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REPORT ON TRANSPORTATION OF HAZARDOUS MATERIALS IN THE PORTLAND METROPOLITAN AREA

The Committee: Albert P. Benkendorf, Muriel J. Bussman, R.N., Gary I. Grenley, Lynette Mannion, Richard E. Roy, Clinton B. Sayler, M.D., Juli Ann Stream, and Roger Eiss, Chairman

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CHRISTINE A. TOBKIN, *Editor and Executive Secretary*

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Report On
TRANSPORTATION OF HAZARDOUS MATERIALS
IN THE PORTLAND METROPOLITAN AREA

To the Board of Governors,
City Club of Portland:

I. INTRODUCTION AND SCOPE OF STUDY

Compared to most other countries in the world today, and to historical standards, Americans benefit from a highly technological industrial base.

As a responsible society we must be concerned about the possibility of release of these hazardous materials from time of generation to permanent disposal. We use products that are lighter, stronger, more electronically complex, less expensive, and more versatile than would have been dreamed possible a century ago. In providing the benefits of high technology, American firms rely upon and produce materials and byproducts which are hazardous and which, if accidentally or intentionally released into the environment, can wreak severe damage on human health and the environment. This report is limited to a single aspect of this problem: *the safe transportation of hazardous materials within and through the* Portland metropolitan area. Specifically, your Committee was charged to:

-- describe the movement of hazardous materials in the Portland area, and the manner in which this movement is regulated;

-- review and determine the extent of public danger due to transportation of hazardous materials in the Portland area;

-- evaluate the adequacy of federal and state regulations and the effectiveness of enforcement;

-- identify safety and precautionary measures that should be taken to prevent accidental spills of hazardous materials during transportation, and to respond to accidental spills when they occur.

Even though the problem of hazardous waste disposal is extremely important, your Committee has not considered the subject. Instead, we have concentrated our limited resources on the very complex topic of transporting hazardous materials.

In reviewing the transportation of hazardous materials in the Portland metropolitan area, we considered:

-- the risks to health and safety

-- the laws and regulations that have been enacted to protect the public from release of these materials during transport

-- the enforcement of these laws and regulations

-- the measures that have been taken to prepare for emergencies that result from the accidental release of hazardous materials during transport.

We have assessed the adequacy of actions that have been taken, and have recommended additional measures we feel are cost effective in providing protection to the public.

II. BACKGROUND AND FINDINGS

A. Definition of Hazardous Materials

For the purpose of this report, a "hazardous material" is a substance which may pose an unreasonable risk to health and safety or property when transported in commerce. Materials so designated may include, but are not limited to, explosives, radioactive materials, etiologic (disease-causing) agents, flammable liquids or solids, combustible liquids or solids, poisons, oxydizing or corrosive materials and compressed gases* (1).

B. Nationwide Incidents and Problems

1. Overview

The U.S. Department of Transportation (DOT) has designated approximately 18,000 materials as hazardous, and the number grows each month as new chemical substances are developed (2). More than 4 billion tons of regulated hazardous materials move in commerce each year (about 250,000 shipments each day) (3,4).

These materials move on trucks, trains, airplanes, ships and barges**. There have been accidental releases of hazardous materials in each mode of shipment; materials from each category listed in our definition have been released at one time or another.

Fortunately the number of accidents resulting in major loss of life is very small compared to the number of shipments made. But national trends indicate a growing problem. The number of reported accidental hazardous chemical spills grew from 2,256 in 1971 to 18,022 in 1978. Reported annual fatalities grew from 23 to 46 (5).

2. Reliability of National Statistics

These national figures may seriously understate the problem. The Materials Transportation Bureau (MTB) of the U.S. Department of Transportation, which is responsible for collecting this information, relies upon voluntary reporting by carriers. A study by the National Transportation Safety Board finds that only about 1500 of the 168,000 known interstate carriers have ever reported hazardous substance spills (6). A General Accounting Office review of 30 major accidents reported by news media found that only 12 of the incidents were reported to MTB by the carriers. The 18 unreported accidents caused 18 deaths, 9 missing person reports, at least 187 injuries, and unknown property damage (4).

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* A flammable substance will catch fire when exposed to a flame at room temperature. A combustible substance will catch fire when exposed to flame only after the substance has been heated.

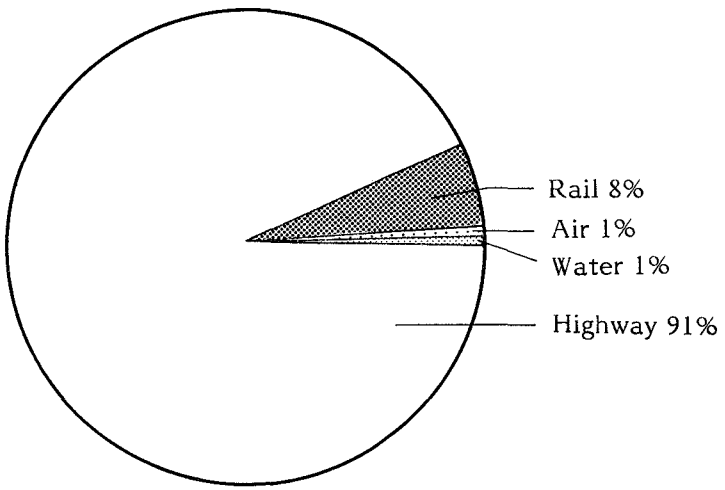
** Pipeline transmission, which is used for many hazardous materials, is not considered in this report.

The National Transportation Safety Board concludes that surprisingly little is known about 1) the amounts of hazardous materials in transport, 2) their distribution among various modes of transportation, 3) the routes on which they are being moved, 4) the number and types of shippers and carriers involved in their handling, 5) the number of accidents involving hazardous materials or their costs to society, 6) the risk to be assessed in developing hazard control strategies, and 7) many other basic questions (6).

3. Analysis of Accidents by Mode of Transportation

Despite the incompleteness of the data, we have examined the incidents that have been reported to get some idea of where risks appear to be greatest. We have considered the number of incidents, injuries and fatalities by substance being transported and by mode of transport.

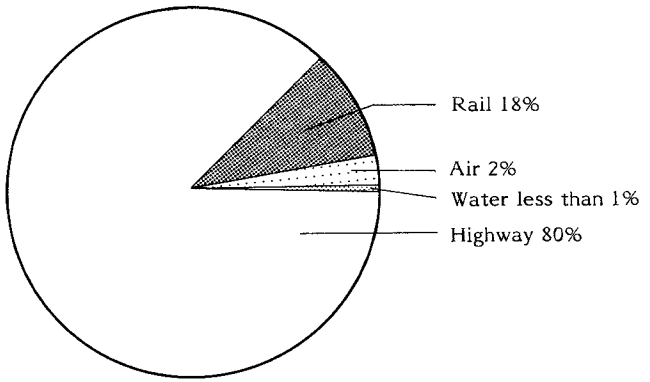
Figure 1 shows the distribution by mode of transportation of hazardous materials spills reported to the Materials Transportation Bureau between 1971 and 1980. Most spills occurred on the highway, rail incidents were a distant second and all other modes were far behind (7).



Number of Incidents Reported
by Mode of Transportation
1971-1980

Figure 1

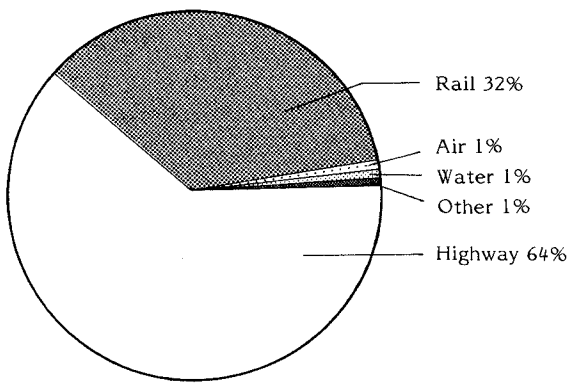
Rail transportation of hazardous materials is a more serious problem when fatalities are considered. Figure 2 shows that of the 241 hazardous materials-related deaths reported in the 1971-1980 period, 80 percent were in highway accidents and 18 percent in rail accidents. Rail accidents are less frequent but tend to be more serious and to involve larger quantities of materials when they occur. Deaths resulting from air and water transport spills were 2 percent and 1 percent respectively.



Number of Fatalities Reported
by Mode of Transportation
1971-1980

Figure 2

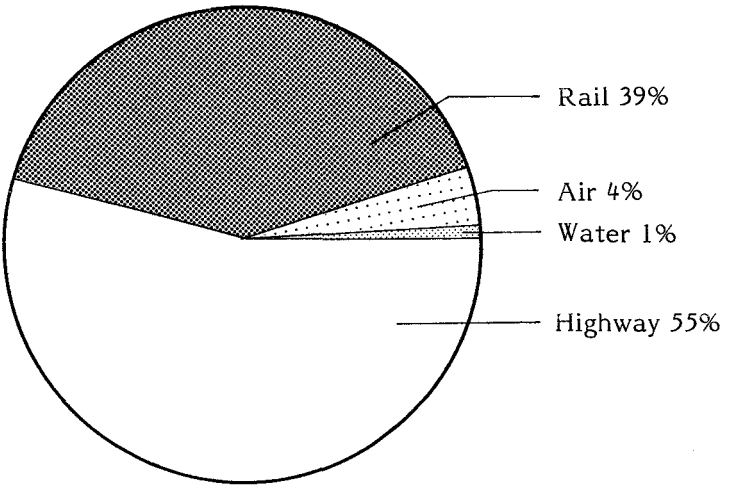
The more serious nature of rail incidents, when they occur, is further confirmed by reviewing distribution of the reported injuries (Figure 3). The largest number of injuries results from highway accidents, with 64 percent of the total. Rail transport incidents caused 32 percent, or half the number resulting from highway transport.



Number of Injuries Reported
by Mode of Transportation
1971-1980

Figure 3

Figure 4 shows the distribution by property damage. Rail accidents continue to grow in relative importance, though highway accidents still account for more than half the total.



Property Damage from Reported Incidents
by Mode of Transportation
1971-1980

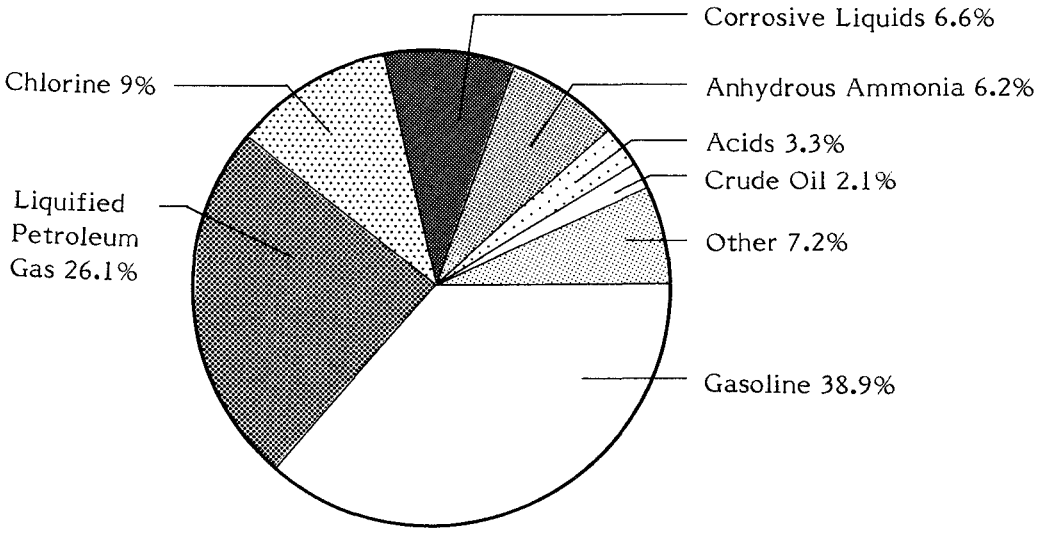
Figure 4

These data provide strong evidence that by any measure selected, the transportation of hazardous materials by trucks should be a primary area of concern. We will examine in detail some of the reasons for this later in the report. Rail accidents, while fewer, have a high impact in injuries, fatalities and property damage. Rail transportation must also be given high priority for any study of hazardous materials transportation safety.

Air, water and pipeline shipments of hazardous materials have also resulted in serious accidents and tragic deaths, and cannot be overlooked by transportation safety regulators or disaster planners. Nonetheless, because your Committee has limited time and resources we have chosen to concentrate our attention on truck and rail transport where deaths, injuries and property damage are many times greater.

4. Analysis of Accidents by Nature of Cargo

Turning to specific hazardous materials, gasoline and liquefied petroleum gas (LPG) accounted for nearly two-thirds of the fatalities reported in the 1971-1978 period (see Figure 5). A lower but significant proportion of the total deaths resulted from accidents in which chlorine, corrosive liquids, and anhydrous ammonia were the cargo (8).



Fatalities in Transportation Accidents by Material Involved (All Modes) 1971-1978

Figure 5

Many of the public sector witnesses appearing before your Committee agreed that public attention has tended to focus on shipment of the estimated 2.5 million containers of high and low-level radioactive materials that are moved annually by all modes of transportation (2). For the period reported, less than one-half of one percent of the incidents involved radioactive materials. These accidents involving radioactive shipments caused only 2 of the 6,667 reported injuries and none of the reported deaths.

5. Examples of Major Incidents

Accident statistics give no sense of the destruction that can result from a major chemical transportation incident, or the impact the incident can have on the lives of residents in the community where an incident occurs, even if the accident is eventually brought under control without injury or death. Evacuations, concern about human life and property, and uncertainty about the future cause serious public anxiety whenever a major incident occurs.

The following items demonstrate the tremendous damage such accidents can cause:

-- Two days following a 1978 24-car derailment in Waverly, Tennessee, a tank car filled with liquefied petroleum gas (LPG) exploded during cleanup operations. Sixteen policemen and firemen were killed, including the chiefs of both departments, and 43 were injured.

-- In 1978 a train derailed near Youngstown, Florida carrying chlorine, LPG, oil, caustic soda, and other hazardous materials. Chlorine escaping from a punctured tank car killed eight people, injured 138 and caused over $1 million in damage. Had the wreck occurred nearer the city, the casualties could have been far worse.

-- Closer to home, a 1959 explosion of a dynamite truck in Roseburg, Oregon killed 14, injured 125 and destroyed 14 city blocks, causing over $12 million in damage (9, 10).

-- In 1979 a train derailment in Mississauga, Ontario--a Toronto suburb--occurred near midnight on a weekend. Shortly after the accident, a tank car of LPG exploded and was thrown over 700 yards. A tank car leaking chlorine came to rest against two tank cars of propane which were in danger of exploding. Over 240,000 people were evacuated for 6 days until the situation was brought under control.

C. Characteristics of Hazardous Materials Transportation in the Portland Area

1. Hazardous Materials Transported

Federal and state regulations governing the transportation of non-radioactive hazardous materials classify them into four general categories: flammable, combustible, corrosive and poison. Examples of materials in each category that are transported within the Portland metropolitan area include the following:

Flammable: gasoline, toluene, liquefied petroleum gas (LPG), acetone, varnish, paints, alcohol

Combustible: fuel oil, machinery oils, grease, asphalt products, plastics, resin, organic dyes, oil defoamer

Corrosive: hydrochloric acid, sulfuric acid, chromic acid, nitric acid, hydrofluoric acid, caustic soda, lime, phenol

Poison: pesticides, chlorine, anhydrous ammonia, wood preservatives, arsenic, paint pigments

Virtually every type of industry in the area uses hazardous materials in its routine production processes. Most of these materials are transported in liquid form.

Statistics are not readily available on the transportation patterns of individual materials. Considerable information is available, however, on the totals moving in each major category. Table 1 shows, for example, an estimate of the total gallons of materials hauled within Multnomah County in 1979 (11):

Table 1

1979 TRANSPORT OF HAZARDOUS MATERIALS IN MULTNOMAH COUNTY

Category	Gallons	Percentage
Flammable	142,635,000	67.9%
Combustible	48,990,000	23.3%
Poison	9,740,000	4.6%
Corrosive	8,795,000	4.2%

These figures emphasize the relative risk posed by flammables and combustibles. Movements of gasoline, oil and asphalt account for over 90 percent of all truck shipments of hazardous materials.

Approximately 400 barrels of low-level nuclear wastes are generated each year at the Trojan nuclear plant and shipped through Portland for disposal at Hanford (11). Witnesses having medical, regulatory and transportation expertise agreed that neither these nor the low-level radioactive chemicals transported to and from Portland area medical institutions appear to pose a major public risk. This viewpoint was confirmed by the Multnomah County risk analysis (11).

Trojan also generates an estimated 30 tons of high-level nuclear wastes from spent fuel each year. Currently this is being stored at the plant site pending a federal solution to the problem of permanent disposal. If the problem is solved, that waste may be shipped through the metropolitan area. When that material is shipped, its transport will merit careful attention by regulators and public safety agencies.

Etiologic (disease causing) agents are not transported in significant quantities in the Portland metropolitan area (11).

2. Transportation Modes and Patterns

Hazardous materials move in and through the metropolitan area by all modes of transportation. Few air shipments occur. Those which do are strictly regulated by the Federal Aviation Administration. Marine transport of flammables and combustibles are sizeable, since a majority of the area's petroleum products are brought in by tanker to privately owned terminals along the Willamette River. These and other water shipments of hazardous materials are regulated by the Coast Guard.

As is true nationally, most serious hazardous materials accidents in the Portland area have involved truck or rail transport. Table 2 shows estimates of movements by these two modes in Multnomah County in 1979 (11):

Table 2

SHIPMENTS OF HAZARDOUS MATERIALS IN MULTNOMAH COUNTY IN 1979

Hazard Category	Hauled by Truck Gallons	Truckloads	Hauled by Rail Gallons	Carloads	Total Gallons
Flammable	126,715,000	304,000	15,929,000	800	142,635,000
Combustible	47,730,000	114,000	1,260,000	60	48,990,000
Poison	3,960,000	9,500	5,780,000	290	9,740,000
Corrosive	4,775,000	11,500	4,020,000	200	8,795,000
TOTAL	183,180,000	439,000	26,980,000	1,350	210,160,000

Table 2 shows that more than 300 truckloads of hazardous chemicals move in the County for every rail carload. The size of the average truck shipment is 400 to 500 gallons; hazardous liquids move on rail in 20,000 gallon carloads. This suggests that there is likely to be a greater frequency of accidents involving trucks, but a greater potential hazard associated with an individual accident involving a railcar. Accident statistics bear this out.

Transportation patterns for hazardous materials can be divided into external and intra-regional shipments.

External shipments are those from sources outside the region to local industries, or shipments from Portland industries to customers outside the region. Since the origin or destination of such trips is some local industrial firm, the land transportation routes involved are the railroads, freeways and major arterials linking Portland area industry to other regions.

Intra-regional shipments, on the other hand, include not only routings between industries within the region but also between industrial areas and local distribution points. For example, when gasoline, fuel oil or paint is moved from terminals, manufacturers and warehousing operations to local retail outlets, the trucks drive on minor arterial streets as well as on major arterials and freeways. Fuel oil is carried on residential streets.

3. Areas and Routes of Special Concern

Most hazardous material shipments move along freeways, arterials and rail lines serving the region's industrial areas. Multnomah County's Hazardous Materials Risk Analysis (11) defined the following "key hazard areas" and "key hazard routes" on the basis of the intensity of hazardous materials movements in and among them (see Figure 6):

Areas: Northwest industrial area
Columbia Boulevard
Inner Southeast industrial area

Routes: I-5
I-405
I-84
N.W. Front Avenue
N.W. St. Helens Road

The northwest industrial area between Front Avenue and St. Helens Road originates or receives between 50 and 90 percent of the shipments of each category of hazardous materials in Multnomah County. The area and the routes leading to and from it clearly merit special concern.

D. Federal Laws and Regulations

1. Relationship of Federal Law to State Law

Numerous federal and state laws have been enacted to govern transportation of hazardous materials. In general, because of the interstate commerce clause of the U.S. Constitution, federal laws will preempt conflicting state laws. As a practical matter, agencies in Oregon follow federal laws and regulations. Therefore, preemption is not an issue of concern in this report.

2. Hazardous Materials Transportation Act

Federal regulation of transportation of hazardous materials comes under the Hazardous Materials Transportation Act of 1974. Under this act, the U.S. Department of Transportation has issued comprehensive regulations governing transportation of hazardous materials. In general, the regulations establish minimum requirements for the following:

-- manufacture, qualifications, maintenance and use of containers and transport vehicles

-- inspection of containers and transport vehicles

-- packaging of materials, labeling of containers and marking of vehicles

-- methods for handling materials

-- notification of and reporting on spills and other incidents.

The federal regulations under the Hazardous Materials Transportation Act provide authority for systematic inspection of transport vehicles. Vehicles found unsafe are grounded until they are repaired. The

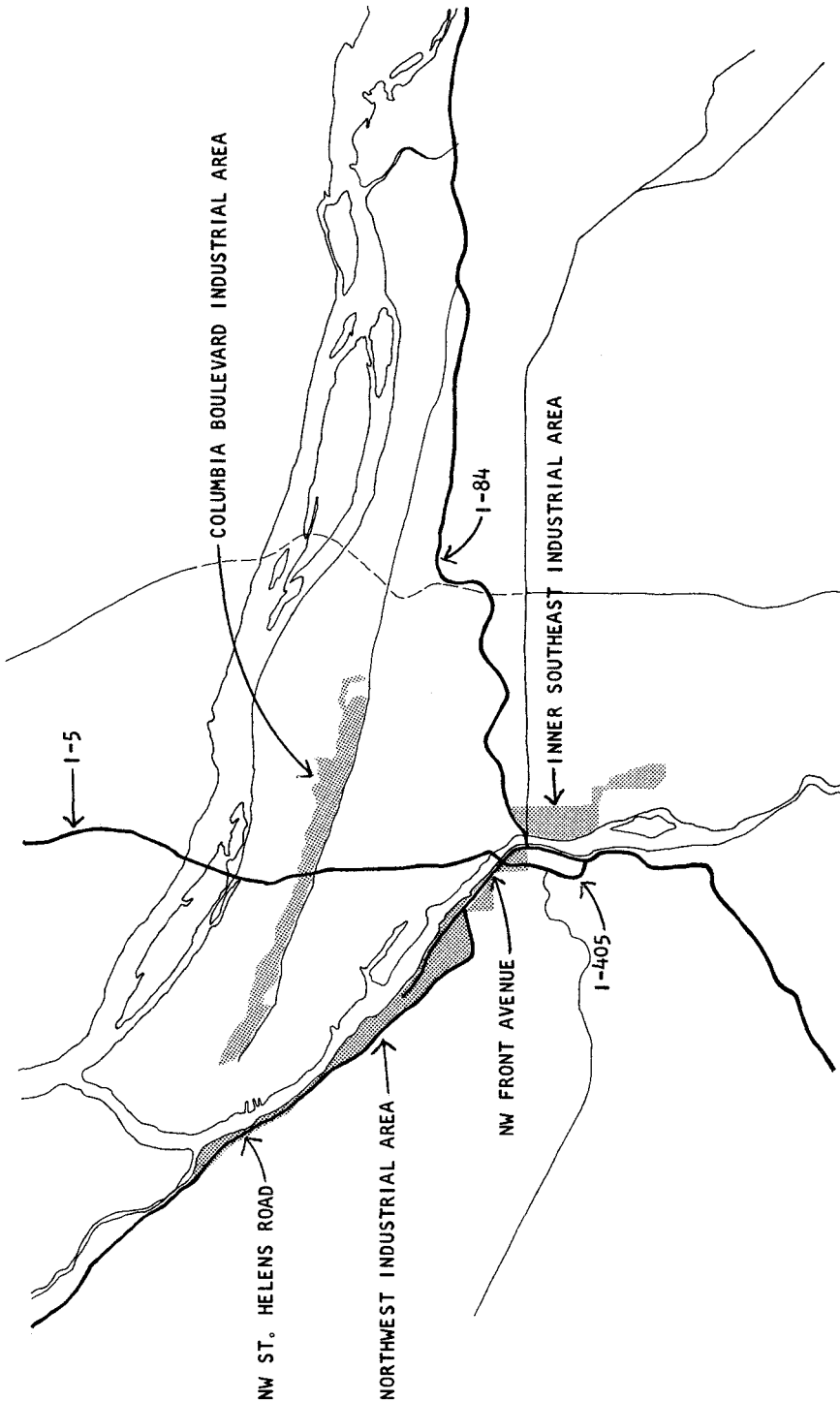


FIGURE 6

AREAS AND ROUTES OF SPECIAL CONCERN - MULTNOMAH COUNTY RISK ANALYSIS

Department of Transportation and the Bureau of Explosives inspect rail cars and highway carriers. Rail car inspections include not only the car containing the hazardous chemicals, but also adjacent cars that may contribute to a possible derailment or to the consequences if derailment occurs. The Federal Aviation Administration inspects aircraft subject to its jurisdiction, and the U.S. Coast Guard inspects vessels for compliance with regulations.

3. Resource Conservation and Recovery Act

In 1973 the federal Environmental Protection Agency (EPA) recommended passage of a law to regulate handling of hazardous waste. EPA reported that existing laws were inadequate to control transportation and disposal of waste on land.

In 1976 Congress responded with passage of the Resource Conservation and Recovery Act, which includes three basic components:

1) A "cradle-to-grave" control system to track all significant quantities of hazardous waste from point of generation to point of final disposal. This component includes:

   -- identification of hazardous wastes

   -- standards for generators and transporters of hazardous wastes

   -- performance, design and operating requirements for facilities that treat, destroy or dispose of hazardous wastes

   -- a system for issuing permits for such facilities

   -- guidelines describing conditions under which state governments can be authorized to carry out their own hazardous waste management programs in lieu of a federal program

2) Identification of dump sites

3) Creation of a fund to allow governments to respond to troublesome disposal sites, and spills of hazardous materials.

Regulations issued by EPA under The Resource Conservation and Recovery Act require a transporter of hazardous waste to:

-- Obtain an EPA identification number

-- Comply with a manifest system to track the waste

-- Deliver the entire quantity of waste to the designated site

-- Retain records for three years

-- Report and clean up discharges and spills

The Resource Conservation and Recovery Act gives each state the option to develop its own programs, including the minimum requirements

listed above, for the management and control of hazardous waste. Oregon has done so, as will be discussed in the next section.

4. Other Federal Regulation of Hazardous Materials Transportation

In addition to the two major statutes described above, other federal laws and regulations are directed to more specific aspects of hazardous chemical transportation. Table 3 lists federal agencies your Committee found were involved in preventing or responding to hazardous chemical accidents.

Table 3

FEDERAL AGENCIES RESPONSIBLE FOR HAZARDOUS MATERIALS TRANSPORTATION OR HAZARDOUS MATERIALS ACCIDENTS

- Department of Transportation
  - Federal Aviation Administration
  - U.S. Coast Guard
  - Federal Highway Administration
  - Federal Railroad Administration
  - Office of Pipeline Safety
  - National Transportation Safety Board
  - Materials Transportation Bureau
  - Environmental Protection Agency
- Department of Health and Welfare
  - National Institute for Occupational Health and Safety
- Nuclear Regulatory Commission
- Department of the Treasury
  - Bureau of Alcohol, Tobacco and Firearms
- Food and Drug Administration
- Department of Defense
- Department of Agriculture
- Department of Interior
- Federal Emergency Management Administration
- Defense Civil Preparedness Agency
- Federal Disaster Assistance Administration

E. State of Oregon Laws and Regulations

1. Public Utility Commission

The Public Utility Commissioner (PUC) of Oregon holds primary authority for regulation of motor, rail and air carriers in the state. The PUC is responsible for setting rules and regulations controlling the transportation of hazardous materials. These responsibilities include (1) safety compliance surveys, (2) highway vehicle inspection and (3) accident investigations. In its rulemaking, the PUC has chosen to provide uniformity and to avoid confusion between state and federal rules by adopting the regulations in force at the federal level.

The PUC requires railroads to determine, for each milepost along their lines in Oregon, the local emergency response agencies having jurisdiction at that point. The resulting lists are provided to railroad dispatchers, to PUC staff, and to the State Emergency Services Office. This action was taken to reduce the time required to identify and notify the appropriate local agencies if an emergency occurs.

2. Department of Environmental Quality

The PUC shares authority over transportation of hazardous materials with a number of other state agencies. The Department of Environmental Quality (DEQ) is charged with supervising and coordinating all state agencies in hazardous waste disposal, but has no authority over hazardous chemicals used as raw or intermediate materials, or as fuels. A shipment of acetone to be used for cleaning metals is free from DEQ regulation on the trip to the plant, but the used solvent comes under DEQ authority on the trip from the plant to its disposal.

The DEQ also requires prompt and safe cleanup of any hazardous materials spilled. Under Oregon law, the party who has physical custody of the hazardous material is responsible for the cleanup. There are private firms in the area who specialize in containing and cleaning up chemical spills. Unless the shipper or carrier can handle the problem unassisted, one of these firms is usually hired to do the job. If this is not done, DEQ has statutory authority to contract for the cleanup and to seek reimbursement from the responsible party through the Circuit Court. To date this authority has never proved necessary; companies responsible for spills have acted quickly and responsibly.

The DEQ administers Oregon's program of notifying local governments of shipments of hazardous materials through their jurisdiction, to provide information for public safety planners. In Oregon this notification is provided by after-the-fact reporting of what has been shipped, rather than notification of shipments before they are made. For a brief time North Carolina required firms to notify regulators before shipments and quickly abandoned the requirement. After only three weeks of operation government officials were one week behind in reviewing the notices received.

The permit program currently in use and administered by DEQ requires the identification by manifest, termed "shipping paper", of hazardous waste by each generator. The manifest, which is kept in the truck cab or train caboose, contains the following:

-- Name and signature of generator

-- Name and signature of transporter

-- Name and signature of operator at disposal or treatment site

-- Type of material in specific terms

-- Quantity of material

-- Basic instructions in the event of an accident.

Completion of the manifest is based on the honor system, though violations are punishable by a fine of up to $3,000, one year in jail, or both. DEQ requires a quarterly report from each generator, but most firms send a copy to DEQ at the time of preparation of the manifest.

The Public Utility Commissioner is required to consult with and consider the recommendations of DEQ when adopting rules controlling the transportation of hazardous waste.

3. Other State Agencies

Next to the Public Utility Commissioner, the Workers' Compensation Board has the broadest statutory authority relating to hazardous materials transportation. Workers' Compensation laws, however, are limited to protecting the health and safety of employees, rather than public safety. In protecting employees, the Board may enforce the rules or standards set by other state agencies. The Board may also conduct vehicle inspections, but only after a complaint has been filed.

The State Fire Marshal, in the Department of Commerce, also has a major role in the transportation of hazardous materials, especially flammable, combustible and explosive cargoes. Statutes authorize the State Fire Marshall to set and enforce standards for the design and operation of equipment for handling and transporting liquefied petroleum gas (LPG). He is also charged with licensing drivers who transport LPG and with inspecting transport and storage tanks. Fines for violating these regulations may be up to $200, 6 months in jail, or both.

The Motor Vehicle Division of the Department of Transportation requires companies to keep records of shipments of vehicle fuel. The trucks that carry vehicle fuel must carry emergency flares, and their drivers must follow rules set by the Motor Vehicle Division to protect the public.

The Oregon Department of Agriculture has adopted regulations covering the transport of restricted use pesticides and of highly toxic pesticides. The Department enforces registration of pesticides and applicators, sets labeling requirements and licenses consultants, dealers, operators and applicators. All commercial applicators are required to know proper transportation methods. Fines for violation of these state laws and regulations may be up to $1,000 ($2,000 for a second violation), one year in jail, or both.

The Energy Facility Siting Council, Oregon Department of Energy, regulates thermal and nuclear power generating plants. This includes the transportation of nuclear fuels to plants and of wastes from the plants. Fines for violation of state laws and regulations for nuclear fuel transport may be up to $25,000 for each day of violation. When setting rules, the Council is required to consider the rules and regulations of the Federal Department of Transportation. This also avoids conflict with the Oregon PUC, since the latter has adopted the federal regulations at the state level.

The Health Division of the Department of Human Resources has established rules to protect the public in case of radiation accidents. Each carrier who transports or intends to transport radioactive material, must submit and maintain an emergency response plan in the event of an accident.

The 1981 Legislature increased maximum fines for infractions of the laws and regulations relating to transportation of hazardous wastes to $10,000 per day per infraction, and also set criminal penalties for violation of certain provisions.

4. Local Government Regulations

For the most part local governments in the metropolitan area have left the regulation of hazardous materials transportation to federal and state authorities, and have concentrated their efforts on enforcement and emergency response.

F. Enforcement of Laws and Regulations

The above text lists a tremendous number of federal and state agencies responsible for different aspects of rulemaking relating to hazardous materials transportation. However, since federal and state laws give primary responsibility to a small number of agencies, the regulatory picture is not quite as complicated as it might appear.

Enforcement is also highly fragmented. Coupled with severe local, state and federal budget constraints, such fragmentation makes it extremely difficult to obtain reliable measures of enforcement staffing levels. The following personnel levels were in force at the time agencies were contacted by Committee members but may not necessarily reflect the situation in the near future.

1. Federal Agencies

The U.S. Department of Transportation enforces trucking regulations through the Motor Carrier Safety Section of the Federal Highway Administration, and enforces rail regulations through the Federal Railroad Administration. The former agency provides two or three inspectors who cover all of Oregon, in theory responsible for enforcing all aspects of trucking laws. In fact, they have little time for truck inspections and they provide no on-road inspections. The rail agency has two employees who focus on rail car inspections and must cover Oregon and parts of Washington, Idaho and Wyoming. Three other FRA inspectors review regional equipment, crossings and other aspects of system safety.

The Bureau of Explosives, a private agency that is part of the American Association of Railroads, provides safety compliance audits for chemical firms and all U.S. railroads. One employee, who covers Oregon, Washington, Idaho and Montana, inspects Portland rail yards two or three times each year.

2. State Agencies

At the state level, six Public Utility Commission vehicle inspectors provide full safety inspections and audits at truck terminals, but very few on-road inspections. These inspectors must cover the state, with the

Portland area receiving approximately one full-time equivalent. PUC rail enforcement personnel include three safety inspectors who work full time with railroads on worker safety training, two equipment safety inspectors, two track safety specialists and one official working to assure that fire districts receive complete and accurate information about shipments.

The PUC recently certified weighmasters from the Oregon Department of Transportation to conduct full truck inspections at weigh stations. Two inspectors cover 11 counties around Portland with ten permanent and two portable scales. They inspect an average of about eight trucks per day in the metropolitan area.

The State Fire Marshall has 13 deputies who inspect trucks hauling propane and other gaseous fuels, and all propane-driven vehicles.

State Police, trained by PUC, provide highway enforcement by focusing on "moving violations". They are responsible for enforcement along 7,000 miles of state highways and must enforce compliance of highway regulations by drivers of automobiles and trucks carrying non-hazardous cargo as well as truck drivers hauling hazardous chemicals.

The 1981 legislative session reduced the State Police budget by $4 million, which resulted in a 17 percent cut in the number of state troopers. At the time of this writing (after Governor Atiyeh's calling a special legislative session but before its convening) a further 20 percent budget cut is being considered for all state agencies, including the state police.

Of more direct impact upon the safety of hazardous materials transportation is the recent elimination of a truck inspection program initiated in 1980.

The Oregon Senate Interim Committee on Transportation found in 1980 that the rates of truck inspection are lower in Oregon than in adjoining states, a conclusion confirmed by many of our witnesses.

3. Local Government Enforcement

Multnomah County is unique among area local governments in having one Sheriff's deputy assigned full-time to safety inspections of trucks carrying hazardous materials. These inspections concentrate on trucks moving on freeways, to offset the State Police reduction of freeway enforcement in the county. The officer responsible reports he inspects an average of 10 trucks per day. The county also has a deputy responsible for over-dimensional and weight-mile violations for all trucks.

The City of Portland Police Bureau has assigned one officer to conduct PUC permit and weight-mile inspections within the City.

In addition, many area fire marshalls work with firms to reduce risks by improving procedures for storage, use and transportation of flammable and combustible materials.

4. Training of Personnel

The legal, public safety, environmental and emergency response aspects of hazardous materials transportation are technical and complex. Training programs should be and are available for shippers, carriers, emergency response personnel and enforcement officers.

Presently available training programs include:

-- The National Fire Protection Association, the Operators Council of the American Trucking Association, the Task Force of Rail Transportation of Hazardous Materials, the U.S. Department of Transportation, and many other public and private national groups and agencies conduct training programs on aspects of hazardous materials transportation. The DOT publishes a list of educational institutions, corporations, businesses and government agencies which provide training programs.

-- The Oregon PUC holds classroom instruction and on-the-road practice for State Police, weighmasters, Portland Police and Sheriff's deputies in Multnomah, Clackamas and Washington counties. Instruction includes enforcement of PUC regulations and covers equipment defects, shipping papers, permits, drivers work logs and medical papers.

-- The Oregon Trucking Associations provides driver education programs which teach drivers the regulations, how the regulations apply to drivers, and the penalties for non-compliance.

-- Multnomah County conducts mini-courses on the chemistry of hazardous materials and response strategies for hazardous materials. Plans for the future include courses on advanced tactics. To date 50 public safety personnel from Oregon and Washington have been through the training programs.

-- Southern Pacific Railroad initiated, and other major railroads are beginning to provide, training programs for fire fighters and emergency service workers from communities in its service area. The sessions are also available to employees of the U.S. Forest Service, state and local police and county emergency service officers.

G. Emergency Response

In the Portland metropolitan area primary responsibility for responding to an accidental spill of hazardous chemicals is shared by local police and fire departments and the U.S. Coast Guard. If the incident is major, emergency medical services and state and federal agencies may be called upon to assist. The specific nature of the response will depend on the nature of the incident.

Even identical incidents that occur in different jurisdictions may be treated differently, depending on local planning, capabilities and delegation of responsibilities. The major functions to be performed are as

follows:

-- The initial responder to the call for help must assess the situation and determine the type of response appropriate. The individual must decide the nature of response needed and whether it can be provided with local resources or whether regional, state or federal help is needed. Usually a policeman or fire fighting official will make this determination.

-- Information must be obtained about the nature of the hazardous material and about the type of response that is appropriate. Federal regulations require vehicles to carry placards that identify the materials and indicate the major dangers at a glance, but reference materials are required to decode the placards. An appropriate response in one instance (use of water to extinguish a fire, for example) may only complicate the incident in another.

-- An immediate danger zone must be designated. Traffic control, including barricades and detours, must be established. Right of way must be provided for emergency vehicles. A decision must be made whether the incident calls for evacuation, and, if so, the extent of the area to be evacuated.

-- A chain of command must be established. If the incident involves only local agencies, this is a matter of routine. If the incident is major and involves many agencies working together for the first time, it may be a major problem and consume considerable time.

-- A strategy must be adopted for containing and controlling the resulting fire or escape of poisonous or corrosive materials. For major incidents the best strategy is sometimes to keep everybody, including emergency personnel, out of harm's way until the situation stabilizes.

-- If medical assistance is needed, another decision about level of response must be made. The 911 emergency telephone system is available to coordinate the medical services available from local hospitals and ambulance services.

The most important response agency, and the one with primary responsibility for public safety in most incidents, is the local fire department. Firefighters are supported by and work closely with the local police department. In the City of Portland and Multnomah County further specialized assistance, expertise and coordination are available from a local Office of Emergency Services.

Working with police and fire team members, the Emergency Medical Services liaison officer designates four areas for medical action:

-- The immediate danger zone, where there is potential danger to life. Casualties are removed from this area as quickly as possible, and only critical life support measures are performed.

-- The triage area, where casualities are assessed for priority of treatment and transportation.

-- The ambulatory area, where mobile victims are directed from the triage area for additional assessment and treatment.

-- The ambulance holding area where arriving ambulances are held until needed.

The EMS liaison officer also activates and monitors a radio communications system based at Providence Hospital, and, if necessary, requests that a physician be called to the scene.

The chemical industry provides important resources for disaster response. The Chemical Manufacturer's Association operates CHEMTREC (Chemical Transportation Emergency Center), an emergency telephone service that provides advice for those at the scene of emergencies and contacts the shipper of the chemicals involved in the accident for detailed assistance and follow-up. The Chlorine Institute, made up of producers of chlorine gas, operates an emergency assistance service called CHLOREP, while producers of deadly hydrogen cyanide offer the HCN system. These industry groups offer special equipment and expertise, and will provide advice by telephone until representatives can travel to the scene and provide direct help in protecting life and property and in cleanup. In addition many individual chemical manufacturing firms provide response teams for specific chemical emergencies involving their products.

The Red Cross, Salvation Army, and many other private organizations provide an important source of help when large numbers of people must be evacuated, relocated, and provided shelter and food. These resources should be part of any major disaster plan.

Emergency assistance from Oregon state agencies are coordinated by the Oregon Accident Response System, which has prepared and adopted a comprehensive emergency response plan. OARS has organized state agencies to be able to respond to emergencies and disasters, including hazardous chemical spills, and has published a reference manual that details important emergency contacts and procedures.

The Federal Emergency Management Agency (FEMA) is an umbrella federal agency that coordinates other federal agencies and helps state and local agencies in planning, research, training and recovery efforts. Its approach, both in planning and in emergency response, is to supplement local activities rather than supplant them.

The U.S. Coast Guard responds to "common body of water" spills where rivers, lakes or other waterways are contaminated. When the spill is from water transportation the Coast Guard is the primary emergency agency, with powers that combine some of those of both police and fire departments. Coast Guard personnel call for outside assistance as needed. The Coast Guard can levy fines against violators and conduct random inspections of vessels for compliance with applicable regulations. The Coast Guard reports all violations and incidents to DEQ.

When a major incident occurs, many other individuals, firms and agencies become involved. As an example, a rail incident that was quickly contained in April 1981 involved the following (in order of notification) (12): the transporter, the chemical company receiving shipment, the Oregon Emergency Services Division, the Portland Fire Bureau, DEQ, the

Emergency Response Coordinator of the chemical company originating shipment, the Portland Office of Emergency Services, the State Fire Marshall, the State Health Division (Emergency Medical Section), the Multnomah County Office of Emergency Management, Fire District 10 Hazardous Materials Reponse Unit, the Federal Emergency Management Agency, the Oregon Governor's Office, the Portland Police Bureau, the Portland Waste Water Treatment Facility, City of Portland Sanitary Engineering, a private contractor cleanup firm, U.S. Coast Guard National Response Center, U.S. Coast Guard Marine Safety Officer, and the Hospital Emergency Administrative Radio system. Some of these in turn informed others (the Coast Guard, for example, notified 18 other firms, agencies or associations not included in this list). Had the incident not been contained, many others would have been involved in the response.

1. Special Readiness Efforts

In 1980 Multnomah County was awarded a grant from the Federal Emergency Management Agency for a special demonstration project including the following projects:

-- A risk analysis to identify areas in the county where hazardous materials are manufactured, stored, distributed or sold* (11).

-- A hazardous materials incident prevention program, with legal enforcement, industrial relations, and public relations components similar to those for fire prevention programs.

-- An information retrieval system, including a reporting system for tracking incidents that have occurred in Multnomah County, a reference library of 90 books and pamphlets about hazardous materials and their properties and handling, and a computerized information retrieval system which can tap local and national data bases for information about hazardous materials and their handling.

-- An inventory of the resources available to the county for dealing with hazardous materials incidents, considering both internal and external sources of assistance.

-- Purchase of special vehicles and equipment to respond to emergency spills of hazardous materials. These include a station wagon with basic emergency response equipment, and a van that can serve as an emergency command center and source of special equipment. The van has a mobile telephone, police/fire radio contact, special protective garments, and special equipment including an infrared viewer, radiological monitoring equipment, devices to identify vapors and explosive mixtures of gases, fire extinguishers and first aid equipment, and regular and non-sparking tools.

-- A training program offering minicourses in the chemistry of

* Much of the data on the transportation of hazardous materials in the metropolitan area cited in this report came from the County's risk analysis project.

hazardous materials and response strategies for hazardous materials incidents.

-- A "how to" manual explaining to other jurisdictions how to set up similar efforts.

The City of Portland has been awarded a supplemental contract to validate the data collected in the County project, to prepare a hazardous materials response program for the City that is tied into the County effort, and to build on the information made available by the County project.

It is important to note that both the County and City programs were made possible by a federal grant. Current and future efforts to reduce federal spending may limit the availability of such grants to Portland area jurisdictions.

III. DISCUSSION

A. Benefits and Risks of Hazardous Chemicals

We come into daily contact with hazardous materials and with products made from hazardous materials. Review of the statistics cited earlier shows that anyone who drives an automobile (or rides in alternative forms of motorized transportation) is within a few feet of the most dangerous chemical transported, if danger is measured by the proportion of injuries or deaths. Most of us have, at one time or another, seen gasoline catch fire, and few have failed to be impressed at the sight. Committee members have not witnessed the proportionately greater power of a gasoline tanker truck fire, but some members saw a film of a rail tank car carrying LPG as it exploded. The power, destruction and danger of the explosion were awesome.

Those who live in or visit homes heated by fuel oil or natural gas are exposed to another form of hazardous materials. The alternative, electric home heat, requires central electric generating plants, which use or produce huge amounts of hazardous materials.

We view secondary and tertiary water treatment as environmentally sound and socially desirable. Yet the process requires ammonia, chlorine, chloride of lime, hydrogen sulfide and phosphoric acid, among other chemicals on DOT's list of hazardous materials.

The manufacture of common paint requires large quantities of hazardous materials, including aluminum componds, ammonia, benzene, carbon disulfide, chlorinated diphenyls and naphthalenes, ethyl silicate, diethylene ether (dioxane), ketones, mercury compounds, methanol, phenol, sulfuric acid, tetrachloroethane, toluene, trichloroethylene, turpentine and xylene.

Electronics, long considered the prototype "clean" industry, uses very large quantities of solvents, acids, luminescent components for cathode ray tubes, and other hazardous chemicals.

Even the simple process of making soap requires lye as a raw material.

And even relatively harmless chemicals can be hazardous in the bulk quantities used for transport. Portland's most serious recent hazardous chemicals incident, which some feel had the potential for an explosion that could have destroyed the Steel Bridge, was caused by ignition of a ruptured tank car containing methanol (wood alcohol).

We may reduce dependence on hazardous chemicals, we may identify and require procedures to improve safety of chemical transportation, we may prepare to respond when accidents occur, but it would not be feasible to eliminate the use of hazardous chemicals.

There are no easy or absolute answers about how best to strike a balance. We must rely on elected officials, regulatory administrators, business leaders, and many private and public sector employees to assess risks and to identify and implement appropriate actions. This must include an intelligent evaluation of cost and benefit. Where possible, costs of prevention and public protection should be reflected in consumer and industrial product prices.

1. Classification of Incidents by Degree of Risk

Much of our discussion will benefit from the following classification of hazardous materials incidents:

-- Normal incidents: These are simple and relatively localized incidents that threaten operators of the vehicles involved in the accident and a limited number of bystanders who happen to be near the accident scene. The incident can be contained using normal fire fighting or chemical containment procedures, with no major risk to public safety officials. These incidents can be handled by local fire departments. The overwhelming majority of incidents fall into this category.

-- Major incidents: These are larger and more dangerous accidents. They require special experience and equipment. Many of the smaller fire departments in the region would be unable to respond effectively, and would need help from neighboring jurisdictions. While the fire fighting personnel responding to such incidents face significant risks, the general public outside the immediate area is not threatened. Portland has had two such incidents in the past year, and has handled them successfully.

-- Potential or actual chemical disasters: These are incidents that cannot be contained by local resources, including those called in from neighboring jurisdictions. Large populations are at risk, and evacuations are required. In many cases the best strategy is to isolate the area and let the worst of the destruction occur, rather than risk the lives of public safety personnel.

2. Special Categories of Hazardous Materials

Public attention has concentrated on two types of hazardous chemicals: radioactive materials and chemical wastes.

In both cases these materials pose risks to public safety beyond transportation. As explained in the introduction, this Committee's attention has been concentrated only on transportation risks.

Your Committee feels, however, that concerns about the safety of nuclear plant operations and about safe disposal of radioactive wastes has led to a level of concern about their transportation that is out of proportion to the risk that exists. All of the data this Committee has reviewed, and all of the witnesses it has questioned, support the view that the public is exposed to far less risk from the transportation of radioactive materials than from the transportation of chemicals. Disposal of chemical wastes is a complex and difficult problem. But wastes are not inherently more dangerous than other chemicals. They amount to ten million tons generated each year, a very minor proportion of the four billion tons of hazardous chemicals shipped in the United States each year. (3,4,6)

B. Extent of Public Danger

Your Committee was requested, in its charge, to determine the extent of public danger posed by the transportation of hazardous materials in the Portland area. Because major accidents involving hazardous materials are infrequent but have tremendous potential to cause death and injury, this has proved a very difficult assignment.

An insurance actuary can calculate the probability of a disaster occuring by estimating the total number of incidents that will occur nationwide in a specified time and dividing this number by the number of communities at risk. This is useful information to the insurance company, because it can be used to set premium rates.

For residents and officials of a single community, however, such information is much less helpful. In reality they will either experience a disaster or they will not; they cannot know in advance which outcome will occur. If disaster occurs, any reasonable amount spent for prevention or preparation may appear--in hindsight--inadequate or poorly used. If none occurs, there will be constant pressures to divert funds from preparation for such incidents to more immediately obvious needs.

Consequently this risk assessment is divided into two parts. First we review the actual record and assess a level of risk assuming that the past portends the future. Then that assumption is put aside and a "worst case" assessment follows which speculates on what might happen should an exceptionally unfavorable combination of circumstances occur.

1. Perspective from the Historical Record

During the 4-year period 1976-1979 there were 38 truck accidents in the metropolitan area involving hazardous materials other than household fuel oil deliveries and local service station gasoline deliveries. Of these, 23 (or 60 percent) involved flammable or combustible materials and the balance involved materials reported as "unknown". About 60 percent also occurred on the key hazard routes listed in the Multnomah County study.

We could find no reports of injuries or deaths a result of an accident involving rail, air or waterborne shipment of hazardous materials within the area during this same period.

Injuries and fatalities from truck accidents involving hazardous materials have not been reported locally. Across Oregon, however, during the period 1976-1979, truck accidents resulted in 27 fatalities and 385 injuries for each 1,000 accidents. These rates are far higher than those reported in the U.S. Department of Transportation data base for hazardous materials incidents. In view of the scathing General Accounting Office review of the reliability of the DOT data base (4), your Committee accepts the state of Oregon information as more reliable.

Since the available information does not indicate how many of these accidents involved vehicles carrying hazardous chemicals, we cannot estimate local injury and death rates from chemical transportation accidents.

PUC studies do indicate that the majority of truck accidents that result in hazardous materials spills involve only the truck hauling the hazardous cargo. Driver error is the most frequent cause. In view of this it does not seem likely that injury or death is very many times more likely if the cargo is a hazardous chemical.

For example, if hazardous chemical cargoes increase the risk of injury or death by a factor of 4, the 38 truck accidents in four years multiplied by 4 times the statewide injury and mortality rates would suggest that 15 injuries and 1 death each year might be a reasonable expectation for the metropolitan area. These rates would be increased or decreased proportionately by the actual (but unknown) factor of increased risk for chemical transportation accidents.

If these rates could be extrapolated into the future, there would be little cause for concern. Public safety might better be served by using available resources to address other problems with a greater mortality rate.

2. Perspective from "Worst Case" Considerations

Unfortunately, a "worst case" review of a number of recent incidents does not suggest that we can safely assume that the historical rate will continue into the future. A single major derailment involving tank cars of highly flammable or toxic materials, under conditions that have actually occurred in other communities, could by itself raise these rates by a factor of hundreds. One "worse case" national study indicates that an accident involving rupture of only one tank car of chlorine could, if it occurred in the worst possible location and during unfavorable wind condition, kill up to 18,000 people (4).

While the Portland area has experienced a number of accidents that fit the description of "normal incidents" (see Section III.A.1), there have been only two recent "major incidents", both within the past year. Neither resulted in injuries or fatalities. Consequently all the above projections have been from normal incidents.

On April 21, 1981, an open valve was discovered on a tank car of ethyleneamine located at the 3900 block of N.W. Yeon Street by the

Portland Terminal Railroad. In the subsequent response and cleanup action, which involved 20 local, state, and federal agencies, garbled communications led temporarily to the belief that the chemical, relatively harmless, was actually ethyleneimene, an extremely poisonous and easily vaporized substance (12). Had this been the case, standard procedures would have required evacuation of a strip downwind from the incident 1.4 miles wide and 2.2 miles long. A wind from the Northeast during such a spill would have endangered much of Northwest Portland.

On October 5, 1980, a westbound train derailed under Portland's Steel Bridge, setting fire to tank cars that were leaking methanol and polyvinyl chloride. No evacuation was required, and the Portland Fire Bureau brought the fire under control. Had circumstances been highly unfavorable, a "boiling liquid expanding vapor explosion" (BLEVE) could have destroyed the Steel Bridge. Such explosions have thrown portions of tank cars more than half a mile from the scene.

A bit further from home, on February 29, 1980, a train collided with a loaded gasoline truck just a few blocks from Seattle's Kingdome Stadium as thousands of Sonics basketball fans were leaving the stadium. By good fortune the 4,800 gallons of gasoline that spilled failed to catch fire. That luck could just as easily have gone the other way. In Portland both the Memorial Coliseum and the Civic Stadium are within a few blocks of "key hazard routes" identified by the Multnomah County Study, with I-5 and the mainline rail tracks within a few blocks of the Coliseum.

This information suggests that the risk to public safety from transportation of hazardous chemicals in the Portland metropolitan area is great enough to be taken seriously. Perhaps the risk compares in magnitude to risks from earthquake, major storms, floods, and other catastrophic events. The risk is not so great that citizens and public safety officials should become unduly alarmed. Short term overreaction can be as damaging as underreaction.

C. Evaluation of Effectiveness of Existing Public Protection

When the probability of a disaster is very low but the impact of the disaster very high, as is the case with transportation of hazardous chemicals, it is difficult to answer the question, "How much protection is enough?"

The question that defines the other side of our dilemma is being asked more frequently: "How much protection can we prudently afford?" When the American economy was healthy and on a seemingly unlimited growth curve, this question seldom arose. Now that we face high unemployment, high inflation and stagnant productivity, it is a growing concern.

Your Committee has not found definitive answers to these questions, and so must rely on collective judgment rather than absolute standards. This method was applied to each of the three types of public protection from hazardous chemical incidents: 1) legislation and regulation, 2) enforcement, and 3) emergency response.

This section of the report briefly considers each of these areas and addresses potential actions that might be taken for each.

1. Legislation and Regulations

None of the witnesses appearing before or contacted by your Committee expressed a need for major changes in the federal laws and regulations that govern hazardous materials transportation. They are voluminous and detailed.

There also appears to be consistent effort to keep them updated. The Federal Railroad Administration, for example, recently required rail tank car owners to retrofit nearly 18,000 cars with shelf couplers. These devices prevent cars from decoupling when vertical motion occurs. Free couplers from the next car were estimated to be the most frequent cause of rail car punctures upon derailment (13).

At the state level, the legislature has a history of concern about hazardous chemical transportation and the Public Utility Commissioners and their staffs have shown conscientious concern for public safety. The PUC's strategy of adopting federal regulations at the state level improves ease of compliance and enforcement without sacrificing public safety.

Your Committee approached the question of state legislation and regulation by attempting to find a state that has enacted a "model" set of rules that Oregon legislators could use as a base. The closest was the "Tennessee Hazardous Waste Management Act", which consolidates all regulations and authorities regarding hazardous waste. The Act is enabling legislation for the Tennessee Department of Public Health. The Department is guided by the Act in determining rules and standards to which producers and transporters of hazardous waste are held. Also, guidelines are set for determining penalties for violations of these rules. The powers and duties of those responsible are clearly defined in order to prevent any conflicts.

Through this legislation the State of Tennessee appears to have developed a well organized, comprehensive plan for dealing with hazardous waste. However, the Act does not address transportation of the many hazardous chemicals that are not wastes. Nonetheless, while Oregon has not appeared to suffer extensively from its present system of control, the Tennessee approach of coordinating the transportation of hazardous materials through one authority, while cooperating with federal agencies, appears more efficient and may be better able to coordinate action in the event of a disaster.

a. Personnel Training and Certification

Better personnel training and certification could result in a major improvement in safe transportation of hazardous chemicals, particularly in the railroad and trucking industries where most injuries and fatalities occur. Presently there appears to be wide divergence in how well train crews and truck drivers understand the hazards of the cargoes they carry and what to do when an accidental spill occurs. Some chemical firms have a policy of assuring that truck drivers know the nature of their cargo and understand fundamental emergency procedures, but the existence, duration and nature of such training vary from individual to individual and from firm to firm.

The fundamental structural differences between Oregon's rail and trucking industries must be recognized in designing any plan of action.

Nearly all of Oregon's rail freight is moved by only three major national firms. In contrast, there are an estimated 300,000 trucks domiciled in Oregon, owned by an estimated 19,000 motor carrier firms. A very large proportion of these are owner-operators with a single truck. These owners struggle to operate in a climate of uncertainty over industry deregulation, high interest rates, rising fuel prices and reduced speed limits.

PUC regulators and local fire departments can work directly with the three railroads to promote personnel safety training and accident prevention practices. When regulations are established PUC can rely on the railroads' internal communications and control to assure that rail personnel are informed and held responsible by their employer for compliance.

In the trucking industry, however, regulators come into contact with only a small proportion of the industry's decision makers. The small size of most trucking firms and the tremendous volume of regulations make communication of important decisions difficult, and complicate the process of encouraging uniform levels of personnel training.

Because of public concerns about trucking safety, the Oregon Trucking Associations is establishing a professional driver certification program. The program will include standards, policies and procedures for driver certification. Truck drivers will be encouraged to take a written examination and road test. Those meeting the proposed standards will become certified. Trucking companies and shippers will be encouraged to hire certified drivers.

Presently the program is directed to the general issues of trucking operations and safety. None of its planned standards will apply specifically to safe handling of hazardous cargoes.

With this foundation, it would not be difficult to expand the program to provide certification and training in the transport of hazardous chemicals. Chemical industry representatives have indicated a willingness to provide truck drivers with 3- or 4- hour training sessions that would inform them about specific hazardous materials and how to handle these materials in both normal and emergency conditions.

There are no assurances that the chemical and transportation industries can be relied upon to provide the needed training programs voluntarily, and to assure that individuals transporting dangerous chemicals first receive training. It is in their long term self interest to do so; failure to do so could bring increased government regulations that could be more expensive and less efficient than self-regulation.

b. "Good Samaritan" Legislation for Chemical Firms

In a review of hazardous materials transportation policies for the Puget Sound Region (14), local officials concluded there was a need for a "Good Samaritan" law to protect chemical companies in the event of hazardous chemical emergencies.

In many cases the nearest representative of a firm responsible for producing a special chemical may be thousands of miles from the accident scene. Yet a local firm may have an employee who is familiar with the

chemical and with procedures for its containment and cleanup. Such an expert may be reluctant to assist public safety agencies because to do so may make him or his firm liable for some of the damages.

Firms could be protected from liability arising from actions taken in connection with containment or cleanup while acting in good faith, without compensation, under the appropriate jurisdictional authority. If this were done, chemical firms could more prudently participate in public efforts to contain and clean up hazardous chemicals spilled during transport. Such participation could bring important additions to the equipment and expertise available to deal with major incidents or disasters.

c. Transportation Deregulation

None of the witnesses who appeared before your Committee or who were interviewed by Committee members expressed concern about national transportation deregulation having an impact on public safety. Several witnesses said they believe that there would be little change in regulations relating to the transportation of hazardous chemicals.

d. Other Legislative Actions

Two other areas that require legislative attention at the state level are the level of fines that are paid for violation of state safety regulations and the number of personnel made available for enforcement action. These topics are discussed below.

2. Enforcement

A number of studies indicate that an alarmingly high proportion of trucks transporting hazardous chemicals have serious mechanical defects. In one instance, approximately 20 percent of the vehicles inspected during spot inspections were removed from service immediately.

According to the City of Portland's Hazardous Materials Hazard Analysis (15), 44 percent of the trucks inspected are determined unsafe and placed out of service, while the short-lived state police inspection took 48 percent of the trucks inspected off the road. (These proportions are higher than the percentage of unsafe trucks in the spot check because inspectors select trucks that appear older and more poorly maintained.)

As mentioned earlier, 19,000 motor carrier firms operate in Oregon. Many of these consist of an individual who owns and operates a single truck. The owner is often near the limit of borrowing power, and has few reserves to cope with unforeseen problems or economic recessions. Often there may be insufficient funds even for adequate vehicle maintenance.

This problem is compounded because there are not enough law enforcement personnel available to remove unsafe vehicles from the road. The PUC estimates that only 20 percent of the trucks carrying hazardous chemicals are inspected each year. A review of the number of enforcement personnel available leads one to question how the proportion of inspected vehicles could be that high.

A handful of officers is responsible for enforcing the federal, state and local truck safety regulations: three safety investigators from the U.S. Department of Transportation cover the state; six PUC vehicle safety inspectors also have statewide responsibility.

The Oregon State Police have sharply curtailed highway patrols in the three-county metropolitan area. The 1981 state budget cuts deleted nearly $4 million and 112 state police jobs which will, in the words of the State Police Superintendent, "cripple" its trucking law enforcement program, and more cuts appear pending. During the brief period when the State Police truck inspection program was in effect, there was a 30 percent reduction in the number of vehicles forced to use truck escape ramps located along steep grades.

At the local level the picture is no more encouraging. Multnomah County has assigned one officer full-time to inspect trucks carrying hazardous materials. No other local government has done even that.

a. Penalties for Violations

There do not appear to be heavy financial pressures on trucking firms to comply with safety regulations. While maximum fines for violations run to thousands of dollars per violation, your Committee could find little evidence that fines actually levied were anywhere near that amount. None of the enforcement officers, regulators, legislators or court officers contacted by your Committee knew much in detail about levels of fines levied for hazardous materials violations. A Committee member seeking this information found that it could be obtained only by a manual search of the disposed tags.

Enforcement officers indicated that the bail level set for a violation typically ranges from $50 to $350. In the absence of better information, it is reasonable to assume that the fines actually levied are in this order of magnitude.

The enforcement officers contacted said they believe that more complete feedback about the disposition of their citations would help them perform their job better. Your Committee also feels that more accessible information about penalties for hazardous materials violations would help legislators determine whether the legal penalties for violations are appropriate. They would also deter violations, especially if the level of fines assessed for major and negligent violations were closer to the authorized limits.

Most large trucking firms recognize the long-term advantages of continuous vehicle maintenance, but many small firms find it preferable to defer the immediate expense of keeping their trucks operating safely. An immediate and severe economic penalty for negligent violations would help remove the short-term incentive for neglecting maintenance.

The Multnomah County officer responsible for truck safety enforcement told your Committee that he receives calls from hired truck drivers telling him their route and asking that he stop them for an inspection. They know their trucks are unsafe and don't want to drive them. They feel this is the best way to get the truck owners to make repairs.

Your Committee is aware of the heavy burden that government regulation places on small business owners and operators, and is reluctant to recommend adding to that burden. However, the public has a right to expect that trucks operate safely, particularly when they carry a load of dangerous chemicals.

Local and state enforcement could be greatly improved through two simple steps: providing more full-time enforcement officers and levying higher fines. After a few years, as compliance improves, the number of officers assigned to this function could again be reduced. Three to six additional officers in the region would be a major improvement. The number may seem very modest, but it would represent an increase of one to two hundred percent.

A higher level of fine collections could partly offset the costs of stricter enforcement and business license fees could be used to fund the balance. These costs would be passed on to consumers of products made from hazardous chemicals, assuring that the full costs are borne by the ultimate users of the chemicals.

Your Committee received a suggestion that small truckers be prohibited from transporting hazardous materials altogether. After discussion, members agreed that this would be an unreasonable restraint of trade. None of the preceding discussion implies that all small trucking firms operate unsafe equipment. Some small firms who are willing and financially able to meet strict safety standards may transport chemicals more safely than firms with large fleets and hired drivers.

Your Committee also considered requiring all trucks carrying hazardous chemicals to pass an annual mechanical safety inspection. This approach was not recommended for a number of reasons: 1) it would be much more costly than improved on-road enforcement, 2) it would unnecessarily increase costs for the many trucking companies that conscientiously maintain their equipment in safe operating order, 3) it would not be feasible to require inspection of every truck moving through the area in the course of long distance hauls, and 4) the PUC studies show driver error a more common cause of accidents than equipment failure. For these reasons improved on-road enforcement seems more cost effective.

3. Emergency Response

In studies published by the Disaster Research Center at Ohio State University (16, 17, 18), researchers found that for most metropolitan areas in the United States, overall preparedness for chemical disasters is generally either non-existent, poorly developed or merely a paper plan. Responses to acute chemical disasters tend to be ad hoc, crude efforts to apply general disaster plans.

The studies found that organizational conflict occurs more often in chemical than in non-chemical disasters. There are frequent disagreements about approach, both among local organizations responding to the crisis and between community and non-community groups (private firms, state and federal agencies). Such conflicts result from differing degrees of expertise with hazardous chemicals, differing responsibilities and mandates, and differing perceptions of the crisis.

The Ohio State researchers found that preparedness improved emergency time response, coordination, and effectiveness of action. The preparatory thinking, discussion, drills and contacts facilitate more effective action. In fact, the studies found that preparedness often prevents minor incidents from escalating into serious catastrophes.

From this perspective the Portland metropolitan area appears well ahead of most metropolitan areas in its readiness to respond to hazardous materials disasters. Much of the credit for this belongs to the Hazardous Materials Management Project of Multnomah County, follow-up activities by the City, and a well-organized Emergency Medical Services operation. As the City and County work to further strengthen their ability to respond, and as other local jurisdictions become aware of what these jurisdictions are doing, readiness should be improved further.

There are, however, ways that the metropolitan area's readiness can be improved. Some of these are recognized and are currently being addressed; others are not.

a. Regional Planning and Response

There is a need to strengthen the capacity of each jurisdiction to respond to chemical accidents. There is also a parallel need for a regional response capability.

Multnomah County has a $75,000 van that transports special equipment and protective clothing to the scene of an incident, and that serves both as a communications center and disaster command post. Your Committee questions whether another local government in the metropolitan area can justify duplicating that investment. Yet the Multnomah County vehicle is stationed in East County, far from all the "key hazard areas" and all but one of the "key hazard routes" identified in the County's study.

Other special equipment may be needed, and special training is definitely needed, before an adequate level of preparedness is reached. But your Committee feels that better organization and planning for use of the equipment and expertise already available in the region is even more urgent. The geographic boundaries of local cities and counties are too arbitrary, the differences between resources of small and large jurisdictions are too great, and the need for economic use of limited resources is too compelling to permit a "go-it-alone" strategy of disaster response.

Many small cities in the metropolitan area, some with "key hazard routes" running through them, are served by small and even volunteer fire departments and are without resources of their own to respond to major hazardous chemical incidents or a chemical disaster. The Ohio State Disaster Research Center found that most smaller communities are least prepared for disasters and can locally mobilize the fewest resources (17).

This gives rise to two important questions. How can adequate protection be provided to all jurisdictions in the metropolitan area? How can we balance the need to be prepared for chemical disasters against a large number of other potential disasters that are each unlikely but possible; how much of its limited resources should a city or county commit to preparation for chemical disasters, earthquakes, storms, floods, volcanic eruptions, nuclear attack, or other possible disasters?

Local governments can proceed, as they have thus far, working as individual jurisdictions, encouraging communications and cooperation whenever possible but with no framework for coordination. Your Committee, however, sees a need to pull together resources and to set priorities for the entire area.

Your Committee considered the desirability of establishing an umbrella disaster response plan for the metropolitan area, using the special equipment and expertise now in the area, and filling gaps without duplicating expensive resources.

Local elected officials, fire departments, police departments and emergency health care agencies could each designate representatives to develop a plan for coordinated investment and action. These could act with local transportation and chemical companies, and with private emergency organizations like the Red Cross to set up a system for classifying the severity of chemical actions and to define the appropriate response for each. A plan, which could be formally adopted by local City Councils and County Commissions, could indicate criteria for deciding which incidents can be handled by the local jurisdictions, which will require regional action, and which need an all-out response involving local, state and federal cooperation. The Puget Sound Study (14) saw a similar need for regional action and proposed a multi-tiered response capability in that area.

If such a course of action is followed, first priority should be given to getting equipment and training that would be useful in a number of potential disaster situations. Evacuation planning and accommodation of evacuees should be near the top of the list.

One witness, asked his opinion about such a regional effort, expressed concern that a jurisdiction with specialized equipment might keep the equipment for a minor local incident rather than make it available for a simultaneous major incident in another part of the region. Your Committee feels that a well designed regional plan adopted by all jurisdictions in the area could set clear procedures and priorities, and not depend upon on-the-spot decisions for resource allocation.

There are many kinds of disasters, each unlikely and each requiring expensive equipment and training for complete preparation. Rather than duplicating resources within the area, jurisdictions must give priority to regional capabilities and needs.

Equipment and training that can be useful in a wide range of disastrous circumstances should be given priority to those useful for a single type of disaster. For example evacuation readiness, an important strategy for floods, earthquakes, and nuclear accidents as well as for chemical disasters, should probably be a higher priority than specialized equipment that is useful only for chemical accidents.

In any event, your Committee senses that thorough training for firefighters who will be responsible for responding to chemical emergencies may be, for most metropolitan jurisdictions, a greater need than specialized equipment. This would be especially true if a regional plan were adopted formalizing procedures for making Multnomah County's equipment available elsewhere in the region.

It should be noted that your Committee is not the first to be concerned with this issue. In 1979 the City Club adopted a report recommending adoption of a disaster response plan for the Portland metroplitan area (19).

b. Simulated Evacuation Exercises

In the previous section evacuation readiness was cited as being important for chemical disasters, as well as for other types of disasters. While many local jurisdictions have written evacuation plans, your Committee has seen no evidence that many plans have had even a single test through simulation. The Ohio State University research finds that such exercises are effective in identifying and resolving potential problems, especially when the disaster extends beyond the borders of a single jurisdiction.

c. Selecting Routes for Transportation of Hazardous Materials

The U.S. Department of Transportation has published guidelines for local governments to use in selecting preferred routes for transportation of hazardous materials in order to minimize public exposure to risk of chemical accidents. Local officials can designate routes that pass through areas of lower population density, that avoid intersections with higher accident rates, and that move over railroad tracks using overpasses rather than ground level crossings.

In its Hazardous Materials Hazard Analysis (15) the City of Portland indicates its intention to identify preferred routes for shipment of hazardous materials.

d. Lack of Information about Hazardous Materials Incidents in Other Areas

In closing, your Committee is moved to comment on the difficulty in getting reliable information about hazardous materials incidents and the actions taken by other local governments in response to chemical disasters. None of the many federal agencies involved in the transportation of hazardous chemicals has provided a clearinghouse function that would help local communities learn from each other's experience.

This lack of information is not a serious problem for major cities and counties. They can assign professional staff full time to get all necessary data. Smaller communities may have difficulty getting the basic facts they need to take timely action.

Training programs, like those offered by Multnomah County and the railroads, are very helpful and meet part of this need. But more information could be made available nationally by compiling brief 1- or 2-page "case studies" describing hazardous materials incidents and their impacts, and listing actions taken as a result of the experience. Such summaries would be useful to local governments in designing or evaluating their own readiness programs.

Your Committee considered whether this function should be provided by the federal government or by a private sector entity. In view of the difficulty experienced in obtaining useful information from U.S. Department of Transportation channels and the clear and concise information available from private sources, such as CHEMTREC, your Committee feels industry groups can better provide such information.

IV. CONCLUSIONS

Based on the considerations presented and discussed above, your Committee has reached the following conclusions:

1) Compared to other risks faced by Portland metropolitan area residents, the risk of injury or death from a hazardous materials accident is very low. However, in view of the severity of the worst chemical disasters, careful attention should be given a program of prevention and emergency response.

2) At present and for the immediate future, the danger to public safety from transportation of radioactive materials and chemical wastes appears far lower than the risk from more common commodities, such as gasoline, liquefied petroleum gas, anhydrous ammonia or chlorine, for example.

3) Private firms and industry organizations have established several programs to improve public protection from hazardous materials accidents. Examples include emergency telephone information on the properties of dangerous chemicals and training programs for public safety agency personnel. Such programs appear cost effective for both the public and industry, and reduce the need for government regulatory action.

4) Existing laws and regulations that govern the transportation of hazardous materials appear, for the most part, adequate for public protection. Federal and state regulators appear to have been sensitive to need for improvements, and have acted promptly as the need for change has become apparent.

5) Transportation deregulation does not appear to weaken regulatory rules designed to protect the public from chemical transportation hazards.

6) There is an obvious and serious gap between the high standards for public protection stated in chemical transportation regulations and the actual enforcement actions taken. In a word, enforcement is inadequate, especially enforcement of trucking regulations.

7) There likewise appears to be a gap between the high maximum fines provided by law for violations and the fines actually imposed, though the inadequate information available did not permit confirmation of this impression. Stiffer fines for negligence could prove effective in improving industry compliance with safety regulations.

8) Better organization of existing information about fines levied by courts for violations of hazardous materials transportation laws and regulations would be useful to industry officials, regulators, legislators and enforcement officials.

9) No mechanism currently exists to assure that truck drivers receive adequate training in the physical and chemical properties of hazardous materials and in emergency procedures when spills occur.

10) Multnomah County and City of Portland officials appear aware of the problem of chemical transportation disasters and are taking effective steps to protect the public. Other jurisdictions should review these actions and consider actions appropriate for their public safety agencies.

11) The Portland metropolitan area lacks a formal program to respond to disasters on a coordinated regional basis. There are many trained individuals and resources scattered among localities, agencies and firms, but there is no regional structure or plan for organized and concerted action.

12) Nationally, there is a lack of a central source of information about chemical disasters and actions that local governments have taken in response to those that have occurred. Such a resource would be especially useful to small cities and counties.

V. RECOMMENDATIONS

Based on the information your Committee has gathered and considered, the following actions would help protect the public from hazardous chemical accidents:

1) State of Oregon laws and enforcement programs should be revised to eliminate any distinction between the transportation of hazardous wastes and of other categories of hazardous materials. Regulation should be based on the physical and chemical properties of a material, not on its history or intended use.

2) Court administrators should better organize information relating to fines that have been levied for hazardous materials transportation violations. Such organization would make the information more accessible and more comprehensible than is now the case.

3) The Oregon legislature should enact "Good Samaritan" legislation for firms with expertise and special equipment to contain or clean up chemical spills. A firm that is not responsible for causing a hazardous chemical accident and that voluntarily assists in the response effort, under the direction of public safety officials, should not become liable for damages resulting from the assistance it provides.

4) More staffing is needed for hazardous materials regulation enforcement in the metropolitan area, especially for enforcement of trucking safety regulations. Both state and local staffing should be expanded for this purpose. A doubling or tripling of existing enforcement levels can be provided at very moderate cost.

5) City, county and fire district officials in the Portland metropolitan area should jointly develop and adopt a regional program for disaster response.

6) While a need exists for equipment and personnel training useful exclusively for chemical disaster response, highest priority should be given equipment and training that will be useful for a wide range of possible disasters. Evacuation readiness is an example of such preparedness, and should be strengthened throughout the region.

7) Over the next few years, local jurisdictions should simulate major hazardous chemical spill incidents in order to improve readiness. These simulations should include (1) incidents requiring concerted action by several local jurisdictions, (2) incidents requiring evacuation of residents in an area, (3) incidents occurring in the vicinity of a major concentration of people, such as near the Memorial Coliseum, and (4) two incidents occurring simultaneously in different metropolitan jurisdictions.

8) The City of Portland should implement its plan to set routes for industrial shipments of hazardous materials, and other jurisdictions should evaluate the appropriateness of such an action in their area.

9) State and local governments should monitor and encourage private sector initiatives to improve public protection from hazardous materials accidents.

10) Chemical and transportation industry firms and trade associations should expand and strengthen their existing programs for preventing and responding to chemical transportation accidents. Specific actions that are needed include:

-- Continuation and expansion of the existing programs by railroads to train railroad crews, local fire fighting personnel, and other emergency service workers.

-- Quick implementation of the truck driver certification proposed by the Oregon Trucking Associations and expansion of the program to provide certification for hazardous cargos.

-- Establishment of an information center providing case histories of local chemical disasters and actions taken in response, to improve the materials available for training emergency response personnel, particularly from smaller jurisdictions.

-- Participation in regional disaster planning, including preparing an inventory of chemical emergency response equipment and expertise available in the region from private sources.

11) The cost of a higher level of safety enforcement and better personnel training should be borne by chemical manufacturers and transporters through business licenses and fines for violations. These costs can be passed on to the consumers of products that use hazardous chemicals in their manufacture.

Respectfully submitted,

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APPENDIX A
PERSONS INTERVIEWED

David Astle, Assistant Commissioner, Rail-Air Program, Office of the Oregon Public Utility Commissioner
Jeff S. Asay, General Attorney, Union Pacific Railroad
Mike Ballan, Budget Analyst, Multnomah County
Dr. Jack Battallia, former Chairman, Committee for Medical Emergency Services, Multnomah County Medical Society
Xerpha Borunda, formerly Department of Environmental Services, Multnomah County
Al Carr, former Director, Emergency Medical Services, Multnomah County
Jane Cease, Chair, Transportation Committee, Oregon State House of Representatives
Charles Davis, Controller, Electro Scientific Industries, Inc., former Oregon Public Utility Commissioner
R. A. Davis, Division Chief Dispatcher, Union Pacific Railroad
Carroll Fuller, Personnel and Safety Director, Widing Transportation, Inc.
Dr. Gary Gates, Director of Nuclear Medicine, Good Samaritan Hosptial
Paul Graham, Assistant Attorney General, Oregon Department of Justice
Paul R. Henry, Supervisor of Safety, Motor Carrier Program, Office of Oregon Public Utility Commission
Lea Jenny, formerly Task Force Administrator, Interim Committee on Transportation, Oregon State Senate
Carol Kelsey, Staff Director, Transportation Committee, Oregon State House of Representatives
James Klum, Assistant Chief, Portland Fire Bureau
George Kraus, Northwest Public Relations Manager, Sourthern Pacific Transportation Company
Myra Lee, Office of Emergency Management, Multnomah County
Ken A. Malmquist, Hazadous Materials Specialist, Multnomah County Fire District 10
Dr. Don McNeil, Chief, Emergency Room Services, Good Samaritan Hospital
Michael A. Meredith, Manager, Oregon Trucking Associations, Inc.
Ross Neely, Officer, Portland Police Bureau, Traffic Division
Frank Ostrander, Assistant Attorney General, Oregon Department of Justice
Richard Reiter, Hazardous Wastes Specialist, Oregon Department of Environmental Quality
B. C. Reynolds, Hazardous Materials Officer, Multnomah County Division of Public Safety
Jim Rice, Engine Officer and Lieutenant, Engine 4, Portland Fire Bureau
Bob Robison, Planner, City of Portland Office of Emergency Services
Penny Roe, Hazardous Materials Grant Coordinator, Office of Emergency Management, Multnomah County
Ruth Shoepe, Coordinator, Emergency Planning, Washington County
David Wade, District Court Administrator's Office, Multnomah County
Dean L. Whitely, Special Agent, Union Pacific Railroad
Lewis Wiedewitsch, Plant Chemist, Pennwalt Corporation
John Williams, Superintendent, Oregon State Police

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APPENDIX B
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APPENDIX B
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NOTES