the affected homes, replaced all of the water fixtures in their houses, replaced all of their hot water heaters. We replaced washers, dishwashers, dryers, icemakers until their attorney hit us with a restraining order prohibiting us from contacting the people directly. We also replaced their pots and pans, plastic dishes until, likewise, he got a restraining order on us. We reimbursed the families for their prepared canned goods as well as frozen foods.

We contributed \$25,000 to the town of Toone in order to speed up the construction of the permanent waterline. We made air samples of two of the homes with the highest concentrations to make certain the environments were safe. We have soil studies underway to determine if they can continue to use their orchards and outlying areas.

In addition to those efforts extended directly to the residents, we have set up a task force with the State of Tennessee, Department of Public Health, the EPA, and the Center for Disease Control for medical studies for the affected families.

We have also assembled a consortium of first-class consulting firms and have in progress studies to determine what corrective actions are necessary for the landfill site.

As of this time, we have made settlements with about half of the families involved and we have offers outstanding for most of the others.

We decided from the very beginning that if we thought we were responsible, we would move in immediately and do what was right for the people. We decided we would not be unduly concerned about protecting our legal flanks and we would confront the situation directly.

More importantly, in my opinion, we took expedient action to get these dozen families' lives back to normal. I don't minimize the situation, Mr. Chairman, but we tried to do whatever we could to facilitate their getting back to normal.

With the exception of the normal concern someone has with having been exposed to contaminated water, I think that their lives are headed back in this direction.

Senator CHAFEE. What did the tests show in the water of these dozen houses? What did the tests reveal? What is in the water? Do you have 300,000 drums?

Mr. BEASLEY. No, sir. The press reports said 250,000 to 300,000. Our calculations indicate that approximately 100,000 drums are there.

I don't want to give you too simple an answer to a complex question. There are 13 wells involved with approximately a dozen chemicals in each well. They vary all over the lot. The higher concentrations are primarily for carbon tetrochloride. Dr. David Allen's testimony yesterday provided the contamination level for each chemical for each well at each period of time at which it has been tested.

Senator CHAFEE. Doesn't this go back to the preparation of the original site? We had testimony here from Mr. Davis which indicated if the site is properly prepared in the beginning it can be pretty secure.

Obviously, this was not the case with your company.

Mr. BEASLEY. I don't want to make any admissions against interest because, as you know, we have a \$2.5 billion lawsuit against us. But I am of the opinion that landfills can be constructed in certain ways to prevent the migration of chemicals from them.

Senator CHAFEE. That did not happen here.

Mr. BEASLEY. No one knows that better than I, sir.

Senator CHAFEE. It has been alleged that your company and EPA and the State all knew of this chemical contamination considerably before it was known by the residents and nothing was done to warn the residents. Is that true?

Mr. BEASLEY. No, sir, not to the best of my knowledge.

Senator CHAFEE. Your company is involved in other problems with disposal sites, is it not, such as Barry Creek, N.J.?

Mr. BEASLEY. Yes, sir, we have other problems around the country.

Senator CHAFEE. What would you recommend to this committee that we do?

Mr. BEASLEY. In what respect, Senator?

Senator CHAFEE. In respect to preventing situations like this again from recurring and then providing for compensation for the victims.

As you indicated in your testimony, you have gone to considerable expense to take care of the people affected and that, indeed, was only 12 families, but you put in new dishwashers, you put in new icemaking machines, plastic plates, a whole host of things. So you have the money to do it and you have done it so far.

What do we do about a company that cannot or will not afford to make these replacements and leaves it up to the individual homeowner to sue?

Mr. BEASLEY. I can certainly say we tried to address this in as forthright a way as possible. We did not want the publicity or expense involved in litigating many, many cases like this and found it was cheaper to go in and replace this than to fight it. I don't think there is a good answer to the situation where a company is going bankrupt or is no longer on the scene. Certainly, you don't want the residents left holding the bag in that situation. In that situation, I think some type of funding pool might well be appropriate.

I personally have trouble in simplifying the complexities of how that fund should be financed in an equitable way, but I don't think there is any dispute that residents who are affected need to be compensated and put in as good a situation as they possibly can.

Senator CHAFEE. Do you think the funding should come totally from the companies and those who generate the problem in the beginning?

Mr. BEASLEY. No, sir, I don't think so exclusively. I think the benefits of chemicals are dispersed through our society. I don't think that the chemical companies are the only ones who have benefited from the making of chemicals. I think consumers and the Government have benefited.

I think the critical question is the allocation of financing for that particular fund. I do not think that existing chemical companies alone should be taxed for the past practices. I do not believe that those chemical companies who are now existing should finance 100 percent all the potential problems that have been buried over the past generations.

Senator CHAFEE. Suppose it were solely for future incidents, that is, sites that are constructed as of, let us say 1980.

Mr. BEASLEY. I think that is an entirely different matter.

Senator CHAFEE. That is where the chemical companies should take care of the funding?

Mr. BEASLEY. We now know today where these chemicals are going to a greater degree than in the past. You can track responsibly.

Senator CHAFEE. Yes, sir. Dr. Allen from the Tennessee Department of Health was here and he testified your company had helped to rectify the situation at Toone and we commend you for that and the activities you have undertaken with these families.

I must say you must feel a little upset when an injunction is gotten against you to prevent you from doing these activities by the people you are helping or some of them.

Did all of them participate in that?

Mr. BEASLEY. It is a very interesting situation, Senator. The attorney brought this \$2.5 million lawsuit without the explicit knowledge of the residents. We were actually negotiating with them for settlement when he initiated the lawsuit. It is clear they signed up with him previously but they were unaware that he was going to bring this action. A number of residents said they were going to withdraw from the suit and settle. At that time he got the temporary restraining order to prohibit me from going down and meeting with the residents and offering settlements.

Senator CHAFEE. Going back to this situation in Toone, my question to you is: How long did it take you to react here? You have outlined what you did. Did you have any notions that your old dump might be involved in the Toone problems or did you wait until some more conclusive studies were taken?

Dr. Allen's testimony indicated that only after the most recent conclusive tests were completed did your company start into high gear.

Mr. BEASLEY. A lot of this was before I joined the company so I am simply reconstructing what I heard. Please keep in mind that the USGS hydrology study upon which we were relying said there

was no way these wells would get contaminated. If the ground-water ever gets into the aquifer, it will be moving in an easterly way, not toward the wells. Our own monitoring well toward the west has always been clean.

When the wells started smelling last year, we helped analyze them. They were similar chemicals. The question therefore was, How did they get there? An immediate study was commenced with the State of Tennessee to see if the previous hydrology study was incomplete or did not contain sufficient data concerning these wells.

At the very first moment when the hydrologist gave an opinion there could be a gradient toward these wells, we told the State and EPA and the residents within hours.

Senator CHAFEE. Did you own this site and do you still own it?

Mr. BEASLEY. Yes, sir, we have owned it continuously since it was purchased a year before—

Senator CHAFEE. What do you do on other sites closer to your facilities? How do you handle those?

Mr. BEASLEY. Fortunately, this is the only offsite disposal area that the company has, so this is our only experience.

Senator CHAFEE. Do you do something when the sites are on your own property?

Mr. BEASLEY. Now we are incinerating as much as we can and sending to landfills.

Senator CHAFEE. Are you using this high-temperature incineration that Hooker was talking about?

Mr. BEASLEY. It is not precisely the same process but it is similar.

Senator CHAFEE. Is that a financially attractive route to go?

Mr. BEASLEY. I am not a chemist, and I obviously don't have the vast experience that Mr. Davis does in the chemical industry. I was surprised by the numbers he gave the committee.

Our estimate is that it costs four to five times as much to incinerate our waste as to take it to a secure landfill.

Senator CHAFEE. Could you submit for the record your people's closest analysis of those figures?

Mr. BEASLEY. I would be very glad to.

Senator CHAFEE. Have somebody back there from your staff make notes on these things because we are making notes. That is important to us. I was surprised by the figures Mr. Davis gave from Hooker. It seemed to me from his figures, judging upon the original capital investment—what did he say—half a million dollars in 1972?

Obviously, there are operating expenses that are quite high, and he indicated you have to bring this up to a high temperature.

Mr. BEASLEY. I might add since I joined the company we have started to design our own incineration plant for all our waste. The cost appears to be in the \$5 million to \$12 million range to do so. Of course, there are other problems with that even though incineration might be the socially preferable way to go about that, it is extremely energy-intensive and we will have to cross interstate lines if we locate a centralized one. I am not certain what the future will be with respect to States' allowing interstate transportation of chemical waste. That should be kept in mind by the committee when we search for better solutions than landfill.

Senator CHAFEE. Senator Simpson?

Senator SIMPSON. Thank you, very much.

I apologize for being late. I was headed for Three Mile Island, Pa.

I understand the thread of your testimony was that you endorse a Federal funding pool. What is your thought about the extent of the participation by the chemical companies in such a pool, whether it would be a commingling of Federal funds or industry funds?

What is that area of financing obligation?

Mr. BEASLEY. Senator, I hasten to say I don't consider myself to be an expert in this area. I dealt primarily with our abatement problems in Tennessee in my testimony. We have been working with the Manufacturing Chemists Association. I would be willing to give my personal view as opposed to an official view.

I think chemical companies have a responsibility to make sure these wastes are disposed of properly and to make sure individuals will not be injured in the future.

I have personal trouble seeing how one allocates responsibility today in 1979 and collects funds from existing chemical companies to pay for past practices as well as how one derives some money from other beneficiaries of those chemicals which have been consumed in the past. These beneficiaries include the Government, consumers, businesses, farmers, and all sectors of society.

These waste disposal costs are going to be passed on in the form of higher prices in the future. If that is true, it follows that consumers paid less for their chemicals in the past than they otherwise would have had expensive abatement practices been undertaken.

You may be interested in knowing that many chemical contracts for commodity chemicals have escalator clauses in them specifically for waste disposal cost. As disposal costs escalate, the cost of the chemical escalates much like a labor contract would with the cost of living. I don't think that any of us suspect that society in its totality will not bear the cost of more appropriate waste disposal.

Senator SIMPSON. As I understand it, under Tennessee law, the contamination of the aquifer, and I don't know if that was under their water law or civil law, apparently there is a common law trespass which I think would make your company strictly liable for damages.

In most cases, the particular rule of law simply would be negligence. Here we are in the area of strict liability, much as we would be in if we were dealing with a gas utility that furnished gas.

What is your thought about the issue of whether these chemicals might begin to fall in the law under the definition of an inherently dangerous substance and, therefore, the issue of strict liability that would embrace that type of subject?

Mr. BEASLEY. If I may, I would like to confine myself to the facts I know best, and that is the Tennessee law. We are acting as if we are liable in this situation. Under Tennessee law, one first determines whether it is a temporary nuisance or permanent nuisance. It is clear that if either be the case, the company is responsible.

We have gone in with a degree of expense and a degree of abatement that far exceeds even what equity in common law in Tennessee would provide.

I might say we are doing so under the realization that in many of these cases, it is simply cheaper to replace the articles or put the people back in their original position than it is to test the article to see whether it was contaminated in the first place.

A classic example we had was with their washing machines. The test to analyze whether a washing machine had a few parts per billion exceeded the cost to replace the machine. So, in this instance, we are replacing rather than testing and trying to convince people that it is safe.

Senator SIMPSON. To what degree are costs a consideration in deciding landfill versus incineration?

Mr. BEASLEY. Senator, I really have no idea. Company employees 15 years ago are long gone and I obviously was not there 15 years ago.

Senator SIMPSON. I have a sense of your frustration, yes.

I have no further questions, Mr. Chairman.

Senator CHAFEE. You were here when we were questioning Mr. Davis of Hooker. I would like your answer to the question: How far do you believe your responsibility extends, you, a chemical company, after a site has been sold or title transferred?

I am not asking you to answer for Hooker. I am asking you to answer for your company.

These chemicals are subsequently ascertained to be far more deadly than they were originally thought to be and go way beyond any dangers that people thought when they were disposed of existed within them?

Now, where does your responsibility end?

Mr. BEASLEY. That is very interesting, Senator, because I find myself on the receiving end as well as the other end because we have purchased properties with chemicals in the ground which came to us undisclosed.

I have to be guarded because I have a number of litigations underway. I think there is no substitute for full disclosure as to what you know about the properties that you are transferring, I am not certain one can ever avoid retaining that liability if in fact it is not properly disclosed by the seller to the purchaser.

I think it is a far different question if the buyer knowingly accepts that responsibility and says, "We understand everything that is there." I think it has to go on a case-by-case basis.

Senator CHAFEE. Often you are dealing with unsophisticated buyers or who are not aware or do not choose to be aware of the dangers in there. You can tell him there is dioxin in there.

It does not seem to me that it is enough to say, "Well, I told him, I did my part, so I am through."

Mr. BEASLEY. I think you have to have a sophisticated person. The test is whether they know or are capable of knowing what they are getting into. I am not certain I would go as far as you and say that buyers of chemical plants are necessarily unsophisticated. I might say our company has bought a piece of property where the presence of chemicals was not disclosed. This goes both ways and even chemical companies can get fooled.

Senator CHAFEE. We have a very difficult problem here.

What do you think of some form of inventory of what you put in a dump with the location of it so that when you dispose of some-

thing in 1978 in a dump and the properties are not fully appreciated but subsequently in 1990 it is determined that the properties in that site or in that particular area in that chemical are lethal and then you proceed to do something about it?

What do you do about it?

Mr. BEASLEY. I think that is an excellent idea. We have already commenced a study of our previous residue and we are trying to calculate from production records going back 30 or 40 years to determine where our residue inventory might be.

The key is not to overreact, but certainly you have to have the information with which to react quickly and decisively. I think knowing what is in these dumps is extremely important.

Senator CHAFEE. You are talking about 100,000 barrels minimum at your Toones site. Do you have dioxin?

Mr. BEASLEY. I have other problems but I don't have dioxins.

Senator CHAFEE. If you had inventory, where would you put it?

Mr. BEASLEY. We don't know the location of each barrel.

Senator CHAFEE. The next question is, Who should be responsible for the testing of that, industry or Government?

Mr. BEASLEY. Let me state what we have done without committing the entire industry. We have assumed the full responsibility for testing this site and have paid for every aspect of that. Certainly in the future, industry will bear the cost and have an opportunity to get compensated from consumers if they can or cease doing business if that is the case. But in this particular situation, we have borne the expense. We have had some technical assistance from the State.

Senator CHAFEE. Thank you, very much, Mr. Beasley.

[The following additional information was supplied by Mr. Beasley subsequent to the hearing:]

VELSICOL CHEMICAL CORPORATION

341 EAST OHIO STREET • CHICAGO, ILLINOIS 60611 • 312/670-4572

Wm Howard Beasley, III

VICE CHAIRMAN OF THE BOARD

April 23, 1979

Dear Senators:

In response to your questions for which I did not have specific data at the hearing on March 29, 1979, I would like respectfully to submit the following:

1. Senator Chaffee asked what specific preparation was made to the disposal site before its use. I have been unable to locate anyone who was around at that time who can tell me any more than that a trench was dug approximately 15 feet deep, the drums were unloaded into the trench and then covered by approximately 3 feet of top soil. I am told by consultants that this was a standard procedure of this era and that it would have been most unusual for anyone to have lined a trench with clay. If the clay happened to have been there, that would have been fine, but the importation of clay was virtually unheard of.
2. A list of chemicals that were found in the well has been supplied by Dr. David Allen of the State of Tennessee Health Department in his testimony.
3. Attached is a current comparison between the disposal cost using a landfill and the disposal cost using incineration. This is an actual situation and represents what outside contractors are now charging. I feel that this is a relevant comparison, since these costs should represent full costs of disposal including operating costs, capital costs, and future maintenance of the site.

This analysis shows that landfilling costs approximately \$66 per barrel, while incineration costs \$210, or over three times as much. If transportation costs are excluded, the costs are \$46 versus \$183, or four times as much. Due to the short supply of acceptable secure landfills, I would expect the landfill costs to escalate more rapidly in the future than the cost of incineration. However, this large gap is not likely to disappear in the foreseeable future. It should be noted that it takes 66 gallons of fuel oil to burn 50 gallons of residue and obviously the cost of fuel will increase substantially in the future.

VELSICOL CHEMICAL CORPORATION

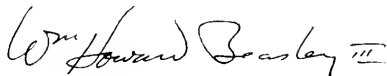
Page 2.

4. Senator Simpson asked about my personal thoughts on how funding might be approached if a super fund were created. My personal view is that the funding responsibility should be assumed proportionately by all of the sectors of our society that have benefited from the manufacture and use of chemicals. One must keep in mind that as this additional cost is imposed by taxation or by regulation, it will naturally follow that prices will be higher than otherwise, capital formation will be lower than otherwise, government tax revenue will be lower than otherwise, and profits will be lower than otherwise. On the other hand, the social costs imposed by improperly disposed of chemicals are high even though they are difficult to quantify. Additionally, the economic consequences for existing, financially responsible firms for previously improperly disposed of chemicals can be severe. Because of these consequences, it is difficult for me to imagine a responsible company knowingly disposing of chemicals in an improper way. For all of these many reasons, social as well as economic, there can be no substitute for the proper manufacture and disposal of chemicals.

Velsicol Chemical Corporation is doing everything it can to improve continually its disposal techniques and will do so whether or not new legislative initiatives are undertaken.

I appreciate the opportunity to express my views to you and the courtesy that you extended to me at the hearing.

Sincerely,



The Honorable John H. Chaffee
 The Honorable Alan K. Simpson
 United States Senate Committee on
 Environmental and Public Works
 United States Senate
 Washington, D. C. 20510

Attachment

COMPARATIVE COSTS--DISPOSAL OF PCL BOTTOMSLANDFILL VS. INCINERATIONApril 1, 1979, CostsI. SCA SERVICES, INC.--Secure Landfill

Disposal cost (50 gallons/705 pounds)	\$ 25.00/drum
Transportation cost (633 miles)	19.91/drum
Drum cost	<u>21.00/each</u>
TOTAL COST for disposal of 705 pounds net (50 gallons)	\$ 65.91
COST PER POUND -- \$0.0934	

II. ENERGY SYSTEMS COMPANY (ENSCO)--Incineration

Shipments consist of 60 per cent PCL, 40 per cent fuel oil by weight. Cost of fuel oil--\$0.4703/gallon.

Weight of PCL Bottoms (undiluted)--14.1 pounds/gallon
Weight of fuel oil -- 7.0 pounds/gallon

	<u>For 30 Gal.</u>	<u>For 50 Gal.</u>
Disposal cost (30 gallons=423 pounds)	\$ 84.60	\$141.00
Fuel oil cost (40.2 gallons=282 pounds)	18.91	31.50
Transportation cost (235 miles)	16.31	27.25
Cleaning of tank truck	<u>6.17</u>	<u>10.25</u>
TOTAL COST FOR DISPOSAL	\$125.99	\$210.00
COST PER POUND -- \$0.2978		

Senator CHAFEE. Our next witness is Representative LaFalce. I understand he is here. Would you like to go on now?

Mr. LAFALCE. Yes.

Senator CHAFEE. We were ready for you earlier but I understand you were tied up in the air somewhere.

Mr. LAFALCE. Yes.

Senator CHAFEE. Why don't you summarize your statement, Mr. LaFalce. Perhaps that would be helpful.

We welcome you here.

**STATEMENT OF HON. JOHN J. LaFALCE, A REPRESENTATIVE
IN CONGRESS FROM THE STATE OF NEW YORK**

Mr. LAFALCE. I would like to express my appreciation to this joint committee for having me here to testify before them and ask unanimous consent that the full text of my remarks be incorporated in the record. [See p. 322.]

As you know, I am the Congressman of the people in the Love Canal area of Niagara Falls, N.Y., so I have been living with the problem of human exposure to toxic substances for some time now.

I first became aware of the potential of the problem in 1977 and began at that time an almost daily battle to bring to the attention of the appropriate authorities the potential plight with which we were truly faced. It came to light after August 2, 1978, when the New York State Commissioner of Health issued an order stating that an emergency health situation existed in that area and strongly exhorted pregnant women, and children under 2 years of age to evacuate posthaste. There was a similar order on February 8, 1979, for people living in a wider perimeter from the dump sites.

What caused this horror story?

Well, we know now that some 25 years ago, hazardous substances were dumped there. We know that schools and homes were built on that property. But the tragedy of the Love Canal is not unique, Senator. Within one county in my congressional district, we have 39 abandoned landfills. Last week, the House Interstate and Foreign Commerce Oversight Committee held hearings on some of those sites in my one county.

The stories are truly tragic and EPA has indicated it is not peculiar to my one county. There are perhaps close to 1,000 abandoned sites across the country which are imminent hazards to the health and welfare of the people of this country as well as our environment.

Congress did enact some legislative framework to deal with the problem of hazardous waste. In 1978, when we passed the Resource Conservation and Recovery Act, we hoped to provide for such incident by providing for a program to eliminate open dumping; a program for financial and technical assistance for planning enhanced solid waste management system; and authority for research, demonstrations, and studies.

However, that law dealt only with current and future handling of solid waste. It did not take into account the wastes that were generated in the past. It is this issue which I would like to discuss with you primarily this morning.

I have introduced H.R. 1048, the Hazardous Waste Control Act, which I believe will fill some of the gaps in RCRA. I hope that

my bill at least will provide a vehicle for discussion and deliberation. We would recommend establishing a program for the identification, reclamation, and monitoring of abandoned waste sites.

It would set fees to be paid by private organizations which would dispose of hazardous waste. It would also call upon the Government to provide a fair portion of that total fee and it will provide a process for the selection of future sites for disposal of hazardous wastes.

The fees against the private sectors would be collected from permit-holding operators of hazardous waste treatment storage facilities. Fees would be placed in a reclamation fund which would be used in combination with State and Federal contributions to deal with abandoned sites.

Another provision would establish contingency funds for payment of costs to clean up hazardous waste situations which threaten the health or safety of individuals. This bill would also authorize Government legal action against such persons responsible for such emergencies in order to recover the cost of cleanup operations.

The Comptroller General in a report to Congress in 1979 agreed with many of the concepts that I have embodied in my bill to fill the gaps in RCRA. The Comptroller's report is called, "Hazardous Waste Management Programs Will Not Be Effective: Greater Efforts Are Needed," and I commend that report to the study of this joint committee.

Before going on to other initiatives directly related to RCRA, I would like to talk about another bill I have introduced which is relevant to hazardous waste disposal and their effects on people. That has to do with the compensation for the victims of exposure to toxic substances. I have introduced a bill which I call the Toxic Tort Act. It would accomplish the following objectives:

One, it would create a Federal cause of action for victims of toxic substances permitting them to seek redress against the negligent manufacturers.

Two, it would create an independent agency within EPA to compensate injured individuals regardless of fault. This would function like the workers compensation program.

Three, it would require studying of exposure to toxic substances and human disease and authorize EPA to make a requisite nexus finding. This requisite nexus finding between the toxic exposure and human effect would overcome the problem of proving causation with additional proof requirements which are extremely difficult, if not inseparable.

Four, it would modify the proof and time limitation requirements which claimants must meet in both State workers compensation proceedings and in court actions permitting the use of a rebuttable presumption based on EPA's requisite nexus finding.

Five, it would subrogate the rights of the injured party, therefore enabling EPA to seek reimbursement from whatever parties they deemed negligent.

Senator CHAFFEE. That certainly sounds like a thoughtful bill, and we certainly will give it a close look. You have introduced that in the House?

Mr. LAFALCE. Yes, and I thank you for your comments.

There are some other legislative initiatives that I believe are necessary and I would like to talk about section 311 in particular of the Clean Water Act and the possibility of a super fund concept based upon the concepts in section 311.

I believe EPA is working on a proposal which as of now, still has not been formulated too thoroughly nor has it become the administration position. But this concept would create a superfund which funds would cover not only oil spills but also hazardous waste spills and abandoned waste sites.

I don't believe DOT would favor that approach but I am hopeful OMB will be the referee between DOT and EPA and will come down strongly on the side of EPA.

I certainly support the concept of a superfund to deal with such environmental calamities. If we enact such a fund, it would be structured to achieve a number of goals rather than just as a means of raising the necessary funds without becoming an undue burden on the Federal budget.

My suggestion is based on the view that we should develop a truly comprehensive program to manage hazardous waste and, to do so, we should have a funding mechanism that not only generates sufficient revenue to do the job but which also encourages the private sector and others involved to keep future problems to a minimum.

The superfund concept generally would use a tax on oil and natural gas, as one revenue source. I believe this would be appropriate, but a broad tax on the natural resources alone would not achieve other goals which a funding mechanism could help with greatly such as conservation and, therefore, reduction of waste, and recycling of wastes into other manufacturing processes, thus reducing the quantity of wastes to be handled; otherwise reducing the amounts of wastes to be handled, treated or disposed of; and reducing the toxicity of waste that cannot be eliminated.

The bill that I introduced has within it a funding mechanism for dealing with abandoned sites which might help meet these goals. My approach is one approach, but I offer it for your consideration as you enter into the superfund concept.

Senator CHAFEE. I think that is the first time we have had this suggestion. The fund would go into store for those who clean up the abandoned sites. That is certainly a worthwhile suggestion.

One of the problems, of course, as you know, is the incredible costs of cleaning up these abandoned sites.

Mr. LAFALCE. The costs of cleaning up the sites range anywhere from a few billion dollars to perhaps \$50 billion. I think the first thing we have to do, Senator, is to identify the sites and then make a determination whether the prospects of human exposure to toxic substances in that site is great, moderate, or minimal.

I would think that in a good many instances, all we would have to do is monitor those sites rather than actually reclaim them.

So while the costs are going to be great, I suspect they might be on the lower order of the range rather than the higher order of the range.

In any event, I do think we need an immediate injection of funds and I think the superfund concept presents a possibility for imme-

diate injection of funds much more so than just simply going it alone as I did in my bill, H.R. 1048.

Therefore, I would strongly support the concept of a superfund, and I believe this is in keeping with the concepts advanced by Senator Muskie and actions taken in the past Congress, at least in the Senate. The House has shown a great degree of reluctance in this matter.

It is important, though, no matter what program we devise, we do not relieve past, present, or future manufacturer disposers of liability for negligence on their part in dealing with hazardous substances.

It is also important our actions find the important delicate balance between encouraging entities in the private sector to take part in the disposal business and the need to assure victims that government will be able to hold irresponsible or negligent parties accountable for their actions.

So, if we do create a fund, we should permit the government to step in and deal with the problem immediately. We don't have time for 5 years of litigation. The problem must be dealt with and dealt with immediately, and I don't think any entity other than the Government can do it. Then we should permit the government to seek recovery from those companies where negligence is involved.

This should apply where, despite greater regulatory efforts to assure safe and careful handling of hazardous materials, problems may also arise.

The superfund concept, too, should include the mechanism to obtain third-party damages by innocent victims because those damages are as real as if the people were involved in an automobile accident or a fire, and, yet, those people are frequently left with no means of redress whatsoever. Again, if we provide for third-party damages within the superfund concept, the Government should have the right of subrogation, to seek reimbursement from negligent parties.

The concepts within my Toxic Tort Act could easily be included within the superfund concept.

Furthermore, within my Toxic Tort Act, I call for punitive damages, particularly for flagrant instances of irresponsibility, but I would not have them flow to any one victim who would get compensatory means of replenishment.

There are a great many other laws that are on the books that would offer the potential to deal with the problem if used creatively. For example, the Clean Water Act, particularly sections 201, 208, 311, and 504. My prepared remarks go into each of those creative uses in some detail.

Let me pass over sections 201 and 208 and even 311.

Now, to go to section 504 in particular because 504 specifically authorizes EPA to provide assistance in emergency situations caused by the release into the atmosphere of any pollutant or other contaminant including but not limited to those which present or may reasonably be anticipated to present an imminent and substantial danger to the public health and welfare.

This section would address such situations as the Love Canal. Unfortunately, while Congress saw fit to authorize a minimal

amount of money for section 504, approximately \$10 million, Congress, perhaps, because of its reluctance to put its money where its mouth is, or perhaps, because of the inhibitions brought about by OMB, Congress has not appropriated 1 penny toward section 504.

In this Congress, whether it be in the supplemental budget, or whether it be in the fiscal 1980 budget, I strongly hope that efforts will be made by each and every member of this committee to appropriate moneys for section 504.

Senator CHAFEE. I know you are aware the President did not put any in for this section.

Mr. LAFALCE. I am well aware of that. That is because of OMB.

Senator CHAFEE. When you indicated it was an uphill fight, you have labeled it correctly.

Mr. LAFALCE. If we are going to do something about this problem, we can because we have an existing vehicle which would permit us to take immediate action. We need action now and there is a vehicle for doing that. I know Senator Muskie made a valiant effort last year on the floor, with the assistance of Senators Moynihan and Javits; but because of the constraints and objection to funding 504 at that time their efforts failed.

I believe we must appropriate money for section 8001(a) of RCRA, which provides for a similar program to Love Canal. That demonstration program never received appropriations. Last year, however, we were able to get \$4 million appropriated in the fiscal 1979 appropriations process for 8001(a).

Senator CHAFEE. That was on a matching basis.

Mr. LAFALCE. Yes, it was on a matching basis. However the contributions of New York to Love Canal makes the Federal contribution pale in significance to the point where almost everyone in New York has said, "Why hasn't the Federal Government done anything to alleviate our problems."

Senator, with that I will conclude my remarks and if you have any questions, I would be pleased to answer them.

Senator CHAFEE. Mr. Representative, this is very, very thoughtful and you have given this a lot of time, 8001 plus 504 suggests and your comments on 311 plus the superfund, the approach to it, the tax on the original supplier, that is the oil industry and then on the operators of the dumps—very very helpful.

As a matter of fact, that gives us kind of a guideline to go by as we delve into this particular area and we appreciate your coming.

Our next witness is Mr. Frank Rovers, Conestoga-Rovers and Associates.

Do you have a statement, Mr. Rovers?

Mr. ROVERS. Yes, sir, I do.

Senator BURDICK. This is not too long. If you would like to read that, why don't you do that?

**STATEMENT OF FRANK A. ROVERS, ON BEHALF OF
CONESTOGA-ROVERS AND ASSOCIATES, ONTARIO, CANADA**

Mr. ROVERS. I consider myself privileged as a Canadian to be here.

Senator BURDICK. We are delighted to welcome you and we are glad you are here.

Mr. ROVERS. Inactive and abandoned hazardous waste disposal sites have been identified in recent years to pose a significant potential for detrimental environmental impact. At the present time, the North American Society is expending significant resources to control this potential. This hearing is a most significant example of this expenditure. Although the North American Society recognizes the significance of inactive and abandoned hazardous waste disposal sites, it does not know the true dimensions of the problem.

Senator CHAFEE. I am glad to have your optimism that North American Society is well on its way to solving the inactive and abandoned waste disposal sites. That is not an optimism I share, but we are glad that you do have that view.

Mr. ROVERS. The solving of the problem commences with the recognition that a problem exists. This recognition is the first and singly most important step to problem solution. The North American Society is therefore well on its way to solving the problem of inactive and abandoned hazardous waste disposal sites. Only now are we doing anything about it. We are recognizing the problem and I have considered the recognition the most important to problem solving and I do feel with that recognition the problem will be solved over the next few years, a problem which has existed for decades will be solved in the next few number of years.

Senator CHAFEE. If we get high points for recognizing it, high points are recognizing it, then I suppose we score, but I think the toughest part is yet to come.

Mr. ROVERS. Significant activities to control the problem of inactive and abandoned hazardous waste disposal sites include, but are not limited to, the following:

One, industrial in-house reviews of past practices.

Two, industrial in-house monitoring of past practices.

Three, government monitoring of past practices.

Four, implementation of remedial work programs.

Five, the formulation and writing of legislation.

The problem of and the solution to inactive and abandoned hazardous waste disposal sites can best be defined in a responsible atmosphere. A responsible atmosphere is one which recognizes the following:

One, ideal solutions often are economically impractical.

Two, practical solutions may often require innovative engineering.

Three, the problem is societal in nature.

Four, inadequate past practices in general were not irresponsible.

Five, society, where possible, must be given an adequate time frame for problem definition, solution definition, and solution implementation.

Senator CHAFEE. I could not agree with you more. We had testimony yesterday if we handled some of these problems in advance before they get out of control, the cost-effectiveness is incredibly high. For a modest expenditure, we can right many wrongs if we know it in advance rather than waiting until the damage is done and the material has seeped out.

If the sites are only correctly prepared in the beginning, much damage can be averted.

Mr. ROVERS. I would like to make one comment.

From experience with Love Canal, geologically, it is a good situation. Today we could design that site for hazard waste disposal. That is the type of situation we are in.

Senator CHAFEE. Would you say that again?

Mr. ROVERS. Using RCRA regulation guidelines of hazardous disposal site design, Love Canal in fact fits the requirements for hazard waste disposal. There are a number of houses close by and now that requirement does not but if the Love Canal did not have the houses near by would be acceptable. The big cost comes for lack of monitoring, where impact was allowed to get to the homes prior to the identification of a problem.

The installation could have been done prior to hitting the homes, affecting the people and the problem could have been controlled.

Senator CHAFEE. Do you think the original construction of the Love Canal as a disposal site was correctly done?

Mr. ROVER. The hydrogeologic situation for the waste disposal is excellent. Niagara County has a situation in general which is good for hazardous waste proposal and I think it is fortunate many people and the waste disposed of in that area have that hydrogeologic environment. However, there is a serious flaw that exists in waste control and this flaw is follows:

When we can secure disposal of something and when we sanitary landfill, we must consider it as an engineering structure. If the chair we are sitting on is not maintained over a long period of time, that chair will eventually collapse under us. If we maintain it, fix it up, it will not collapse. With everything man structures, we do the same thing if we do not maintain the buildings, they will fall down. If we maintain them, they will stand.

Secure disposal must be done in the same way. We must monitor and look after it as long as the waste it contains continues to be defined as hazardous. This is a most important criteria for design. This is something that people are addressing in a minor fashion but not in as strong a fashion as I believe they should.

I believe that the single act which can reduce most significantly hazardous waste cost as hazardous waste disposal is a relatively inexpensive act. This includes not ground monitoring but all kinds of water.

Senator CHAFEE. It includes what?

Mr. ROVERS. Not just ground water monitoring. You insure that the whole secure design is monitored continuously like you do on a bridge, like you do on a building. You look after the whole structure, not just a part of it.

Senator CHAFEE. Take the Love Canal situation.

Are you suggesting if that had been properly maintained, that would have been a secure disposal site?

Mr. ROVERS. If it had been properly maintained and monitored—

Senator CHAFEE. Was it properly built in the beginning?

Mr. ROVERS. Yes, it was in a good environment and it was properly done at the time. If, for instance, certain things were left out that we would do today by monitoring you would have detected those failures and we would have corrected them. That is why it is so important to monitor, that we do things in engineering all the

time that later on we find out has a flaw in it and we correct that flaw, and monitoring would detect those flaws and correct those flaws.

Senator CHAFEE. Suppose the clay cover on the Love Canal had not been removed. Would the problem that is presently being encountered have occurred sooner or later?

Mr. ROVERS. Yes, sir, it would have occurred later but it would have occurred.

Senator CHAFEE. As a result of what, lack of maintenance?

Mr. ROVERS. It is a bathtub effect. It would have taken longer for the bathtub to fill up but it would have filled up.

Senator CHAFEE. In other words, the rain eventually would have gotten through the clay cover?

Mr. ROVERS. Rain gets through a clay cover. There is no such thing as an impermeable clay cover.

Senator CHAFEE. What could have been done?

Mr. ROVERS. By monitoring, you would have detected the fact that contaminants were collecting. You would have monitored more and you would treat leachate collected as you would do at any other normal site.

Historically, the problem at an inactive and abandoned hazardous waste disposal site was defined following an offsite detrimental impact. As a result, remedial work costs are extremely high. Remedial costs can be significantly reduced by site monitoring and therefore problem identification prior to significant offsite detrimental impact.

We believe that the single act which can reduce most significantly remedial work costs at hazardous waste disposal sites, is the relatively inexpensive act of monitoring. This is a difficulty. I have addressed it as if it were a simple question and I do not intend to do that.

Having identified the problem of inactive and abandoned hazardous waste disposal sites, the North American Society is faced with the responsibility of funding site investigations and remedial works which may be required to secure the sites.

We believe that inactive and abandoned hazardous waste disposal sites are a societal responsibility. The North American Society which includes the general public, governmental agencies, industries and professions, at the time, generally did not conceive the disposal of hazardous waste in the hydrogeologic environment, as being practiced, to be unsafe.

The disposal practices being condemned today were accepted standards in the past. At the same time, the whole of society benefited from the products made which resulted in the hazardous byproduct waste.

Increased environmental awareness, refined scientific technology and detailed environmental research are now identifying that past practices were unacceptable. Society, however, benefited from the products which did not include a cost for the secure disposal of the waste byproducts. It is recognized that hazardous waste disposal significantly below the accepted standard can be defined as being irresponsible. In general, industry has not acted in this fashion. It is for the above reasons, we believe, that the problem of hazardous

waste disposal sites which are inactive and abandoned are a "societal" responsibility.

With the problem being societal in nature, the following funding formula for site investigation and remedial work is proposed. It is proposed that the fund be funded from the following source. (1) The general public; (2) industry; (3) waste disposal surcharges.

The fund would be used for remedial works on present and future inactive and abandoned hazardous waste disposal sites.

A number of immediate actions can be taken which would have a significant impact on the problem of inactive and abandoned hazardous waste disposal sites. To be complete, proposed and presently operated sites are included in this discussion.

(1) Establishment of, wherever possible, buffer zones which would allow for the monitoring of the hydrogeologic environment, and the implementation of a remedial control program within this boundary should such a program be required. For all sites, remedial control programs should be designed for implementation, if required.

Do you have a rule of thumb on buffer zones, how wide they should be?

Mr. ROVERS. No, we don't. They should be significant and at every new site a remedial action program should be designed today, not when a problem happens, but today. If we say we are going to do it this way, and nothing migrates, let's assume it will migrate and design something that will take care of it.

If I have to dig a trench 700 feet wide, I have to have the buffer zone to do it, and that will tell you what that should be. That is why it is important to design today the control program for the future.

You might find you cannot design a control program. You are doing industry great injustice if you do not tell them, as a professional, the responsibility they have should migration take place.

An example, in the past designs of sanitary land sites secured disposal sites have never included the cost for the possibility of the contaminants moving. We then have a false sense of what a secure disposal site really costs, and there are certainly many industries today—

Senator CHAFEE. Everybody thinks the contaminant won't move.

Mr. ROVERS. That is true. You have a false sense of security and you have other methods that are much higher in cost.

No. 2, the establishment of the monitoring of the site—you must monitor the site on a continuous basis to be sure you have security. If you don't have security, you must fix it so that you do.

No. 3, the implementation of a "responsible atmosphere" regarding inactive and abandoned hazardous waste disposal sites.

This concludes my statement.

Senator CHAFEE. I don't know what number three means. What is the implementation of a responsible atmosphere regarding inactive and abandoned hazardous waste disposal sites? What does that mean?

Mr. ROVERS. I talked about responsible atmosphere previously. Here is what I consider one to be: An ideal solution, but one which is often impractical—very often we run across a problem and someone demands of us an ideal solution—the perfect cleanup. That is

often economically totally impractical. Two practical solutions may require innovative engineering. A problem occurs. It is a problem that has never occurred before. We are faced with new, innovative engineering solutions. We present the ideas and we are faced then with the problem of saying, "Have you ever checked it out before," and we say, "No; we have never checked it out before," and they say, "No; we can't approve." In other words, if it requires innovative engineering, at least allow the industry or the community to clear up with innovative engineering.

Engineering often does not have a proof of success. Three, the problem is societal in nature; four, inadequate past practices in general were not irresponsible, and, five, society, where possible, must be given an adequate time frame for problem definition, solution definition and solution implementation.

If this can be possible, if you can remove the dangers of health to individuals, for instance, then the society should be given an adequate time frame to do this, but costs very often are significantly less if enough time is given to do the job properly.

Senator CHAFEE. In your funding, as I recall, you had three methods of funding. You had the public—

Mr. ROVERS. They would all add to this fund.

Senator CHAFEE. Three contributors—the public, industry, and the disposable sites themselves.

Mr. ROVERS. Right.

Senator CHAFEE. Have you found in your experience that putting a heavy charge on the disposal sites encourages the cornercutters to avoid the sites and just dump recklessly in other areas?

In other words, it seems to me there is a curve here which we can track, which shows that people will use safe sites if the safe sites are not too expensive and the responsible companies will continue to use the safe sites, but with the irresponsible ones, the number of them will increase directly as the cost of the disposal goes up. They are the people we are worried about. Do you have any thoughts on that?

Mr. ROVERS. Yes, I have. Safe sites are costly. There is no way that we can avoid that. It is therefore imperative that the people who recognize that they must use a safe site, if they don't use it will be harshly dealt with.

Senator CHAFEE. I would agree with that, but the trouble is we have this incident in North or South Carolina where they dumped the stuff along the road. It was a very modest cost for them to dump that stuff in the right place, but they chose to be reckless. I don't know if they were driven by ignorance or a desire to avoid any expense.

Mr. ROVERS. There is no question that the correlation you have identified is real. You increase the cost and the chances of roadside dumping, and so on also increases.

However, I don't really know how you can avoid that. Secure disposal is costly and there is only one way to avoid it, and that is have the public pick up part of the tab. I don't really agree with that, so I must believe that the cost must be there and you must pay that cost, and if you do not pay it, and choose to do otherwise, you must be very harshly dealt with.

Senator CHAFEE. Let me get back to the Love Canal situation.

You testified a few moments ago with that cap on, despite the cap being there, that actually there would have been leakage. The bathtub would have filled up and it would have gotten out. Now, was that knowledge known in 1953?

Mr. ROVERS. No, that was not understood at that time. There are many things about secure and hazardous waste that are understood today that were not understood at that time.

Senator CHAFEE. It is not a question of hazardous waste. It is a question of seepage through clay. In other words, what you are saying, as I understand it, is that water gets through clay.

Mr. ROVERS. Yes.

Senator CHAFEE. When water gets through a clay cap and into the tub, it fills it up. We had testimony earlier from the Hooker people that water seeps through clay a third of an inch every 25 years. It must take a long time to fill up that trench at that rate.

Mr. ROERS. The problem at the Love Canal was a fracture flow system. You do not have a tight clay. The clay Hooker was talking about was the clay at depth which was not fractured. You have a small sand layer at the top of the site and below that you have an extensive fracture zone. Flow-through fractures are significantly different than normal clay though systems. There are only two places in North America where any attempt is made to define fracture flow and the porosity associated therewith has never been defined. Go to western Canada. Great scientific efforts are being made to define fracture flow. That is how new the science is. You are talking about a science that is relatively new.

It would not have been understood at that time to be that way. This is with many cases and many hydrogeologic environments.

Senator CHAFEE. It would not have been understood in 1953?

Mr. ROVERS. No.

Senator CHAFEE. It would have been understood since, though?

Mr. ROVERS. I don't even believe it is fully understood today. The bathtub effect is a theory that has been postulated but it has not been proven. Other people believe other things have happened at the Love Canal. Scientific people feel that theory is not sound. It has not been proven. We don't understand fully even today the Love Canal system.

Senator CHAFEE. What is not understood, the bathtub filled up and the chemical filled up and ran over. There is no suggestion the chemicals did not leak out.

Mr. ROVERS. No, it didn't. There is a strong suggestion that the grading is upward and you had water flowing into the tub from the bottom of the site into the bathtub.

Senator CHAFEE. Therefore, their original clay bottom was not good enough?

Mr. ROVERS. There is an upward grading which is the ideal place for a disposal site. You can never have downward migrating contaminants.

Senator CHAFEE. Therefore, it seems to me what you are saying is—you have just said, coupled with the fact that it requires constant maintenance, any disposal site, as I understand your testimony, requires constant maintenance and monitoring?

Mr. ROVERS. Yes, as long as—

Senator CHAFEE. Or constant monitoring which will then result in maintenance?

Mr. ROVERS. That is correct.

Senator CHAFEE. Therefore, it seems to me nobody should ever dispose of one of these sites to somebody who is not going to do that?

Mr. ROVERS. It should never be disposed of to somebody who is not going to do it, but you can give it to someone who will do it. If I want to accept your landfill and continue to monitor it, understanding what my responsibilities are, I think that is possible and could be done, but continuous monitoring and maintenance, as long as the waste that is in that site can be considered to be hazardous, is of utmost importance. Otherwise, we are never going to solve the problem of abandoned and inactive hazardous waste. We keep generating them and closing them up and forgetting about them, but they will come back to haunt us.

Senator CHAFEE. Are you convinced it is possible to build a site today using today's technology monitoring and maintaining it that will be safe?

Mr. ROVERS. Yes.

Senator CHAFEE. Why do you say that?

Mr. ROVERS. I believe that you can design a secure site to minimize the possibility of movement by monitoring. You will detect any movement that takes place and the technology is adequate to control that movement in a fashion which will not cause a detrimental environmental impact. That is the only way we can ever expect to clean up our existing problems, and they are being cleaned up and it is unfortunate that in many cases they were not cleaned up prior to any Mrs. Smith's water supply wells.

Senator CHAFEE. How is Canada doing in this?

Mr. ROVERS. The same problem we have here. They are watching to see what the United States is going to do so they can follow the example.

Senate CHAFEE. Thank you very much for coming. We appreciate it.

[Whereupon, at 12:35 p.m., the subcommittee was recessed to reconvene subject to the call of the Chair.]

[Statements submitted for the record by today's witnesses and a statement from the American Petroleum Institute follow:]

STATEMENT OF SENATOR JACOB K. JAVITS
BEFORE THE JOINT SUBCOMMITTEES ON
RESOURCE PROTECTION AND ENVIRONMENTAL POLLUTION
THURSDAY, MARCH 29, 1979

Mr. Chairman, I appreciate the opportunity to appear before the Subcommittees on Resource Protection and Environmental Pollution to present my views on the Federal role in the disposal of hazardous waste.

It was just seven months ago that Senator Moynihan and I alerted our colleagues to an emergency situation in Niagara Falls, New York. A relatively obscure site known as Love Canal became the focus of national attention when it was discovered that chemicals, buried more than twenty-five years ago, had surfaced and infiltrated scores of nearby homes, posing serious health hazards to the residents and the environment. The events which followed are now history. Hundreds of families have been evacuated, but not without preceeding serious consequences - birth defects, miscarriages, skin irritants and respiratory ailments.

What also surfaced last summer was the realization that the Federal government lacks the authority to deal with abandoned hazardous waste sites. The Congress, and this committee in particular, has been diligent in recognizing environmental hazards which threaten our ecosystem and pose problems for the health and safety of our people. Accordingly, relevant laws have been enacted such as the National Environmental Policy Act, the Clean Air Act, the Federal Water Pollution Control Act, the Toxic Substances Control Act and the Resource Conservation and Recovery Act. Although RCRA establishes a comprehensive program for the management of dangerous wastes, the issue of how to deal with abandoned sites had seemingly been forgotten. Love Canal was a tragic reminder that the issue can neither be overlooked nor ignored.

The projected cost of clean-up, reconstruction and relocation of the Love Canal crisis is \$25m. The only Federal response has been an emergency appropriation of \$4m by the Congress, and \$2m from the Federal Disaster Assistance Agency pursuant to a Presidential declaration of a state of emergency.

Here again, Federal law is lacking. Following the declaration of emergency, New York State submitted a series of project applications totaling \$23m. Subsequently, FDAA cited Love Canal as, "a chronic health problem" and denied all but \$2m for remedial construction of the southern portion of the Love Canal site. The FDAA Administrator informed New York that, " the legislation under which FDAA operates is designed to deal with immediate emergency situations. If FDAA were to continue to provide emergency assistance over a period of years, we would be operating outside of the constraints intended for this program."

Unfortunately, the incident is not isolated, nor a problem only for New York State. Since last summer, a number of additional sites have been identified including "Valley of the Drums" in Kentucky, Meadowlands in New Jersey, and leaking landfills in Iowa and Massachusetts. No one, including the Federal government, the states nor the industries which produced the chemicals, know how many landfills are leaking dangerous chemicals or where they are located. More importantly, no one is able to determine the number of people exposed, or what chemicals they are being exposed to.

According to the Environmental Protection Agency, there are approximately 32,000 landfills containing hazardous materials. Of

these, EPA estimates that as many as 1200 may be imminently hazardous to the public. Furthermore, EPA estimates that the costs associated with clean-up for the 1200 sites range between \$3m for temporary action, and \$26-44b for a permanent solution. It appears that our industrial dreams of the 1940's could turn into a toxic nightmare for the 1970's.

Furthermore, Mr. Chairman, abandoned sites are not the only hazardous waste issues presenting problems to New York and the other states. As I mentioned, a portion of the needed regulatory framework dealing with active and future sites is already law. Subtitle "C" of the Resource Conservation and Recovery Act establishes a "cradle to grave" regulatory program which mandates Federal or state approved, monitoring of hazardous wastes beginning with the manufacturing process and ending with the disposal of wastes in a permitted site. It also provides for Federal funding for state hazardous waste programs.

The Act called for EPA to issue final guidelines by April 1978. However, the final regulations are not expected until early next year. Therefore, nearly two years after enactment, the majority of hazardous wastes continue to be disposed of improperly. The lack of Federal guidelines ^{also} hampers states which are attempting to establish their own disposal laws.

In the absence of Federal guidelines for both abandoned sites and current disposal sites, the problem solving has been left to the states. New York has been pursuing the problem through a number of aggressive initiatives: (1) Under the direction of Governor Carey the Dept. of Environmental Conservation and the Health Department

are preparing a comprehensive strategy of programs and funding for a Federal-State-local approach to the problems of hazardous wastes; (2) established an Erie/Niagara Task Force to identify industrial waste disposal sites in Erie and Niagara Counties (Love Canal area), and so far the task force has identified 200 sites in these two counties; (3) established a Statewide Study of Toxics in the Environment to identify statewide dump sites, contaminated groundwater and lake and river sediments and to date the Statewide. Study has identified nearly 500 locations which may have been used for the disposal of toxic or hazardous materials; and (4) enacted the Industrial Hazardous Waste Management Act to provide for the identification and listing of hazardous wastes, monitoring, storage and disposal.

Clearly, the states cannot afford to assume all of the costs associated with the management of hazardous wastes. The Federal government must share in the task.

First, I encourage and support the establishment of a comprehensive liability and compensation act, or, "superfund" which would make money available on an emergency basis for hazardous waste spills. In that way, those responsible for the wastes will help pay to clean them up. States could also consider a fee system as a means of financing their waste programs.

Second, Federal regulations for abandoned sites need to be established, and states with programs meeting those standards should be entitled to Federal aid. Without uniform guidelines states with strict guidelines run the risk of turning away industries which will seek to locate in states with less stringent laws.

Third, the level of Federal funding available for state clean-up programs needs to be increased.

Finally, we need to address the problem of public opposition to siting facilities. EPA estimates that when RCRA is implemented 50-60 additional sites for commercial use will be needed. Situations such as Love Canal have understandably made the public sensitive to the siting of hazardous waste facilities in their areas.

Mr. Chairman, I realize that the suggestions I have made are broad and raise a number of questions which need to be resolved. I urge the Congress and this committee to explore fully the alternatives and to develop responsible solutions to the problems.

In summary, the disposal of hazardous wastes must be regulated. If new laws are needed, let's legislate. If existing laws need to be amended, let's amend them. And in the interim, the Federal government should be prepared to assist the states faced with emergencies such as Love Canal. For example, the emergency contingency fund contained in section 504 of the Water Pollution Control Act Amendments was established to, "provide assistance in emergencies caused by the release into the environment of any pollutant... anticipated to present an imminent and substantial danger to the public health." This section has never been funded. The financial costs will be high, but we have already witnessed the human cost of not regulating.

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STATEMENT BY
BRUCE D. DAVIS
EXECUTIVE VICE PRESIDENT,
INDUSTRIAL CHEMICALS GROUP,
HOOKER CHEMICAL COMPANY

BEFORE THE
JOINT SENATE SUBCOMMITTEE HEARING
of the
ENVIRONMENTAL POLLUTION SUBCOMMITTEE,
THE HONORABLE EDMUND S. MUSKIE, CHAIRMAN
and the
RESOURCE PROTECTION SUBCOMMITTEE,
THE HONORABLE JOHN C. CULVER, CHAIRMAN

March 29, 1979
Washington, D. C.

Good morning. Senator Muskie, Senator Culver, members of the Subcommittee on Environmental Pollution and Resource Protection. I am Bruce Davis, Executive Vice President of the Industrial Chemicals Group of Hooker Chemical Company. I am pleased to have this opportunity to appear before this Joint Subcommittee Hearing and to share with you and your colleagues some facts and some of our views on the management of hazardous wastes.

Our company celebrated the 75th anniversary of its founding in 1978; for most of that time the Niagara Falls area has been the focal point of our chemical manufacturing operations. The location has served the Company well; it now has five divisions headquartered there, employing approximately 3,100 people. At Niagara Falls, our major products include chlorine, caustic soda, and a number of chemical intermediates and specialty products which find a wide assortment of end uses in practically everything you see or use around you in daily life. Our Durez Division, in nearby North Tonawanda, New York, supplies phenolic molding compounds and industrial resins which are used by the transportation, electrical and construction industries, to name a few.

In the manufacture of all of these chemical products, waste or residues, are inherently generated. In fact, I know of very few chemical or other manufacturing processes that fail to produce some waste or byproduct.

Likewise, every one of man's activities produces waste of one kind or another. It does not matter if the activity is eating food or driving a car, wastes are produced.

The chemical industry usually calls its wastes "residues." Sometimes the only problem with a residue is that it takes up space, or is unsightly, or has an unpleasant odor. The problems in disposal of these residues are relatively small.

But if the residue is potentially harmful to human health or the environment, it must have special storage and disposal considerations -- isolation or destruction. Isolation -- storage in disposal sites -- has been, and still is, the principal method of industry handling of potentially harmful residues.

By way of example, I will discuss four closed-out landfill disposal sites which Hooker Chemical has used for the isolation of chemical residues. (See attached map.)

The first site I'd like to discuss is the Love Canal. (See attached map.) Thirty-seven years ago, the Love Canal offered a rather ideal, isolated site for chemical residue storage. It was in a sparsely populated area. The surrounding soil was an impervious clay through which buried residues would not migrate.

However, in order to have a better appreciation of the suitability of the Love Canal site, it is necessary to have a little of the historical background of Niagara Falls and the Love Canal, itself.

Niagara Falls is known mainly as a tourist center. Interestingly enough, though, the Falls attracted not only tourists, but industry as well, and both have contributed to the growth and economic well-being of Niagara Falls and the surrounding communities.

The availability of salt, water and abundant electrical power made Niagara Falls a very logical place for industry to locate in the late 19th and early 20th centuries. In fact, Hooker built its first chemical plant in Niagara Falls in 1905, since the electro-chemical process developed by Hooker for the production of chlorine and caustic soda depended upon economical and adequate supplies of salt, water and electric power.

By the time Hooker located in Niagara Falls, the area, with its vast power potential and easy access by river and lake, had already attracted several industries and many ambitious business schemes. Perhaps the most visionary was that of Mr. William T. Love. He proposed in 1892 to build a power canal between the upper and lower Niagara Rivers, utilizing the 300 foot drop in water level to generate electric power to drive the machinery of industry that he had persuaded to locate in his "Model City" a few miles north of Niagara Falls. In those days, long power transmission lines were impractical, so power users had to locate close to the generating station.

In 1894, having gained a generous charter for his company, work started on the Love Canal about six miles upriver from the Falls. Soon afterwards, the country found itself in the middle of an economic depression and support for the project faded. The final blow came when the inventor, Louis Tesla, developed an economical method of transmitting electric power over great distances by means of alternating current. The need for a "Model City" no longer existed, and by 1910 the last of Love's property including the partial excavation that was to be his canal, had been auctioned.

For 30 years, the site lay essentially abandoned. Then, in 1942, permission was granted for Hooker to use the Canal as a residue disposal site while purchase of the land was pursued.

The canal site, located in an undeveloped, sparsely populated area, was ideal for the disposal of chemical residues since by design it was built to retain water within the impervious clay walls. In fact, tests recently conducted indicate that the clay has a water transmission rate of only one-third inch in 25 years.

The Canal, itself, was a trench about 3,000 feet long (approximately one-half mile), 60 feet wide and 10 feet deep. The property subsequently acquired by Hooker was a 200 foot wide strip with the canal in the approximate center of that strip.

It must be understood that detailed records of the operations, quantities and types of chemicals deposited in the canal 30 years ago are no longer available. However, we have attempted to reconstruct many of the operations based upon knowledge of the various processes then being conducted in the plant, and the recollection of old-time employees.

Disposal of chemical residues began about 1942 in the northern section of the Canal. Portions of the section were divided or dammed off as needed. Then, chemical wastes which had been hauled to the site in drums were placed generally in the original trench and covered with several feet of clay material.

It should be recognized that the life of a steel drum is limited and the practice of placing residues in drums before disposal was not intended to insure permanent containment of the residues in the drums. This is another reason why the impervious clay of the Canal made it such a good disposal site.

About 1946, the disposal of residues began in the southern end of the Canal. In this portion of the Canal, smaller sections were excavated within the original trench and, in some cases, outside the trench, but within the property boundaries. The excavations were then filled with residues that had been accumulated in drums at the plant and covered with clay material which was then compacted. Another small

section was then excavated to receive more residues and the process repeated.

In 1947, negotiations for the purchase of the land were completed and the property was acquired by Hooker.

When Hooker stopped using the Canal, about 22,000 tons of chemical residues, mostly chlorinated organics, had been deposited.

By 1952, the Board of Education of the City of Niagara Falls had begun to express interest in acquiring the Hooker property for a school. As a result of the School Board's insistence, Hooker deeded the property in 1953 for \$1 on condition that the deed include a clause which gave notice of the past use, and under which the School Board released the Company from claims that might result from the buried chemicals. The pertinent part of that deed reads as follows:

"Prior to the delivery of this instrument of conveyance, the grantee herein has been advised by the grantor that the premises above described have been filled, in whole or in part, to the present grade level thereof with waste products resulting from the manufacturing of chemicals by the grantor of its plant in the City of Niagara Falls, New York, and the grantee assumes all risk and liability incident to the use thereof. It is, therefore, understood and agreed

that, as a part of the consideration for this conveyance and as a condition thereof, no claim, suit, action or demand of any nature whatsoever shall ever be made by the grantee, its successors or assigns, against the grantor, its successors or assigns, for injury to a person or persons, including death resulting therefrom or loss of damage to property caused by, in connection with or by reason of the presence of said industrial wastes. It is further agreed as a condition thereof that each subsequent conveyance of the aforesaid lands shall be made subject to the foregoing provisions and conditions."

For the construction of the school, the School Board chose land adjacent to the central part of the Canal, which had not been utilized by Hooker for disposal of chemical residues. Subsequently, however, portions of the central section of the Canal which were previously unfilled, were filled primarily with municipal refuse, fly ash and cinders and eventually a playground was built.

The Board of Education subsequently deeded the northern section of the site to the City for the purpose of building a park, and the southern part passed into private ownership.

With the building of the school, development of the privately-owned adjacent properties was accelerated. By 1964, there were over 150 homes; and by 1976, there were over 200 homes in the area. No homes were ever built directly over the disposal site.

Sometime over the years after Hooker deeded the property, the clay covering was disturbed, apparently during the construction of homes or roads in the area. Surface water resulting from heavy rain and snow entered the Canal, which gradually filled up just like a bathtub, and then overflowed. The water mixed with chemical wastes, producing a liquid called leachate, which seeped into some basements of houses built on adjacent properties.

In late 1976, local authorities received complaints from Love Canal area residents of odors and chemicals in their sump pumps. In 1977, the City commissioned a firm of consulting engineers to study the site and recommend remedial action. Hooker engineers and scientists provided the City consultants with technical information and assistance. A report was issued by the consultant, but it was felt that further studies were needed. On March 31, 1978, the City commissioned another engineering consultant, Conestoga-Rovers and Associates, to develop and submit a comprehensive groundwater pollution abatement plan covering the southern section of the Canal. It was agreed that the costs of this study would be shared equally

by the City of Niagara Falls, the City of Niagara Falls Board of Education and Hooker.

A report was submitted in June 1978, containing a proposal for remedial work, the estimated cost of which was \$850,000. Hooker offered to contribute up to one-third of that total estimated cost of \$850,000 to expedite the implementation of the corrective program; that offer still stands.

On August 2, 1978, the New York State Health Commissioner recommended the temporary relocation of pregnant women and children under age two, living within the first two rings of houses adjacent to the site, and closure of the school pending completion of the remedial work.

A short time later, the State of New York embarked upon a plan to purchase the first and second "rings" of homes surrounding the Canal.

The remedial work, as proposed by Conestoga-Rovers, was accepted by the State at that time, but did not begin until October 1978. (See attached drawing.)

The remedial plan consists of laying a drainage tile system through the backyards of the houses to collect leachate from the Canal and adjacent properties, and to drain contaminated soils. In this way, the area will eventually be cleansed of chemicals. The tile system is designed to drain into a large collection tank and from there the liquid will pass through a bed of activated carbon that will absorb most of the

chemicals. To be doubly sure the water has been cleansed, the water will then be sent to and processed by the City Wastewater Treatment Plant before discharge to the River. This work has continued through the winter of 1978-1979.

The final stage of the remedial work is the installation of a clay cap over the Canal and drainage system to prevent rain and snow from seeping through to the Canal. The clay cap will also be provided with its own surface drainage system to prevent erosion of the clay. The cap will then be covered with topsoil and grass to prevent the clay from drying out and cracking. There are plans to extend remedial work to the central and northern sections of the Canal later this year under an EPA demonstration grant.

Test wells have been drilled in several locations around the area down through to the top level of the bedrock to discover if there has been any leakage of chemicals into the groundwater. No traces of chlorinated organic chemicals have been detected but the groundwater was found to contain naturally occurring sulfides making the water unfit for drinking.

Further tests are being carried out in the Love Canal area to determine if the natural drainage of surface water has carried the buried chemical residues further afield. Hooker has assisted the various environmental agencies in these tests, and we will continue to offer our technical advice and assistance.

Health surveys are under way to try to determine any possible health effects resulting from exposure to low levels of chemicals. It is one thing to identify minute quantities of chemicals -- a technique which has been greatly improved. It is another thing entirely to assess what effects these traces may have had on living organisms. This is why medical research in the area has been intensified.

With regard to the Love Canal, the New York Department of Health recently issued the following statement:

"We cannot say with certainty that the higher rates found . . . are directly related to chemical exposure but the data do suggest a small but significant increase in the risk of miscarriages and birth defects. Although the magnitude of the additional risk to this population is indeed small, prudence dictates that we take a most conservative posture to minimize even that small additional risk."

The Department said that studies to date did not document any increased incidence of liver disorder, except among residents of the first two rings of homes which have been evacuated, nor was an increase noted in abnormal blood problems, except for some cases of iron deficiency anemia which were described as being fairly prevalent among the general population. The Department also said it had found no evidence of toxicity related to exposure to benzene,

a known cancer-causing agent. Likewise the Department said it has found no evidence of excess neurological disorders, including epilepsy, or cancer among current residents of the Love Canal area. The Department is continuing to collect and evaluate data.

The second area that I would like to discuss is the Hyde Park landfill site, which is located north of the City of Niagara Falls -- in the Town of Niagara. (See attached Map.) It is in an industrialized area with companies such as Niagara Steel Finishing Company, N. L. Industries, and Grief Brothers Corporation in the immediate vicinity.

When Hooker stopped using the Love Canal for disposal of chemical wastes in 1953, another site was needed. The Hyde Park site seemed to have ideal characteristics and was purchased by Hooker. Aerial photographs indicate that part of the general area had been used by others as a dumpsite as early as 1938.

Hooker began disposal operations at Hyde Park in 1953. At that time, a fence was erected around the site and dikes were constructed to prevent the infiltration of surface water. Chemical residues were then placed in excavations approximately 25-30 feet deep in the central portion of the site.

In 1972, Hooker, in conjunction with Niagara County health officials, began to prepare the site for closure. With clay covering, the contours were improved for better

drainage. Also, drainage tiles were put in around the entire perimeter of the landfill site to collect any possible leachate, and sump pumps were installed in two locations to pump collected leachate into a holding lagoon. The lagoon serves as a collection basin to hold leachate until it is removed for subsequent off-site disposal.

By 1974, we were disposing of very few chemical residues in the Hyde Park landfill, but we continued until 1976 to use the eastern tip of the site to dispose of rubble and fly ash.

In 1978, additional clay was placed over the entire site. New drain tiles were installed and lowered several feet to improve the efficiency of the drain tile system. Planned improvements include enclosures over the sump pumps and a covered leachate collection pond. However, we are still waiting for the Town of Niagara to grant building permits to allow the completion of this plan.

Another part of the Hyde Park program is to determine if any chemicals are leaking into the groundwater (underground water). In conjunction with the New York Department of Environmental Conservation, monitoring wells have been installed in three different locations surrounding the site. We have three wells at two sites and two wells at another. One well is near the surface; one is about halfway down to bedrock; and the other is in bedrock. Our plan includes the drilling of even more wells if needed.

The noted wells were completed two to three months ago and to date we do not have satisfactory samples to analyze because it takes a few months for wells to reach a state where the samples consistently duplicate one another. When this happens, the wells are "equilibrating," and until that happens, the samples cannot be considered reliable.

In addition, we have sampled the water from the wells of three residents in an area about 300-500 yards north of the site. The well water was checked for 129 chemicals, and found to be well within New York State levels. However, a high bacteria content was found, possibly attributable to household septic systems in the area. Health officials have said that because of the high bacteria count the water should not be used for human consumption.

The natural drainage channel for this industrialized area is called "Bloody Run." The tributaries of this creek branch out around the landfill site, join together, flow under Grief Brothers, then out into an open channel past a few homes in the area leading to the edge of the Niagara University campus where it drops into an underground storm drain that is 20 or 30 feet down below ground level. It then runs west and into the Niagara gorge.

There are signs of chemicals present in the sediment under Bloody Run, and this has led us into a sophisticated program to determine their nature, source and extent. We have

detected certain chemicals in samples that we, the EPA, and other agencies have taken. These samples indicate the presence of chemicals which Hooker produced and could have disposed of in the Hyde Park landfill . Some of them include mirex, Lindane and certain chlorinated hydrocarbons. There are also some additional chlorinated hydrocarbons which are fairly common to industry and could have come from several sources. Out of samples which we took last December, one analysis showed dioxin at a level of / parts per billion in the sediment about 6 to 8 inches down from the surface. We then advised EPA and various state and local officials of the results of the analysis. We do not believe the chemicals (at the levels found) constitute a health hazard. They do, however, warrant additional investigation.

We expect to have new analytical data as quickly as possible as a direct result of an accelerated testing program developed in conjunction with various agencies. In addition to the test wells earlier mentioned, the program includes surveying and contour mapping and the identification of pollutants that may be present in sediment. Analysis of soil samples throughout the area should help us determine if there is contamination other than in the sediment of Bloody Run.

We have been working closely with the State Department of Environmental Conservation. We meet with them monthly to report on our programs and discuss technical viewpoints.

At this point, the sampling program is the most important part of the investigation. Upon concluding the sampling program, a final report, including any necessary corrective program, will be filed. Implementation of a corrective program would follow shortly thereafter.

The third site is known as the 102nd Street landfill. (See attached map.) The property acquired by Hooker in the 1940's lies south of the Love Canal with the LaSalle Expressway dividing the two sites, and is adjacent to the Niagara River. In the mid-1950's, Hooker acquired the Oldbury Electrochemical and Niagara Alkali Companies, as well as their landfill operations which were adjacent to our landfill site. Hooker's property is in an area which has been used for waste disposal for sometime. The property adjacent on the west is a park -- and former municipal landfill. On the east is another industrial landfill site.

Some chlorinated organic chemicals have been deposited at the 102nd Street site, but the majority of the material deposited there was inorganic wastes that are generally insoluble in water. Any leachate from such wastes should not pose an environmental hazard.

The site was closed in 1972 in accordance with a plan approved by the U.S. Army Corps of Engineers and responsible State and local agencies. Per that plan, a wall was built at the water's edge and clay and soil were placed over the whole site.

In 1978, in cooperation with the Department of Environmental Conservation, Hooker developed a site survey plan and a well drilling program to determine the flow of groundwater and the extent, if any, of possible chemical migration. This well drilling program will be started this summer, and if any remedial action is necessary, it will be started early in 1980.

The last of the sites which I would like to discuss is the Niagara plant. (See attached map.)

Aerial photographs taken in 1938 show the Niagara River shoreline at the plant to be very different from what it is today. Over the years, land was reclaimed from the river, by the use of fly ash, slag and municipal and industrial wastes.

In 1947, the land was purchased by Hooker and became known as the "N" and "S" areas. Records indicate that the materials deposited in the "N" area were similar to those deposited in the 102nd Street site, which were primarily inorganic wastes. The "N" area was also used as a staging area to temporarily store drums or wastes until they were moved to the Love Canal or Hyde Park.

The "S" area and the City Water Treatment Plant are essentially adjacent to one another, but are separated by a street. The "S" area served as a disposal site for a wide variety of chemical wastes -- mainly chlorinated organic residues.

In the summer of 1978, the City sent divers down into the shore shaft of the water treatment plant on a routine inspection and maintenance check. A sludge sample from the untreated water was brought to the surface and found to contain various chemicals, many of which were made by Hooker. The treated water, however, has been found perfectly safe for drinking. In fact, the total amount of chlorinated organics found in the drinking water from the Niagara Falls water treatment plant is far lower than the national average as reported in the National Organic Monitoring Survey (NOMS) by EPA. For example, Washington, D.C. has 100 to 200 parts per billion of chlorinated organics in its drinking water while Niagara Falls has approximately one-tenth of this amount.

The fact that contaminants were in the shore shaft is not easily explained.

Those are some of the facts that must be considered. In order to determine whether any off-site migration of contaminants has occurred at the Niagara Falls Plant, Hooker has implemented a comprehensive plan of action. The plan is to drill over 100 monitoring wells - including several wells on the water treatment plant property. At many locations, two wells will be used. One is drilled down in bedrock, the other is located near the surface. These wells will be used to determine the direction of groundwater flow and also the presence of any chemicals in that groundwater. Over 70 wells

have already been drilled, and it will take a few months before information from the test wells is reliable and useful.

In the meantime, the city water supply is being regularly tested and continues to maintain a high level of quality and purity.

With the benefit of our experience, and the development of new technology to meet new demands, Hooker is continuing with its long-range program to solve residue disposal problems.

We have been reducing the volume of waste by redesigning our chemical processes to improve efficiency and produce less waste. We are also recycling materials to extract more chemicals the second time around. This also reduces waste.

We are also destroying certain toxic wastes by incineration. This has the advantage of being an immediate solution as it does not involve either moving bulk materials or maintaining a land disposal site.

We have recognized for some time that burying liquid wastes is not the ideal method of disposal. It appears that the only way to break down some chemicals is with heat, but the problem is that many of these chemicals are so stable, even when heated, that they are used to make fire-retardant fabrics and plastics. Nevertheless, Hooker has developed a high temperature incinerator that can break down these liquid wastes. This major technological breakthrough is a patented process and has been used by others as well as by Hooker.

Since the incinerator was put into operation in 1961, about 200,000 tons of liquid waste have been destroyed, significantly reducing the burden being placed on chemical landfill sites. Over the years many improvements have been made and we are now working on a process to destroy solid wastes.

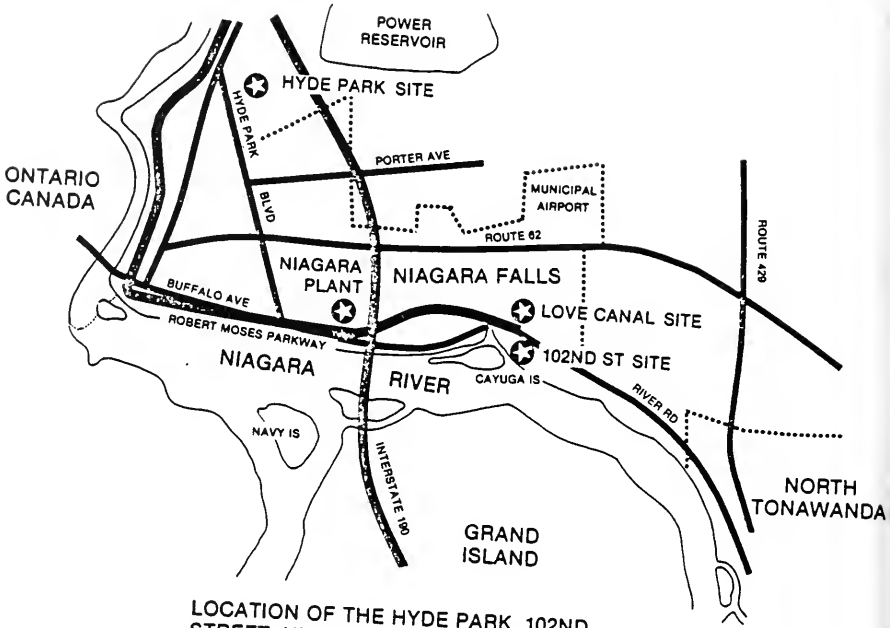
These programs have achieved dramatic reductions in residue volume over the past few years. (See attached chart.) Although a majority of our wastes are incinerated today, we will never be able to totally eliminate the need for landfill sites. There are some materials which cannot be destroyed by heat, and are best isolated in landfills where they can be monitored. Constantly improving technology and new government regulations concerning landfills are helping to insure that landfills will help provide environmentally responsible solutions to the hazardous waste disposal problem.

We understand that Congress will soon be considering new legislation relating to hazardous waste disposal. The complexity and far reaching societal concern associated with this nation-wide problem -- past, present, and future -- is certainly of considerable interest and concern to Hooker Chemical Company and the entire chemical industry. We are working closely with the Manufacturing Chemists Association to develop industry-wide recommendations in this area.

In summary, Hooker has designed and is implementing, a far-reaching, comprehensive and complex program for testing and monitoring the various landfill sites at Niagara Falls

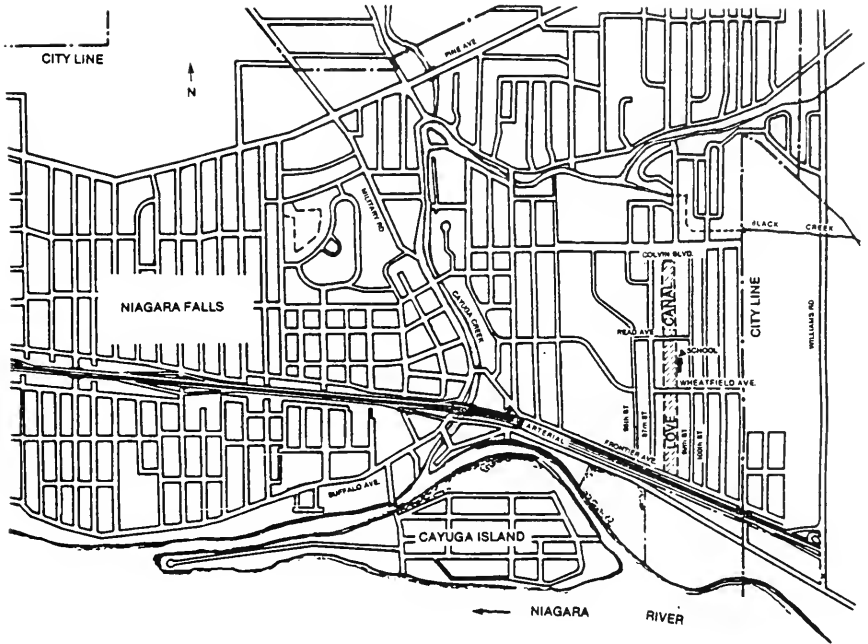
upon which sound plans for any corrective action can be based. These programs are so extensive, and the chemical testing required is so specialized, that qualified laboratories have been employed in Texas, Nebraska, Iowa, and California to supplement our own capabilities and those in the nearby areas. Deadlines, milestone dates, and program content have been developed in detail for each landfill site, then carefully integrated into an overall program, with review and approval for the DEC. We are on schedule and have met all milestone dates.

In every field of endeavor, our knowledge has been increased dramatically in the last decade. We know much more about chemicals. We know much more about handling the residues of chemical production. We know how to analyze for the presence of chemicals in much lower quantities than was possible 10 to 20 years ago. We know much more about the environment and human health. Hooker will continue to develop programs to utilize this increased knowledge to keep in the forefront of technical solutions for the protection of the environment.

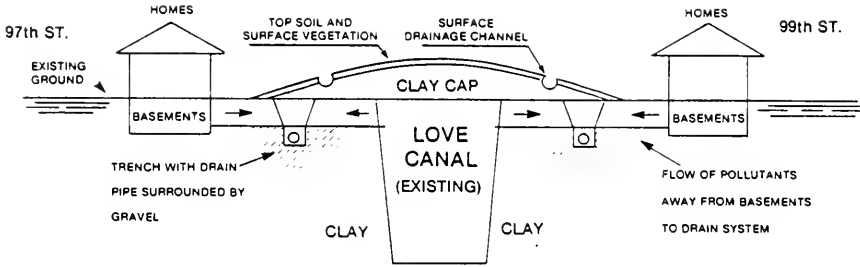


LOCATION OF THE HYDE PARK, 102ND STREET, NIAGARA PLANT, AND LOVE CANAL SITES IN THE NIAGARA FALLS AREA

LOVE CANAL SITE

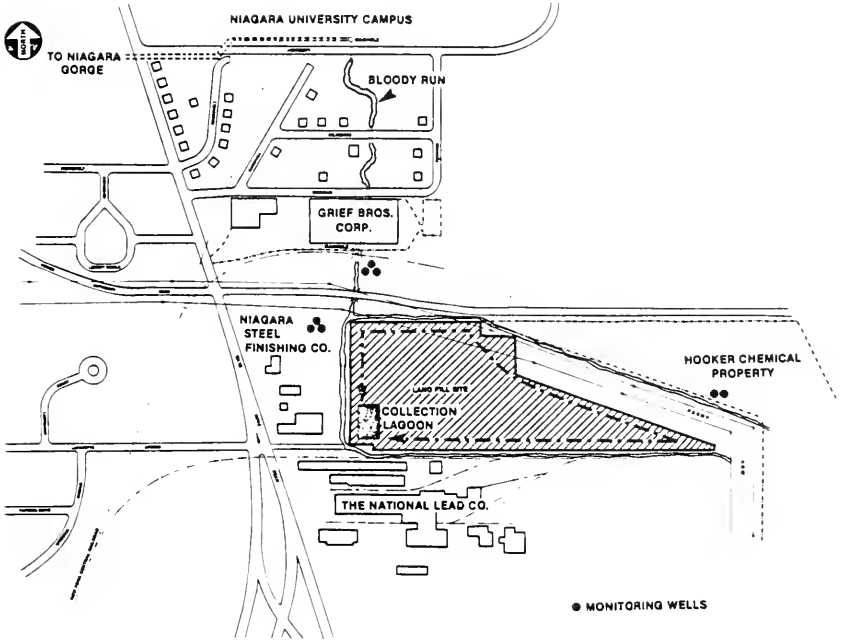


The Love Canal Site is located about six (6) miles east of the Falls.



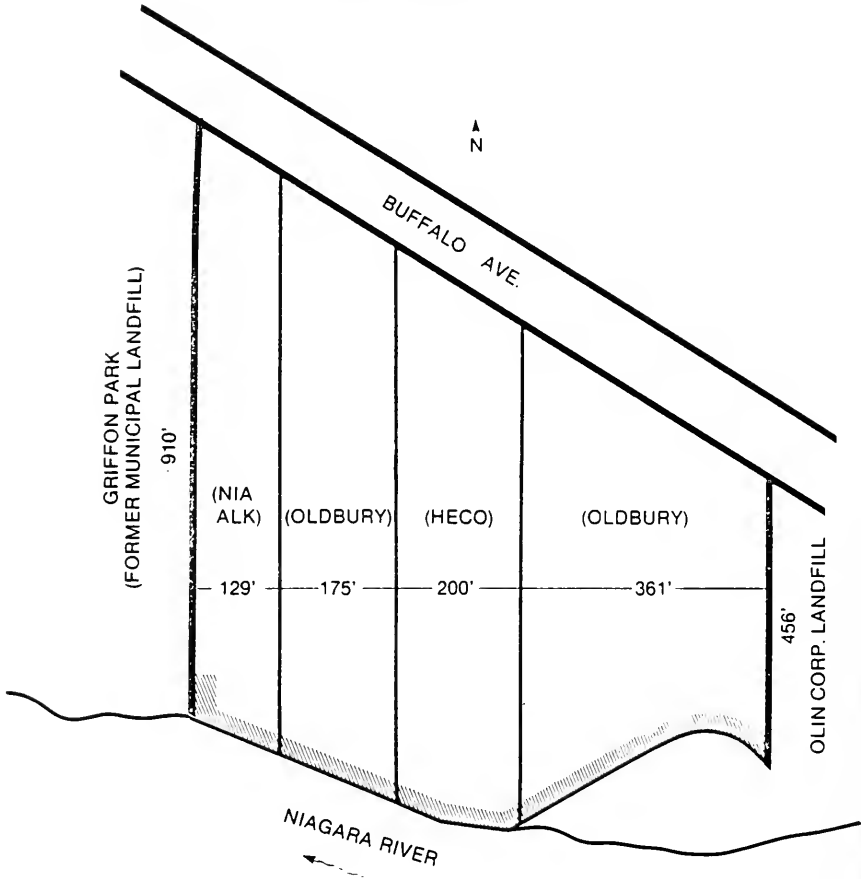
The remedial plan consists of a drainage system, and a clay cap over the site.

HYDE PARK SITE



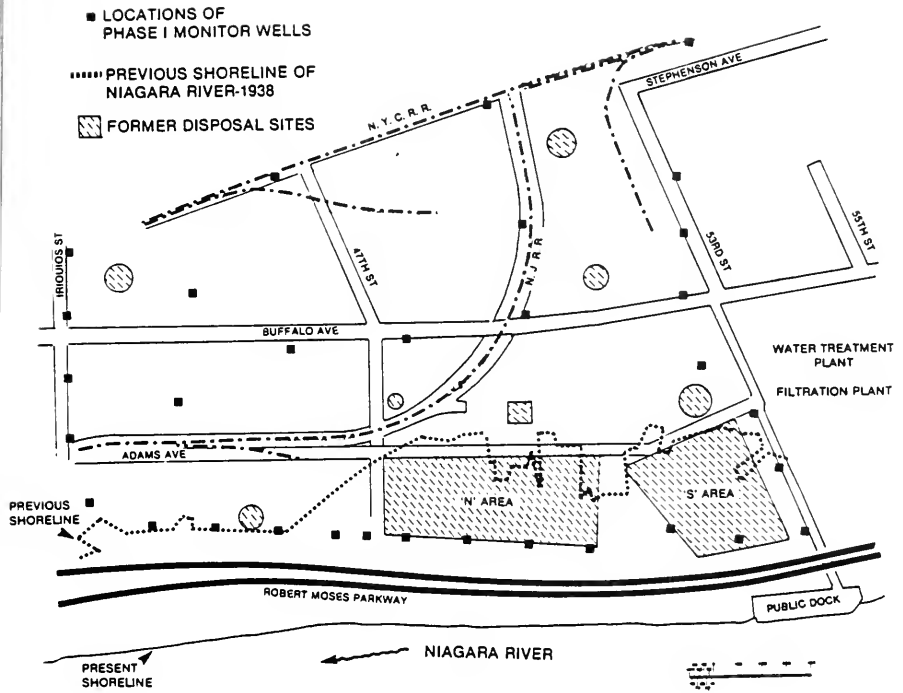
The Hyde Park disposal site is located four (4) miles north of the Falls.

102nd STREET SITE



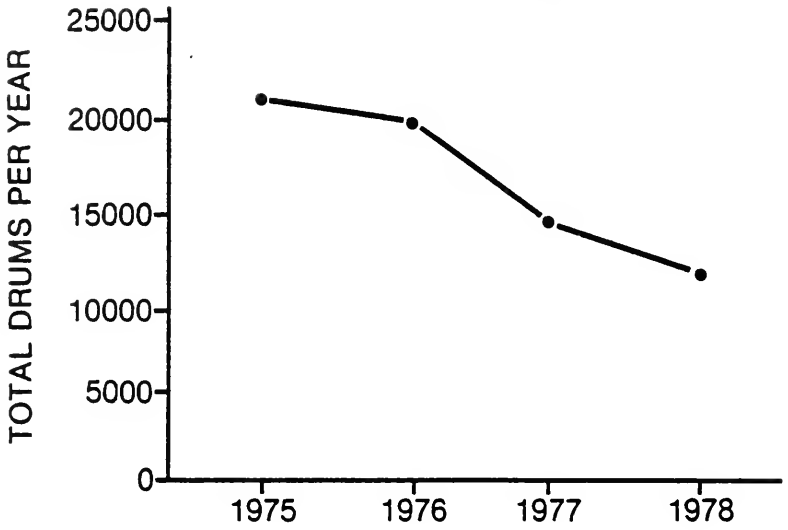
The 102nd Street site is located about six (6) miles east of the Falls.

NIAGARA PLANT



Map of the Niagara Plant, four (4) miles east of the Falls.

DRUMS OF CHEMICAL RESIDUES TO LANDFILLS



TESTIMONY OF
Wm. HOWARD BEASLEY, III
VICE CHAIRMAN OF THE BOARD
VELSICOL CHEMICAL CORPORATION
CHICAGO, ILLINOIS
BEFORE THE
SENATE ENVIRONMENT AND PUBLIC WORKS COMMITTEE
JOINT HEARINGS OF THE RESOURCE PROTECTION AND ENVIRONMENTAL
POLLUTION SUBCOMMITTEES
MARCH 29, 1979

Mr. Chairman, I appreciate the opportunity to testify today concerning our efforts to rectify a situation where a former landfill appears to have been contaminating approximately a dozen wells adjacent to it.

At the outset, I think it is important to point out that my charter at Velsicol is to bring this company to the forefront of environmental security. My full-time efforts, along with using the resources of some of the nation's top experts in this field, are devoted to this goal. In fact, environmental security at Velsicol is the first priority -- before profit, before growth. Our expenditures and problem-solving approaches with the Hardeman County, Tennessee situation, as well as other environmental matters, reflect this commitment.

By way of background, this landfill was used between 1964 and 1973. Approximately 45 acres of the 243 acres of the property were used to dispose of residue.

There is always a question as to whether or not a landfill could cause contamination of groundwater. Soon after the landfill was started, the United States Geological Survey indicated that if this did happen, the slope of the groundwater movement was away from the area where people were drawing their water. It concluded that: "There is, therefore, no possibility for any existing water-table wells to produce potentially contaminated water from the water-table aquifer." . . . "the potential contamination hazard for such wells is nil."

In the past 15 years, a number of families located on property adjacent to the landfill added additional wells and drew more water from the existing wells. Approximately a year ago, a few of the residents began to detect a funny smell in their water. The compounds in the water were identified, with our assistance, as being chemicals similar to those in the landfill. We immediately commenced a joint study with the State of Tennessee with an independent hydrology company to determine whether the chemicals got into the well through underground migration or through some other means. Other ways could have included the inadvertent dumping or rinsing of a drum in the well area. At that time, we were relying on the earlier scientific report that it would be most unlikely that the landfill could have been causing this problem.

On October 6, 1978, which happened to be the first week of my coming to Velsicol, a preliminary opinion from our hydrologist was that the landfill possibly could be the cause of the well contamination, and we immediately set in motion a plan of action to rectify the situation. The State and EPA officials, as well as the residents, were immediately notified of this opinion. We also initiated contact with the news media and provided them with the facts we had. Velsicol offered to pay the water connection fee for the dozen families affected so that they could be hooked up to a permanent fresh-water supply. We also agreed to pay for the fresh-water which was then being provided by the state.

I personally went down to talk with the families and sought their advice as to what they wanted to have done and even offered that very day to purchase their homes at fair market value before contamination, as well as to pay them for the inconvenience of having to move. Their attorney turned this down. By this time, it appeared that a permanent water system would not be available for at least five months, so we installed a water system of our own for the families, with underground piping. Trucking water from Jackson, Tennessee to the

residents costs us approximately \$1,200 per week. Furthermore, we did the following:

1. Replumbed all affected homes.
2. Replaced all hot water heaters.
3. Replaced washers, driers, dish washers, ice makers, until their attorney obtained a restraining order prohibiting us from contacting the people.
4. Replaced all pots, pans, plastic dishes, coffee pots and other cookware, until their attorney obtained the restraining order prohibiting all contact.
5. Reimbursed the families for all home-prepared canned and frozen foods.
6. Contributed \$25,500 to the town of Toone, Tennessee when the city council appeared to be reluctant to commit city funds for extending a permanent water supply to this area which, by the way, will serve many more families than just the dozen adjacent to our landfill.
7. Made air sample studies in two of the homes with the highest well contamination concentration in order to make certain that the air was satisfactory.
8. We are now conducting soil sample studies in garden plots and orchards to see if there is any reason not to continue to use these areas.

In addition to the effort extended directly to the residents, we have set up a number of task forces dealing with related concerns:

1. We are working with the State Department of Public Health, the EPA and Center for Disease Control on medical studies for the affected families.
2. We have set up a consortium of the finest consulting firms in the country to help us determine what corrective actions are necessary.

As of this time, we have made settlements with about half of the families involved and have offers outstanding for most of the others.

We decided from the very beginning that if we thought we were responsible, we would move in immediately and do whatever was right for the people. We decided that we would not be unduly concerned about protecting our legal flanks and that we would confront the situation directly. More importantly, we took expedient action to get these dozen families' lives back to normal. With the exception of the normal concerns someone would have with having been exposed to contaminated water, their lives appear to be heading in this direction.

The approach we have taken in Hardeman County has been that of a responsible corporate citizen. I believe that you would find this to be the case if you talked to people who know the details, and we encourage you to do so.

For example, as part of a series on the national waste disposal controversy, the Boston Globe reported:

"Since it is likely to be years before the EPA actively enforces hazardous waste regulations, the current unfolding of the environmental mess in Toone, Tennessee could provide a model for voluntary action by other chemical companies as future hazards are uncovered."

Mr. Chairman, I am not proud of the problems which this landfill has created, nor do I minimize the inconvenience that this has caused these dozen families. However, I am very proud of our dedication and actions to resolve this situation. We set a written goal at the beginning that our behavior would be guided in such a way that this might serve as a model of how business and government, as well as affected individuals, could work together to solve such problems. You may ask what has made it work as successfully as it has. I would answer that this particular solution has been due to the good faith efforts by state and federal officials -- particularly the Tennessee Division of Water Quality and EPA Region IV -- as well as our representatives working on the problem.

We let government know from the beginning that there would be no need to threaten us with any legal sanctions because we would act more speedily and more fully than any court would have had us do. The state and the EPA told us what they knew about the situation, candidly and completely, and we did the same. We did not try to hide anything, nor minimize any of the problems. We told it as it was and worked together toward a mutual solution. Of vital importance was that all of our efforts were directed toward helping the people, as opposed to fighting each other.

We are very fortunate in this case because our situation was well contained within a very small local aquifer and there does not seem to be at this time any additional well which might be subject to contamination. With the completion of the permanent water main next month there should be no need ever to use these wells again.

Perhaps the biggest burden these families have had to live with the past year has been the mental concern of trying to deal with many of the fallacious, greatly exaggerated rumors that have been created. I do not mean to minimize the situation; I am simply pointing out that many people, while trying to help these individuals, probably have caused them a great deal of needless anguish.

In closing, I would like to point out that while this initiative worked for us in this particular situation, I cannot recommend it universally for every company that has a landfill problem. The risks one takes when assuming such a move are tremendous, and one is continually subjected to fallacious claims and over-anxious lawyers. Furthermore, when one starts such a program, particularly with a landfill, he simply does not know where all his problems might be and he lays himself open if the problem turns out to be far greater than ever anticipated. We at Velsicol are pleased that we took such an initiative. It has turned out well for us, well for the state and federal agencies and most importantly, very well for the people.

STATEMENT OF
THE HONORABLE JOHN J. LaFALCE

Before
The Environment and Public Works
Subcommittee on Environmental Pollution
and the
Subcommittee on Resource Protection

THE REAUTHORIZATION OF
THE RESOURCE CONSERVATION AND RECOVERY ACT OF 1976

March 29, 1979

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Mr. Chairman: It is an honor to testify before you today on the reauthorization of the Resource Conservation and Recovery Act of 1976 (RCRA) and related issues.

Before I discuss my feelings about how current law should be changed and improved, I want to share some facts which will provide a context for my recommendations and make you aware of how urgent I believe it is for Congress to take action to fill the gaps in existing law.

On August 2, 1978, the New York State Commissioner of Health advised pregnant women and children under the age of two to evacuate the Love Canal area of Niagara Falls, which is in my Congressional District. This order led to the permanent relocation of 236 families immediately adjacent to the site. Why had this order been issued? Because health data had shown that the women living in this area suffered from a high rate of miscarriage, and children who were born to couples living there had a high rate of birth defects, ranging from cleft palates to mental retardation.

Again on February 8, 1979, New York's Commissioner of Health had to issue a similar order for a wider geographic area surrounding the Love Canal. This order involved the temporary relocation of approximately 50 families for the same reasons as were given in August of 1978. This time the families who had to move were those who lived along swales - old streambed paths - which formerly flowed out from the Canal. These areas proved to be extremely permeable and leaching toxic chemicals flowed along these paths of least resistance.

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What caused this horror story? The U.S. Environmental Protection Agency, with assistance from the NYS Department of Environmental Conservation and the New York State Department of Health, identified over 200 chemicals, many of which are suspected carcinogens, to be present in the soil and ambient air emanating from this abandoned landfill and polluting the environment in which these people lived. This terrible tragedy has brought fear, sickness, and serious personal injury to the innocent victims of toxic wastes which were indiscriminately buried in the Love Canal over 25 years ago.

But the Love Canal is not unique. Approximately 39 abandoned landfills have been identified in Niagara County alone, the Love Canal being only one of them. Last week, the House Interstate and Foreign Commerce Subcommittee on Oversight and Investigations held hearings on some of these sites in Niagara County. One which was discussed was the Hyde Park Landfill, which sits in the midst of factories and a university. Workers from the factories testified that illnesses such as growths, skin lesions, childbirth defects, (one child being born with 3 ears), are now common among the workers and their families. It was made known that over the last eight years more than half the workers in one factory have had serious health problems, and eight out of sixty workers have contracted cancer.

These stories are truly tragic. EPA has stated that there are perhaps close to 1,000 abandoned sites across the country which are imminent hazards to the health and welfare of the people of this nation as well as our environment. EPA has also said that there could be as many as 30,000

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abandoned sites "out there" waiting to be indentified, and the costs of cleaning them up are staggering. Estimates are that approximately \$20 to \$25 billion will be needed to clean up the imminently hazardous ones, and an additional \$24 billion to monitor those that need not be reclaimed, a total cost of \$50 billion. The Love Canal price tag so far is approximately \$13 million to abate the leachate, clean up the environment and temporarily relocate the affected families. This figure does not include the permanent relocation costs which the State of New York has chosen to assume for all those living within the geographic scope of the August order.

It is because we have these abandoned sites and we know that they are potential timebombs that I believe we should act on the issue of abandoned sites during the reauthorization process.

When Congress passed RCRA in 1976, we hoped to prevent such incidents by providing for a hazardous waste regulatory program; a program to eliminate open dumping; a program for financial and technical assistance for planning enhanced solid waste management systems; and authority for research, demonstrations and studies. Essentially, Congress passed a law which would regulate solid waste and track hazardous waste from "cradle to grave".

HAZARDOUS WASTE CONTROL ACT

However, RCRA dealt only with current and future handling of solid waste; it did not take into account the mismanagement of wastes that were generated in the past. It is this second issue which I wish to discuss with you first.

I have introduced a bill, H.R. 1048, the Hazardous Waste Control Act, which is intended to fill some of the gaps in RCRA which have become

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evident since its enactment three years ago. I hope this bill will serve as a basis for discussion during the reauthorization process.

My bill would amend RCRA by establishing a program for the identification, reclamation and monitoring of abandoned hazardous waste sites; setting fees to be paid by private organizations which store or dispose of hazardous wastes, and providing a process for the selection of sites for future disposal of hazardous wastes.

More specifically, my bill would mandate a concerted effort to identify all abandoned landfill sites that do or may contain hazardous wastes (a program which, I am pleased to say, is currently being conducted in my own state of New York). Once they are identified, they would be reclaimed, if desirable and feasible. If reclamation is not feasible, they would be monitored to ensure that public and environmental health and safety are not endangered.

Fees would be collected from permit-holding operators of hazardous waste treatment, storage or disposal facilities. Revenues from these fees would be placed in a reclamation and maintenance fund, which in turn would be used, in combination with state and federal contributions, to deal with abandoned sites.

Another provision in the bill establishes a contingency fund for emergency assistance and payment of costs to clean up hazardous waste situations which threaten the health of the general public. This portion includes an authorization for the government to bring legal action against those responsible for such emergencies to recover the cost of clean-up operations.

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My legislation also deals with the question of where to locate new hazardous waste disposal sites, an issue not presently covered by RCRA. When RCRA was passed in 1976, few foresaw the widespread public opposition to new hazardous waste disposal sites which has swept the nation. The general public was not then fully aware of the large number of abandoned sites throughout the country, the deleterious effects they were having on people's health and safety, and their dire impact on the environment. Now that public awareness has grown, in part due to the Love Canal, the Valley of the Drums, and other such infamous sites, citizens are understandably leery about the dubious honor of having a new site proposed for location in their backyards.

However, if we are to continue to accept the benefits from our highly technological society, we must provide for the selection of new hazardous waste disposal sites. Hazardous wastes continue to be produced at an exponential rate as by-products of our manufacturing process, and they should be buried in safe sites instead of along the roads or in the ocean. Further, dangerous wastes from mismanaged older sites will have to be moved to new and safer locations.

EPA has estimated that municipal solid waste alone amounted to about 130 million metric tons in 1976, enough to fill two New Orleans Superdomes each day, 365 days a year. By 1980 the annual total is projected to increase to 180 million tons, almost 40% more in four years.

Industrial waste generation is estimated at 344 million metric tons a year, with a growth rate of 3% per year. EPA estimates that 10 to 15

-6-

percent of industrial wastes will be classified as hazardous under RCRA.

In addition, our municipal wastewater treatment systems generate wastes known as sludge, and agriculture produces even more wastes. All these residues need to be recycled, incinerated or disposed of safely. My bill aims to provide a program to achieve safe future disposal by setting up a program for the siting of new hazardous waste disposal sites. This would be accomplished by having the EPA Administrator approve or disapprove an application after having consulted with the National Academy of Sciences, state and local governments, and a public hearing in the area affected.

The Comptroller General, in a Report to Congress published on January 23, 1979, agreed with many of the concepts I have suggested for legislation to fill the gaps in RCRA. The Report is entitled, Hazardous Waste Management Programs Will Not Be Effective: Greater Efforts Are Needed. It is, I believe, a careful analysis and agenda for action in this troublesome area.

TOXIC TORT ACT

Before I discuss other legislative initiatives relating directly to RCRA, I would like to take this opportunity to tell you about another bill I have introduced. While this legislation is not meant to be part of the RCRA reauthorization process, it is relevant to the problem of hazardous waste disposal and its effects on people.

As we all know, perhaps the greatest tragedy of the Love Canal experience and most cases of chemical poisoning, is that those who suffer physical injuries and other damages have no effective means of obtaining compensation for their losses. The lack of scientific and medical knowledge relating exposure to toxic substances with human illnesses, when combined with traditional proof requirements of our judicial system, almost preclude compensation for injured persons.

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I have, therefore, introduced the Toxic Tort Act, H.R. 1049, to address some of these problems. My bill would accomplish the following objectives:

1. It would create a federal cause of action for victims of toxic substances, permitting them to seek redress against negligent manufacturers.
2. It would establish an independent Board within EPA to compensate victims of pollution-related injuries regardless of fault. This agency would function, in principle, like a workers' compensation system.
3. It would require EPA to study the relationships between exposure to toxic substances and human disease and authorize EPA to make a "requisite nexus" finding. This would overcome the problem of proving causation with traditional proof requirements.
4. It would modify the proof and time limitation requirements which claimants must meet in state workers's compensation proceedings and in court actions, permitting the use of the presumption based on EPA's "requisite nexus" findings.
5. It would subrogate EPA to the rights of the injured party, enabling EPA to seek reimbursement from negligent parties.

COUNCIL ON ENVIRONMENTAL QUALITY STUDY

Last Tuesday I proposed an amendment to the Toxic Substances Control Act which would improve the government's research into effects of toxic substances exposure. I am happy to say that the House Commerce Subcommittee on Consumer Protection and Finance adopted it on Thursday, March 22.

The amendment directs the Council on Environmental Quality to conduct a comprehensive study on the compensation of victims of exposure to toxic substances, authorizing \$2 million to carry it out. The study would be done in consultation with other agencies, such as the Department

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of Labor, EPA, the Department of Health, Education and Welfare, the Justice Department and others, that are currently studying toxic substances questions. This study should be completed and submitted to Congress within 18 months after enactment. It is, I believe the next logical step in a program to guard our health and our environment from unreasonable risk or injury caused by toxic substances exposure. The study will provide recommendations to improve the system of compensating innocent victims of toxic exposure, such as the residents of the Love Canal and Hyde Park areas in my congressional district; East Gray, Maine; Toone, Tennessee; Cancer Alley in New Jersey; Charles City, Iowa; and countless others. The amendment also provides a mechanism to collect much of the information which will be needed in order to implement the Toxic Tort Act.

OTHER LEGISLATIVE INITIATIVES

Other legislative initiatives which have been developed deal not only with abandoned sites - as my bill does - but also with existing and future sites. It is my hope that these two prongs of the hazardous waste problem can be melded together, along with funding concepts capable of dealing with both of them in a reasonable time frame, in one comprehensive program.

Many proposals suggest that the only way to ensure a sufficiently large fund with which to handle all environmental calamities - such as oil spills, hazardous waste spills, and abandoned sites - is to develop an all-encompassing "superfund." This concept was raised during the 95th Congress by Senator Muskie; the Senate passed a bill including it, but the House rejected it.

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The Administration's position remains unclear, unfortunately. I am advised that EPA supports a "superfund" concept based on the concepts in Section 311 of the Clean Water Act. Their fund would cover oil spills, hazardous waste spills and abandoned waste sites. The Department of Transportation, with prime responsibility for oil spills through the Coast Guard, favors keeping a separate oil spill fund, rather than having a fund for multiple purposes. OMB, refereeing between these two, is awaiting the recommendations of a Justice Department coordinated Task Force, due in May, before developing a final Administration position.

Knowing as I do how difficult and potentially costly a problem we face in trying to mount an effective effort in the area of hazardous wastes, I support the concept of a "superfund" to deal with a number of environmental calamities. I would suggest, however, that it be structured to achieve a number of goals, rather than just as a means of raising the necessary funds without becoming an undue burden on the federal budget.

This suggestion is based on my view that we ought to develop a truly comprehensive program to manage hazardous wastes, and to do so we ought to have a funding mechanism which not only generates sufficient revenue to do the job but which also encourages the private sector and others involved to keep future problems to a minimum.

The "superfund" concept generally uses a tax on oil, or on both oil and natural gas, as its revenue source. These are both appropriate, in my view, as oil and natural gas, in addition to being hazardous substances themselves, constitute primary natural resources in the manufacture of many chemicals and other dangerous materials.

But a broad tax on the natural resources alone would not achieve other goals which a funding mechanism can help greatly with, such as:

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- * conservation, and therefore reduction of waste;
- * recycling of hazardous wastes into other manufacturing processes, thus reducing the quantity of wastes to be handled;
- * otherwise reducing the amounts of wastes to be handled, treated or disposed of; and
- * reducing the toxicity of wastes that cannot be eliminated.

My bill, in the funding mechanism suggested for dealing with abandoned sites, contained one approach which would help meet these goals. This is the suggested fee to be paid by those who store or dispose of hazardous wastes.

I'm not wedded to this approach - there are many ways to achieve these same goals and I put mine forth as just one for your consideration. But I do feel that a fee system which derives its revenues from both the producers of the raw materials, at the start of the production cycle, and from those who dispose of the wastes at the other end, can provide both needed revenues for a comprehensive program and desirable incentives to keep the dimensions of the problem to a minimum in the future.

So I propose that we combine the two revenue sources and then use them both, through a "superfund" concept, to deal with all of these problems. I would also suggest that the states be asked to supply at least some of the funds needed to deal with problems within their borders, inasmuch as they have benefitted from having the industrial processes which produce wastes and they ought, therefore, to carry some of the societal burdens associated with them. My bill suggests 10%, but on reflection I think that perhaps 5% is more equitable.

In no way should any program we devise relieve past, present or future manufacturers or disposers of liability for negligence in dealing with hazardous

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substances. It is important that our actions find the proper balance between the need to encourage responsible entities in the private sector to take part in the disposal business and the need to assure that both victims and the government be able to hold irresponsible or negligent parties accountable for their actions.

If we do create a "superfund," then, it should be done in a way which permits the government to step in, deal with a problem, and then seek reimbursement from those who caused the problem if negligence was indeed involved. This concept should apply to abandoned sites and to those future situations where, despite greater regulatory efforts to assure safe and careful handling of hazardous materials, problems may also arise.

Some of those involved in developing legislation in this area have expressed reservations about including damages beyond the costs of ameliorating the physical problems themselves within the funding mechanism. I understand these reservations, but I would suggest that unless we take third-party damages into account, and try to deal with them, we will not have tackled the entire problem.

Innocent victims are involved - people who have suffered personal injury, temporary or permanent loss of income, deep psychological scars and often severe reductions in the value of property. These damages are as real as if they were in an automobile accident or a fire, yet they are frequently left with no means of redress whatsoever.

I would recommend, therefore, that these third-party damages also be part of a "superfund" concept. Again, the government would have the right of subrogation and could seek reimbursement from negligent parties. My Toxic Tort Act, described earlier, includes a punitive damages section for particularly flagrant instances of irresponsibility; the revenues from these damages

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would flow to the government - another source for the "superfund."

I am hoping to refine these new concepts and to introduce new legislative proposals in the near future, but felt I should share them with you now for your consideration.

RELATED LEGISLATION

By not having a program which regulates all aspects of solid waste, we have created a gaping hole in our national policy to reduce the amount of pollutants in the environment. Congress has passed other landmark legislation, including the Clean Air Act, the Clean Water Act, the Toxic Substances Control Act, the Safe Drinking Water Act and others. RCRA is only one link in the chain of environmental safeguards Congress has enacted. Yet a chain is only as strong as its weakest link. Without full implementation and full funding for each of these laws, we will be unable to fulfill the promises they made to present and future generations of Americans.

EPA and the Administration have been criticized, often with cause, for serious delays and other problems in implementing these and other laws. Yet Congress has also been lax, in that we have not provided appropriations to fund many of the sections of these laws. My efforts to find sources of assistance for the Love Canal emergency provide examples of both Administration and Congressional reluctance to deal forcefully with hazardous waste issues.

The most likely source of assistance seemed at first to be the Clean Water Act, containing several sections which seemed relevant to the Love Canal. I discussed four of them -- sections 201, 208, 311 and 504 -- with EPA Administrator Douglas Costle and OMB Director James McIntyre. I believe that each, if applied creatively, could have been most useful in dealing with the Love Canal and similar situations. Let me explain.

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Section 201 provides for grants for construction of wastewater treatment works. It is a \$40 billion program. The solution which has been designed for the cleanup of the Canal is, in effect, a micro sewer system. French tile drains are being laid so the leachate can be collected. The contaminated wastes will then be flushed through an on-site pretreatment plant, and eventually through the municipal sewage treatment plant. If EPA were to recognize the fact that this plan of action is, in essence, part of a municipal sewer system, then 201 funds could have been used in this innovative way. However, EPA resisted this approach, stating that it is not a "traditional" use of these funds. Love Canals are not traditional problems, and I think that EPA should be looking for innovative uses of its programs for new problems as well as traditional ones.

Section 208 provides funds for state and areawide planning and management programs to address non-point source discharges. It provides for local input and localized planning. "208 agreements" must be certified by the Governor and no 201 grants can be awarded without the 208 agreement in place. It must be reviewed and updated each year as necessary.

I attempted to get New York State to use some of its funds for planning at the Canal. This also met resistance, because it was unknown whether or not the toxic contaminants from the Canal had yet polluted the groundwater or deep water aquifers. It seemed to me that the 208 planning program was ideally suited to addressing the questions (a) whether water contamination had occurred and, if so, how to alleviate

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or (b) if contamination had not taken place, how to make sure it didn't in the future. This, I felt, would have been a creative use of an existing program, implementing laws to address problems of which we are only now becoming aware.

Section 311 provides for the designation of hazardous substances which, when discharged, present an imminent and substantial danger to the public health or welfare. It also provides penalties for discharges of such substances. A National Contingency Plan is to provide for effective action to minimize damage from oil and hazardous discharges. A revolving fund is authorized to pay for clean up of spills of oil and hazardous wastes, with EPA's Administrator given authority to seek to recover costs from polluters through the judicial process.

The section provides the basis for the "superfund" concept which I discussed earlier. It is unfortunate that EPA has taken over five years to promulgate regulations for the hazardous substances portion of Section 311. I am hopeful that the new set of standards -- the first was thrown out in a court action -- will take effect, as scheduled, at an early date.

Finally, Section 504 authorizes EPA to provide assistance in emergencies caused by the release into the atmosphere of any pollutant or other contaminant including, but not limited to, those which present, or may reasonably be anticipated to present, an imminent and substantial danger to the public health and welfare.

This Section addresses most fittingly situations such as the Love Canal. With the assistance of my Senate Colleagues from New York, I tried to obtain funding for the Canal under Section 504 last year. Both Senator Javits and Senator Moynihan - as well as Senator Muskie - spoke eloquently

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in support of the amendment to the Supplemental Appropriations bill to provide funds to clean up the Love Canal and abate the health and environmental emergency. However, OMB objected to funding under Section 504 because it would open the proverbial "floodgates" for funding any situation. Thus far, not one penny has been appropriated under Section 504 for use anywhere.

Section 504 is relevant to hazardous waste problems and a wide variety of other environmental problems. It would have been ideally suited to provide a flexible source of federal help for the Love Canal and other such situations, and presumably this is why it was enacted. Yet, I regret, we have not appropriated one penny for it to date. Regardless of whether we succeed in devising a comprehensive way of dealing with toxic and hazardous wastes, I am hopeful that the 504 program will be funded this year.

Proponents of the "floodgates" argument expressed concern that providing funds for the Love Canal under this provision ran the risk of "busting the budget" when viewed in the context of the overall problem. However, Congress can easily control this by deciding precisely how much money it wishes to provide. EPA would then have to use that money selectively. We would be derelict in our duty to protect the health and welfare of American citizens if we once again fail to fund Section 504.

The one area of law where we were able to convince the Administration to provide more than the emergency assistance funds that were approved under the President's declaration of the Love Canal as a federal emergency was under Section 8001(a) of RCRA for a demonstration

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grant. OMB insisted that the \$4 million provided in the supplemental appropriations bill for this purpose be matched by non-federal -- i.e., state and local -- funds on a 50-50 basis. Nevertheless, this was a breakthrough, as it was the first time Section 8001(a) was funded. I hope it will not be the last.

CONCLUSION

My primary goal in this Congress is to help bring about the creation of a comprehensive program to deal with hazardous wastes, both those from the past in abandoned sites and those from the present and future in more effectively controlled means of disposal. The "superfund" concept discussed earlier, combined with the incentives I have tried to put in my suggested fee system for users and handlers of hazardous substances and wastes, offers one way of approaching the difficult questions of funding solutions to these problems. I hope that it or something similar can be enacted at any early date. In the interim, I will continue to urge funding for the provisions I've outlined here, for they can help, pending the comprehensive program I am convinced we need.

I have tried to emphasize that there is a greater role for Congress to play in controlling toxic substances in the environment, particularly with regard to their ultimate disposal. As members of the national legislature, we have both moral and legal obligations to the citizens of this country to protect their health, environment and welfare. The people look to us to make sure that our world will be safe for them and for succeeding generations.

Your deliberations will lead to the writing of legislation on which we will all have to vote. I know you share my goal of making your legislative proposals as good as they possibly can be; my testimony

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today is intended to provide such ideas as I can, based on my experience with the Love Canal and other similar problems, in hopes that they will be helpful to you in your deliberations.

I and my staff stand ready to do whatever else we can in this process. Thank you again, Mr. Chairman, for allowing me to share my views on these difficult issues with you today. I would be pleased to entertain any questions you might have for me.

TESTIMONY STATEMENT BY FRANK A. ROVERS
TO JOINT HEARINGS OF THE RESOURCE PROTECTION
AND ENVIRONMENTAL POLLUTION SUBCOMMITTEES
OF THE SENATE ENVIRONMENT AND PUBLIC WORKS COMMITTEE

MARCH 29, 1979

1.0 INTRODUCTION

INACTIVE AND ABANDONED HAZARDOUS WASTE DISPOSAL SITES HAVE BEEN IDENTIFIED IN RECENT YEARS TO POSE A SIGNIFICANT POTENTIAL FOR DETRIMENTAL ENVIRONMENTAL IMPACT. AT THE PRESENT TIME, THE NORTH AMERICAN SOCIETY IS EXPENDING SIGNIFICANT RESOURCES TO CONTROL THIS POTENTIAL. THIS HEARING IS A MOST SIGNIFICANT EXAMPLE OF THIS EXPENDITURE. ALTHOUGH THE NORTH AMERICAN SOCIETY RECOGNIZES THE SIGNIFICANCE OF INACTIVE AND ABANDONED HAZARDOUS WASTE DISPOSAL SITES, IT DOES NOT KNOW THE TRUE DIMENSIONS OF THE PROBLEM.

THE SOLVING OF THE PROBLEM COMMENCES WITH THE RECOGNITION THAT A PROBLEM EXISTS. THIS RECOGNITION IS THE FIRST AND SINGLY MOST IMPORTANT STEP TO PROBLEM SOLUTION. THE NORTH AMERICAN SOCIETY IS THEREFORE WELL ON ITS WAY TO SOLVING THE PROBLEM OF INACTIVE AND ABANDONED HAZARDOUS WASTE DISPOSAL SITES.

SIGNIFICANT ACTIVITIES TO CONTROL THE PROBLEM OF INACTIVE AND ABANDONED HAZARDOUS WASTE DISPOSAL SITES INCLUDE, BUT ARE NOT LIMITED TO, THE FOLLOWING :

- 1) INDUSTRIAL IN-HOUSE REVIEWS OF PAST PRACTICES
- 2) INDUSTRIAL IN-HOUSE MONITORING OF PAST PRACTICES
- 3) GOVERNMENT MONITORING OF PAST PRACTICES
- 4) IMPLEMENTATION OF REMEDIAL WORK PROGRAMS
- 5) THE FORMULATION AND WRITING OF LEGISLATION.

2.0 ATMOSPHERE FOR PROBLEM SOLUTION

THE PROBLEM OF AND THE SOLUTION TO INACTIVE AND ABANDONED HAZARDOUS WASTE DISPOSAL SITES CAN BEST BE DEFINED IN A RESPONSIBLE ATMOSPHERE. A RESPONSIBLE ATMOSPHERE IS ONE WHICH RECOGNIZES THE FOLLOWING :

- 1) IDEAL SOLUTIONS OFTEN ARE ECONOMICALLY IMPRACTICAL
- 2) PRACTICAL SOLUTIONS MAY OFTEN REQUIRE INNOVATIVE ENGINEERING

- 3) THE PROBLEM IS SOCIETAL IN NATURE
- 4) INADEQUATE PAST PRACTICES IN GENERAL WERE NOT IRRESPONSIBLE
- 5) SOCIETY, WHERE POSSIBLE, MUST BE GIVEN AN ADEQUATE TIME FRAME FOR PROBLEM DEFINITION, SOLUTION DEFINITION, AND SOLUTION IMPLEMENTATION.

3.0 REMEDIAL WORK COSTS

HISTORICALLY, THE PROBLEM AT AN INACTIVE AND ABANDONED HAZARDOUS WASTE DISPOSAL SITE WAS DEFINED FOLLOWING AN OFF-SITE DETRIMENTAL IMPACT. AS A RESULT, REMEDIAL WORK COSTS ARE EXTREMELY HIGH. REMEDIAL COSTS CAN BE SIGNIFICANTLY REDUCED BY SITE MONITORING AND THEREFORE PROBLEM IDENTIFICATION PRIOR TO SIGNIFICANT OFF-SITE DETRIMENTAL IMPACT.

WE BELIEVE THAT THE SINGLE ACT WHICH CAN REDUCE MOST SIGNIFICANTLY REMEDIAL WORK COSTS AT HAZARDOUS WASTE DISPOSAL SITES, IS THE RELATIVELY INEXPENSIVE ACT OF MONITORING.

4.0 FUNDING OF REMEDIAL WORK COSTS

HAVING IDENTIFIED THE PROBLEM OF INACTIVE AND ABANDONED HAZARDOUS WASTE DISPOSAL SITES, THE NORTH AMERICAN SOCIETY IS FACED WITH THE RESPONSIBILITY OF FUNDING SITE INVESTIGATIONS AND REMEDIAL WORKS WHICH MAY BE REQUIRED TO SECURE THE SITES.

WE BELIEVE THAT INACTIVE AND ABANDONED HAZARDOUS WASTE DISPOSAL SITES ARE A "SOCIETAL" RESPONSIBILITY. THE NORTH AMERICAN SOCIETY WHICH INCLUDES THE GENERAL PUBLIC, GOVERNMENTAL AGENCIES, INDUSTRIES AND PROFESSIONS, AT THE TIME, GENERALLY DID NOT CONCEIVE THE DISPOSAL OF HAZARDOUS WASTE IN THE HYDROGEOLOGIC ENVIRONMENT, AS BEING PRACTISED, TO BE UNSAFE. THE DISPOSAL PRACTICES BEING CONDEMNED TODAY WERE ACCEPTED STANDARDS IN THE PAST. AT THE SAME TIME, THE WHOLE OF SOCIETY BENEFITTED FROM THE PRODUCTS MADE WHICH RESULTED IN THE HAZARDOUS BY-PRODUCT WASTE. INCREASED ENVIRONMENTAL AWARENESS, REFINED SCIENTIFIC TECHNOLOGY AND DETAILED ENVIRONMENTAL RESEARCH, ARE NOW IDENTIFYING THAT PAST PRACTICES WERE UNACCEPTABLE. SOCIETY, HOWEVER, BENEFITTED FROM THE PRODUCTS WHICH DID NOT INCLUDE A COST FOR THE SECURE DISPOSAL OF THE WASTE BY-PRODUCTS. IT

IS RECOGNIZED THAT HAZARDOUS WASTE DISPOSAL SIGNIFICANTLY BELOW THE ACCEPTED STANDARD CAN BE DEFINED AS BEING IRRESPONSIBLE. IN GENERAL, INDUSTRY HAS NOT ACTED IN THIS FASHION. IT IS FOR THE ABOVE REASONS, WE BELIEVE, THAT THE PROBLEM OF HAZARDOUS WASTE DISPOSAL SITES WHICH ARE INACTIVE AND ABANDONED, ARE A "SOCIETAL" RESPONSIBILITY.

WITH THE PROBLEM BEING SOCIETAL IN NATURE, THE FOLLOWING FUNDING FORMULA FOR SITE INVESTIGATION AND REMEDIAL WORK IS PROPOSED. IT IS PROPOSED THAT THE FUND BE FUNDED FROM THE FOLLOWING SOURCES :

- 1) THE GENERAL PUBLIC
- 2) INDUSTRY
- 3) WASTE DISPOSAL SURCHARGES

THE FUND WOULD BE USED FOR REMEDIAL WORKS ON PRESENT AND FUTURE INACTIVE AND ABANDONED HAZARDOUS WASTE DISPOSAL SITES.

5.0 IMMEDIATE ACTION

A NUMBER OF IMMEDIATE ACTIONS CAN BE TAKEN WHICH WOULD HAVE A SIGNIFICANT IMPACT ON THE PROBLEM OF INACTIVE AND ABANDONED HAZARDOUS WASTE DISPOSAL SITES. TO BE COMPLETE, PROPOSED AND PRESENTLY OPERATED SITES ARE INCLUDED IN THIS DISCUSSION.

- 1) ESTABLISHMENT OF, WHEREVER POSSIBLE, BUFFER ZONES WHICH WOULD ALLOW FOR THE MONITORING OF THE HYDROGEOLOGIC ENVIRONMENT, AND THE IMPLEMENTATION OF A REMEDIAL CONTROL PROGRAM WITHIN THIS BOUNDARY SHOULD SUCH A PROGRAM BE REQUIRED. FOR ALL SITES, REMEDIAL CONTROL PROGRAMS SHOULD BE DESIGNED FOR IMPLEMENTATION, IF REQUIRED.
- 2) THE ESTABLISHMENT OF MONITORING PROGRAMS WHICH ARE DESIGNED TO IDENTIFY THE SECURITY OF THE DISPOSAL SITE.
- 3) THE IMPLEMENTATION OF A "RESPONSIBLE ATMOSPHERE" REGARDING INACTIVE AND ABANDONED HAZARDOUS WASTE DISPOSAL SITES.

6.0 CONCLUSION

THE RECOGNITION OF THE PROBLEM BY THE NORTH AMERICAN SOCIETY IS THE ASSURANCE THAT THE PROBLEM OF INACTIVE AND ABANDONED HAZARDOUS WASTE DISPOSAL SITES WILL BE CONTROLLED.

American Petroleum Institute
2101 L Street, Northwest
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(202) 457-7300



Charles J. DiBona
President

March 28, 1979

Honorable Edmund S. Muskie
Chairman, Subcommittee on Environmental Pollution
United States Senate
4204 Dirksen Senate Office Building
Washington, DC 20510

Honorable John C. Culver
Chairman, Subcommittee on Resource Protection
United States Senate
4204 Dirksen Senate Office Building
Washington, DC 20510

Gentlemen:

I am pleased to forward to you the comments of the American Petroleum Institute on the subjects of hazardous waste disposal, hazardous substances spills and other related matters. Please make these comments a part of the record of the hearings.

Sincerely,

A handwritten signature in cursive script, appearing to read 'Charles J. DiBona'.

SUBMISSION OF COMMENTS

of

AMERICAN PETROLEUM INSTITUTE

on

HAZARDOUS WASTES AND TOXIC CHEMICALS IN THE ENVIRONMENT

pursuant to

JOINT HEARINGS OF THE SUBCOMMITTEES ON ENVIRONMENTAL POLLUTION
AND ON RESOURCE PROTECTION OF THE U.S. SENATE COMMITTEE ON
ENVIRONMENT AND PUBLIC WORKS IN WASHINGTON, D.C., MARCH 28-29,
1979.

March 28, 1979

FOREWORD

The American Petroleum Institute shares the deep concern of the Senate Subcommittees on Environmental Pollution and on Resource Protection regarding specific toxic substances like DDT, PCB, and kepone and grave incidents like Love Canal and "Valley of the Drums," which appear to involve a variety of toxic substances. The pressing need for protecting health and the environment from such threats is indisputable. And to that end the following comments are devoted.

Section I of the Institute's comments, Resource Conservation and Recovery Act, deals with the importance of developing levels of control appropriate for different hazardous materials and toxic substances and their accompanying conditions instead of seeking blanket solutions. Section II, The Concept of Superfund, provides a summary of existing and proposed compensatory funds at both the federal and state levels. It makes the point that while the concept of a superfund may be serviceable and valuable when properly applied to a specific area, attempts to include all pollutants in all media under a single umbrella are virtually certain to end in unmanageability, staggering costs, and failure.

I. RESOURCE CONSERVATION AND RECOVERY ACT

The American Petroleum Institute (API) appreciates the opportunity to submit these comments pursuant to the joint Senate subcommittee hearings on hazardous wastes and toxic chemicals held on March 28-29. It is fully in accord with the goal of protecting the public and the environment generally. At the same time, API recognizes the extreme complexity of the problems presented in attempting to implement the Resource Conservation and Recovery Act (RCRA). This statement summarizes the petroleum industry's concerns and, by way of amplification, carries as Attachment A API's comments on some of EPA's efforts to date, submitted to EPA on March 16, 1979.

API commends EPA for its willingness to receive information from affected members of the public and for its conscientious attempt to develop a regulatory program that will satisfy conflicting needs in a reasonable manner. Nonetheless, API regards the framework of regulations so far proposed by EPA with serious misgivings and believes that EPA, perhaps driven by unrealistic statutory and court-imposed deadlines, has adopted an approach which is fundamentally unsound and which will prove to be unworkable from administrative, economic, and, ultimately, environmental points of view.

RCRA addresses solid wastes, liquid wastes, semi-solid wastes, and gaseous wastes. It applies to industrial, agricultural, municipal, and other wastes. It is concerned both with exceedingly toxic wastes which in minute quantities can threaten

human health and with low-risk wastes which present a hazard only if massive quantities are involved or unusual circumstances arise. While certain wastes in RCRA's purview are of concern because they are acutely toxic, others entail long-term, chronic toxicity problems. Likewise, RCRA must oversee wastes which degrade quickly, as well as those which are persistent and will not degrade biologically. Finally, in addition to the diversity that characterizes the wastes which RCRA encompasses, there is an equal diversity in the manner in which such wastes have traditionally been handled, the nature and location of disposal sites, the movement of wastes through the environment, and the exposure of human population to wastes.

Given this bewildering diversity, it is essential that both legislation and regulation identify and respond to the varying degrees and types of risk and appropriate requirements. In API's best judgment, the regulations proposed by EPA under RCRA fail to achieve these goals. Again, these comments address EPA's efforts under RCRA and the major difficulties encountered to date.

1. EPA Has Failed to Differentiate Among Relative Degrees and Types of Risk, Which Results in a Scheme of Regulatory Control Requirements That Make No Adjustment for the Level of Hazard Involved.

The fundamental conceptual problem which pervades EPA's entire effort surfaces in the regulations proposed under Section 3001 of RCRA, which would establish a single category of hazardous wastes. While EPA employs a variety of characteristics, criteria, and other means of identifying a hazardous waste, the information

generated in this process is used only to make a simple yes-or-no classification, that is, a waste becomes either "hazardous" or "non-hazardous." Any waste adjudged to be "hazardous" is then subjected to the entire panoply of control measures spelled out in the regulations pursuant to Sections 3002, 3003 and 3004. In the application of this full battery of control requirements, no distinction is made to reflect differences in relative risk resulting from the peculiarities of the waste to be regulated.

The shortcomings of this approach are obvious, numerous, and severe. Application of the EPA definition of "hazardous waste" to the universe of wastes will result in a hopeless deluge of random candidates for regulation. There is no logical second step to prioritizing wastes to assure that regulatory attention and control expenditures will be directed first at those wastes and disposal practices presenting the most serious threats to human health and the environment. The regulatory scheme contains no distinctions by which more extensive controls will be required to regulate the more hazardous cases. The very concept of the regulations therefore virtually guarantees that massive efforts will be required in all cases, including those where present practices present little or no actual risk.

The only rationale which could support this approach is the assumption that the resources available to implement this program are limitless and that society is willing to commit such resources to eliminate virtually every risk wherever a hazardous waste is

identified. Such an approach is inconsistent with the statute and certainly with the recent promise made by EPA Administrator Douglas Costle. "[W]e will," he said, "(1) regulate only when the benefits exceed the costs and (2) find more efficient ways of meeting environmental goals in the least costly manner."^{1/}

2. EPA's Approach Ignores the Statutory Mandate to Impose Only Those Requirements Which are Necessary to Protect Human Health and the Environment.

EPA's simplistic, non-discriminatory approach to regulating hazardous wastes by imposing the same rigid control requirements on all hazardous wastes without consideration of costs or benefits associated with controlling differing degrees of risk violates its statutory obligations. As explained in detail in the legal section of Attachment A, the statute and its legislative history contain specific references to the need for EPA to consider different types and magnitudes of risk factors in determining which solid wastes should be considered hazardous and what degree of control should be imposed.

EPA is obligated to consider such factors as quantity; concentration; physical, chemical, and infectious characteristics, including toxicity; persistence; degradability in nature; and potential for accumulation in human tissue. It is also obligated to consider other factors such as flammability, corrosivity, and location of generation and disposal, all of which may contribute to the hazardous nature of a given substance. Indeed, each of

^{1/} 9 Env. Report (BNA) Cur. Dev. 5 (May 5, 1978)

these factors may affect the seriousness of the risks and, therefore, the extent of control necessary.

Not only the requirements of law, but also common sense should preclude EPA from establishing and enforcing a regulatory framework based on oversimplification. The need to show a reasonable relationship between costly requirements and the problems they address has recently received renewed emphasis. In Executive Order 12044 and related actions, President Carter and his Administration (again, described in more detail in the legal section of Attachment A) have established additional requirements beyond the statute. These compel EPA to insure that its regulatory requirements do not impose unnecessary costs upon the nation. Likewise, EPA Administrator Costle has pledged: "We are reviewing the marginal costs of pollutant removal for all future regulatory proposals to be sure that we adopt the least costly approaches to clean-up that are statutorily allowed."^{2/} Unfortunately, while it has developed cost studies and has evidenced some concern about costs, EPA nonetheless has failed to assess properly the economic impacts of its currently proposed regulations.

3. EPA Methodology Contains a Number of Specific Defects.

In developing the regulations under Section 3001, EPA has:

- o Identified a group of characteristics -- for example,

^{2/} 9 Env. Report (BNA) Cur. Dev. 5 (May 5, 1978).

toxicity, corrosivity, ignitability, and reactivity -- to determine whether the waste is hazardous;

- o Prescribed a series of tests to determine whether a waste possesses these characteristics; and

- o Listed a series of wastes claimed to possess some or all of those characteristics and designated other wastes for which tests have not been prescribed, such as mutagenicity and teratogenicity.

Under the EPA proposal, a waste would be classified as hazardous if it satisfied any of the tests prescribed to show toxicity, corrosivity, ignitability, or reactivity. In addition, a waste listed by EPA would be presumed hazardous. EPA has not revealed what standards or data it relied upon in compiling the list of wastes presumed hazardous. Nor has EPA explained what tests it applied to the listed wastes or the nature of any results. It is therefore impossible to evaluate what consistency exists between the tests and the list.

- a. EPA's Scheme Ignores the Fact That Some Wastes Are More Hazardous Than Others.

Each of EPA's tests is designed to give the either-or classification of a substance as hazardous or non-hazardous. For example, a waste is corrosive if its pH is less than or equal to 3, or greater than or equal to 12, or if it corrodes steel under the SAE 1020 test at a rate greater than 0.250 inch per year. As a result, lemon juice or coffee would "fail the test" -- just as would an 80 percent solution of sulfuric acid.

A similar situation is found in the test for toxic waste. If the test extract contains any substance covered by a National Interim Primary Drinking Water Standard in excess of 10 times the standard, it is classified as hazardous. Thus this test procedure establishes an arbitrary classification scheme, which in turn causes wastes of widely varying toxicity to be treated as if they were identical.

It also appears that EPA has placed emphasis primarily on industrial waste and has excluded other wastes such as municipal wastes. It has been documented that such excluded wastes, especially when they are chlorinated, can contain high levels of organics suspected of being carcinogens. Of similar concern is the fact that the proposed rules are not fully consistent with existing rules which are part of the National Pollution Discharge Elimination System.^{3/}

b. EPA's Toxic Extraction Procedure Is Unrealistic if Applied to All Situations.

EPA's test procedure for toxicity utilizes an acetic acid solution with a pH of 5 to simulate worst-case conditions that might exist in a municipal landfill. Conditions in most industrial facilities differ from municipal operations. EPA provides no evidence, nor is there any reason to believe, that the acetic acid procedure is appropriate to identify hazardous wastes in industrial waste disposal sites.

^{3/} 40 C.F.R. Part 136.

Another major defect lies in EPA's presumption that leachate from a facility will be diluted in the groundwater system by a factor of 10 within a distance of 500 feet from a disposal facility. This approach arbitrarily assumes worst-case ground conditions throughout the country and has no basis in fact. Dilution of wastes varies greatly from site to site, depending upon a variety of factors, including soil permeability and the hydraulic gradient of the groundwater system. Additionally, the EPA procedure also fails to take into account the wide differences in the mobility and solubility of different chemical substances.

c. The Volume of Waste Must be Considered.

The proposed regulations, except peripherally in Proposed Subpart B, do not distinguish between hazards, or related control requirements, on the basis of differing volumes and quantities. Again, the failure is rooted in oversimplification. If, for example, the harm EPA is seeking to prevent by the imposition of its rigid control requirements is contamination of groundwater, then clearly the actual danger from one small pit is much less than that from a huge lagoon. The EPA approach would treat them both in the same way.

d. The Proximity of a Hazardous Waste to Human Population or Water Supply Must be Given Attention.

EPA's failure to give proper consideration to location presents still another weakness in approach. The risk of harm to

human health and the environment posed by otherwise identical surface impoundments, for example, differs tremendously, depending upon proximity to drinking water wells or water supply aquifers. A surface impoundment located in an area with brackish groundwater should not be compelled to install the same type of impermeable liners that might be justified to protect a drinking water source. Likewise, air contamination may be a concern for facilities located in urban areas, but is very unlikely to present a problem in remote, isolated areas.

e. Other Site-Related Factors Such as Geology, Hydrology, and Climate Should Also be Considered.

As noted above, EPA's methodology for identifying wastes as toxic is founded on the erroneous assumption that all hazardous materials will leach through soil and be diluted by the same factor within a given distance, regardless of the composition and geo-chemical properties of the leached materials. As documented in the reports by API's engineering consultants in Attachment A, there are wide differences in the geo-chemical properties of soil, especially ion-exchange capacity, which significantly affects dilution rates.

Climate is another significant site-related factor for which EPA has not properly accounted. The problems posed by a lagoon in a net evaporation area may be substantially different from those related to a lagoon in an area of net precipitation.

f. The EPA Regulations Make No Effort to Relate the Control Requirements to the Type of Risk Presented.

The proposed regulations prescribe the same sets of control measures for any waste deemed "hazardous" regardless of the reason for the classification. This leads to the absurd result that a waste which is classified hazardous because it is ignitable must be disposed of in a leak-proof facility, the purpose of which is to prevent leaching of the material into groundwater. In this case the requirement would be unnecessary because the risk of ignitability in groundwater is zero.

4. The Notes Procedure Does Not Provide Adequate Relief from Unreasonable Control Requirements.

In an effort to satisfy the clear need for flexibility in applying control requirements to widely varying cases, EPA has included in its proposal a system of Notes which purportedly provide some latitude in issuing permits for hazardous waste facilities. The Notes procedure, however, fails to redress an approach that is flawed by excessive rigidity and oversimplification. The Notes provide no authority to exempt a facility from the basic control requirements, even in situations where the degree of risk does not justify those requirements.

The control requirements for the design of liners underneath landfills and surface impoundments illustrate this problem. The Notes system fails to allow an exception based upon a showing that such leakage containment is unnecessary because migration of the leachate could not possibly cause any harm to human health or

the environment. The Notes system would not allow the owner of a landfill to demonstrate that such containment is unnecessary because the hazardous wastes involved would degrade rapidly upon contact with the soil. Finally, the Notes system would not allow an exemption from the containment requirements for wastes designated hazardous only because of ignitability characteristics, which are not of concern if such wastes leach into the groundwater.

5. The Overly Broad Definition of Hazardous Wastes Combined with the Stringent Requirements for Their Disposal Will Lead to a Situation Where Compliance Is Impossible Because of the Unavailability of Approved Hazardous Management Facilities.

As a result of the overbroad definition of hazardous waste and of the stringent and inflexible requirements imposed on hazardous waste management facilities, many existing disposal sites which have not caused damage in the many years of operation will be unable to meet these standards and will have to shut down.^{3/} The same stringent and inflexible requirements will likewise severely hinder the establishment of new qualified hazardous management facilities. It should be noted that even in the event that an owner/operator can demonstrate that a proposed facility will comply with EPA regulations, an applicant must deal with additional obstacles in the form of state and local government requirements and possible public opposition.

The public's perception of hazardous waste is linked with substances like DDT, PCB, or kepone, and with incidents like Love

^{3/} The proposed regulation will apply equally to both existing and new facilities.

Canal. This regulation will lump together substances which possess a much smaller hazard with those which are extremely hazardous. The net effect is likely to be public resistance, even to sites which would be involved only in the disposal of low-hazard materials.

The point is that the broad definition of hazardous wastes in the regulations will create a quantum jump in demand for disposal facilities which meet the Subtitle C requirements. Given this jump and the difficulties discussed immediately above, the availability and capacity of qualified disposal facilities are almost certain to fall short. There is no system by which the limited number of sites available will be allocated for waste having highest priority for control. Instead, there will be a squeeze in which generators of hazardous wastes will be forced to compete for a limited and possibly diminishing number of disposal sites. Such a result would clearly violate the specific Congressional intent that the hazardous waste program not require changes in generators' operations.

6. EPA's Proposed Regulatory Framework Is in Conflict With the Basic Principles of All Other Environmental Programs.

EPA's approach in establishing only a single classification of hazardous waste and in requiring the same control measures for every case falling within that classification appears even more doubtful in comparison with the requirements of other environmental programs. It is difficult to find examples where the Agency has felt compelled to act on such oversimplification.

Since the purpose of environmental regulation is to protect identifiable environmental values, the essential goal of most of EPA's programs has been to define the specific environmental objectives, then to tailor control requirements necessary to achieve those objectives. Certain requirements have been imposed on an across-the-board basis, but normally such requirements have been developed for individual industries, one at a time, and only after thorough evaluation of probable environmental harm, technological considerations, and costs. In no case has EPA successfully implemented such a flawed program as reflected in the proposed RCRA regulations.

7. API Suggests Alternative Approaches for Implementation of RCRA.

The proposed framework cannot be defended on the grounds that it is the only feasible way to implement RCRA. There are many available alternatives. Many states, for example, already operate regulatory programs to control the disposal of hazardous wastes. Nearly all such programs provide flexibility to adjust control requirements to the varying factors of individual cases.

One approach, as illustrated by the Washington state program, is to create more than one category of hazardous waste, with varying control requirements applicable, depending on whether the wastes present a more or less serious environmental hazard. Another approach, employed by the State of Texas, differentiates among the facilities which are allowed to handle certain types of

wastes, thereby preventing high risk wastes from being improperly disposed.

Although EPA faces statutory deadlines, the Agency should develop a more flexible and sophisticated regulatory system which would reasonably reflect degrees of risk, cost, and benefits. It could, for example, begin a phased program imposing uniform control requirements on a narrowly defined category of hazardous wastes which would include only the highest priority cases where the risk of human health or environmental damage is the greatest. Then, in an orderly fashion, EPA could expand the coverage of the regulatory framework to include other classes of hazardous wastes as these are identified.

Under another approach, developed and supported by API, the level of of the hazard presented by the waste is ascertained through a circumscribed set of tests. The wastes are categorized on the basis of the level of hazard presented, as determined by the tests. Unlike the EPA approach, there is no single hazard/no hazard determination, but a ranking of wastes. Furthermore, the API approach would allow for a "rebuttal" of a listing or determination that the waste is hazardous through additional test results or other pertinent information.

Once a waste was categorized by its degree of hazard, the API approach would then employ the permitting procedure to match the site with the waste. Some sites would therefore not be required to meet "no-discharge" requirements, but such sites

would not be allowed to handle highly toxic wastes either. The party seeking a permit would have the responsibility to identify the nature of the proposed site and the wastes to be disposed. In this manner, only those requirements which are necessary to prevent the risk posed by the waste would be required. API believes this is a cost-effective scheme which avoids the imposition of costs that confer little or no benefit on the environment.

II. THE CONCEPT OF SUPERFUND

API's General Position

For a number of years, API has strongly supported establishment of a comprehensive, uniform oil spill liability and compensation fund bill at the Federal level. It has supported a federal law which would preempt state funds and liability laws; be adequately sized to protect the public interest; set liability limits at workable and insurable levels; provide for a fund to compensate for all real, proven cleanup costs and third party and natural resource damages, after the spiller's liability and other compensation schemes are exhausted; ensure that the spiller had first responsibility for cleanup and claims settlement; and, be administered by an existing federal agency without creating a new government bureaucracy.

But API has opposed the inclusion of hazardous substance spills and disposal of hazardous waste in oil superfund legislation on the grounds that such issues should be addressed by separate legislation. It has also opposed assessment of damage caused by oil spills based on cost-per organism affected or destroyed, pointing out the necessity for considering the natural recovery rate of the ecosystem.

It now appears that the concept of a superfund is spreading to hazardous substances and hazardous waste disposal. Certainly, there is increasing legislative interest in hazardous waste control, clean up, third party and natural resource damages,

liabilities, and a compensation mechanism. Legislative action on these points should await EPA's completion of the Congressionally mandated hazardous substances study required by the 1978 Amendments to Section 311 of the Federal Water Pollution Control Act. The API believes that the body of law now existing and the superfund bills currently before Congress argue for separate legislation for oil spill compensation and hazardous substance spills and hazardous waste disposal.

Background

Before the Torrey Canyon incident in 1967, no adequate national or international legal regimes existed to compensate for damages from oil pollution or to enable governments to recover costs incurred in cleaning up oil spills. As a result of this major pollution incident, four major international regimes were developed to help compensate for losses caused by oil spills.

TOVALOP (Tanker Owner Voluntary Agreement Concerning Liability for Oil Pollution), set up by the tanker industry in 1969, provides a compensation mechanism for oil spill cleanup and pollution damage. Its terms encourage prompt cleanup and claims settlement. TOVALOP provides coverage of \$16.8 million per incident.

CRISTAL (Contract Regarding an Interim Supplement to Tanker Liability for Oil Pollution) is a cargo owners' contract to provide supplemental compensation for tanker owners' cleanup costs and third-party damage claims after remedies available to

claimants under other regimes have been exhausted. Member companies contribute to a fund based on each company's annual oil movements or transfers. CRISTAL became effective in 1971 and provides coverage of \$36 million.

In addition to these voluntary agreements, the Intergovernmental Maritime Consultive Organization (IMCO) set up two oil spill compensation regimes. First, the International Convention on Civil Liability for Oil Pollution Damage (CLC) came into force in June 1975. To date, it has been ratified by 36 nations. It imposes liability on shipowners for cleanup and other third-party damage. Second, the International Convention on the Establishment of an International Fund for Oil Pollution Damage (Fund Convention) came into force in 1978. The Fund Convention provides compensation supplemental to that available under CLC and indemnifies tanker owners subject to CLC for a portion of their CLC liability. The industry believes it is regrettable that the U.S. has not ratified CLC or the Fund Convention and urges Congress to do so as soon as practicable.

Existing and Proposed Superfund Legislation

Attachment B, in tabulated form, contains additional details regarding legislative actions, existing and prospective regarding superfund. The number and variety of such actions at both the federal and state levels, as indicated in Attachment B, are perhaps the strongest argument that can be made in support of a comprehensive federal statute which would preempt state laws and

funds, and in support of limiting superfund to oil rather than attempting to apply it to all hazardous materials and toxic substances.

Although not mentioned in Attachment B, it is interesting to note that Maine and Florida, for example, already maintain sizeable funds to pay claimants above the limits of the spillers' liability. While these funds have collected millions of dollars in taxes, only a relatively small amount has been spent for cleanup.

Other issues of concern to industry are how oil spill damage to natural resources should be assessed and whether the superfund should provide for repositioning of oil spill equipment and funding of research.

It now appears that the House may pass a superfund bill similar to one which it passed last year. On March 13-14, Rep. Biaggi (D-N.Y.) Chairman of the Subcommittee on the Coast Guard and Navigation, held hearings on his bill H.R.85. API supports this bill with some modifications and urges the Senate to give serious consideration to this approach to oil spill compensation legislation.

An administration bill creating a compensation fund and liability regime for oil only will be introduced into both Houses shortly. Although EPA has urged that hazardous substances be included along with oil in any superfund, the administration has decided to treat the issues separately. As noted above, the API concurs with such an approach.

As matters now stand, the major piece of existing legislation concerning oil spills is the Federal Water Pollution Control Act, Section 311 as amended. This authorizes a revolving fund of \$35 million to pay for removal costs of oil spills and any damage to the environment. By comparison, the proposed superfund would be available up to \$200 million for cleanup and damages.

Exclusion of Hazardous Substance Spills
from Oil Spill Superfund Legislation

API believes strongly that hazardous substances spills should be excluded from legislation addressing oil spill liability.

In 1972, the Federal Water Pollution Control Act, as amended, included, among other things, the control of hazardous substances with potential to enter the waters of the United States in addition to the similar control of oil existing in previous law. Although extensive definition was given to what hazardous substances were and how they were to be defined by the EPA Administrator, their control and enforcement was specified to be parallel to that existing for oil discharges into navigable waters. The Administrator, however, was charged with designating hazardous substances and distinguishing among them on the basis of their removal characteristics and with developing a civil and criminal penalty structure.

The difficulty of accomplishing this task was demonstrated by the fact that it took the Administrator six years, until March 1978, to issue the final regulations on hazardous substance

control. Following promulgation, but before the effective date of these regulations, they were judicially challenged and their implementation and enforcement was enjoined. The challenge centered on claims that EPA had illegally determined the actual removability of the materials and that the harmful quantity determination had been arbitrary and capricious. The court, in due course, declared that the regulations were "invalid, void, unenforceable and of no legal effect."

In its closing hours, the 95th Congress took action to amend Section 311 of the Water Quality Act so as to provide a program on hazardous substance control that could be administered. Important to this discussion is the fact that the amendments also included the requirement in §311(b)(2)(B) for an 18-month study on "methods and mechanisms to achieve a higher standard of care in all aspects of the management and movement of hazardous substances."

In light of this history, it seems most unwise to continue to try to consider the spill of "oil" and "hazardous substances" in one and the same manner. EPA obviously had difficulties in proposing such regulations even over a six year period, and the Federal District Court agreed. EPA itself asked for, and Congress granted, a change in the way such materials were to be controlled. Finally, Congress asked that a further study be made on control of hazardous substances that would include "management and movement of these materials on the part of owners, operators,

or persons in charge of onshore facilities, offshore facilities or vessels."

The Congressionally mandated study will be obliged to consider the many differences between oil and hazardous substances. Almost 300 materials have been listed as hazardous. Many, but not all, are derived from oil. Most, but not all, act quite differently from oil when released in water. Handling methods may be similar to, or differ greatly from those of oil. Manufacture of the designated hazardous substances may be accomplished by one or by several intermediate, different processors and owners. Volumes in commerce vary greatly, and product values differ by many orders of magnitude. The study should address these as well as other considerations which would equitably differentiate between rules and regulations for oil and hazardous substances.

EPA is proceeding with implementation of regulations for the control of hazardous substance discharges from facilities and transporters in navigable waters with penalties already prescribed by law. This approach will provide a mechanism for control of hazardous substance spills during the time that the congressionally mandated study is being made. It is therefore premature to propose legislation that includes hazardous substance spills.

Summary

API has long sought legislation which would create a single, adequate, equitable, and comprehensive oil pollution liability

and compensation fund. Four steps are essential to the development of such a fund:

1. API believes that the uniformity provided by preemption is absolutely essential to effective administration of any comprehensive oil spill legislation. Present state laws are duplicative, inequitable, and costly both to the industry and to the public. A single, adequately sized federal law preempting state oil pollution liability and compensation funds is the key to establishing a workable solution to proliferating, conflicting state funds. One stop claims processing would avoid confusion on where to file claims, avoid wasteful litigation, and be least costly to the public. At the same time, costs to the state and to the public would be reduced, within a framework of adequate compensation for proven losses.
2. Past experience has clearly demonstrated the difficulty encountered in attempting to define and control hazardous substances. The petroleum industry is deeply convinced that the question of hazardous substances and hazardous wastes should be addressed in separate legislation and that its inclusion in a comprehensive oil pollution liability and compensation fund bill could slow or jeopardize passage of essential superfund legislation.

3. On the broad issue of natural resource damage assessment and compensation, API recommends that:
 - o Compensation should be provided to claimants for economic losses to natural resources with traditional or historical value, but not on the basis of spurious or arbitrary assignment of values to all living creatures;
 - o Compensation should only be provided for all provable economic losses; and
 - o Compensation for proven economic losses should be based only on the extent to which the damaged ecosystem will not recover through natural regenerative processes to prespill conditions.
4. Proposed superfund legislation should take into account:
 - o Workable and insurable liability limits;
 - o Uses of the fund; which do not result in unnecessary drains on the fund;
 - o First responsibility of the spiller for cleanup and claims settlement; and
 - o Adequate defenses of the spiller and the fund.

SUPERFUND LEGISLATION

A. EXISTING MAJOR FEDERAL OIL SPILL COMPENSATION FUNDS

<u>Established by</u>	<u>Size of Fund</u>	<u>Damages Covered</u>	<u>Limits of Liability</u>
Clean Water Act, Section 311(k)	\$35 million revolving fund authorized.	Economic damages for removal costs incurred in accordance with Section 311; states affected by a discharge which act to remove the discharge; the federal government for its costs, and for res- toration of natural resources.	Removal costs up to \$125 per gross ton for inland barges or \$125,000, which- ever is greater; and for onshore and offshore faci- lities, up to \$50 million.
Trans-Alaska Pipeline Act, Trans-Alaska Pipeline Lia- bility Fund	\$100 million, collected by five cents per bbl tax on oil going through the pipeline.	Economic damages for removal costs and any damage to the environment and economic livelihood which can be proved.	Movement of oil through pipe- line, vessel loading, and on to destination creates strict liability (no fault) for all damage, with owner and oper- ator of the vessel (jointly and severably) liable for the first \$14 million of damage claims and fund liable for balance of claims up to \$100 million total.

<u>Established by</u>	<u>Size of Fund</u>	<u>Damages Covered</u>	<u>Limits of Liability</u>
OCS Lands Act Amendments of 1978, (Title III)			
o Offshore Oil Pollution Compensation Fund:	\$100-200 million, collected by three cents per bbl tax on oil taken from CCS.	Economic damages for removal costs; loss of use of property, injury or destruction of natural resources; and loss of tax revenue for a period of one year due to injury to real or personal property.	For vessels, greater of \$250,000 or \$300 per gross ton, except unlimited liability where owner or operator fails or refuses to provide reasonable cooperation and assistance in cleanup activities; in the case of offshore facilities, all removal and cleanup costs, plus claims for damages not to exceed \$35 million in total.
Deep Water Port Act, Deep Water Port Liability Fund	Not to exceed \$100 million, collected by two cents per bbl tax at deep-water port.	Removal costs and damages resulting from a discharge of oil within any Safety Zone.	Lesser of \$20 million or \$150 per gross ton in absence of gross negligence or willful misconduct; licensee of deepwater port liable for cleanup and damages resulting from discharge of oil from the deepwater port of a vessel moored there; liability not to exceed \$50 million unless gross negligence or willful misconduct is involved.

B. EXISTING STATE OIL SPILL LIABILITY LAWS

1. Limits of Liability

States with no specified limits: Alabama, Alaska, California, Connecticut, Georgia, Illinois, Indiana, Louisiana, Maine, Maryland, Massachusetts, Michigan, Minnesota, Mississippi, New Hampshire, Ohio, Oregon, Pennsylvania, Rhode Island, South Carolina, Virginia, Washington, Wisconsin.

Others: Delaware, insurance covers \$30 million for vessels, \$50 million for facilities. Void when discharger negligence is proven.

Florida: \$100/grt. or \$14 million for vessels, \$8 million for facilities, unlimited damage liability for terminals.

New Jersey: Unlimited clean up liability; \$150/ton up to \$50 million for damages for vessels; \$50 million for damages for facilities.

New York: \$50 million for facilities or \$300/grt. for vessels.

North Carolina: \$100/grt. or \$14 million for vessels, \$8 million for facilities.

Texas: \$5 million.

<u>2. Costs Covered</u>	<u>State</u>	<u>Cleanup</u>	<u>Property Damage</u>	<u>Natural Resources</u>	<u>Economic Loss</u>
	AL	X	X	X	
	AK	X	X	X	X
	CA	X	X		
	CT	X			
	DE	X	X	X	X
	FL	X	X	X	X
	GA	X		X	
	IL	X		X	
	IN	X		X	
	IA	X		X	
	ME	X	X	X	X
	MD	X	X	X	
	MA	X	X	X	
	MI	X			
	MS	X			
	NH	X	X	X	X
	NJ	X	X	X	X
	NY	X	X	X	X
	NC	X	X	X	
	OH	X			
	OR	X	X		
	PA	X			
	RI	X			
	SC	X	X	X	
	TX	X			
	VA	X	X	X	
	WA	X	X	X	
	WI	X			

3. Proof of Financial Responsibility

Alaska: \$20 million for vessels, \$1 million for facilities.

Connecticut: \$50,000 for vessels.

Delaware: insurance requires \$30 million for vessels, up to \$50 million for facilities.

Florida: \$100/grt. or \$14 million for vessels and \$8 million for facilities.

Maryland: \$100/ton for vessels.

Massachusetts: \$25,000 for vessels.

New Hampshire: required by statute, no regulations drafted.

South Carolina: \$14 million for terminals and vessels.

C. ANTICIPATED STATE SUPERFUND LEGISLATION

Alaska: \$1 million per year appropriation to cover the state's cleanup costs, to be borne by per-barrel tax.

California: Oil spill liability of \$6,000 per day for each day of a spill and \$6,000 for each 1,000 gallons spilled.

Connecticut: A spill fund to finance an expansion of shoreline spill cooperatives.

Massachusetts: An insurance program, providing up to \$14 million for cleanup costs or damages resulting from a major (over 2,000 gallons) spill.

New Hampshire: A \$1.5 million oil spill fund to be created by a one cent per barrel tax.

New Jersey: An insurance program for oil and other hazardous spills which disrupt business and under which claims would be limited to \$1 million.

Ohio: A cleanup revolving fund to be reimbursed by dischargers.

Pennsylvania: A cleanup fund.

Rhode Island: A coastal protection fund to be borne by tax on vessels' dead weight tons rather than per-barrel transfer tax.

III. SUMMARY OF EXISTING FEDERAL OIL SPILL, HAZARDOUS SUBSTANCE SPILL, AND HAZARDOUS WASTE DISPOSAL LEGISLATION, REGULATION AND LITIGATION

A. EXISTING LAWS

1. Major

	<u>Penalty Limits</u>	<u>Liability Limits</u>	<u>Criteria for Harm</u>	<u>Status of Regulations</u>
Sec. 311 of the Clean Water Act	\$50,000 for hazardous substances, unless result of willful negligence, then \$250,000. But EPA will let Coast Guard limit of \$5,000 fine stand as a practical matter of enforcement for oil spills.	Inland barges, \$125 per gross ton or \$125,000 whichever is greater; for other vessels; \$150 per gross ton or \$250,000, whichever is greater; offshore facilities, \$50 million; onshore facilities \$50 million.	Size of discharge, degree of damage or harm to the public health and safety or the environment (including consideration of toxicity, degradability, and dispersal characteristics of substance).	EPA is implementing regulations for the control of hazardous substances in navigable waters during time Congressionally mandated study of problem is being made. Final regulations are to be based on results of the study.

	<u>Penalty Limits</u>	<u>Liability Limits</u>	<u>Criteria for Harm</u>	<u>Status of Regulations</u>
Resource Conservation and Recovery Act	Up to \$25,000 per day for each day of continued noncompliance with regulations.	No provision for retroactive application against companies that created or dumped hazardous wastes.	Toxicity, persistence, and degradability in nature; potential for accumulation in tissue and other related factors such as flammability and corrosiveness.	Subtitle C regulations dealing with hazardous wastes to be promulgated in final form by December 31, 1979. Proposed Section 3001, 3002, and 3009 regulations published in Federal Register on December 18, 1978.
Hazardous Materials Transportation Act	\$10,000 for each day of continued violation of regulations.	Unlimited.	Violation of regulations issued under the Act rather than any harm to the environment.	Constantly being promulgated, updated, and added to.

<u>Authority</u>	<u>Date</u>	<u>Agency</u>	<u>What the Act Provides</u>
Atomic Energy Act	1954	NRC, DOE	Standards and licenses for nuclear waste disposal sites. Protection from damage from nuclear facilities.
Safe Drinking Water Act	1974	EPA	Regulations for public drinking water systems. Grants for approved state programs. Regulations for state underground injection control programs.
Federal Food, Drug and Cosmetic Act, plus numerous amendments	1938	FDA	Tolerances for contaminants in commercially produced foods for interstate commerce. Ban of unsafe foods.
Last amendment	1976		
Consumer Product Safety Act	1972	CPSC	Tolerances for contaminants in household products, labelling, ban of unsafe products.
Federal Hazardous Substances Act	1960	CPSC	Seizure of misbranded or banned hazardous substances in interstate commerce.
Occupational Safety and Health Act	1970	OSHA	Regulations for workplace exposure for chemicals. Grants available to states.
Toxic Substances Control Act	1976	EPA	Obtain industry data on production, use and health effects of chemicals. Regulation of manufacture, distribution in commerce, use and disposal of a chemical substance.
Federal Insecticide, Fungicide & Rodenticide Act. Amended	1972 1975	EPA	Registration and classification of all pesticides. Grants for enforcement and applicator certification to states.
Ports and Waterways Safety Act of 1972	1972	Coast Guard	Regulation of bulk shipment of oil and hazardous materials.
Clean Air Act Amendments	1970, 1977	EPA	Regulation of hazardous pollutant emissions. Air quality standards.
Marine Protection, Research, and Sanctuaries Act Amended	1972, 1974	EPA, Corps of Eng.	Regulates ocean dumping of materials. Permits for materials transport and dumping.

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Hazardous and
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