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THE TOXIC WASTE DUMP PROBLEM AND A SUGGESTED INSURANCE PROGRAM

Ann Fisher*

I. INTRODUCTION

The dramatic increase in industrialization during the twentieth century has been accompanied by the use of vastly larger quantities of industrial chemicals and rapid development of new chemical compounds. While these chemicals have undeniably contributed to the improved standard of living, many of them require careful handling due to their dangerous properties. The chemical industry has, generally, adapted its production processes to account for difficulties such as corrosiveness, instability which may lead to explosion or perhaps to deterioration and loss of the desired chemical characteristics, and health effects. Recently, however, attention has focused on chemical wastes. These wastes may be production process byproducts which happen to have no economic value, or they may be the end result after the desired compounds have been "used up." Since these wastes may be dangerous, it has been customary to dispose of them in special chemical dumps, often after sealing the wastes in drums.  

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1 About 70,000 chemicals are produced commercially, in roughly 115,000 plants in the United States, according to EPA's Steven Jellinek. Newsweek, Aug. 21, 1978, at 27. Each year, 300 to 500 new chemical compounds are placed on the market. N. Greenwood & J. Edwards, Human Environments and Natural Systems 273 (2d ed. 1979), and up to 2000 new chemicals enter the environment. Public Apathy Toward Chemical Risks is Perilous, Conservation Foundation Letter, Sept., 1978, at 1.

2 About 126 billion pounds of hazardous wastes will be produced in 1980. Cong. Q.,
The shortcomings of the dump or landfill disposal method have recently been highlighted by the events in the Love Canal area of the City of Niagara Falls, New York. Twenty-five years after the chemical dump was closed, dangerous chemicals were visible at ground level and were seeping into the basements of nearby homes. Upon identification of some of the chemicals and recognition of the potential health hazards, 239 families were ordered by the State of New York to leave their homes. In addition to the relocation assistance for these families, substantial costs were incurred by government in an attempt to cover the chemical landfill and prevent further seepage of chemicals.

Any attempt to estimate the full costs of the Love Canal disaster is fraught with difficulties, as will be discussed below. This article focuses upon the potential danger inherent to similar chemical waste dumps which are located throughout the United States. Sooner or later, they also will begin to leak, requiring extensive clean-up efforts. Legal responsibility for the clean-up costs may be very difficult to establish, and governmental agencies may hesitate to fund the corrective action due to the extremely high costs and for fear of setting a precedent.

How, then, can money be found to pay for, or to prevent, such disasters? In this article, it is argued that one possible approach would be to institute a federal insurance program similar to the National Flood Insurance Program (NFIP). While this proposal is not viewed as a solution to the hazardous waste problem, it has the potential of providing financial protection for those who find that their homes or businesses are dangerously close to toxic wastes. This program would complement, not substitute for, other policies dealing with the hazardous waste problem.


It may be appropriate to define hazardous or toxic wastes more specifically:

“Hazardous waste” means a waste or combination of wastes, which because of its quality, concentration, physical, chemical or infectious characteristics may: (a) cause, or significantly contribute to an increase in mortality or an increase in serious, irreversible or incapacitating reversible illness, or (b) pose a substantial present or potential hazard to human health or the environment when improperly treated, stored, transported, disposed of, or otherwise managed.


Radioactive wastes are an important component of the hazardous waste problem. Since the estimation of damage and of costs of corrective action is extremely difficult at the present time, this proposal deals only with nonradioactive hazardous wastes. Further
The first part of this article explores the extent of the hazardous waste problem in the United States, by examining what is known about the number and location of toxic waste sites and estimates of cleanup costs. It then describes the Love Canal disaster in Niagara Falls, New York, and efforts to deal with it. To emphasize the widespread existence of hazardous waste dumps, a number of other cases are briefly described. The article then reviews existing and pending legislation related to toxic waste disposal. The National Flood Insurance Program is described as a pattern for a policy proposal: the final section discusses a National Hazardous Waste Insurance Program (NHWIP).

II. THE EXTENT OF THE HAZARDOUS WASTE PROBLEM: NUMBER OF SITES AND CLEANUP COSTS NATIONWIDE

In the past, information on and management of hazardous waste disposal has been sketchy. In order to upgrade its information base, EPA contracted with Fred C. Hart Associates, (a New York consulting firm), for a report—the Hart Study—on the number of hazardous waste sites in the United States and approximate cleanup costs. Before discussing the findings, it should be emphasized that these are preliminary results based on a 60-day study.

The responses to an October 2, 1978 letter sent to each of the ten regional offices indicate that there are about 30,000 disposal sites in the United States which may contain hazardous wastes. Of these, the regional offices reported that about 800 may contain significant quantities of hazardous wastes. These numbers are to be relied upon with caution for a number of reasons. For example,
some of the regions reported that all landfills may contain hazardous wastes. Some regions omitted sites—perhaps due to lack of data—related to specific types of significant problems such as pesticides. Other regions gave no methodology for their estimates. The most important factor which may affect the accuracy of the estimates stems from the EPA headquarters letter itself. This letter, in three separate paragraphs, instructs the regional offices to supply only that information already on file or readily available about hazardous waste dumps.\(^*\) The regional offices are also discouraged from discovering additional hazardous waste disposal situations. It is difficult to evaluate the magnitude of the overestimates (since some regions included all landfills) and the underestimates (due to lack of information) of sites which may contain hazardous wastes. The cautious tone of the EPA letter however, may have encouraged under-estimation.\(^*\)

In recognition of some of the shortcomings of the figures reported by the ten regions, the Hart Study made an alternative estimate of the number of sites. According to Section 3005 of the Resource Conservation and Recovery Act of 1976 (RCRA), any facility involved in the treatment, storage, or disposal of hazardous wastes must obtain a permit.\(^9\) Fred C. Hart Associates estimated that 19,365 active sites are presently needed to handle the

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\(^*\) It is not expected that EPA make any effort to “discover” sites (through field visits, substantial file searches or other means) for which we do not currently have information . . .

\(\quad\) It is expected that this information will derive only from your current regional files. However, if you can readily and conveniently solicit additional information and help from the States, we encourage this. It is recognized that the development of this inventory will add national visibility to the incidents identified therein because the inventory will be shared with the Congress and will probably be requested by and be made available to the public. Because of this, incidents included in the inventory should be situations for which you have more than circumstantial information, the public (at least locally) is already aware, and publicly accessible information is already on file.

\(\quad\) . . . It need not cover situations for which all or most information must be obtained from the States, local agencies or others or for which field inspections must be made to “discover” and describe the situation. There definitely is no requirement to go out and “discover” hazardous situations, nor is it expected to inventory situations for which only unconfirmed information is available.

\(\quad\) Id. at 39-40.

\(^9\) Underestimation would be consistent with the June 16, 1978 EPA memo directing the Hazardous Waste Management Division not to look for imminent hazards. This memo was still in force on October 30, 1978. Hearing Before the Subcommittee on Oversight and Investigations, 95th Cong., 2nd Sess. 317 (1978). In November, 1978, EPA began to seek out and monitor abandoned hazardous waste sites. Id. at 459-460.

generation of hazardous wastes and, will, therefore, require per-

mists.11 On the assumption that a site is active for ten years, and

may pose health threats for forty years after being closed, and

after adjusting the 19,365 active sites in 1978 for the smaller

number of active sites in earlier decades, an estimate of 50,664 is

given for the hazardous waste site inventory.12 The assumptions

behind this estimate may be questioned. The forty-year danger

period is twice the twenty-year monitoring guideline of the RCRA

for properly operated and closed sites. However, for very durable

compounds, even forty years may be too short. It could also be

argued that the 5 percent decay rate per decade, for estimating

the smaller number of active sites in earlier decades, may be inac-

curate. Thus, the 50,664 number is a very rough estimate of all

active plus inactive sites which may contain hazardous wastes.

Two of the ten EPA regions did not estimate the number of

sites with significant problems. For the remaining eight regions,

about 4 percent of the sites were reported as possibly containing

significant quantities of hazardous wastes. If this 4 percent is ap-

plied to the 32,000 estimate, then 1,280 sites may have significant

problems.13 On the other hand, EPA has estimated that as much

as 90 percent of hazardous wastes are disposed of improperly.

Fred C. Hart Associates estimated that 75 percent of landfill sites

are in locations such as wetlands, major aquifers, and floodplains

which are particularly subject to contamination problems.14 If

these percentages are applied to the 50,664 inventory, as many as

34,198 sites could have significant problems.

In summary, the Hart Study implies that there are between

32,000 and 50,000 hazardous waste sites in the United States,

with approximately 1,300 to 34,000 of these sites containing sig-

nificant amounts of hazardous wastes which could damage health

or the environment. Unfortunately, this very wide range of esti-


11 HART, supra note 5, at 18. RCRA mandated that EPA issue regulations by April,

1978, listing specific hazardous wastes and setting standards for generators and transport-

ers of these wastes. Within 90 days of the listing, persons owning or operating hazardous

waste treatment or storage facilities must obtain a permit. EPA’s listing was announced on

May 5, 1980, to be effective in November, 1980 (so permits have not yet been issued). Wall


12 HART, supra note 5, at 23.

13 Id. at 25.

14 FRED C. HART ASSOCIATES, TASK IV-ECONOMIC ANALYSIS, DRAFT REPORT 66-74 (EPA

mates does not pinpoint specific sites.  

Some cleanup cost information was available for 51 sites in the information base of 232 sites. This cost information ranged from $6.3 to $18.4 million per site. Extrapolated to the national level for 1,280 sites, costs would range from $8.1 to $23.6 billion.

Since these are very gross estimates, twenty-four sites were analyzed in depth. The cases were categorized by facility type, problem type, and waste type. For each site, unit cost was estimated for all appropriate remedial measures. These measures usually included only those actions of an emergency nature to reduce risks to human health. Less cost information was available for actions which would significantly reduce the source of contaminant migration.

16 More recently, EPA has listed 151 sites "which may contain potentially dangerous quantities of hazardous waste," according to EPA Deputy Administrator Barbara Blum. U.P.I. Release, July 12, 1979. Cleanup of these sites was stated to be the highest agency priority. No explanation was given for this small number compared with the Hart study figures. Id.

In October, 1979, a Congressional Subcommittee published the results of its own study of waste disposal sites, based on a survey of the 53 largest U.S. chemical companies. Subcommittee on Oversight and Investigations, 96th Cong., 1st Sess., Waste Disposal Site Survey (Comm. Print 1979). The information did not indicate how many of the reported 3,383 sites actually contain hazardous wastes, partly because of the lack of federal definitions of "hazardous" waste. Id. at XIV. However, at least 1,099 of the sites are closed, and will not be subject to regulation under the Resource Conservation and Recovery Act. 42 U.S.C.A. §§ 6921-6987 (1977). In addition to including only 14 percent of the chemical companies in the country, the average record coverage extended back to only 1968. Subcommittee on Oversight and Investigations, supra, at XIII. The companies also reported 960 hauling companies who removed wastes to unknown places. Id. at XXV.

State efforts are also underway in order to narrow the range of estimates for the number of hazardous waste sites which require attention. For example, 215 disposal sites were identified in Erie and Niagara Counties, New York—the region containing the Love Canal. Interagency Task Force on Hazardous Wastes, Draft Report (Mar., 1979). Of these, 36 sites have definitely received large quantities of hazardous wastes, and remedial work may be necessary. Id. at II-2. Legal responsibility for cleanup will be difficult to determine, since 35 of the 36 sites are no longer active. Another 116 sites may have received significant quantities of hazardous wastes; at least 62 of these are inactive. Id. A more recent interim report found 520 toxic waste dumpsites throughout New York. New York State Department of Environmental Conservation and Department of Health, Toxic Substances in New York's Environment (May, 1979). An update of this report is expected in the summer of 1980. Unfortunately, these reports contain little information on cleanup costs.

17 While an attempt was made to make the 24 representative of the 232 cases, data availability was also an important consideration in site selection.

18 The cost information was supplemented by assuming that non-hazardous wastes methods could be applied to handling of hazardous wastes. This may severely bias cost estimates downward, since chemical/physical treatment of potentially hazardous industrial
For the twenty-four selected cases, two cost levels were estimated. For Level I, measures would be taken to prevent the deterioration of existing problem sites such as minimum acceptable cleanup activities on an emergency short-term basis. For Level II, thorough cleanup costs were estimated for permanent protection of health and environment. In both estimates, third-party costs were omitted.

With disclaimers regarding site-specific cost variations relative to type and volume of waste, and additional disclaimers due to lack of information on site size and extent of contamination, the Hart Study estimated average cost for Level I treatment to be $3.6 million per site, and $25.9 million per site for Level II treatment. Adjusting the 1,280 potential sites figure to eliminate those which are likely to be misidentified so that they end up not needing cleanup, and omitting radioactive waste sites requiring separate analysis, total Level I costs would be $3.9 billion. Since about 11 percent of the sites are government owned, and about 64 percent of the sites are privately owned but financially nonviable, this implies potential taxpayer expense of $2.9 billion for Level I wastes may cost $60 to $90 per ton, compared with open dumping at a cost of $2 to $3 per ton. Darnay, Solid Waste Management in Transition, PUB. MANAGEMENT, Aug. 1974, at 2.

For example, Level I costs included site investigation, waste removal or clay cover, perimeter protection with dikes or ditches, security fencing, monitoring and administration. Level II added complete waste removal and disposal at secure facilities plus additional monitoring.

Another report gives per unit cleanup costs for various activities:

<table>
<thead>
<tr>
<th>Action</th>
<th>Cost Estimates</th>
</tr>
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<tbody>
<tr>
<td>In-place confinement of contaminant-immediate costs</td>
<td>$800,000 per acre</td>
</tr>
<tr>
<td>Excavation and disposal at secure facility</td>
<td>$5-$10 million per acre</td>
</tr>
<tr>
<td>Cover and fencing (where water contamination does not occur)</td>
<td>$40,000 per acre</td>
</tr>
<tr>
<td>Removal of contaminant from drinking water</td>
<td>$.50 to $5.00 per 1000 gallons</td>
</tr>
<tr>
<td>Dredging with land disposal</td>
<td>$10-$50 per cubic yard</td>
</tr>
</tbody>
</table>


8 percent of the information base involved radioactive wastes. Since these sites may require substantially higher cleanup costs, they were not considered. 8 percent of the twenty-four in-depth cases were found not to need corrective action. (i.e., sites which had been identified as potential problems turned out not to be problems.) These factors allow reduction of the number of problem sites by 16 percent, with the full recognition that radioactive wastes must be handled separately.
cleanup. Similarly, total Level II costs would be $27.8 billion, with $20.9 billion for privately owned, financially non-viable sites and government owned sites.

If the 4 percent figure for sites with significant quantities of toxic wastes is applied to the larger population estimate of hazardous waste sites, and the adjustment is made as in the above paragraph, then total Level I costs would be $6.1 billion. Of this, only $1.5 billion would be for privately owned, financially viable sites. Level II costs would total $44.1 billion with $10.9 billion of that for privately owned, financially viable sites.

While these cost figures seem very large, they may well be under-estimates, due to difficulties with the data on costs and with the estimates of how many sites require attention.22 If new techniques become available for handling toxic wastes, that would also affect the cost figures. These estimates certainly underestmate the costs to society, since all third-party costs have been ignored.

At this point one toxic waste disposal area, the Love Canal, will be examined in more detail, primarily in an attempt to specify the costs. Even though this may not be a typical hazardous waste problem, it is one for which more information is available.

III. THE LOVE CANAL

A. The Love Canal Disaster

In the late nineteenth century, William T. Love began the construction of a power canal which was to connect the upper and lower levels of the Niagara River.23 The technological breakthrough enabling long distance transmission of electricity combined with an economic depression caused Love's project to fail financially, after the construction of about one-half mile of the canal covering 16 acres.

22 For instance, it was earlier stated that as many as 34,000 sites could have substantial problems. See text at page 5; the largest number of sites considered for the cost estimates above is 2,027.

The Chemical Manufacturers Association, on the other hand, claims that there are only 180 to 235 abandoned hazardous waste sites, with approximate cleanup costs of $1 million per site. CMA argues that total cleanup costs for abandoned sites would thus cost $300-$500 million, with any other inactive sites owned by a financially viable company being cleaned up by the company. INSIDE E.P.A. No. 4, at 2-3 (1980).

23 For background information and preliminary health studies reports, see NEW YORK STATE DEPARTMENT OF HEALTH, LOVE CANAL—PUBLIC HEALTH TIME BOMB (Sept., 1978).
After several years the abandoned canal began to be used by Hooker Chemical Company, now a subsidiary of Occidental Petroleum, as a disposal site, and the standard disposal techniques of that era were used. Liquid, solid, and semi-solid chemical wastes were carried to the Love Canal in metal or fiber drums, which were then emptied directly into the canal, or into larger drums. The empty transporting drums were subsequently either reused or buried with the wastes. Between 1942 and 1952, approximately 21,800 tons of 82 different chemicals were dumped in the Love Canal. The clay-type dirt around the canal was considered to be desirable, since its low permeability would prevent migration of chemicals to nearby areas.

In 1953, the Hooker Chemical and Plastics Corporation sold the Love Canal to the City of Niagara Falls. The dump was covered with earth, and a public elementary school was built on the central section. The deed for the land states that chemicals were buried in the canal, and releases Hooker Chemical Company from any responsibility for future risk or liability. The school was built on a slab in order to avoid chemical erosion of a more conventional foundation. In the late 1950’s, houses were built along the edges of the landfill. People were attracted to the area partly by the new school and partly by promises of a municipal park for the area. They apparently were not told that the homes were adjacent to a covered chemical dump.

From the very beginning, residents noticed unusual aspects of the area. Children and their pets received strange burns from playing on the covered landfill. Trees turned black. Rocks thrown against pavement would ignite with bright colors. People in the area did not attach much significance to these events until heavy rains during the mid-1970’s began to intensify the odors which

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44 Available sources cite different dates for the first dumping, with some dates going back to the 1920’s. Id. at 3. According to the Interagency Task Force on Hazardous Wastes, Hooker Electrochemical Corporation made a written agreement in 1942 with the Canal’s owner (the Niagara Power and Development Company), which allowed Hooker to dispose of wastes in the Canal. Hooker purchased the site in 1947. Interagency Task Force on Hazardous Wastes, Draft Report III-72, III-73 (Mar., 1979).

45 Id. at III-73. The Love Canal was also used for municipal wastes from the City of Niagara Falls, and may have been a disposal site for other chemical companies. N.Y. Times, Aug. 5, 1978, at 18; Buffalo Courier Express, May 30, 1980, at 1, 26-A.

had been noticed in the neighborhood, particularly in basements lining the south section of the Love Canal. For residents and for government agencies, recognition of the potential danger of the Love Canal has been characterized as a process of gradual dawning awareness, rather than a sudden, authoritative announcement. The first expression of government concern may have been in September, 1976, when New York's Department of Environmental Conservation representatives tested the site for Mirex, a highly persistent insecticide which is a suspected carcinogen. In January, 1977, the City of Niagara Falls began a hydrogeological investigation of the Love Canal. The preliminary results showed the need for more information. In April, 1978, then State Health Commissioner, Dr. Robert P. Whalen, found site conditions to be a serious health threat, and ordered the county health commissioner to begin corrective action and health studies. On August 2, 1978, Commissioner Whalen declared a state of emergency, closed the 99th Street School, and recommended evacuation of pregnant women and children under two years of age living in the first two rings. Ring 1 contained those homes with back yards adjacent to the canal. Ring 2 added the houses across the street. The two rings covered an area two streets wide and three blocks long. On August 9, 1978, Governor Carey announced the evacuation of all 236 families in Rings 1 and 2.

The recognition of danger became more widespread, as it was discovered that parts of the canal's walls covered swales—old creekbeds—which at one time flowed out from the canal. Higher permeability in these spots had resulted in substantial leaching

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28 Gradual dawning of awareness may depend upon multiple factors. There seems to be a strong tendency for people to feel that things which do not have fairly immediate effects are not harmful. This is typified by comments such as "I have lived here for X years and I'm fine, so it won't hurt me," or "It may happen to the other guy, but not to me." Another problem stems from conflicting evidence, or from conflicting news coverage, or from reversal of position (such as the cranberries-cause-cancer scare of 1959). For other examples, see Public Apathy Toward Chemical Risks is Perilous, Conservation Foundation Letter, Sept., 1978, at 1.

29 The number of families was later expanded slightly. As of October, 1979, 239 homes had been purchased by the state's Urban Development Corporation, at a cost of $10.2 million. Buffalo Courier-Express, Oct. 18, 1979, at 1. Three families elected to remain in the first two rings. N.Y. Times, Nov. 11, 1979.

from the canal. On February 8, 1979, Commissioner Whalen responded by recommending that pregnant women and children under two years of age who lived along the swales be temporarily relocated at state expense.

Recognition of the Love Canal's impact has widened since the initial action of closing the 99th Street School and evacuating residents in the first two rings. On August 30, 1979, the Niagara Falls Board of Education closed the 93rd Street School because of possible toxic chemical contamination in two creeks which flow near the school. In late August, 1979, residents near the remedial construction area complained of illness caused by noxious fumes from the construction work. The state paid for temporary relocation of 268 residents, as long as each family provided weekly medical certification that a member's illness was canal related. For the two-month period during which construction was completed, this relocation cost the state about $6,000 per day.

The Love Canal Homeowners Association has been instrumental in increasing public awareness of the issues involved. One indication of their effectiveness may be the attempt of the state to sell ninety-six homes along the canal, provided the purchasers would move them away from the construction area. Only eight of the homes were bought. Because the state health department is unwilling to certify that these structures, or structures anywhere in the state, are risk-free, several municipalities in the area have passed resolutions prohibiting relocation of the homes within their boundaries. The primary concern of the communities was that speculators might sell the homes to buyers without notifying them of potential contamination danger. The highly visible Homeowners Association continues to call for the relocation of additional families around the Love Canal; to lobby for further assistance, and to act as watchdog for the construction and monitoring activities.

Independent research suggested higher incidence of illness along the swale areas, and the Congressional Subcommittee on

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31 Buffalo Courier-Express, Sept. 5, 1979. Many doctors were reluctant to certify that an illness was caused by the toxic chemicals. *Id.*


33 *Id.* July 11, 1979, at 1. Buildings not moved by September 15, 1979 were to be demolished. However, the City of Niagara Falls did not give permits for the demolition debris to be pushed into the basements, so the houses are still standing (and still owned by the state's Urban Development Corporation).
Oversight and Investigations augmented public pressure for permanent relocation of 140 additional families in the area surrounding the Love Canal. On October 16, 1979, Governor Hugh L. Carey announced that New York State would spend about $5 million to purchase the equity of the homes of approximately 100 families that had been temporarily relocated to area motels. The relocation proposal was then expanded so that all residents within a ten block radius of the canal (550 families) would have the option of selling their homes to the state. With supplemental funds expected to come from the Niagara Falls City government and federal sources, a new task force was to be established to revitalize the neighborhood.

A May, 1980 study showed that eleven of thirty-six Love Canal area residents had chromosome abnormalities, which is a much higher proportion than normal. EPA announced that 790 families in a ten-block area would be temporarily relocated at federal expense. However, delays in the relocation effort led the frustrated residents, operating through the Love Canal Homeowners Association, to hold two EPA representatives as hostages for several hours on May 19, 1980. Two days later, President Carter issued a federal emergency declaration, allowing temporary relocation for up to a year. Local citizen groups, including the Ecumenical Task Force of the Niagara Frontier, the Concerned Area Residents, the LaSalle Development Residents Association, People for Permanent Relocation, Catholic Charities, and the Love Canal Homeowners Association continue to lobby for per-

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85 Buffalo Courier-Express, Oct. 27, 1979, at 1. Approximately seventy-five tenant families are eligible for relocation assistance, in addition to the homeowners. Id. Nov. 3, 1979, at 1. By November 30, 1979, 345 additional homeowners had requested state appraisals of their property. Id. Dec. 1, 1979, at 1. However, residents were reluctant to begin looking for a new home, since the results of the appraisal were not expected to be announced until April, 1980, with acquisition expected in mid-June. Buffalo Evening News, April 10, 1980, at 17. The reluctance of local governments to become potentially liable for cleanup and rehabilitation costs delayed the establishment of the task force. Legislation for a modified task force was under state consideration in early June. Buffalo Evening News, June 3, 1980, at 35.


87 Buffalo Courier-Express, May 22, 1980, at 1, 3-4 & 20. The President's declaration allows temporary relocation under Federal Emergency Management Agency (FEMA) authority. However, present law does not give FEMA or EPA the power to permanently relocate residents. Buffalo News, May 31, 1980, at 1, and June 6, 1980, at 1. Senator Jacob Javits (R.-N.Y.) has introduced legislation to purchase the residents' homes.
With this background on the Love Canal situation, an attempt will be made in the next section to specify the costs of the Love Canal disaster.

B. Love Canal Cleanup Costs

In order to remedy the Love Canal situation, a drainage system was constructed around the dumpsite to collect the leachate and prevent further migration. The water level in the canal was lowered and the French tile drainage system reversed the flow of groundwater, moving contaminants back toward the canal. The collected wastes filter through an activated carbon treatment plant, designed and operated by CECOS International, Inc.; formerly Newco Chemical Waste Systems, Inc. The pretreated wastes then go into the municipal sewage system.

Construction began at the southern end of the canal, where problems were most severe, on October 17, 1978. This phase of the project was completed in about two and one-half months, and construction in the central and northern zones was essentially completed by early November, 1979. After installation of the drains, the surface was covered with a cap of clayey material in order to eliminate the escape of odors, and to prevent rainwater from entering the canal and creating more leachate. Numerous test wells in and around the canal will permit monitoring of the hazardous wastes.

Cost estimates for the remedial construction are given in parts A and B of Table I, and total $11.2 million. This is only a frac-

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88 Removal of the toxic chemicals and contaminated earth was judged to be prohibitively expensive, as well as potentially more dangerous than the containment technique used (since removal would require exposure and transportation of the buried wastes). Removal would also necessitate finding a suitable relocation site, and might not “rehabilitate” the area any faster than the method used. Love Canal Remedial Measures Demonstration Grant, Feb. 3, 1979, at 27-28.

89 By April, 1980, some seeding work remained to be done, and some monitoring wells still had to be sunk. Telephone conversation with DEC's Mary Kadlacek in April, 1980.

40 Table I: Love Canal Cleanup Costs, With Funding Source

A. Remedial Construction, Southern Zone (completed)

$6.55 million total.

$1.20 million New York State
1.35 million City of Niagara Falls
4.00 million Federal Government—Federal Disaster Assistance Administration (FDAA)

B. Remedial Construction, Northern and Central Zones (underway)

$4.65 million total.
tion, however, of the costs associated with the Love Canal. The remainder of Table I shows estimates for other *publicly funded* costs.\(^4\) These figures include health tests and medical services, and environmental monitoring of the site and surrounding area. Included also are relocation costs for those families who were temporarily moved out of the area during the construction phase, as well as for those who were permanently relocated. Permanent relocation involved purchase of homes and moving costs in addition to temporary rental costs. The Love Canal Homeowners Association was very concerned about possible accidents during the construction phase which might require evacuation from the general area. A standby bus service was provided as a contingency measure.

People were asked to leave the area in August, 1978, but many

<table>
<thead>
<tr>
<th>Description</th>
<th>Cost (Total)</th>
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<tbody>
<tr>
<td>C. Health and Environmental Testing and Services</td>
<td>$2,725 million</td>
</tr>
<tr>
<td>D. Temporary Relocation (including temporary relocation costs for those who eventually were permanently relocated)</td>
<td>$883,000 total</td>
</tr>
<tr>
<td></td>
<td>$8,258 million total</td>
</tr>
<tr>
<td></td>
<td>$4,258 million New York State</td>
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<tr>
<td></td>
<td>$4,000 million Federal Government—Environmental Protection Agency</td>
</tr>
<tr>
<td>E. Permanent Relocation (includes acquisition costs in Rings 1 and 2)</td>
<td>$9,216 million total. New York State</td>
</tr>
<tr>
<td>F. Standby Bus Service</td>
<td>$550,000 total. New York State</td>
</tr>
<tr>
<td>G. Human Services Grant (reimbursement to the local United Way)</td>
<td>$200,000 total. New York State</td>
</tr>
<tr>
<td>H. State Aid for Property Tax Relief</td>
<td>$1.0 million total. New York State</td>
</tr>
<tr>
<td>I. Other (miscellaneous items, such as fencing, security costs, etc.)</td>
<td>$800,000 total.</td>
</tr>
<tr>
<td></td>
<td>$200,000 New York State</td>
</tr>
<tr>
<td></td>
<td>600,000 Federal Government—FDAA</td>
</tr>
<tr>
<td><strong>TOTAL COSTS:</strong></td>
<td><strong>$26.574 million</strong></td>
</tr>
<tr>
<td></td>
<td><strong>$16.624 million New York State</strong></td>
</tr>
<tr>
<td></td>
<td><strong>1.350 million City of Niagara Falls</strong></td>
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<tr>
<td></td>
<td><strong>8.600 million Federal Government</strong></td>
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**Source:** New York State Department of Environmental Conservation. These cost figures are as of March, 1979. After the initial two-year phase, the City of Niagara Falls will assume operation of the site. These operating costs are not included. An April, 1980 update raises construction and relocation costs, making the new total $30 million from state sources plus $8 million in federal funds. However, the additional costs are not broken down by spending category, so the $26.574 million figure is used in the discussion.

\(^4\) See Table I, C through I, *supra* note 40.
of them did not find a replacement home until December, 1978. To ease the financial strain for those who owned homes that they could not occupy, or that had become less saleable due to proximity to the Love Canal area, the state lowered property taxes for more than 600 families through 1984 and is reimbursing local governments for the difference in revenues.

When all of these costs are combined with the construction costs, the publicly funded total is $26.574 million, shared by New York State, the federal government, and the City of Niagara Falls. This amount covers the first two years, during which the construction and assessment of effectiveness of the cleanup operation is to be completed. After that, the City of Niagara Falls will assume operation of the Love Canal site.

Any attempt to assess the costs associated with the Love Canal disaster is likely to be a serious underestimate. For example, residents from the area typically did not keep records of medical costs over a long time period. Even if those records were available, it would be difficult to partition the medical cost figures into

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42 There is some possibility that part of these costs will be reimbursed by Hooker Chemical Company, or through a shifting of financial responsibility among government units. In August, 1978, Hooker offered to share cleanup costs up to $280,000 in its role as a "good corporate citizen," without accepting any liability. On December 20, 1979, the Justice Department filed a $124 million suit against Occidental Petroleum Corporation (of which Hooker Chemical is a subsidiary) in U.S. District Court in Buffalo. The suit names Olin Corporation (which operated a dump site adjacent to one of the Occidental sites) as codefendant. The suits claim Hooker improperly disposed of nearly 200,000 tons of chemical wastes at four sites in Niagara Falls. Wall St. J., Dec. 21, 1979, at 6. On April 28, 1980 the Attorney General of New York filed a $635 million suit against Occidental Petroleum Corporation and its Hooker Chemical subsidiaries at the State Supreme Court in Lockport, New York. Buffalo Courier-Express, April 27, 1980, at 1; Wall St. J., April 29, 1980, at 12. Subsequently, New York State was added as a defendant in the federal case, although the state can also pursue its own case. Buffalo Courier-Express, June 12, 1980, at 1.

The $26.6 million cost figure is also low; by April, 1980 New York’s cost had reached $30 million and the federal government had spent $8 million. These figures do not include the relocation and medical testing costs associated with the May 22, 1980 emergency declaration. Preliminary estimates give $3-5 million for temporary relocation, Wall St. J., May 22, 1980, at 10, revised to $8 million, Buffalo Courier-Express, June 1, 1980, at B-8. One official estimated $33 million for permanent relocation compared with $26 million for permanent relocation. Buffalo Courier-Express, May 24, 1980, at 1. The EPA-sponsored medical examinations are estimated to cost from $600 to $1,000 per person, Buffalo Courier-Express, June 5, 1980, at 1, while the home air samples will cost $500 each. Buffalo Courier-Express, June 11, 1980, at 3. On the other hand it has been estimated that Hooker could have disposed of its Love Canal wastes at a safe site in 1952—the year the dump was closed—for $4 million in 1979 dollars. Hazardous Waste Control Efforts: A Frightful Mess, Conservation Law Foundation Newsletter, April, 1980, at 1.

43 The date of City takeover had not been determined by June 15, 1980.
those related to medical problems induced by Love Canal and medical care for other reasons. As for future medical costs, it will be difficult to ascertain whether or not illnesses, birth defects, and other infirmities are related to subtle toxic effects which do not become evident for years or perhaps for generations.

It also appears that new costs will continue to arise in connection with the Love Canal. EPA, for example, is expanding the cleanup work to nearby Black Creek which is several hundred yards north of the Love Canal and near the 93rd Street School, and has announced as well, that it will conduct an extensive health study to be a part of an $8 million demonstration grant funded by the state and federal government.\(^{44}\) EPA’s cleanup effort is estimated to cost $270,000: $35,000 for a fence around Black Creek and $235,000 to clean the storm sewers.\(^{45}\) The health study cost estimate is $635,000.

Relocated residents mention other out-of-pocket costs which have not been reimbursed. Some feel the state’s assessment of their home was less than its true market value. Often they could not find a comparable home at the same price, so purchased larger, more expensive homes. Although the state provided some funds to help with moving costs, plus a supplement beyond the purchase price of their former home, the simple costs of settling into a new house generally exceeded this. The most important omitted costs are those which are most difficult to quantify: feelings of loss of control over the situation and the anguish of uncertainty as to whether future health problems will occur as a result of exposure to toxic chemicals.

While the $26.574 million may be taken as a conservative minimum cost estimate based on relatively hard data, a realistic upper cost estimate is more difficult to establish. According to the attorney for the Homeowners Association, over $3 billion in claims have presently been filed, all related to the Love Canal. More claims are expected, due to the mutagenic and teratogenic nature of the chemicals.

Before examining in further detail the existing and pending leg-


\(^{45}\) Buffalo Courier-Express, Feb. 22, 1980, at 3. The sewer work, originally expected to be completed in June, 1980, was behind schedule in April. Id. Apr. 9, 1980, at 2.
islation pertaining to toxic waste dumps, a brief review of other toxic waste disposal problems is appropriate.

IV. OTHER TOXIC WASTE DISPOSAL PROBLEMS

A. North Carolina

The Love Canal situation is hardly an isolated incident. In August, 1978, up to 33,000 gallons of transformer oil containing PCB's were dumped along 210 miles of roads in North Carolina. With no suitable hazardous waste disposal site, North Carolina adopted an interim measure, covering the oil with charcoal and then liquid asphalt to seal it in place. The state estimated that it would cost roughly $2 million to create an EPA-approved dump at Warrenton, North Carolina, and store the 40,000 cubic yards of contaminated dirt, but local residents rejected the proposal. On June 4, 1979, EPA denied North Carolina's petition to use a more elaborate method to cover the wastes along the roadsides. The closest EPA-approved site which can accept PCB wastes is in Alabama. To dig up the tainted soil, move it to the disposal facility, and pay the fee to the private operator of the site has been estimated at roughly $12 million. Problems associated with transporting the hazardous waste through the states between North Carolina and Alabama would have to be considered if this action were taken. Residents also rejected a proposal for construction of disposal facilities in each of the fourteen counties where the contaminated oil was dumped.

As in other hazardous wastes cases, the legal aspects are somewhat difficult to ascertain. Three New York men, who were in the business of hauling transformer oil, pleaded guilty to dumping the oil. On June 12, 1979, the executive of the North Carolina firm, Ward Transformer Company, where the contaminated oil originated, was acquitted of charges of conspiracy and being ac-

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46 Polychlorinated biphenyls (PCB's) are a large class of very stable industrial chemicals which, until recently, were widely used as lubricants, plasticizers, in transformer fluids, in pesticides, etc. Since PCB's are known to cause skin disease and liver damage, and are suspected carcinogens, EPA has phased out their use, based on the Toxic Substance Control Act, 15 U.S.C.A. §§ 2601-2629 (West Supp. 1980).


48 The plea was entered on June 4, 1979, in a plea-bargain arrangement in North Carolina. They are scheduled to be sentenced the week of June 23, 1980. Telephone conversation with a North Carolina EPA attorney.
cessory to the dumping in Halifax County, North Carolina Superior Court. While the transformer company executives have been indicted in federal court, the case was not scheduled for trial until late June, 1980. Even if they are found guilty, it appears unlikely that either the hauler or the executives will have the financial resources to pay for cleanup. While the oil was dumped on state land, EPA probably cannot make a case against the state to require cleanup. The questions which remain are how the waste is to be disposed of and who is to pay for it?

B. Valley of the Drums

Another well publicized toxic waste dump is the Valley of the Drums, near Louisville, Kentucky. Under Section 311 of the Water Quality Act, EPA is working to contain, clean up, or dispose of hazardous wastes on a twenty-three acre site where drums of toxic chemicals had been stored since the early 1960's. In addition to stacks which were five to ten barrels high, the site operator had dug pits and trenches, into which chemicals and drums were dumped.

In March, 1979, EPA worked for twenty-one days at a cost of $300,000 to implement a short-term solution. Since run-off from leaking drums had entered a nearby creek, a system was installed in the creek to remove volatile organics and floating compounds. Trenches were dug around the site in order to divert the surface flow to a catch basin, from which the liquid is pumped through a water treatment plant achieving a 98 percent reduction in pollutants. On the site itself, drums were segregated and marked according to whether the contents were solid or liquid. Empty barrels were recycled, or crushed if not reusable. Nothing has been done about the four or more pits containing toxic chemicals, since the Water Quality Act does not allow EPA to stop the chemicals from polluting the air or ground water. EPA is still looking for a suitable long-range disposal method.

C. New York

Toxic waste dump problems have become evident in several

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* Ward Transformer Company is the largest rebuilder of transformers in the eastern United States.

other areas. The waste disposal firm of Pollution Abatement Services of Oswego, New York is one situation with fairly reliable cost information. This firm began operating in 1970. The resulting air pollution led the New York State Department of Environmental Conservation to order shutdown of the bankrupt firm's incinerator six years later. Using the EPA-owned portable treatment plant, approximately $2 million was spent to dispose of over a million gallons of contaminated liquids which had been placed in lagoons. SCA Chemical Waste Services, Inc. submitted the low bid of $2.23 million for analysis, transport, treatment and disposal of 21,500 drums of waste.

While this $4.23 million total is much less than the $26.574 million estimate for the Love Canal, the Pollution Abatement Services situation is considered to be far less serious, partly because of its isolated location, and partly because fewer dangerous chemicals have been found in the 2,700 barrels sampled. A more appropriate cost comparison might be the $4.23 million for Pollution Abatement Services with the $11.2 million construction costs of the Love Canal remedy perhaps, adding, the $800,000 in miscellaneous costs—I. on Table I. If, however, there are any third-party costs, the $4.23 million will be an underestimate.

At first glance, the $26.574 million cost estimate for the Love Canal seems quite close to the $25.9 million per site Level II treatment estimate given in the Hart Study. However, it is difficult to compare the cost estimates. In both cases, the Hart Study's Level II definition is closest to the remedial action being

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83 The federal money came from the Coast Guard Revolving Fund. Telephone conversation with EPA representative in Atlanta.

84 In July, 1979, the State Legislature had appropriated $750,000 to dispose of the drums, compared with the $2.23 million needed. On April 3, 1980, Governor Hugh Carey vetoed a $1.5 million appropriation in the 1980-81 budget for cleanup of hazardous wastes in Oswego County. U.P.I. Release, Apr. 4, 1980.

85 See Table I, supra note 40.

86 See text at notes 15-22, supra.
taken. However, the Hart Study estimates do not appear to include the health testing and relocation costs, listed as parts C, D, E, F, G, and H in Table I.\textsuperscript{67} Presumably, any long-term monitoring costs are included in the Hart Study Level II estimates. Such monitoring costs are not included in the cost figures for the Love Canal, and probably not in the Pollution Abatement Service figures. Thus, while these cost figures really are not comparable, it can be concluded that they are underestimates, since none—or only some, for the Love Canal—of the third-party costs are included.

Even present attempts to provide safe disposal methods for hazardous wastes are under attack. For example, Niagara County, New York has two firms which have received approval from the State's Department of Environmental Conservation as commercial hazardous waste management facilities.\textsuperscript{68} These firms, CECOS International, Inc. which was Newco Chemical Waste Systems, Inc. prior to January 1, 1980 and SCA Chemical Waste Services, Inc., treat chemical wastes for about half of the United States. Their methods are more sophisticated than were used for the Love Canal. For instance, many dangerous chemicals are neutralized by reacting with other chemicals, and storage pits are lined with plastic and covered with a clay cap when full. Some waste chemicals are also processed for use as a liquid industrial fuel.

Problems have arisen, however. Homes are located about one-half mile from CECO's 385 acre site. A creek flows through part of the site, which includes marshy lowland in a federal flood hazards area. In addition to odor complaints by local residents, EPA recently found that leachate from one of CECOS' secure landfills was above approved levels.

SCA's 630 acre facility is not as close to residential areas, but odors have still been a source of complaint. Accidental spills have also been a problem. EPA is concerned about the fact that SCA does not store PCB's in watertight buildings. Thus, even current efforts to prevent future Love Canals may be inadequate.

The descriptions above give some background regarding types

\textsuperscript{67} See Table I, \textit{supra} note 40.

\textsuperscript{68} Information on the two sites is included in the Interagency Task Force on Hazardous Wastes, Draft Report II-78-II-90, II-87-II-88; and in Michael Desmond, \textit{Niagara Nightmare}, Buffalo Courier-Express Sunday, June 17, 1979. Both sites are near the city of Niagara Falls.
of chemical waste disposal problems, with some information regarding cleanup costs. However, before a corrective or ameliorative policy can be suggested, it is necessary to explore the laws relevant to the problem.

V. A BRIEF SUMMARY OF LEGISLATION RELATED TO HAZARDOUS WASTES

A. Existing Legislation

The legislation with great potential impact is the Resource Conservation and Recovery Act (RCRA), passed in October, 1976. In addition to emphasizing conservation rather than disposal of resources, and improved disposal of all solid wastes, RCRA calls for the development of regulations to identify and manage all hazardous wastes from generation to disposal including treatment, transportation, and storage.

EPA was to formulate these regulations by April 21, 1978, but the first ones were not promulgated until February 26, 1980. These regulations require generators of hazardous wastes to keep records of all toxic wastes that are sent to off-site treatment, storage, or disposal facilities, after appropriate packaging and labelling. These regulations also require that transporters of hazardous waste continue the record keeping started by generators, and deliver the waste to the designated facility. In the event of a discharge of the wastes being transported, the transporter is re-

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92 40 C.F.R. § 262.

93 40 C.F.R. § 263.
sponsible for cleanup, and for reporting the spill to the Department of Transportation.

However, the crucial regulations listing hazardous wastes and giving standards for operating hazardous waste facilities were not announced until May 5, 1980. RCRA encourages states to establish their own regulations. Prior to the announcement of EPA guidelines, however, states were reluctant to act; if their regulations turned out to be weaker than those of EPA, costly revisions would be needed. On the other hand, if some states had regulations more stringent than the federal ones, they might lose industry to states with minimal restrictions on hazardous waste disposal. New Jersey, and California are among the few states with comprehensive regulations on hazardous chemicals. Several states, such as New York, Kentucky, and Wisconsin have laws which will use the EPA regulations when they become effective on November 19, 1980. Delay in issuing the regulations stemmed both from EPA's concern that the guidelines are legally sound, and from the shortage of technical knowledge in the hazardous waste field. It may also be relevant to note that in September, 1978, only 161 of EPA's nearly 11,000 employees were as-

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48 This delay has led to suits against EPA filed in U.S. District Court for the District of Columbia: Illinois v. Costle, No. 78-1689 (D.D.C.); Environmental Defense Funds, Inc. v. Steffan Plehn, No. 78-1715 (D.D.C.); Citizens for a Better Environment v. Costle, No. 78-1734 (D.D.C.); National Solid Wastes Management Association v. Costle, No. 78-1899 (D.D.C.). On January 3, 1979, the court found that EPA had been conscientious in its efforts and ordered that the regulations be promulgated in final form not later than January 31, 1980, a deadline which was not met.

There has been substantial criticism of the delays, as illustrated in the Subcommittee on Oversight and Investigations, 96th Cong., 1st Sess., HAZARDOUS WASTE DISPOSAL REPORT (Comm. Print, 1979).
signed to hazardous wastes although others work on industrial discharges, industrial air pollution, the Toxic Substance Control Act,69 and research.70 This staff worked with about 2 percent of the EPA's budget.71

Once RCRA has been implemented, it may have substantial impact.72 For example, those owning or operating facilities to treat or store hazardous wastes will be required to obtain a permit; non-conforming disposers may have their permits revoked.73 There will be civil and criminal penalties for noncompliance with the law.74 Sections 7002 and 7003 state that anyone may start a citizen suit against those in violation of the Act, and the Act's administrator may bring suit to prohibit the handling, storage, treatment, transportation, or disposal of any hazardous waste creating imminent danger to public health or the environment.75

Other legislation related to toxic wastes include: the Federal Insecticide, Fungicide, and Rodenticide Act of 197276 which has as its purpose to control pesticides in waterways; the Clean Air Acts

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71 For October 1, 1978 through September 30, 1979, EPA's budget was $1.2 billion, with $25.2 million for hazardous wastes. Of the $25.2 million, about $15 million went to states to help them examine hazardous waste problems.
72 EPA has now asked for more staff and funds to deal with this problem. Most recently, EPA requested $45 million to finance the work of its new agency task force to probe toxic waste sites; $20 million would be used to find and assess sites, $23 million for cleanup activities and $2 million for enforcement by the Justice Department. Buffalo Evening News, July 12, 1979.
73 RCRA could be relatively ineffective, too. Concern has been expressed that EPA's definition of hazardous wastes may omit many known toxic substances, perhaps due to enforcement cost considerations. Hearing Before The Subcommittee on Oversight and Investigations, 95th Cong., 2nd Sess. 368-70, 405-07, 450-56 (1978). According to EPA estimates, 10 to 15 percent of the 334 million metric tons per year of industrial wastes will be classified as hazardous, under RCRA. Companies generating less than 100 kilograms of waste per month (no matter how toxic it might be) would not be covered by RCRA. Cong. Q., Mar. 22, 1980, at 799. The excluded companies account for 91 percent of all hazardous waste generators, but only about 1 percent of what EPA defines as hazardous wastes. Buffalo Courier-Express, May 6, 1980, at 2.
74 However, EPA must show that a significant hazard exists. Cong. Q., Mar. 22, 1980, at 797.

The Clean Water Act of 1977 set up regulations to enforce clean water standards. Section 311 authorizes a revolving fund to pay for spills of oil and 297 hazardous wastes, and EPA has an enforceable right to recover costs from polluters. However, the Section 311 regulations apply only to navigable waters, not to air, land or ground water. Section 504 is designed to provide assistance whenever released contaminants may present imminent and substantial danger to public health or welfare, but Congress has never appropriated money to implement this.

The Toxic Substance Control Act of 1976 (TSCA) provides for direct control of new and existing chemicals. If a chemical involves unreasonable risk, then EPA can limit or prohibit its manufacture, processing, distribution, use and disposal. The Act requires corporations to send EPA data on expected effects on people of new chemicals planned for the market. Only a very small portion of the chemicals in use have been tested at this point however.

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80 33 U.S.C.A. § 1321 (1978). As part of the implementation of section 311, the National Oil and Hazardous Substances Pollution Contingency Plan was developed by the Council on Environmental Quality. 40 C.F.R. § 1510 (1979). The final revision became effective March 19, 1980. 45 Fed. Reg. 17,832-60 (1980). The plan calls for coordination between federal and state efforts, with funding from government agencies and the U.S. Coast Guard revolving fund, and applies only to spills of at least 1,000 gallons of oil or hazardous substances in navigable waters or on their shoreline.
83 Id. § 2605.
84 Id. § 2604.
85 Less than 10 percent of the chemicals in use have even been tested for carcinogenicity. Public Apathy Toward Chemical Risks is Perilous, Conservation Foundation Letter, 2, Sept., 1978, at 2. The percentage tested for other health effects is probably smaller.
TSCA is designed to regulate which chemicals can be used by industry, while RCRA is designed to regulate what happens to these chemicals after use. As mentioned above, there have been several implementation delays. Unfortunately, RCRA is silent on inactive chemical dumpsites except in cases where EPA can identify the owner and prove in court that the site is a health hazard. It is a preventive program, designed to deal with hazardous wastes generated now and in the future.88

B. Pending Legislation

For abandoned waste sites, often there are no financial resources available to compensate for the environmental, health, and economic damage associated with the problem. It is essential to recall at this point the Hart Study estimate that 64 percent of hazardous waste sites are privately owned but financially non-viable.87 Several bills have recently been introduced in Congress in an attempt to remedy this aspect of the hazardous waste problem at the national level. A number of states are also considering or have taken action.88

The Administration proposed superfund legislation: the Oil, Hazardous Substances, and Hazardous Waste Response, Liability, and Compensation Act.88 The bill's major thrust is to require the responsible parties for toxic waste pollution to bear the costs of cleanup, and would apply to oil spills, spills of hazardous substances, releases from abandoned or inactive dumps except those with permits under RCRA, and any releases creating imminent

88 However, section 8001(a), 42 U.S.C.A. § 6981 (1977), which provides for demonstration projects, was the basis of $4 million in funding for the Love Canal. Section 7003, 42 U.S.C.A. § 6973 (1977), on imminent hazards, could also apply to abandoned dumps. Another $4 million for the Love Canal resulted from the Disaster Relief Act of 1974, 42 U.S.C. §§ 5121-5202 (1976). This was the first time that relief from a manmade disaster was funded under this act.

87 See note 5, supra.

88 For example, New York State recently appropriated $300,000 to locate and study toxic waste disposal sites; the measure also empowers state officials to order cleanup or to carry out inactive hazardous waste disposal site remedial actions. Buffalo Evening News, June 27, 1979. New Jersey has combined state funds with an EPA grant to set up a hazardous waste strike force. Id. June 28, 1979.

danger to public health or welfare.\textsuperscript{90}

Eighty percent of the Administration-proposed superfund would come from fees on the production of petroleum, petrochemicals, and inorganic chemicals, with the remainder paid by federal, state and local governments.\textsuperscript{91} Upon discovery of danger from an abandoned hazardous waste site, $300,000 of emergency assistance would be available for things such as provision of drinking water and evacuation of residents.\textsuperscript{92} Two hundred thousand dollars from the superfund would be available for first-year containment of the waste.\textsuperscript{93} After that, the state would bear the costs, and would have to oversee, and possibly finance, the maintenance of the site for nineteen years.\textsuperscript{94} The government would, however, be able to try to recover costs from those owners, lessees, and operators of abandoned sites who contributed to the release of toxic materials. Prior owners, generators or disposers would also be liable. Liability would be limited to $50 million per hazardous waste-related accident.\textsuperscript{95} The Administration's superfund bill has limited compensation features, and no retroactivity.\textsuperscript{96} Reimbursement for personal injury and property damage would be limited to spills from leaking oil tankers or overturned

\textsuperscript{90} Id. \textsuperscript{91}§ 603-604. Combining oil and hazardous substances has led to jurisdictional disputes among Congressional committees. James J. Florio, D.-N.J., has introduced H.R. 5790, 96th Cong., 1st Sess., to deal with cleanup of hazardous waste dump sites, and specifically exempted oil spills and chemical spills into navigable waters. Cong. Q., Mar. 28, 1980, at 797. The Chemical Manufacturers Association was successful in its effort to have the "strict liability" and joint and several liability clauses modified. CMA also argues that only abandoned inactive sites should be included and that funding for these sites should not be provided by industry, but that chemical manufacturers would clean up their own waste disposal sites. 1 \textit{Inside E.P.A.} No. 4, at 2-3, 8-10 (1980).

\textsuperscript{91} H.R. 4566 \textsuperscript{92}§ 606, 96th Cong., 1st Sess., (1979). Fees would be up to 3 cents per barrel on oil and up to one half cent per pound on raw materials used to make the chemicals which involve hazardous wastes. This may be less effective than earlier versions introduced by John J. LaFalce of New York (H.R. 3797, H.R. 3798) since the Administration bills' fees are based on \textit{products} not on the volume and toxicity of wastes as in the LaFalce bills. The program would be phased in gradually, with $250 million in fees and appropriations the first year, $375 million the second year, and $500 million each of the next two years. The program would be reviewed before a decision about extending it beyond four years.

\textsuperscript{92} Id. \textsuperscript{93}§ 601(g).

\textsuperscript{93} Id. \textsuperscript{94}§ 603(b).

\textsuperscript{94} Id.

\textsuperscript{95} Id. \textsuperscript{96}§ 604.

\textsuperscript{96} H.R. 4566 \textsuperscript{97}§ 607, 96th Cong., 1st Sess., \textit{Cong. Rec.} (1979). On the other hand, the LaFalce bills, see note 91 \textit{supra}, would compensate all persons, up to $50,000 each, who are physically injured by toxic pollutants. Compensation would include medical benefits, rehabilitation benefits, and up to 80 percent of lost wages. H.R. 3797 \textsuperscript{98}§ 3226, Cong. Sess. .
trucks transporting toxic chemicals. However, those hurt economically by the sites, such as fishermen in the oil spill example, would receive limited compensation for loss of livelihood. Victims of abandoned waste sites would not be compensated for medical expenses, or for loss of property or jobs.

The Eckhardt bill—the Hazardous Waste Act of 1980—calls for an inventory of hazardous waste sites, which would help each state rank its inactive hazardous waste dumps, according to their threat to public health or the environment. With the state ranking, EPA would annually designate 100 inactive sites having the greatest danger as “top priority sites.” The Eckhardt bill encourages states to plan a hazardous waste program in order to be eligible for 95 percent federal funding for cleanup of abandoned hazardous waste sites. An approved state plan would require monitoring of up to fifty years, which is longer than in other pending legislation, and would also require the availability within the state of adequate hazardous waste disposal facilities.

The Eckhardt bill authorizes a five year, $1 billion fund for cleanup activities of sites which are abandoned or have owners who are unable to finance cleanup. The bill contains no personal injury provisions for sites abandoned before 1980. For active sites or inactive sites which are financially solvent, court action would be taken against generators, transporters, previous and present site owners and operators to force cleanup or recover cleanup costs. For wastes generated after January 1, 1980, the generators would be responsible for injury damages, including personal injury, property damages, and economic or noneconomic loss, for as long as the wastes remain hazardous. Generators of hazardous wastes would pay fees based on the danger of treatment, storage, or disposal of the waste. The fees would be used to satisfy damage claims and for operation of approved state hazardous waste programs.

The House Public Works Committee approved a bill—H.R. 85—to set up a $200 million fund to clean up oil spills and a $100 million fund for chemical spill cleanup. The oil cleanup fund

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97 H.R. 6931 §§ 2 & 4(b), (introduced March 26, 1980).
98 Id. § 4(b).
99 Id.
100 Id. § 4(c).
101 Id. § 4(c) & 4(e).
102 CONG. Q., April 26, 1980, at 1143, and May 10, 1980 at 1236.
would be financed by a three-cent-per-barrel oil fee, and the chemical cleanup money would come from the chemical industry, largely based on the toxicity of chemicals produced. Victims who suffered economic losses from oil or chemical spills could be compensated, but there would be liability limits for oil and chemical companies. The bill does not include abandoned hazardous waste sites, since the committee has jurisdiction only over navigable waterways.

The Florio bill—H.R. 7020—on the other hand, would set up a $600 million four-year cleanup fund for inactive or abandoned toxic waste dumps, with a 50-50 sharing of costs between industry and government. The bill includes a $35 million authorization for EPA to prepare a priority list of inactive waste sites throughout the nation, and requires monitoring of potentially harmful sites. EPA would be able to clean up hazardous leaks that threaten public health or the environment, if the responsible parties could not or would not do so. Once the responsible companies had been identified, EPA could sue for recovery of cleanup costs. Liability would be limited by apportioning damages according to the amount caused by each company. At least 10 percent of EPA's cleanup costs would be paid by the state where the dump is located, and states would be responsible for long-term maintenance of the sites plus provision of adequate disposal sites. In the May 13, 1980 markup session, the House Commerce Committee deleted a section enabling individuals who suffered personal or property damages to sue the responsible parties in federal court. Even if passed, the bill may be relatively ineffective since industry's share of the fund is tied to the amount appropriated for the government's share.

The Senate response to the Administration superfund proposal is the Culver-Muskie bill, which would cover discharges of any

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103 Cong. Q., May 3, 1980, at 1181-82 and May 17, 1980, at 1355-56. H.R. 7020 is a compromise version of an earlier measure, H.R. 5790, which had a $1.3 billion superfund with a larger share from industry, and held all companies contributing to a dumpsite equally responsible for all cleanup costs.

104 After passage by the House Commerce Committee, H.R. 7020 was referred to the Ways and Means Committee, where committee Chairman Al Ullman (D.-Ore.), received a thirty day referral on May 20 Cong. Q., May 24, 1980, at 1399.

105 S. 1480 was drafted jointly by the Environmental Pollution Subcommittee and the Resources Protection Subcommittee, which sent the bill to the Senate Environment and Public Works Committee on May 22; Wall St. J., May 23, 1980, at 5. The information here is based on a February 1, 1980 Staff Working Paper and Cong. Q., June 7, 1980, at 1585.
hazardous substance into the environment—including those permitted under other pollution control laws. In this more comprehensive proposal, $700 million of the superfund would be based upon fees paid by importers, manufacturers, and generators of hazardous chemicals, with a federal contribution of $100 million.\textsuperscript{106} The emergency fund could be used for evacuation of residents and emergency containment of chemicals, as well as permanent relocation of residents and chemical containment or removal. Compensation to victims would include medical costs, property damage, impairment in earning capacity, and other losses.\textsuperscript{107} Victims could sue in federal court to recover damages from chemical companies for medical expenses; more liberal rules of evidence would reduce the burden of proving that an injury had been caused by the discharge, release, or disposal of hazardous substances.\textsuperscript{108}

The chemical industry and dump site operators would contribute to a $200 million fund to pay for incidents at inactive dumps after they have been closed for five years. Owner liability would be limited to five years, and a $50 million limit is proposed on liability for all victim damage caused by a single incident.\textsuperscript{109} As in the Florio bill, liability is limited to the portion of the release or damages contributed by the company.

The debate surrounding the legislative proposals discussed above centers around four basic issues: (1) the scope of the legislation (Should all abandoned sites be included, or only some of them? Should all hazardous discharges, including oil and radioactive wastes, be covered from all potential sources, such as workplaces, in addition to waste sites? Should the law cover emergency measures only, or long term cleanup, and how much money should be spent?); (2) liability (Should the strict, joint and several liability clause be weakened to apply only in negligence cases? Should firms be liable for hazardous waste disposal that was acceptable at the time of practice but is now illegal or is now

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\textsuperscript{86} The full committee is expected to act on this bill during June, 1980, and President Carter has expressed support for this version of the superfund. Buffalo Courier-Express, June 12, 1980, at 24.

\textsuperscript{106} S. 1480 § 5.

\textsuperscript{107} Id. § 4(a).

\textsuperscript{108} Id. § 4(c). Presently unacceptable evidence such as animal studies and health studies for small population groups would be allowed.

\textsuperscript{109} This substantially weakens the joint, several, and strict liability section in earlier versions of S. 1480.
causing or will cause discharges?); (3) compensation (Should victims be compensated at all? If so, should they be compensated for property damage, illness, or loss of earnings, and for how long?); (4) funding sources (Should taxpayers pay for this effort, or should industry, or both? If industry is to bear some of the costs, which sectors will pay? Should generators who dispose of hazardous wastes properly be required to help pay for the problems created by careless firms?). Resolution of these issues will not be easy, since such a resolution depends upon existing laws, economic considerations, value judgements, and political feasibility.

Hopefully, the legislative proposals will be combined and streamlined before a final form becomes law. The present inflation-and-recession mood in Washington implies that limits will be placed on the funds available for cleanup and compensation in hazardous waste situations. Even $500 million per year in a superfund means it will take a long time to meet the $3.9 billion costs for short term solutions estimated in the Hart Study,110 and the permanent solution cost estimates were $44.1 billion. This means that EPA and the states will have to set priorities, and some hazardous waste problems will have to wait until money becomes available. People who are affected by the sites placed on "hold" will still be suffering physical and economic damages. The insurance program proposed below could help while they wait for corrective action. People near sites which are being cleaned up are likely to find that compensation falls far short of their costs, either because certain types of costs are not compensated under the resulting legislation, or because relatively low limits are placed on the amount of compensation which victims may receive. The proposed insurance program could help them recover more of their costs. Since the proposal stemmed from a study of the National Flood Insurance Program (NFIP), a review of its features follows.

VI. THE NATIONAL FLOOD INSURANCE PROGRAM

The National Flood Insurance Act of 1968, as amended by the Flood Disaster Protection Act of 1973,111 provided a low cost flood insurance program for buildings and contents in coastal and rivi-

110 See note 5, supra.
This program was enacted in response to the fact that federal flood control works and disaster relief had not stopped the rise in annual flood losses, and communities were still encouraging development in floodplains. In the "emergency" phase of the program, the Federal Insurance Administration provided each community with a preliminary Flood Hazard Boundary Map. For communities which participate in this emergency phase, or first step, of the program, structures are insurable at subsidized rates regardless of risk.

The subsidy lowered the rate to about 10 percent of the actuarial or real risk rate. In addition to providing insurance, a goal of the program was to regulate development in floodplains. So, in order to qualify for the emergency program, a community must have required: (a) building permits; (b) anchoring of buildings in flood-prone areas; (c) construction techniques and materials to minimize flood damage in flood-prone areas; (d) adequate drainage in new subdivisions; and (e) design or placement of new util-

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Similar programs include the Federal Crop Insurance Programs (administered by U.S.D.A., for such things as hail damage), crime insurance and riot reinsurance programs Title XI—Urban Property Protection and Reinsurance Act of 1968 (administered by H.U.D.).

113 For example, in 1972 tropical storm Agnes took 123 lives, displaced 250,000 people, and accounted for over $1 billion in property loss. With less than a one percent probability of such a storm returning in any given year, Eloise hit the same region in 1975, with $228 million in damage. By 1973, federal disaster relief outlays had grown to $2.5 billion, Platt, supra note 112, at 303, partly as a compassionate response to the fact that flood insurance premiums from private insurance companies were too high to be affordable.


115 42 U.S.C.A. § 4056 (1977). The minimum annual premium is $25. Residential rates per $100 of coverage are $.25 for structures and $.35 for contents. Nonresidential rates are higher (up to $.75 per $100 of coverage). In the emergency program, the upper limit is lower than in the regular program (e.g., $45,000 for a single family home and its contents compared with $245,000 under the regular program). Id. § 4013. There is a $200 deductible clause for buildings and another $200 for contents. Tenants may also insure their personal property. Flood insurance is purchased through commercial insurance brokers. Id. §§ 4051, 4052, 4081, 4082. Items not coverable include such things as storage tanks, docks, growing crops, shrubs, land, livestock, roads and motor vehicles.
ity systems to prevent flood loss.\footnote{Id. §§ 4022, 4102.}

During the emergency phase, a detailed on-site survey was made to yield a floodplain map showing different risk zones according to elevation.\footnote{Id. § 4101.} This Flood Insurance Rate Map (FIRM) was used in the "regular" program to determine insurance rates by zone according to the risk for a particular location.\footnote{Id. §§ 4014, 4015. About 16,100 communities have joined the emergency program. Of these, approximately 1,500 have now qualified for the regular phase. However, 54 percent of the policies are in the regular program.} Under the regular program, property could be insured for larger amounts. In turn, the communities' flood plain management activities became more comprehensive in accordance with the detailed map. New buildings could not be put in high risk areas, and were to be elevated or floodproofed in lesser risk areas.\footnote{Id. §§ 4012a, 4106a.}

Communities have an incentive to participate in the NFIP, since structures in the floodplain may not be eligible for any federally-connected financing, such as Federal Housing Administration, or Veterans Administration loans, EPA grants, or conventional mortgages from a bank or savings and loan association that is regulated or insured by the federal government, if the community is not in the program.\footnote{Constitutionality was also an issue. Floodplain restrictions "(1) must be clearly related to protection of the public health, safety, and welfare; (2) . . . must not be confiscatory; and (3) . . . must not be unreasonably discriminatory." Platt, supra note 112, at 306. The confiscation criterion can be particularly difficult, if it essentially makes the owner a holder of worthless land.} Failure to participate also makes the flood prone area ineligible for any federal funds, including disaster relief, to develop or improve property.\footnote{In the 1968 legislation, the mapping was scheduled for completion by 1983. Even in 1976, costs were up to $5,000 per stream mile. About one-third of the maps had been completed by mid-1979; most of the rest were in process. $114 million was authorized for NFIP studies in 1979. 42 U.S.C.A. § 4127 (West Supp. 1980).}

Implementation of the regular phase of the NFIP has proceeded more slowly than anticipated, because of the necessity of making accurate flood plain maps.\footnote{The NFIP may save $1.7 billion per year in flood damages by the year 2000.} The mapping effort has proved to be a very expensive, lengthy process.\footnote{When the community is in the program, some of this financing may require flood insurance for a particular property. 42 U.S.C.A. §§ 4012b, 4106b (1977).} There has been some debate as to the definition of an acceptable probability of flood damage so that various zones could be delineated within the
detailed maps.\footnote{Platt, \textit{supra} note 112, at 307-09.} Another point of contention has been the rates established for each zone. The original 1968 legislation required actuarial rates for all construction started after the community received its preliminary Flood Hazard Boundary Map. This had the effect of making almost all new construction ineligible for flood insurance, until the 1973 amendments which allowed insurance on new structures at subsidized rates until the FIRM was issued.\footnote{Pub. L. No. 93-234, § 103, 87 Stat. 975 (Dec. 31, 1973).} The delays in completing the FIRM's negated much of the regulatory aspect of the program, since the community construction requirements could be less stringent during the emergency phase.

In April, 1979, there were nearly 1.5 million NFIP policies in force, totalling over $53 billion of coverage for flood-prone property. For this insurance, almost $115 million in annual premiums was collected.\footnote{\`{H}alf of the premiums were for the subsidized emergency policies.} During the first four months of 1979, over 11,000 claims were paid, totalling $44 million (with 12,000 claims pending as of April 30). For the previous year, 1.4 million policies had about $49 billion in coverage, with $108 million in premiums collected. During that year, 28,651 claims were paid, totalling $136 million.\footnote{The approximate equality of premiums to claims payments reflects the shift to actuarial rates as communities become part of the regular program. During the period 1973-1978, the federal subsidy varied from a high of 63 percent of the flood insurance costs to a low of 37 percent. Flood losses are financed by borrowing from a revolving fund (up to $500 million) for the excess over premiums. 42 U.S.C.A. § 4017 (1977).} Administrative costs for the insurance aspects of the NFIP are estimated to be around $12 million per year. The major costs, however, approximately $85 million per year, arise from the mapping efforts involving over 300 people and from education about flooding and hurricanes.

In the following section, it will be noted that there are similarities between flood damage and the damages created by abandoned hazardous waste dumps, at least with respect to the individuals affected. There are also reasons to assert that private provision of insurance to compensate individuals would be no more feasible for abandoned hazardous waste sites than for flood-prone areas. Given the gaps in existing legislation and the uncertainties surrounding the adoption of any of the pending legislation, it can be argued that a program and commitment similar to the NFIP would substantially alleviate the problems associated
with abandoned hazardous waste dumps, although currently used toxic waste sites could also be included in such a program.

VII. A Policy Proposal: National Hazardous Waste Insurance Program

At the present time, individuals and communities which suffer damages from abandoned toxic waste dumps must rely upon specific legislation for disaster relief for each situation. The delays while waiting for legislative action lengthen the period of uncertainty facing the people affected, and may increase their monetary costs as well as the psychic costs associated with the problem. Some people are fortunate enough to work, reside, and own property only in areas which are not susceptible to toxic waste pollution. Other individuals may refuse to engage in any activities in areas known to have the potential for hazardous waste leakage. However, this refusal could be very expensive, depending upon the particular circumstances. In addition, many people may have imperfect information at the time of decision. For instance, customers looking at the new houses around the Love Canal were not told that hazardous wastes were buried nearby. These considerations support the argument that damages from abandoned toxic waste dumps are largely beyond the individual's control in much the same way that an earthquake or a flood is.

Even if proposed hazardous waste legislation is adopted, compensation for physical, economic livelihood and property damages is likely to have relatively low upper limits. A clear example of this is the series of actions taken in the New York State Legislature to deal specifically with the Love Canal. Congress also took specific funding action for the Love Canal, as discussed in an earlier section. See text at notes 38-48, supra. Yet individuals do avoid damages from these natural events by building above the lowest flood plains or away from the worst fault lines, or by using construction materials and design which will withstand the stresses of these disasters. Complete damage prevention would eliminate the use of huge amounts of otherwise desirable land or would require substantially more expensive construction in order to avoid what may be a low probability disaster. So, based upon lack of knowledge or upon calculation of low expected damages, development has continued in these hazard-prone areas.

This lack of knowledge or errors in the calculation of expected damages has, as discussed in the previous section, led to very large disaster losses, many of which could have been prevented. See text at notes 111-127, supra. Tying the availability of flood or earthquake insurance to control over development in these hazard-prone areas can reduce future damages. The assumption is that the government has or can get more complete knowledge to more correctly assess expected damages in these areas.

Much of the pending legislation remains silent regarding abandoned hazardous waste dumps.
will be no mechanism which the individual can use to protect himself from such damage or from the excess of costs over compensation resulting from pending legislation. The policy suggested here gives the individual a way to protect himself, and would increase his range of choice if, for example, an otherwise attractive house or job were available in a location which might be subject to hazardous waste seepage. It would also provide the option for individual protection in situations where the danger of toxic waste was discovered after taking the job or purchasing the house.

Before discussing the features of a National Hazardous Waste Insurance Program (NHWIP), the rationale for government involvement in insurance provision will be reviewed. The NFIP will be evaluated against this rationale, which will then be used as an indication of the appropriateness of government involvement in a hazardous waste insurance program.

The argument supporting government insurance programs is based on situations where there are substantial economic burdens imposed by occurrence of certain events subject to risk, and where private insurers could not accept the risk. Most of the growth of government insurance programs can be attributed to society's tendency to become more risk-averse, or to have greater subjective perceptions of risk. When private insurers are unable or unwilling to handle certain risk situations, this residual may be filled by government insurance. There are additional reasons for government insurance, rather than private insurance: convenience; achieving a wider social purpose; necessity for compulsion;

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131 Despite the government subsidy, relatively small numbers of people choose to purchase flood insurance. This has been attributed partly to the consumer's lack of information with respect to the probability of the disaster occurring and with respect to the expected amount of damage the individual would suffer if the disaster should occur. Kunreuther, Limited Knowledge and Insurance Protection, 24 PUB. POLICY 227 (1976). Consumers frequently do not know of available insurance options. If the consumer's cost (of time and effort, plus out-of-pocket costs) of obtaining and evaluating this information is considered, it may be that a simplified decision rule is used, rather than the traditional utility-maximization procedure. Hence, the individual may not even consider searching for more information until a threshold level of awareness is reached and this awareness may depend largely on the individual's prior experience (with floods, with others who have flood insurance). To increase the number of potential victims covered by insurance, it may be necessary to present graphic examples of damage and easily understood explanations of the insurance options, or to make insurance mandatory in some circumstances.

efficiency; and dealing with risks produced by society itself. National Flood Insurance meets several of these criteria. (1) Only those likely to have flood losses will tend to purchase flood insurance. This will lead to large losses being spread among a small number of policy holders, causing such high insurance rates as to make these losses generally uninsurable in the market.  

(2) Society may achieve a broader purpose in controlling development in flood-prone areas. (3) Even if they have a high likelihood of flood damage, most individuals will not voluntarily buy flood insurance, either because they underestimate the risk of damage, or because they assume disaster assistance relief will be available if they suffer damage, so that compulsory insurance is required. (4) The evolution of the NFIP from a partnership with the National Flood Insurers Association to operation under a government controlled corporation in 1978 may reflect convenience and a desire to improve efficiency. The NFIP can be justified on the basis that many people throughout the nation suffer flood damages. Taxpayers can be expected to help pay for this risk (which is not insurable in the private market) since entire regions may be disrupted by floods, causing indirect losses, yet the requirement for insurance assures that those who are directly affected will bear some of their own risk costs.

A similar argument may support a national hazardous waste insurance program. Evidence presented in earlier sections showed the significant costs of a nationwide hazardous waste site cleanup program. At any given point in time, there is some probability that one of these sites will create problems, so there is risk. The "dawning awareness" of hazardous waste problems has led to greater subjective perceptions of risk on the part of many people living or working near toxic waste dumps. The fact that private insurance programs for hazardous waste site related personal injury and property damage are not available indicates that these risks may not be insurable. Since only those likely to suffer toxic waste damages would tend to purchase such insurance, there would be large losses which could not be spread among a large number of policy holders, making this unprofitable for private insurers.

A broader social purpose could be accomplished by a NHWIP,
by regulating development in areas prone to hazardous waste damage, so as to reduce future damages. For some individuals, compulsory purchase of hazardous waste insurance may be necessary to offset their unrealistically low subjective perception of risk, or their assumption that a government bail-out would follow any hazardous waste problem. Taxpayers can, perhaps, be expected to help pay for this risk, although this argument is stronger with respect to cleanup than for compensation of individual personal injury and property loss. A government insurance program does not necessarily require taxpayer subsidies, however; the NFIP is designed to collect premiums on the basis of actuarial risk when the program is fully implemented. A similar feature could be included in the NHWIP. An economic efficiency aspect of the NHWIP arises from the premiums paid, so that those affected by hazardous waste risks would bear some of their own costs. Finally, this program may deal with risks produced by adverse conditions of society itself. The present and future dangers from toxic waste dumps resulted from what turned out to be inadequate hazardous waste disposal methods. These inadequate methods meant lower prices to those purchasing the related products. It seems safe to assume that the purchasers were numerous and dispersed throughout society. Hence, it may be claimed that society at large, having received the benefits of lower product prices, is now responsible for assuming the risks associated with previous inadequate disposal methods.

With the above justification for government assumption of some of the risk associated with hazardous waste disposal, the next step is to explore how a NHWIP might work, and how it would compare with the NFIP.

It is unlikely that toxic waste insurance premiums would be affordable if provided by private insurance companies. A federal program for toxic waste insurance would have the flexibility for enough subsidization to be affordable, tied to an incentive for communities to limit or regulate the activities near abandoned toxic waste sites. Such a program would also have the potential of lowering the taxpayer cost of some of the pending legislation; it would be reasonable to have fairly low upper limits on compensation guaranteed to all who meet a legislated damage test, if the affected individuals also had the option to recover more of their costs through an insurance program.

For those bills including compensation clauses, this would re-
duce the size of the superfund needed, or would allow greater cleanup effort for the same size superfund. Some of the superfund proposals have no compensation features. The NHWIP would be a desirable complement to one of these proposals, and a supplement to those bills with compensation features. In addition, those who benefit from the insurance program help to pay for it, shifting some of the burden away from the general taxpayer or superfund contributor to those who want the toxic waste protection.

Communities in the NFIP must regulate construction by limiting its location and requiring floodproofing of permitted structures. In a similar manner, under NHWIP, development near hazardous waste storage areas could be prohibited in high risk zones and could require preventative construction techniques in lower risk zones. Detailed requirements would have to await the drawing of potential impact area maps with zones designating risk areas. As in the NFIP, the mapping effort would be time-consuming and expensive, but would be essential in order to determine the risks for any specific location. As in the NFIP, an "emergency phase" of the NHWIP could allow subsidized insurance for all persons and property in participating communities, regardless of risk. To participate in this phase of the NHWIP, the community would agree to control development in suspected high-risk areas; more stringent controls would apply in the "regular phase." The locations of many hazardous waste sites are unknown, either because dumpers did not realize the potential danger of the materials and kept no records, or because present economic incentives for hazardous waste disposers encourage them to hide their activities. Once the location of a site has been established, however, the mapping technology is available.\textsuperscript{134} The factors considered would include airborne movement of toxic vapors, surface runoff, and migration of the leachate from chemical waste sites.

The boundaries of the potential impact areas will be partly determined on an arbitrary basis comparable to the arbitrariness used for the definition of a floodplain. In this case, designated

"safe" levels of harmful toxic materials would be used to deline­ate the boundaries. The "safe" levels would be specified on the basis of medical and technical information regarding the effects of toxic materials singly and in combination for various concentra­tions, and on the probability of the wastes escaping from their present site.\textsuperscript{135}

Once the potential impact areas have been mapped, with zones designating different risks, the insurance premiums could be based on actuarial rates, reducing government subsidy of NHWIP.\textsuperscript{136} Within the potential impact areas, zoning regulations could preclude certain types of development which might lead to higher risks. If, for example, children are more susceptible to toxic chemicals than adults, schools could be prohibited in the higher risk zones.

The cost to taxpayers of this toxic waste insurance program will depend upon a number of factors. These include but are not lim­ited to: (a) the types of coverage which are part of the program, such as physical injury, property damage, loss of livelihood, mental anguish, funds for corrective action for an entire community; (b) upper limits on each type of coverage;\textsuperscript{137} (c) the premium rates charged for each type of coverage; (d) the number and size of potential impact areas which essentially determines the potential number of insurance purchasers;\textsuperscript{138} (e) the number of people who actually buy hazardous waste insurance, and the amounts

\textsuperscript{135} This determination of safe levels (or of various risk levels) will not be easy. A very small percentage of the chemicals in use has been tested for toxic effects. Toxicity of low level but prolonged exposure is difficult to determine, due to the potential influence of other factors which cannot be held constant over long time periods. Chemicals which may be harmless, or perhaps only slightly toxic, in isolation may have synergistic effects when combined, leading to highly toxic compounds.

\textsuperscript{136} Actuarial rates may be more difficult to determine for hazardous waste disposal sites than for floods, since fewer records are available for hazardous waste disasters than for floods. This problem may be less severe by the time the potential impact area maps have been drawn, since more hazardous waste disasters can be expected (unfortunately). These disasters should not be the result of un­mindful dumping of hazardous wastes in the future, once RCRA, 42 U.S.C.A. §§ 6901-6987 (1977), becomes effective. However, as mentioned before, RCRA is silent on abandoned hazardous waste sites.

\textsuperscript{137} If proposals for an overall national health insurance program were enacted, this might affect the type of physical injury covered and upper limits to such coverage. A clause could be included in the NHWIP legislation so as to preclude double collection from federal insurance programs, yet allow supplemental coverage in one of the programs.

\textsuperscript{138} Unless new evidence discloses that everyone in the nation is subject to substantial risk from hazardous wastes, it does not seem economically efficient to have a national health insurance program for hazardous wastes with everyone paying a premium. The NHWIP would not be this broad.
purchased by these buyers; (f) the actual incidence of hazardous waste damages; and (g) the time frame chosen for mapping all potential impact areas. Until decisions are made at the legislative level regarding pending legislation, and until more research has been done to indicate how many hazardous waste dumps will create problems each year and how severe these problems will be, it is difficult to argue for specific rates or limits on coverage. Further research is necessary in order to determine the cost of a hazardous waste insurance program designed to achieve a specific level of relief and mapping. Alternatively, such research could estimate the amount of relief and mapping which could be done for a given appropriation of funds.

VIII. Conclusion

New York State’s Love Canal, Kentucky’s Valley of the Drums, and North Carolina’s 210 miles of PCB-contaminated highways are only a small indication of the hazardous waste problems accompanying the improved living standards which depend largely upon the chemical industry. This article has assessed the present state of knowledge regarding the scope of the toxic waste dump problem in the United States with an emphasis on urban areas where more people would be affected by exposure to toxic wastes. The cost of containing toxic wastes in present storage sites, and of cleanup and restoration of hazardous waste dumps was also examined.

Existing legislation on hazardous wastes is silent on the issue of abandoned toxic waste sites. Several proposals are now pending at the congressional level. However, each has shortcomings, particularly, regarding the individual’s potential health problems, loss of livelihood, or loss of property as a result of toxic waste sites. The policy suggested here which is similar in rationale and structure to the National Flood Insurance Program, would give potential victims the opportunity to protect themselves from hazardous waste damages, through purchase of federally subsidized insurance. Not only would this have the advantage of providing that beneficiaries of the program bear at least part of the cost, it would also have the potential for reducing disaster relief payments to communities by coupling availability of insurance to development planning focused on reducing the chance of toxic waste damage.
The Policy Proposal In Summary Form

A. People in communities where hazardous waste sites may be located would be able to purchase subsidized insurance to protect them from damages caused by leakage of these wastes.

B. Insurance could cover physical damage requiring medical treatment, property damage resulting in repair work or loss of value, and loss of livelihood.

C. Availability of hazardous waste insurance would be coupled with community regulation of development in areas prone to hazardous waste damage.

D. Communities would be encouraged to participate in the hazardous waste insurance program by requiring participation as a condition for eligibility for federally-connected financing of any development in potential impact areas, as in the National Flood Insurance Program.

E. This insurance program could become a strong companion to some of the related pending legislation. For example, community participation in the program could be required in order for the community to be eligible for the corrective assistance suggested in pending legislation. Cleanup of an abandoned toxic waste dump will not erase the damages already suffered by people in the potential impact area, so the need for the insurance program would remain even if all abandoned sites were secured. In addition, these cleaned up sites would not be secure forever. In-use hazardous waste facilities are also subject to accidental releases of toxic materials.

F. As in the National Flood Insurance Program, once the primary impact area maps have been completed, all new construction would be insurable at actuarial rates, rather than at subsidized rates.

This policy will not eliminate the hazardous waste problem. It has the advantage, however, of restoring to potential victims some of the loss they have suffered and of providing that those who may benefit from the program bear a large portion of its costs.