

AN ABSTRACT OF THE THESIS OF

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David C. Lawson

Current evidence suggests that development and industrialization has engendered the manufacture and use of chemical products which may harm human health and degrade the environment. One of the most pressing environmental needs since World War II is perhaps the issue of how society either manages or mismanages hazardous wastes. The purpose of this study was to assess current management and disposal practices among Small Quantity Generators (SQG) and Conditionally Exempt Generators (CEG) in Benton County, Oregon. Study objectives included identification of the number of registered and nonregistered SQGs and CEGs, identification of the types of businesses, estimation of the quantities of hazardous wastes produced and used, and assessment of current levels of awareness among generators of hazardous wastes of pertinent regulations and safe environmental practices. A survey instrument was used to collect data during in-person interviews with representatives from a total of 48 businesses in Benton County.

Findings indicated that the majority of both the registered (70%) and nonregistered (72.2%) businesses performed cleaning and degreasing activities at their business locations. Other activities, in order of importance, included fabrication, retail sales, manufacturing, and painting. With respect to the types of wastes produced or

used, the majority of the respondents indicated the production or use of waste oils and aqueous liquids. Similarly, the majority of registered businesses (96.7%) indicated that they provided employee training in hazardous waste management. Asked to identify their method of disposal, both SQG and CEG respondents listed return to supplier, recycle on-site, treatment, storage and disposal facilities, garbage/landfills, evaporation, and sales of wastes, in order of importance, as their preferred method of disposal. Most of the respondents indicated that their principal recycled wastes were solvents and oils, followed by refrigerated gases and other products.

The study also considered the influence of state and federal laws and regulations as applied to hazardous wastes, and whether or not these administrative rules created a problem for Benton County businesses. In contrast to prior studies which have indicated that among most businesses federal and state laws and regulations were regarded as too complex and inflexible, or who complained that lack of access to information or lack of time to remain informed served as significant constraints upon their ability to comply, the majority of Benton County businesses indicated "no problem" with the administrative rules.

The conclusion of the study was that an overall comparison of Benton County SQGs and CEGs does not provide clear and convincing evidence that nonregistered businesses, by virtue of the regulatory exemption, practice illegal hazardous waste disposal and management procedures to a greater degree than the more fully regulated registered business.

A Descriptive Study of Current Practices of Hazardous Waste Management
Among Identified Small Quantity Generators in Benton County

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TABLE OF CONTENTS

<u>Chapter</u>	<u>Page</u>
1 INTRODUCTION	1
Identification of Hazardous Wastes	3
Categories of Hazardous Waste Generators and Regulatory Require- ments	4
Need for the Study	5
Statement of the Problem	6
Definition of Terms	7
Limitations of the Study	8
Summary	9
2 REVIEW OF RELATED LITERATURE	11
Regulation of Small Quantity and Conditionally Exempt Generators of Hazardous Wastes	11
Principal Regulatory Authority	12
State Authority Relating to Hazardous Wastes	13
Oregon Regulatory Authority for Small Quantity or Conditionally Exempt Generators	14
Extent of the Problem of the Illegal Disposal of Hazardous Wastes by Small Quantity Generators	18
Reasons for Small Quantity Generator Illegal Disposal Practices	20
Control of Hazardous Wastes Produced by Small Quantity or Condi- tionally Exempt Generators	21
Overall Extent of Hazardous Waste Disposal Problems and Manage- ment Practices	23
Hazardous Waste Management Chart	29
Summary	31
3 METHODS AND PROCEDURES	33
Data Collection	33
Development of the Instrument	34
Analysis of the Data	35
Summary	36
4 RESULTS AND DISCUSSION	38
Description of the Respondents	38

TABLE OF CONTENTS (continued)

<u>Chapter</u>	<u>Page</u>
Responses to the Questionnaire	39
Question 1	39
Question 2	43
Question 3	48
Question 3a	50
Question 4	52
Question 5	56
Question 5a	57
Question 6	59
Question 7	63
Question 8	66
Question 9	77
Summary	81
5 SUMMARY, CONCLUSIONS, AND RECOMMENDATIONS	82
Summary	82
Conclusions	84
Recommendations	87
Public Policy	88
Monitoring and Enforcement Strategies	89
Public Education	90
Continuing Research	92
REFERENCES	93
APPENDICES	99
A Oregon State Fire Marshal Hazardous Substance Employer Survey	99
B EPA Notification of Hazardous Waste Activity	102
C Uniform Hazardous Waste Manifest	105
D Letter of Introduction	108
E Current Practices of Hazardous Waste Management Among Small Quantity Generators in Benton County	110

LIST OF FIGURES

<u>Figure</u>	<u>Page</u>
4.1 Type of Activity by Percentage of Respondents	40
4.2 Types of Waste Produced by Percentage of Respondents	43
4.3 Quantities of Hazardous Waste Produced by Type, Median Gallons per Month	44
4.4 Provision of Hazardous Waste Training to Employees	49
4.5 Type of Training Provided to Employees	51
4.6 Methods of Disposal in Benton County	53
4.7 Transportation of Hazardous Wastes to a Disposal Facility	57
4.8 Administrative Requirements for Use of the Transportation Procedure . .	58
4.9 Hazardous Waste Products Recycled in Benton County	60
4.10 Median Quantities of Hazardous Wastes Recycled Per Month	62
4.11 Interest Expressed in the Waste Reduction and Management Program . .	64
4.12 Problems With State Regulation	67
4.13 Remaining Informed About Regulations	68
4.14 Technical Difficulty of Determining Status of Hazardous Wastes	69
4.15 Costs of Determination of Status of Hazardous Wastes	70
4.16 Problems of Access to Hazardous Waste Information	71
4.17 Problem of Identifying Transporters With Permits	72
4.18 Problem of Identifying TDF	73
4.19 Costs of Disposal at a TDF	74
4.20 Costs of Consultant Advice	75

LIST OF FIGURES (continued)

<u>Figure</u>	<u>Page</u>
4.21 Problem of Availability of Technical Experts Within Organization	76
4.22 Correct Responses to Statements Regarding Government Hazardous Waste Policies	78

LIST OF TABLES

<u>Table</u>	<u>Page</u>
2.1 Household Waste Management Chart	30

A Descriptive Study of Current Hazardous Waste Management Practices
Among Identified Small Quantity Generators in Benton County, Oregon

CHAPTER 1
INTRODUCTION

Since World War II, growth in national economies and industries has resulted in new products, such as those based upon the use of plastics, and the manufacturing and use of several chemicals, each of which has the potential to harm human health or to degrade the environment. With this level of economic growth and the increased use of chemical products, questions have arisen concerning the manner in which hazardous waste disposal is either managed or mismanaged. A few characteristic examples of neglectful practices in this area of concern are as follows:

- Illegal disposal is rampant among small quantity generators (SQG). Enforcement officials have identified most of the large quantity generators, but have registered only a small percentage of the SQG. Most of the SQG (e.g., dry cleaners or auto service and repair shops) are located close to residential neighborhoods. According to a recent survey, 70 percent of the SQGs are located in metropolitan areas close to large population concentrations (Association of Bay Area Governments [ABAG], 1987; Schwartz & Pratt, 1990).
- In Clackamas County, Oregon, 1313 counts of criminal charges were filed against a resident of Welches for the illegal disposal of hazardous wastes on residential property (Hazardous Waste Violations Net Criminal Charges, 1992).

- Oregon State University (OSU) was recently fined for illicit waste storage practices. Upon inspection of the OSU campus in January, 1992, the Oregon Department of Environmental Quality (DEQ) found several violations, including the following: storing hazardous waste without a hazardous waste storage site permit; and shipping hazardous wastes off-site without the use of a hazardous waste manifest. As a result, the DEQ issued OSU a civil penalty of \$2,500 for violations of hazardous waste regulations (Kelley, 1992).

Since the organization of the petrochemical industry in 1940, more than 65,000 chemicals, many of which are dangerous to handle and/or store, have been manufactured for use in medicines, solvents, paints, adhesives, and numerous other products. Consumers may or may not be aware of the health or environmental effects of these products. According to the U.S. Environmental Protection Agency (EPA), 543 billion pounds of toxic waste are generated each year in the United States, or more than one ton per person per year. Of that amount, 135 billion pounds are discharged annually into rivers, lakes, and streams (LaVo, 1988). With dwindling landfill space and high clean-up costs, current hazardous waste management and disposal practices may lead to severe health and environmental problems within this decade, and certainly by the opening of the 21st century.

Due to public pressure and the obvious dangers of hazardous waste management, the U.S. Congress began to pass environmental legislation at a rapid pace, beginning with the Resource Conservation and Recovery Act of 1976 (Phifer & McTigue, 1988). This enactment was in part an amendment of the Solid Waste Disposal Act of 1965, and it was followed by the Hazardous and Solid Waste Management Act in 1984. These three acts are jointly and commonly referred to as the RCRA, which consists of three major programs or the Subtitles C, D, and I (Wagner, 1990):

- 1) Subtitle C: Regulation of hazardous wastes, serving as the basis for the development of the hazardous waste regulations that have been promulgated by the EPA;
- 2) Subtitle D: Regulation of nonhazardous solid wastes; and
- 3) Subtitle I: Regulation of underground storage tanks that hold petroleum products and hazardous substances.

Thus, any person who generates, transports, or manages hazardous wastes is subject to Subtitle C of the RCRA. In general, the RCRA empowered the EPA to regulate the disposal of hazardous wastes and the promulgation of necessary regulations.

Identification of Hazardous Wastes

To identify hazardous wastes, the EPA (U.S. Environmental Protection Agency [EPA], 1989) has developed identification criteria and promulgated a list of those wastes that:

- a) cause, or significantly contribute to, an increase in mortality, or an increase in serious irreversible or incapacitating illness, or
- b) pose a potential hazard to human health, or the environment when improperly treated, stored, transported, or otherwise managed.

A waste is classified as hazardous if it exhibits either of the following four characteristics: ignitability, corrosivity, reactivity, or extraction procedure (EP) toxicity. A waste is also classified as hazardous if it is a "listed" hazardous waste. When wastes contain significant concentrations of hazardous waste constituents, then the EPA assumes these wastes to also be hazardous, thus listing them in the U.S. Code of Federal Regulations (CFR) (1991). The CFR contains the current versions of all promulgated regulations and Title 40 of the CFR lists the regulations prescribed by the EPA (Wagner, 1990).

Categories of Hazardous Waste Generators and Regulatory Requirements

In general, there are three categories of hazardous waste generators, each of which is subject to different regulatory requirements (EPA, 1986).

- 1) Fully regulated generators (i.e., larger companies), classified as such if in one calendar month they:
 - produce 2,220 or more pounds of hazardous waste,
 - produce more than 220 pounds of spill clean-up debris containing an acutely hazardous waste, or
 - accumulate, at any time, more than 2.2 pounds of acutely hazardous waste on-site;
- 2) Small quantity generators, classified as such if in one calendar month they:
 - produce between 220 and 2,200 pounds of hazardous waste,
 - produce 2.2 pounds or less of acutely hazardous waste,
 - produce more than 220 pounds or less than 2,200 pounds of spill clean-up debris containing a hazardous waste, or
 - accumulate, at any time, up to 2,200 pounds of hazardous waste on-site; and
- 3) Conditionally exempt small quantity generators, classified as such if in one calendar month they:
 - produce 220 pounds or less of hazardous waste,
 - produce 2.2 pounds or less of acutely hazardous waste,
 - produce 220 pounds or less of spill clean-up debris containing an acutely hazardous waste, or
 - accumulate, at any time, up to 2,200 pounds of hazardous waste on-site.

Need for the Study

The issue of hazardous waste management and the disposal practices of the SQG and the conditionally exempt SQG has been identified as a priority item by the Benton County (Oregon) Environmental Issues Task Force (personal communication, July 1991). Thus, the underlying reasons which provide the need for this study are as follows:

- 1) According to the director of the Benton County Environmental Health Division (Bob Wilson, personal communication, April 1992), SQGs in Benton County receive no services from the Oregon DEQ or from either county or local government, with the exception of periodic workshops offered by these agencies on waste reprocessing procedures. It is the director's position that there is a need to assess current management and disposal practices among SQG in Benton County.
- 2) Benton County businesses have not been surveyed regarding hazardous waste management and disposal practices and procedures.

As indicated in the introductory remarks, officials believe that illegal disposal methods are rampant among the SQG, many of which are located adjacent to or within residential neighborhoods. Most of the illegal dumping is done through sewerage systems or on the ground, or by merely storing these wastes for indeterminate periods. The improper management and disposal of hazardous wastes, or the release of toxic chemicals into the air or water or onto the land, may have serious health and environmental consequences. For example, exposure to toxic substances may be related to the factors of the increase in cancers, miscarriages, birth defects, leukemia, and allergies (Ouelette, 1990; Schnaiberg, 1992).

The study conducted by Schnaiberg (1992) reveals that increasing revelations of risks arising from the growing use of chemicals in industry and the resulting ac-

cumulation of toxic wastes have heightened awareness among diverse communities of the possible effects of air and water pollution as well as the loss of habitat and open space. According to Baumol and Mills (1984), toxic wastes may be among the most serious of the emissions problems besetting society. Thousands of firms, many of which are very small businesses, produce minute amounts of waste that are yet lethal enough to cause damage. Furthermore, numerous producers and/or users of toxic substances remain unknown to relevant governmental agencies. Thus, the need for the study is designed to identify businesses that produce hazardous wastes and to assess their current management and disposal practices.

Statement of the Problem

The purpose of the study is to assess current management and disposal practices among SQGs and conditionally exempt SQGs of hazardous wastes in Benton County, Oregon, and to provide appropriate advice to the Benton County Environmental Health Division and the Benton County Environmental Issues Task Force. Thus, the following objectives were developed:

- 1) To identify how many registered and unregistered small quantity and conditionally exempt generators there are who produce hazardous wastes in Benton County.
- 2) To identify the types of businesses represented by small quantity and conditionally exempt generators of hazardous wastes in Benton County.
- 3) To identify the specific types of hazardous wastes represented by these generators in Benton County.
- 4) To identify the quantities of hazardous wastes produced by these generators in Benton County.
- 5) To assess current methods of managing hazardous wastes.

- 6) To assess the current levels of awareness among generators of hazardous wastes regarding pertinent regulations and safe environmental practices.

Definition of Terms

The following terms are defined for use in this study:

Acutely hazardous waste: Wastes that the EPA has determined to be so dangerous in small amounts that they are regulated in the same way as larger amounts of other hazardous wastes.

Corrosive: Hazardous wastes that dissolve metals or burn the skin (i.e., waste rust removers, waste battery acid).

Generator: The person or institution who actually produces the waste or who first causes the waste to become subject to the Resource Conservation and Recovery Act.

Hazardous waste: Any waste identified as an RCRA hazardous waste (i.e., by characteristics, or as listed), as well as any Part 261 material.

Ignitable: A liquid that has a flash point of less than 140°F or solids that can spontaneously combust through friction, absorption, or loss of moisture.

Reactive: Hazardous waste that is unstable or which undergoes rapid or violent chemical reactions with water or other materials (e.g., cyanide plating wastes, waste bleaches).

Resource Conservation and Recovery Act (RCRA): A series of laws passed by federal legislation which require the executive branch to develop and implement regulations governing the management of hazardous wastes.

Solid waste: Any solid, liquid, or contained gaseous material that is no longer in use; these wastes are either recycled, thrown away, or stored until the producer has a sufficient quantity to treat or to otherwise dispose with.

Waste: Common household trash, complex materials in industrial wastes, sewage, sludge, agricultural residues, mining refuse, or wastes from hospitals or laboratories.

Limitations of the Study

1. The scope of this study is limited to a list of Benton County (Oregon) small quantity and conditionally exempt hazardous waste generators registered by the Oregon DEQ, as well as producers who are not registered by the Oregon DEQ.
2. Information on currently registered businesses was extracted from a list provided by the Hazardous Waste Division of the Oregon DEQ, Portland, Oregon (personal communication, March, 1992).
3. Information on businesses currently unregistered was obtained from the Oregon Fire Marshal's Office (personal communication, June 1992).
4. Since data collection procedures involved in-person interviews with all registered and unregistered small business hazardous waste generators in Benton County (Oregon), only those businesses whose addresses were indicated on the DEQ/Fire Marshal lists were included for the purposes of this study.
5. It should be noted that business operators are not legally obligated to register with the DEQ. However, small businesses that generate a certain amount of waste are expected to register. Thus, the data gathered was limited to those businesses practicing voluntary compliance (DEQ, personal communication, April 1992).

6. The current study was restricted to the description of existing hazardous waste management and disposal practices in Benton County, Oregon.

7. In-person interviews with small business owners, managers, or assistant managers were conducted by the investigator on the business premises of existing business establishments, or at locations agreed upon by the investigator and the respondent. The interviewer cannot validate the authenticity of the respondents' responses insofar as they are related to their current business practices.

8. In conducting this study, most of the respondents indicated that their responses concerning the amounts of waste produced or disposed was based upon best-guess estimates, and that records of such waste quantities were neither kept nor maintained.

Summary

It is believed that one of the obvious areas of neglect in the development and evolution of modern industrialized societies has been the manner in which hazardous waste disposal is either managed or mismanaged. Several examples of neglectful practices have been provided in support of this claim. As a result, the U.S. Congress passed the Resource Conservation and Recovery Act of 1976, which included three major programs (i.e., Subtitles C, D, and I). The EPA, as authorized by this and other enabling acts, has developed identification criteria for hazardous wastes, lists of which have been included in the U.S. Code of Federal Regulations. Three categories of hazardous waste generators, including fully regulated, small quantity, and conditionally exempt small quantity generators have been classified by the EPA, based upon the amounts and characteristics of the chemicals used or produced.

The purpose of the study, subject to the stated limitations and based upon the results of a survey conducted in Benton County (Oregon), was to assess current man-

agement and disposal practices for hazardous wastes among Benton County SQGs and CEGs. Assessment procedures included: Identification of registered and non-registered businesses, identification of specific types and quantities of hazardous wastes generated, and the assessment of current levels of hazardous waste awareness regarding pertinent regulations and safe environmental practices.

CHAPTER 2

REVIEW OF RELATED LITERATURE

Prior to 1984, small quantity generator (SQG) waste was not regulated as a hazardous waste (Dana Duxbury & Associates, 1989). However, since that date the EPA policy has been to bring the SQG into regulatory compliance. At the state level, regulatory procedures were implemented through the EPA information dissemination process, through voluntary compliance, and by means of enforcement actions directed at violations. At the local level, community organizations and local governments were encouraged to undertake efforts to promote regulatory compliance and the improvement of waste management procedures. In this chapter, federal, state, and local regulatory authority and policies with regard to SQG are reviewed, as well as reasons for and the extent of the problem of the illegal disposal of hazardous wastes as well as the means to control hazardous waste disposal among this classification.

Regulation of Small Quantity and Conditionally Exempt Generators of Hazardous Wastes

To address the issue of small quantity hazardous waste generators as well as other solid waste concerns, the U.S. Resource Conservation and Recovery Act (RCRA) was enacted in 1976 and subsequently amended in 1984 (EPA, 1986a, 1986b). There are three categories of hazardous waste generators: fully regulated, small quantity generators, and conditionally exempt small quantity generators. Each of these categories is subject to differing regulatory requirements, and rules have

been promulgated to implement the federal policies. The current investigation is focused only upon the latter two categories, to the exclusion of consideration of businesses classified as large or fully regulated generators of waste.

Principal Regulatory Authority

This initial federal legislation was subsequently reinforced by the implementation of state and local regulatory authority. Appropriate federal and state laws relating to hazardous substances, which may be used as a reference guide for the material considered in this study, have been reviewed by the Iowa Department of Water, Air and Waste Management (1985). The principal programs and regulatory areas included under the authority of each of these acts is summarized below.

- 1) RCRA (40 C.F.R. 260-265, 270): A comprehensive program including the classification of hazardous wastes; a cradle-to-grave manifest system; standards for generators, transporters and treatment, storage, and disposal (TSD) facilities; a permit program for TSD facilities; and authorization of the initiation of state programs in lieu of federal regulatory authority.
- 2) Comprehensive Environmental Response, Compensation and Liability Act (CERCLA, 40 C.F.R. 300): Reporting sites and releases; government cleanup of sites; establishment of a response fund; fees for disposal of crude oils and 42 chemical feedstocks; and broadened liability provisions.
- 3) Federal Insecticide, Fungicide, Rodenticide Act (FIFRA, 40 C.F.R. 150-189): Protect consumers from ineffective products; requirement for registration prior to sale; EPA inspection of producers and of marketplaces; EPA seizure of adulterated, misbranded, or unregulated pesticides; and EPA tolerance levels for pesticide residues.

- 4) Clean Air Act (National Emission Standards for Hazardous Air Pollutants, 40 C.F.R. 61): Requires the EPA to list pollutants, establish pollutant standards, approve construction of new sources of pollutant control.
- 5) Clean Water Act (Section 307, Toxic Pollutants; Section 311, Hazardous Substances, respectively, 40 C.F.R. 104, 129, 401 and 40 C.F.R. 116, 117, 125): In Section 307, the EPA lists toxic pollutants, whereas Section 311 prohibits unpermitted discharge into navigable waters; lists hazardous substances; requires notice of discharge within 24 hours.

State Authority Relating to Hazardous Wastes

An example of the implementation by state regulatory authorities of some of the federal codes is as follows (Iowa, Department of Water, Air and Waste Management, 1985):

- 1) Hazardous waste management programs and amendments (Rules 900, Chapter 14, I.A.C.): Comprehensive regulatory program which includes classification of hazardous wastes; cradle-to-grave manifest system; standards for generators, transporters and TSD facilities; provision for land condemnation by the Executive Council for TSD facilities, including leasing of condemned sites to private operators.
- 2) Siting of hazardous waste facilities (Rules 900, Chapter 150 I.A.C.): Establishment of site license requirements; creation of siting boards; overriding of local authority; no provision for federal authority.
- 3) Superfund (CERCLA): Establishes that persons having control over hazardous substances are strictly liable to the states; sets limits of liability; creates hazardous waste remedial fund for cleanup of hazard-

ous conditions and abandoned or uncontrolled sites; sets fees for hazardous waste disposal; and establishes registry of abandoned or uncontrolled sites.

Oregon Regulatory Authority for Small Quantity or Conditionally Exempt Generators

Insofar as the federal regulatory programs were in large part directed toward the fully regulated category of businesses, SQG were provided with relatively little assistance or technical advice on issues of waste management. However, in the State of Oregon various support programs and legislative efforts and policies have been undertaken to increase assistance to SQG to assure compliance with hazardous waste regulation and management practices.

The 65th Legislative Assembly in Oregon determined that conditionally exempt generators (CEG) did not have access to economically feasible options for the management of hazardous wastes. As a result, Oregon HB-3515 directed the Oregon DEQ to provide the Assembly with a report on current hazardous waste management and funding problems and/or options. The subsequent report (Oregon, Department of Environmental Quality [DEQ], 1990) highlighted the following principal obstacles to implementation of federal legislation for this category of producer: lack of disposal options, costs, complexity of the rules, issues of liability, and lack of incentives. The report also outlined recommendations and the steps to be taken toward a fuller understanding of the problems of CEG.

Legislative proposals which had passed into law were subsequently reviewed in the Oregon DEQ newsletter (Legislative Proposals Update, 1991) as follows:

- 1) Senate Bill 241 on hazardous wastes management: Intended to fund a waste management assistance program for Oregon small businesses

through an increase in hazardous waste disposal fees. Key program elements include workshops and seminars for industry specific groups, on-site environmental assessments, and a toll-free hotline and sponsorship of model demonstration projects.

- 2) House Bill 2246, waste tire legislation: Clarifying regulation of tire fences and other claimed beneficial uses of waste tires; requires waste tire generators to provide waste tires only to permitted waste tire carriers.
- 3) Senate Bill 184, enforcement enhancement: Modifies current requirement of five days advance notice prior to civil penalty assessments for certain violations; adds "hazardous substance" to 1989 oil spill legislation authorizing DEQ assessment of civil penalties.

To help small businesses understand the requirements of the Oregon law on New Toxic Use Reduction and Hazardous Waste Reduction (House Bill 3515), the DEQ has instituted workshops throughout Oregon. These events were held in Portland, Medford, Eugene, Beaverton, Bend and in several other locations (Hazardous Waste Technical Forum, 1992). This approach was based upon the theory that pollution prevention is the best approach for most handlers of hazardous materials and generators of hazardous wastes. Thus, the Oregon New Toxic Use Reduction Act encompassed the following suggestions in its workshops to assist businesses with waste management problems (DEQ, 1991):

- 1) Inventory Management:
 - a) Prepare inventories of all hazardous chemicals used;
 - b) Purchase fewer toxics and more nontoxic chemicals; and
 - c) Purchase only what is needed.

- 2) Process Modification:
 - a) Modify processes to reduce hazardous emissions and waste generation (e.g., reduce the flow of water in cleaning operations, replace water cleaning with mechanical methods, or install closed-loop systems for recycling processed waste waters or waste streams);
 - b) Improve the efficiency of equipment operation; and
 - c) Perform regular preventative maintenance on equipment.
- 3) Volume Reduction:
 - a) Don't mix hazardous with nonhazardous wastes; and
 - b) Physical or chemically treat wastes to make them nonhazardous.
- 4) Recovery and Reuse:
 - a) Recover and recycle hazardous wastes on-site;
 - b) Reuse wastes in the process; and
 - c) Participate in a waste exchange.

With House Bill 3515 passed into law as the New Toxics Use Reduction and Hazardous Waste Reduction Act, Oregon was among the first of the states to mandate pollution prevention planning procedures. The state's comprehensive policy approach toward industrial chemical usage, directed at the reduction of the adverse effects of chemical uses, is another example of successful policy implementation, based upon the following:

- Pilot collection event for CEG and policy decisions on the status of used oil management (WRAP Workshops Continue, 1991).
- Conduct of public hearings on proposed rules for underground storage tanks; financial assistance and rules on tank leakage issues (UST Update, 1991).

- Conduct of statewide training workshops on the Oregon "front end" process, rather than reliance on traditional "end of the pipe" approach (Hazardous Waste Technical Forum, 1992, April).
- Establishment of the "Governor's Toxic Use Reduction Award" program to encourage waste reduction, as well as to recognize businesses and public or private organizations with exemplary reduction programs (Hazardous Waste Technical Forum, 1992, May).

The Oregon Hazardous Substance Survey, conducted by the Office of State Fire Marshal, Bureau of Hazardous Materials (Rodia, 1990), represents another policy program implementation. This is an annual survey completed by employers for hazardous substances purchased, used, stored, sold, or possessed, including information on the kind and maximum amounts of such hazardous substances. The State Fire Marshal's Bureau also administers user or possessions fees, an annual assessment upon the hazardous substance reported used in the largest quantity by any one employer. In addition, hazardous substance and toxic use reduction fees have been adopted by the Oregon Legislature as the means to provide funding for the Community Right-to-Know Act. An example of the State Fire Marshal's survey form is included as Appendix A.

In Benton County, the Corvallis Department of Public Works also conducts periodic industrial waste management surveys (Penpraze, 1989). Wastewater survey questionnaire information is designed to satisfy the city's legal requirement to comply with Oregon DEQ and U.S. EPA regulations regarding the monitoring of certain industrial contributions to waste treatment systems. Thus, the City of Corvallis has issued ordinances in relation to sewer usage which requires users to obtain wastewater discharge permits under certain circumstances. This ordinance specifies the steps to be taken by small businesses when reporting accidental discharges into the system.

Extent of the Problem of the Illegal Disposal of Hazardous Wastes by Small Quantity Generators

To understand the extent and the severity of problems related to the illegal disposal of hazardous wastes by SQG, it is important to first consider some of the hazardous waste substances produced by businesses within this category. According to Deyle (1989), there are 10 major hazardous waste classifications produced by SQG, including:

- spent solvents
- strong acids or alkalies
- ignitable wastes
- photographic wastes
- pesticide solutions
- dry cleaning filtration residues
- spent plating wastes
- solutions/sludges containing silver
- waste formaldehyde
- ignitable paint water

As noted in the introductory chapter, illegal disposal is believed to be rampant among SQG and CEG. Evidence of illegal disposal practices has been presented as follows:

- A Florida SQG survey was designed to survey on a county-wide basis all of the types and quantities of hazardous waste generated as well as methods of disposal (U.S. Department of Commerce, Environmental Monitoring Systems Lab, 1988). Results of the survey indicated that approximately 10,000 metric tons, or nine percent of the total SQG hazardous waste produced annually in the areas surveyed was discharged into public sewers. In addition, approximately 6,000 metric tons, or five percent of the total SQG generated annually, was disposed of on the properties in use. Other illegal disposal practices noted included disposal in ponds, pits, lagoon, or injected into wells.

- The U.S. House of Representatives requested the Texas Department of Health to review problems caused by the SQG disposal of hazardous wastes into solid waste landfills (U.S. General Accounting Office, 1983). The report submitted provided inconclusive results, but did indicate that of 48 SQG contacted, 11 were dumping hazardous wastes into municipal sewage systems. However, the report noted that upon reinspection, wastes were no longer subject to this illegal disposal practice. In another case, determination was not made concerning whether the wastes so disposed were actually hazardous materials. Six other cases reported indicated diluting wastewaters prior to disposal, actions tolerated by local sewage disposal officials. In the remaining three cases, the report indicated that city ordinances had been violated, but none were believed to have violated existing federal pretreatment standards. In general, the report concluded that the disposal of hazardous wastes into municipal sewer systems was recognized as a potential problem.
- In Larimer County, Colorado, a household hazardous waste survey was conducted among residents to determine their level of awareness concerning the disposal of household hazardous wastes (Blehm & Scudder, 1991). The results indicated that 40 percent of the population were unable to identify hazardous substances or products used within their homes, while 70 percent were evidently unaware of the potential environmental hazards posed by the improper disposal of wastes. It was concluded that a variety of unsafe disposal practices were commonly used as means of disposal. (Note: Though household waste is excluded from RCRA hazardous waste management and

regulation, its classification falls under the category of CEG if hazardous wastes are generated.)

- In 1985, a telephone survey conducted in Massachusetts indicated that of 504 interviews, five percent of the respondents disposed of oil on the ground, into the sewer system, or at a landfill, whereas only 10 percent of the households disposed of oil-based paints and pesticides each year (Bass, Calderon, & Khan, 1990). The report also indicated that almost all of these substances were disposed of improperly and that 88 percent of the paints and 94 percent of the pesticides were sent to landfills.
- In 1991, a household survey conducted in Benton County, Oregon (Corvallis) indicated that 57 percent of the respondents disposed of their household wastes by incorrect methods (McEvoy, 1991).

Reasons for Small Quantity Generator Illegal Disposal Practices

Based upon the assumption of widespread illegal disposal practices among SQG or CEG, a question arises concerning how many businesses there are in these categories in the United States? The most obvious answer is that the precise number cannot be known. However, the EPA, based upon an initial estimate of 175,000 businesses, recently revised estimates to reflect the number of 100,000 (Katz, 1988). It is further supposed that the reasons for illegal disposal among these businesses fall into three categories: lack of information, costs or other economic factors, or lack of enforcement practices (Schwartz & Pratt, 1990). These reasons have been analyzed as follows.

1) Lack of information: Previous studies have pointed at lack of information as one of the key reasons why SQGs illegally dispose of hazardous materials (Brown,

Kelley, & Gutensohn, 1988; California, Senate Office of Research, 1987; Reinhardt, 1989; Silverman & Jackson, 1987). Surveys indicated that 51 percent of the firms interviewed were not familiar with appropriate state and/or federal regulations. A second reason why some SQGs lacked information was that to avoid being labeled as a hazardous waste generator, they avoided participation in appropriate programs.

2) Cost or other economic factors: The second most popular reason given for the illegal disposal of hazardous wastes was transportation costs (Reinhardt, 1984). The standard minimum transportation charge was determined at between \$200 to \$300, amounts which may be presumed not to seriously affect fully regulated generators, but which could imposed a real financial burden upon SQGs. In addition, numerous smaller businesses were only marginally successful, thus compliance costs constituted major investment decisions.

3) Lack of enforcement: The final, but not the least, reason for the illegal disposal of hazardous wastes by SQGs was lack of enforcement. Given an estimation of 100,000 SQGs, the EPA finds the task of enforcement close to impossible in nature (Katz, 1988). This factor is principally due to shortages of funds and manpower on the part of federal and state agencies. At the time of the report, it was stated that the average SQG could expect a visit from a government inspector on the average of once each 15 years.

Control of Hazardous Wastes Produced by Small Quantity or Conditionally Exempt Generators

Subject to existing federal standards, SQGs are allowed to accumulate wastes for 180 days. To comply with these standards, the SQG must take the following steps:

- 1) Obtain an EPA identification number by completing a notification form (Appendix B). The EPA number identifies the generator and is used to track waste from specific sites throughout its entire history (Wagner, 1991).
- 2) If waste is to be disposed off-site, the generator must package and label the waste properly for transportation. To track transported wastes, the generator is required to prepare a Uniform Hazardous Waste Manifest (Appendix C), a federal form that requires explicit information on the type, quantity, amount, and chemical concentration of the waste in question. The manifest also identifies, through each step of the trip to the disposal site, exactly who handles the waste and who will receive it (EPA, 1986a, 1986b; Griffin, 1988; Hopcraft, Vitale, & Anglehart, 1989).
- 3) Once the waste is ready for shipment, the generator must use a licensed transporter to dispatch the waste to the desired disposal site. The transporter, under RCRA Subtitle C, is any person engaged in the domestic off-site transportation of hazardous wastes. This person must also have an EPA identification number and must comply with the regulations of the appropriate manifest system (Wentz, 1989).
- 4) Waste must be transported to a designated treatment, storage, and disposal facility (TSDF), each of which must also have an EPA identification number and a permit to operate.
- 5) In addition, the CEG, or those who produce less than 110 lbs per month of hazardous materials, and no acutely toxic materials, do not have to comply with EPA identification procedures or the stringent management requirements for fully regulated or small quantity generators. However, CEG must handle what wastes they have in a proper

environmental manner and in accordance with "any other local and state standards and codes" (Traverse, 1991, p. 198).

Overall Extent of Hazardous Waste Disposal Problems and Management Practices

As previously discussed in this chapter, the Comprehensive Environmental Response, Compensation and Liability Act (CERCLA), or "Superfund," establishes that persons exercising control of hazardous substances are liable to the states in which they reside. The Act also created a hazardous waste remedial fund for the cleanup of hazardous conditions and abandoned sites. However, despite this innovative and bold EPA policy, the costs of remediation or clean-up of hazardous waste sites continues to mount. According to Abelson (1992), projected costs have increased for two principal reasons: more sites have been discovered and the costs of treating them have risen. A current estimate of the number of Superfund hazardous waste sites has been placed at 75,000. The report further indicated that the estimated cost for the most stringent approach to the problem of soil and/or ground water contamination would incur costs in excess of \$1 trillion. Moreover, remediation must deal with the associated problems of radioactivity, heavy metals, and such organic solvents as Trichloroethylene (TCE) and Perchloroethylene (PCE).

To focus specifically upon U.S. nuclear weapons plants, it is believed that cleaning up hazardous and radioactive wastes generated in the process of weapons production would take decades to complete. A report from the U.S. Office of Technology Assessment (U.S. Congress [OTA], 1991) states that over the past 50 years the U.S. Department of Energy has been producing nuclear weapons at more than a dozen facilities, each of which has generated and released chemically toxic and highly radioactive wastes into the surrounding environment. It is believed that

the contamination of soils, sediments, surface waters, and groundwaters throughout the weapons complexes is extensive. The OTA analysis states that the current Department of Energy plans for handling this problem are inadequate to the massive nature of the task, and that they should be reevaluated and augmented as necessary. What is clear is that the creation of both uncontrolled and controlled disposal sites for hazardous wastes and other contaminants have not alleviated the national environmental problems related to this problem.

For reason of the problems associated with more than 33,000 hazardous waste sites in the U.S., the Agency for Toxic Substances and Disease Registry (ATSDR) has developed a list of seven priority health conditions (PHC) to assist in the evaluation of potential health risks to persons living near these sites and to determine necessary research activities involving hazardous substances identified at these sites (Hazardous-Waste Sites: Priority Health Conditions and Research Strategies—United States, 1992) . This list includes the following health conditions:

- 1) birth defects and reproductive disorders,
- 2) cancers (selected sites),
- 3) immune function disorders,
- 4) kidney dysfunctions,
- 5) liver dysfunctions,
- 6) lung and respiratory diseases, and
- 7) neurotoxic disorders.

This report further notes that since 1986, given that approximately two million persons in the U.S. live within a one-mile radius of the nearly 1,300 hazardous waste sites on the PHC list, 1,200 public health assessments have been conducted. Tarshis (1992) and Harding (in press) have also noted that when the ethnic diversity of the populations living near hazardous waste sites is examined, minority populations (e.g., African-Americans, Hispanic-Americans, Native Americans, Pacific

islanders, Asian-Americans) suffer more from industrial pollution than the white majority population. Heavily Hispanic Williamsburg, New York, is considered to be one of hundreds of minority communities that have become the site of a toxic waste dump, trash incinerator, landfill, or other trash facility. Though such facilities exist in the neighborhoods of the dominant majority population, studies completed by both Tarshis and the EPA have confirmed that minority populations bear an unfair share of the American toxic waste burden.

To minimize hazardous waste volume and to destroy hazardous waste chemicals, numerous hazardous waste cleaning firms and companies have urged acceptance of the principle of constructing hazardous waste incinerators in various localities and communities. However, the issues and controversy emanating from the implementation of this principle, based upon burning hazardous wastes with the use of sophisticated technologies, have continued as a subject of debate. Proponents of hazardous waste incineration state that the use of burning technologies are not a cause for concern, whereas the opponents of this practice state that hazardous waste incinerators constitute accidents waiting to happen (Patrico, 1991). Plans for the construction of incineration facilities have become widespread, especially in rural areas. Currently, incinerators are planned for parts of eastern Washington, Utah, Nevada, California, Nebraska, Missouri, Oklahoma, Tennessee, Alabama, Georgia, Florida, Texas, Indiana, Michigan, Ohio, upper New York, New Jersey, and Pennsylvania. In connection with concerns over the construction of this type of facility, incidents or effects have been noted as follows:

- Calvert City, KY: residents believe that they have suffered a cancer epidemic as a result of dioxin exposure, air pollution, and the discharge of particulate.

- Lenoir, NC: In 1980, 14 residents near a hazardous waste incinerator developed respiratory illnesses. Proof for the cause of the illness was verified by a team of Lenoir medical specialists.
- Baton Rouge, LA: emissions from an incinerator may have been the cause of mortality for 12 years. In 1971, the responsible company paid for 32 cattle that died of pneumonia.

The issue of toxic waste, including the proximity of these facilities to residential neighborhoods and community feeling directed toward these facilities, has not been limited to certain geographical regions or states in the U.S. For example, in 1979, the citizens of Woburn, Massachusetts detected and documented a cluster of health problems, including childhood leukemia, which may have been associated with industrial toxic wastes (Ackerman, 1991; Holtgrave, 1991). The problems were connected with the relationship of a site for chemical disposals to city wells over a number of years. Suspected carcinogens found in the wells were confirmed by TCE and tetrachloroethylene levels above federally prescribed limits.

A second example of a hazardous waste site episode involved the community of East Gray, Maine, in which members of one family were found to constantly suffer from headaches, bladder infections, kidney problems, pneumonia, dizzy spells, and asthma (Salzberg, 1991). An investigation revealed that McKin, the waste treatment company, was cutting corners by dumping some of its wastes on the land within the site, thus contaminating the soil, an underground lake, and belowground waters. A state health survey reported that the miscarriage rate in East Gray was 7.9 times the national average. Thus, in recent years thousands of Americans, with little to no scientific training, armed only with their concern for the health of their families, have learned how to track down toxic-waste dumping as well as the processes of forcing the government and/or concerned companies to clean up the damage.

When the issue of hazardous waste health problems is introduced, the problem of the disposal of infectious wastes originating from disposable hospital and clinic waste (i.e., medical wastes) provides an area of special concern. This type of waste, generated from patient care or treatment, includes bandages, sharps, surgical wastes, or laboratory wastes, much of which has been found to be illegally dumped. A 1987-1988 Seattle-King County Public Health Survey reported that only 33 percent of local hospitals had established written programs to train operators about effective sterilizer operation and the hazards associated with certain practices; at the same time, no local medical offices had developed similar procedures (Turnberg, 1991). Studies have indicated that from 50 to 100 needle puncture wounds are reported each year from handling solid medical wastes, and that nausea, headaches, and diarrhea have been reported as a result of exposure to airborne gram negative bacilli.

Still another hazardous waste problem involves pollution along the U.S.—Mexican border. DeWitt (1991) has reported that more than 2,000 foreign-owned factories, most of which are American corporations, have been established in the border region of Mexico, some 3,200 km in length. Attracted by low wages and lax pollution laws, these assembly plants have attracted thousands of Mexicans into already crowded border cities, overwhelming municipal services and turning some of the region into a large cesspool. Samples taken near Mexican industrial parts indicate that 75 percent of these sites were discharging toxic chemicals such as xylene or other solvents directly into the public waterways. The result was toxic levels which were 6,300 times as high as the standards for drinking water in the U.S.

Other hazardous waste dumping and management problems in the U.S. include the following:

- Columbia, MS: Reichold Chemical, Inc. buried thousands of barrels of toxic waste on its own properties, some of which escaped into the

surface water, the soil, and the air, causing home adjacent to the site to lose from 25 to 80 percent of their market value (Samuelson, 1991).

- Household batteries are the second most common source of toxins in landfills, accounting for 10 to 25 percent of hazardous household waste. Batteries can leak toxic heavy metals, including mercury, lead, cadmium, and manganese, into the surrounding groundwaters. When incinerated, toxic materials (e.g., lead or mercury) are released into the air (Jackson, 1991). An associated problem is that cadmium release results in high toxicity since it is carcinogenic when inhaled and causes kidney damage when ingested (Damian, 1991).
- Research completed on families living near hazardous waste facilities has indicated, among other effects, that living close to the landfills, perceiving a risk to self, believing that a hazardous waste problem existed, and perceiving negative changes in the home and neighborhood could all be associated with greater levels of psychological distress among affected populations (Unger, Wandersman, & Hallman, 1992).

Ultimately, the question of the current status or progress associated with the passage of CERCLA remains. To the public it is shocking to hear that "after spending billions of dollars on some of the nation's worst toxic sites, the federal government is throwing up its hands, saying some are impossible to clean" (Regan, 1992, p. 1). Regan further indicated that the future policy of the EPA will be to grant waivers to those Superfund sites that cannot be cleaned, requiring only that they be monitored to track the spread of toxic chemicals. The answer to the above question is that since its inception in 1980, the CERCLA program has resulted in the clean-up of only 80 Superfund sites, or only six percent of the total number estimated to be in existence. However, in noting the existence of several of the problems connected

with both the proper and improper management of hazardous waste landfills and incineration procedures, it should be noted that literally thousands of criminal prosecutions have resulted from environmental investigations. A few selected examples are as follows (EPA, 1988b):

- Diesel fuel and other pollutants discharged through municipal sewers in Louisville (Kentucky) into the Ohio River by the Louisville and Nashville Railroad company resulted in the following: 11/16/82, the Company pled guilty to two counts and was fined a total of \$38,000.
- Industrial sludges and wastes deposited at the Old Forge Borough sanitary landfill site by Lackawanna Refuse Removal, Inc. resulted in a two-count indictment charging violations of CERCLA, Sec. 103(c)[42 U.S.C.{9603(c)}]. The Lackawanna was fined \$10,000, whereas charges against the producer of the wastes were dismissed.
- The A. C. Lawrence Leather Company, Inc. was charged with two counts of storage violation, one count of disposal without a permit, and two counts for the submission of false statements and then fined several thousands of dollars in penalties.

Hazardous Waste Management Chart

As noted in the previous section, lack of information or the complexity of the regulations were principal reasons given for the illegal disposal of hazardous wastes. As a result, individuals, households, or businesses may not be adequately equipped to dispose of their wastes which fall into this category. The questions then arise: What is a hazardous waste? How will it affect water supplies if dumped into sewer systems or on the grounds? Where can hazardous wastes be placed for safe disposal? To answer these and similar questions, a hazardous waste chart, prepared by the

Water Pollution Control Federation (1987), is provided to allow enlightened and informed decisions with regard to the disposition of these types of wastes.

Table 2.1 Household Waste Management Chart.									
Type of Waste	○	□	●	■	Type of Waste	○	□	●	■
Kitchen:					Bathroom:				
Aerosol cans (empty)		□			Alcohol-based lotions	○			
Aluminum cleaner	○				Bathroom cleaner	○			
Ammonia based cleaner	○				Depilatories	○			
Bug sprays			●		Disinfectants	○			
Drain cleaner	○				Permanent lotions	○			
Floor care products			●		Hair relaxers	○			
Furniture polish			●		Medicine (expired)	○			
Metal polish with solvent			●		Nail polish (solidified)		□		
Window cleaner	○				Nail polish remover (solidified)		□		
Oven cleaner (lye base)		□			Toiled bowl cleaner	○			
					Tub and tile cleaner	○			
Garage:					Workshop:				
Antifreeze	○				Paint brush cleaner (with solvent)	○		●	■
Automatic transmission fluid			●	■	Paint brush cleaner with TSP	○			
Auto body repair products		□			Aerosol can (empty)		□		
Battery acid (or battery)			●	■	Cutting oil			●	
Brake fluid			●		Glue (solvent based)	○		●	
Car wax with solvent			●		Glue (water based)				
Diesel fuel			●	■	Paint (latex)		□		
Fuel oil			●	■	Paint (oil based)			●	
Gasoline			●	■	Paint (auto)			●	
Kerosene			●	■	Paint thinner			●	■

Table 2.1 Household Waste Management Chart (continued).									
Metal polish with solvent			●		Paint stripper (lye base)	○		●	
Motor oil			●	■	Primer			●	
Other oils			●		Rust remover (phosphoric acid)	○			
Windshield washer solution	○				Turpentine			●	■
Miscellaneous:					Varnish			●	
Ammunition			●		Wood preservative			●	
Artists' paints, media			●		Garden:				
Dry cleaning solvents			●	■	Fertilizer		□		
Fiberglass epoxy			●		Fungicide			●	
Gun cleaning solvent			●	■	Herbicide			●	
Lighter fluid			●		Insecticide			●	
Mercury batteries			●		Rat poison			●	
Moth balls			●		Week killer			●	
Old fire alarms					Shoe polish		□		
Photographic chemicals (unmixed)			●		Photographic chemicals (mixed, diluted)	○			
Swimming pool acid			●						
Key: ○ = Pour down drain, flush with water; □ = Dispose in sanitary landfill--do not pour down drain; ● = Save for community collection day or licensed hazardous waste contractor; ■ = Recyclable materials.									

Summary

To address the issue of hazardous waste generators and other solid waste concerns, the Resource Conservation and Recovery Act was enacted in 1976 and was subsequently amended in 1984. At present, there have been several federal and numerous state legislative enactments passed which have served to regulate the production and management of hazardous wastes in order to minimize its impact on human health and the environment. Some of these laws include the CERCLA, the

FIFRA, the Clean Air Act, and the Clean Water Act, in addition to the RCRA.

Most state enactments and regulations follow and operate within the framework of the federal hazardous waste regulations.

With respect to small quantity and conditionally exempt generators of hazardous wastes, the State of Oregon has issued a number of legislative enactments as subsequently administered (i.e., Senate Bill 241, House Bill 2246, Senate Bill 184, House Bill 3514) which serve to provide workshops in issues of waste management, clarify the regulation of waste tires, and modify current advance notice requirements prior to the assessment of civil penalties for certain violations. Current specific activities include public hearings on proposed rules for underground storage tanks, the conduct of statewide training workshops, and the establishment of the Governor's "Toxic Use Reduction Award" program to encourage waste reduction. Other Oregon policy programs include the State Fire Marshal's annual hazardous wastes survey and an industrial waste management survey.

Among SQG and CEG, illegal disposal is believed to be rampant nationwide, illegal practices which have been evidenced by survey results from Florida, the Texas Department of Health, and by household surveys in Colorado and Massachusetts. The principal reasons for illegal disposal of hazardous wastes include lack of information, or complexity of regulations; cost factors; and lack of enforcement means. To control hazardous wastes, SQGs must acquire an EPA identity number, prepare disposal manifests in accordance with federal regulations, and properly package and label wastes for transportation. Similarly, transporters and treatment, storage, and disposal facilities must also acquire EPA identity numbers to operate and to handle wastes. Finally, a hazardous wastes chart for household wastes has been provided to allow informed decisions about the disposal and management of both hazardous and nonhazardous wastes.

CHAPTER 3

METHODS AND PROCEDURES

Data Collection

To address current practices of hazardous waste management and disposal issues among registered and nonregistered SQGs and CEGs in Benton County, Oregon, data was gathered in cooperation with the State of Oregon Department of Environmental Quality, the Oregon State Fire Marshal, and the Benton County Environmental Health Division. Benton County, with a population of 71,000 residents (including the municipalities of Corvallis, Alsea, Bellfountain, and Philomath in addition to rural areas), was established in December, 1847 (Kiesling, 1992). The principal industries in the county are included in the following classifications: agriculture, lumber and timber, teaching, research and development, electronics, and wineries. Primary data on registered SQGs and CEGs was obtained from existing information provided by the Department of Environmental Quality (R. Volpel, Portland, Oregon, personal communication, 1992); data on nonregistered SQGs and CEGs was obtained from existing State Fire Marshal information (personal communication, Office of the State Fire Marshal, Salem, Oregon, 1992). The data gathered included a listing of businesses and/or companies by size, name, street and city address, zip code, and telephone number. However, due to the small sample size obtained from these two governmental agencies, random sampling, presumably more representative of SQGs and CEGs in Benton County, was not conducted for this investigation.

A letter of introduction was first drafted on Benton County Environmental Health Division letterhead paper and signed by the director of the Division (Appendix D). The purpose of the letter was to inform the selected businesses about an in-person visitation and interview by the researcher, as well as to explain nature of the research, provide assistance, and guarantee confidentiality. Approximately four to five days after the mailing, follow-up telephone calls were made to all of the businesses selected for an appointment for the purpose of scheduling an in-person interview. The in-person interview was conducted by the researcher, using a prepared questionnaire (Appendix E). During interviews, the researcher also observed the manner in which business representatives responded (e.g., fear of identification, reservations) to the questionnaire. As appropriate, these observations are included in the overall analysis and discussion.

Development of the Instrument

The instrument developed for use as an interview guide for data collection, "Current Practices of Hazardous Waste Management Among Small Quantity Generators in Benton County," was modeled after Deyle (1989). The instrument was pre-tested for content validity through review by a number of Benton County Environmental Health professionals, by the director of the Benton County Division of Environmental Health, by representatives of the Corvallis Waste Disposal Company, and by an Oregon Department of Environmental Quality hazardous waste specialist knowledgeable about the nature of this study. By this means, feedback and a critical analysis of the instrument was obtained. Critical feedback was also obtained through review of the instrument by the Oregon State University Research Center, a representative of which assisted in organizing the questionnaire in a logical format for purposes of content analysis that could be easily administered and scored.

Analysis of the Data

The principal purpose of the current study was to assess the current hazardous waste management and disposal practices among registered and nonregistered businesses classified as either SQG or CEG in Benton County, Oregon. Specifically, the current study focused upon the following associated activities:

- Prepare a list of activities that typically use or generate waste that are potentially hazardous, and whether or not these activities are performed at the business location (e.g., cleaning with acids, painting);
- Indicate whether or not waste types from a selected list (e.g., oils, aqueous liquids) were produced at the business location and, if so, determine the quantity of wastes produced per gallon per month;
- Determine whether or not organizations which produce wastes provide some type of training to employees who handle hazardous wastes, including the type of training provided;
- Determine how businesses discard hazardous wastes, their means of transportation, and the type of information required to conduct the transportation procedure;
- Determine whether or not small businesses recycle hazardous wastes and the quantities of wastes produced per month in pounds;
- Determine whether or not small businesses are interested in waste reduction and management programs;
- Determine whether or not the complexity of state and federal laws and regulations, as well as the high cost of disposal, were problems to the businesses concerned;
- Determination of the state of knowledge concerned with liability issues arising from processes of hazardous waste removal; and

- Determination of the business classification of each business surveyed (i.e., small or conditionally exempt generator).

With respect to these variables, the data acquired were manually entered into readable computer language for an IBM PC. To analyze the data, a descriptive statistical study was employed using the *SPSS/PC+* (Norusis, 1988) to analyze and compare (i.e., on the basis of cross tabulation) frequencies between registered and nonregistered SQG and CEG for the management and disposal practices of hazardous waste. The results of the study were also used to generate computer graphics to depict mean scores and both minimum and maximum median scores for each response item. Those variables with the largest calculated means were considered to be those which exercised the greatest influence among SQG and CEG in Benton County, Oregon. For most of the questions included in the survey, the respondent was given the option of selecting "other," a category which allowed the insertion of written comments that would not have been otherwise reflected among the alternative responses to the questions included in the instrument.

Summary

To address current practices of hazardous waste management and disposal issues among registered and nonregistered SQGs and CEGs in Benton County, Oregon, data was gathered in cooperation with the State of Oregon DEQ, the Oregon Fire Marshal, and the Benton County Environmental Health Division. A letter of introduction was then mailed to selected businesses to inform them of an in-person visitation and about the nature of the research. The in-person interview was conducted by the researcher, using a prepared questionnaire.

The instrument used for the conduct of the survey was pretested for content validity through review by a number of Benton County environmental health profes-

sionals, by the director of the Benton County Division of Environmental Health, by representatives from the Corvallis Waste Disposal Company, and by other specialists with demonstrated expertise in the area of concern for this study. The principal purpose of the current study was to assess current hazardous waste management and disposal practices among registered and nonregistered SQGs in Benton County. To accomplish this purpose, the study was focused upon a number of specific activities, to include determination of whether or not the organizations which produce wastes provide some type of training to employees to handle hazardous wastes. The information gathered from the respondents was subsequently entered into readable computer language for analysis as a descriptive statistical study with an IBM PC.

CHAPTER 4

RESULTS AND DISCUSSION

Responses to the survey questionnaire were obtained from small quantity and conditionally exempt generators of hazardous wastes in Benton County, Oregon, primarily for the identification and comparison of the number of registered and nonregistered businesses with respect to: types and quantities of hazardous wastes produced, assessment of current methods of disposal and management procedures, and the analysis of awareness of currently applicable hazardous waste regulations and codes.

Description of the Respondents

Data for this study was obtained from a list of registered SQGs and CEGs from existing DEQ data and from a list of nonregistered SQGs and CEGs obtained from existing State Fire Marshal data, each of which included basic demographic information. From the DEQ data list, a total of 40 handlers of hazardous wastes were identified. Of this number, seven were found to be either closed or out of business, one business was not identified by a valid address, and two of those included were located outside of the boundaries of Benton County. Therefore, 30 respondents were obtained from the DEQ list. Data obtained from the State Fire Marshall list included 27 companies reporting the handling of waste products. Of this number, five businesses were duplicate entries of businesses already placed on the DEQ list, one business was listed twice on the Fire Marshal's list, one company was no longer in business, one business refused to comply with the requested interview, and one

business was reclassified as a large quantity generator. Thus, 18 respondents were obtained from the State Fire Marshal data. Combination of the two lists resulted in an overall total of 48 responses from businesses who agreed to participate in the current investigation.

Of the total of 48 respondents, 30 were registered businesses and 18 of the businesses were not registered. Among the registered businesses, 10 (33.3%) were classified as SQGs and 20 (66.7%) were classified as CEGs. Among the nonregistered businesses, 6 (33.3%) were classified as SQGs and 12 (66.7%) were classified as CEGs.

Responses to the Questionnaire

The results of the responses to each questionnaire item, followed by a brief discussion of the findings, are presented in this section.

Question 1

Question: I have a list of activities that typically use or generate waste that is potentially hazardous. As I read each one, please tell me whether or not it is performed at your location.

According to specific types of activities, based on the Standard Industrial Code, responses were as shown in Figure 4.1 (p. 40):

- a) Retail sales: Of the registered businesses, 15 (50.0%) of the respondents stated that they performed retail sales at their location, or that they were involved in a retail sales business. Among the nonregistered businesses, only 8 (44.4%) reported that they were involved in a retail sales business.

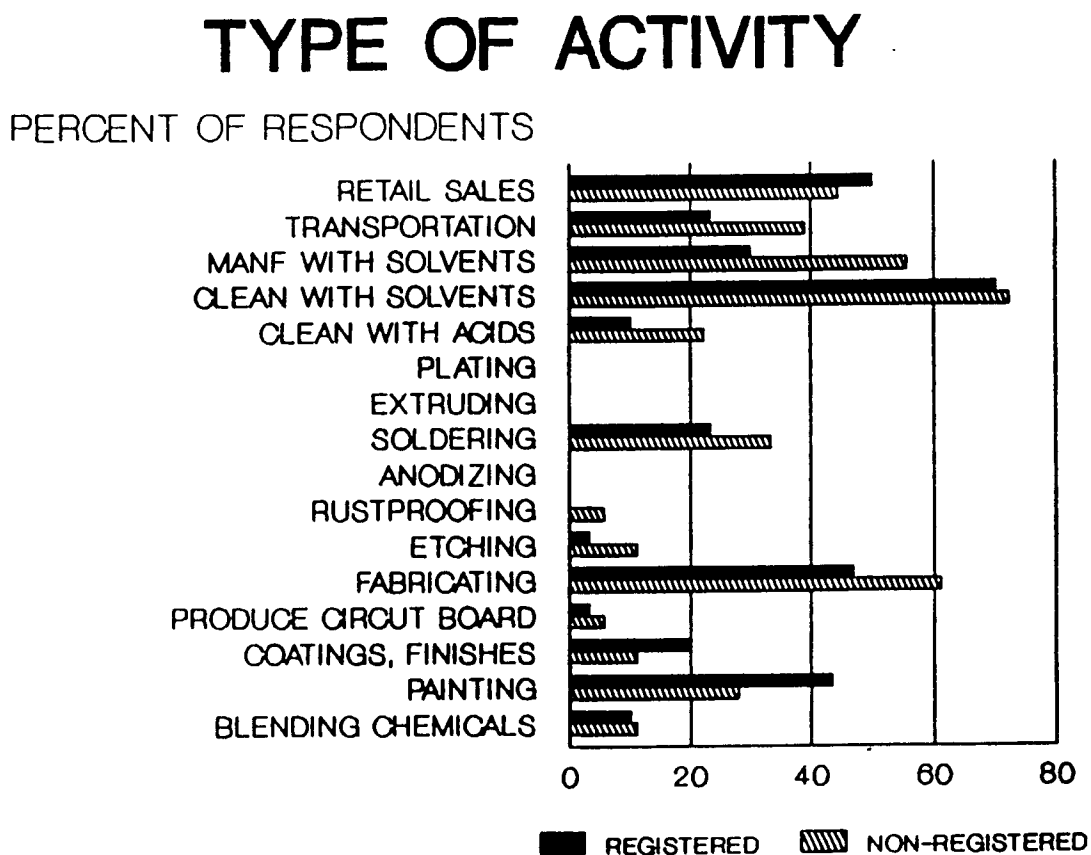


Figure 4.1. Type of Activity by Percentage of Respondents.

- b) Commercial transportation: A total of 7 (23.3%) of the registered businesses and 7 (38.9%) of the nonregistered businesses responded that they were involved in the business of commercial transportation.
- c) Manufacturing that uses solvents: Whereas only 9 (30.0%) of the registered businesses indicated that they were involved in manufacturing businesses which used solvents, the majority of the nonregistered businesses (10, or 55.6%) stated that they made use of solvents in their manufacturing processes.
- d) Cleaning/degreasing with solvents: Among the registered businesses, 21 (70.0%) responded affirmatively. Among the nonregistered busi-

nesses, a similar proportion (13, or 72.2%) stated that they were involved in a business which involved cleaning/degreasing with solvents.

- e) Cleaning with acids and/or caustics: Only 3 (10.0%) of the registered businesses stated that they performed cleaning with acids and/or caustics, whereas among the nonregistered businesses, 4 (22.2%) responded in the affirmative.
- f) Plating: All of the registered and nonregistered businesses, respectively, 30 (100.0%) and 18 (100.0%), stated that they were not involved with plating.
- g) Extruding: Again, none of either the registered or nonregistered businesses indicated an involvement with extruding.
- h) Soldering: Among the registered businesses, 7 (23.3%) stated that they performed soldering activities, whereas among the nonregistered businesses, 6 (33.3%) stated that soldering was performed.
- i) Anodizing: Similar to responses g) and h), none of the registered or nonregistered businesses reported involvement with anodizing procedures.
- j) Pickling/rust proofing: Among the registered businesses, with the exception of one "don't know" (DK) response (3.3%), none reported involvement with either pickling or rust proofing. Among the nonregistered businesses, only 1 (5.6%) responded in the affirmative.
- k) Etching of metals, glass, wood or similar procedures: Among the registered businesses, 1 (3.3%) responded in the affirmative, while 2 (11.1%) of the nonregistered businesses responded similarly.
- l) Fabricating, cutting/machine metal: Whereas 14 (46.7%) of the registered businesses indicated they were involved in this type of

activity, 11 (61.1%) of the nonregistered businesses responded affirmatively.

- m) Production of wire circuits or printed wire boards: An equal number of responses among both registered and nonregistered businesses, respectively, 1 (3.3%) and 1 (5.6%), responded affirmatively.
- n) Application of coatings/finishes: Among the registered businesses, 6 (20.0%) responded affirmatively, whereas only 2 (11.1%) of the nonregistered businesses responded similarly.
- o) Painting: Respectively, 13 (43.3%) and 5 (27.8%) of the registered and nonregistered businesses indicated involvement in painting activities.
- p) Blending/formulation of chemicals or compounds: While 3 (10.0%) of the registered businesses responded in the affirmative, 2 (11.1%) of the nonregistered businesses indicated a similar involvement.

Respondent results indicated that the majority of both the registered and nonregistered businesses in Benton County, respectively, 21 (70.0%) and 13 (72.2%), performed cleaning and degreasing activities at their business locations. With respect to the highest proportion of affirmative responses, this was followed by 14 (46.7%) registered and 11 (61.1%) nonregistered businesses involved in fabrication activities. A substantial number of businesses were also involved with retail sales, including 15 (50.0%) of the registered and 8 (44.4%) of the nonregistered businesses. In addition, a substantial number of the nonregistered businesses (10, or 55.6%) indicated that they performed manufacturing activities based upon the use of solvents. Painting was also performed by a high number of registered businesses (13, or 43.3%). However, none or few of either the registered or nonregistered businesses indicated an involvement in activities which involved plating, extruding, anodizing, or etching. From a similar survey, based upon the SQG industrial categories of

vehicle maintenance, metals manufacturing, printing and ceramics, laundries (dry cleaning), pesticide application services, and photography, it was determined that the three most common waste types generated by SQGs (i.e., 84% of all wastes) were used lead-acid batteries, spent solvents, and strong acids and alkalies (EPA, 1985).

Question 2

Question: I have a list of waste types. As I read each waste type, please tell me whether or not your organization produces it, and about how much of that waste is produced per month.

Figures 4.2 and 4.3 show, respectively, the types of wastes by percentage of respondents and the quantities of waste (in median gallons) by type for each SQG.

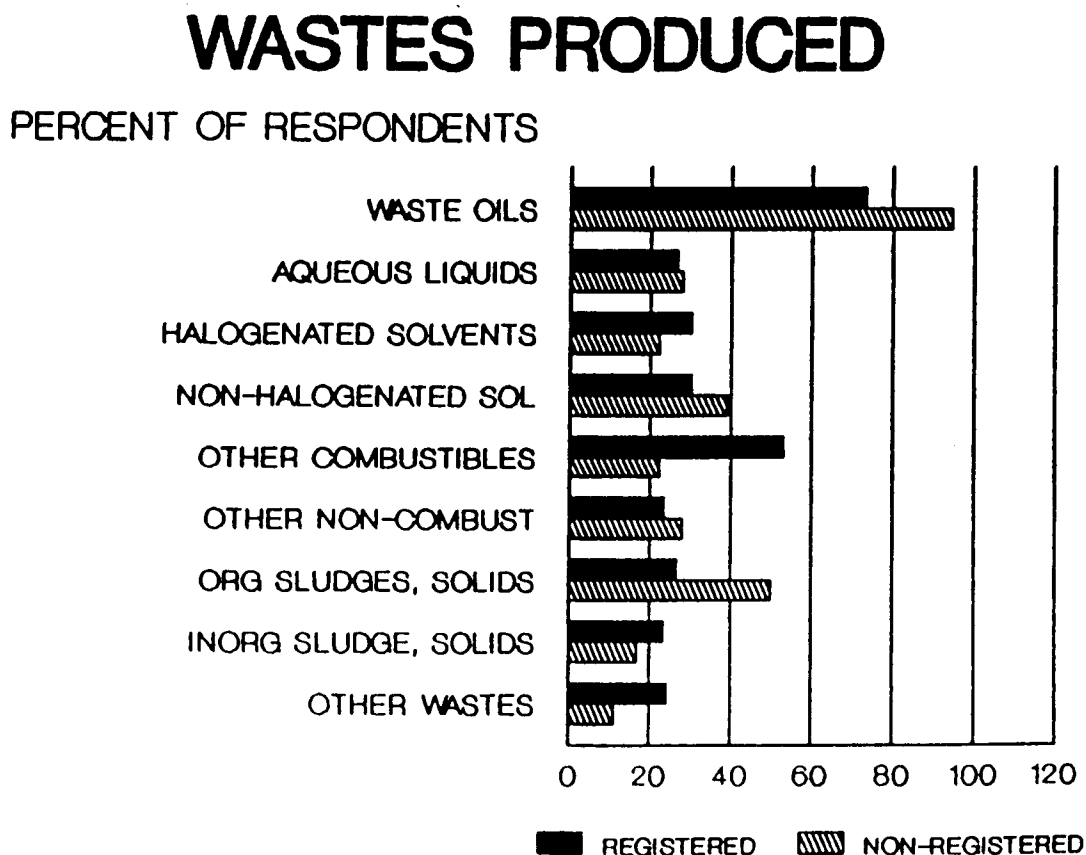


Figure 4.2. Types of Waste Produced by Percentage of Respondents.

QUANTITY OF WASTES PRODUCED

MEDIAN GALLONS PER MONTH

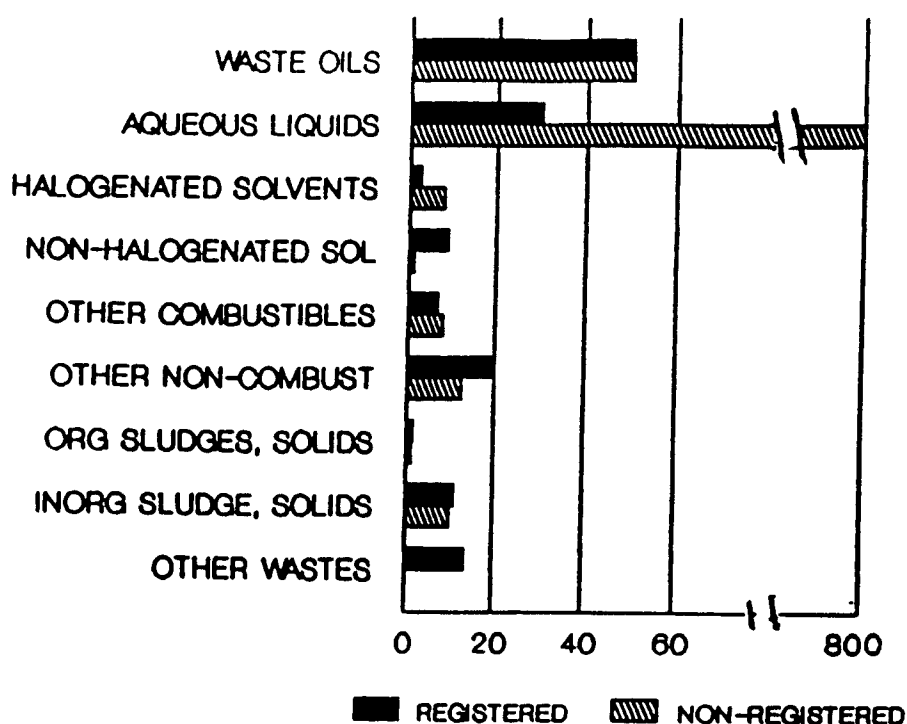


Figure 4.3. Quantities of Hazardous Waste Produced by Type, Median Gallons per Month.

Specific waste amounts by type of waste for the two business categories were as follows:

- a) Waste oils: 22 (73.3%) of the registered and 17 (94.4%) of the non-registered businesses indicated that they produced waste oils as a result of their business practices. Among both registered and nonregistered businesses, the median waste per month was 50 gallons.
- b) Aqueous liquids: Among registered businesses, 8 (26.7%) responded affirmatively and 1 (3.3%) indicated "don't know" (DK); among non-registered businesses, 5 (27.8%) responded affirmatively. Median production of aqueous liquids was 30 gallons per month for registered

businesses, a sharp contrast to the figure of 800 gallons per month reported by nonregistered businesses.

- c) Halogenated solvents: Among registered businesses, 9 (30.0%) responded affirmatively, in contrast to a similar response from 4 (22.2%) of the nonregistered businesses. In the latter category, an additional 2 (11.1%) indicated "don't know" (DK). For registered businesses, the median amount produced was 2.5 gallons per month, in contrast to 8.0 gallons among nonregistered businesses.
- d) Non-halogenated solvents: A total of 9 (30.0%) registered and 4 (22.2%) nonregistered businesses stated that this waste substance was produced, whereas an additional 2 (11.2%) of the latter category indicated "don't know" (DK). The median amount of waste for the two business types was nine gallons and one gallon, respectively.
- e) Other combustible liquids: 16 (53.3%) of the registered and 4 (22.2%) of the nonregistered businesses responded affirmatively.
- f) Other noncombustible liquids: Among the registered businesses, 7 (32.3%) reported generation of this form of waste, whereas 5 (27.8%) of the nonregistered business responded affirmatively. The median amounts produced were 20 and 12.5 gallons, respectively.
- g) Organic sludges or solids: For these waste types, 8 (26.7%) of the registered businesses responded affirmatively, while 1 (3.3%) indicated "don't know" (DK). Among nonregistered businesses, 9 (50.0%) responded affirmatively. The median waste per month was 1.5 gallons and 1.0 gallon for, respectively, registered and nonregistered businesses.
- h) Inorganic sludges or solids: 7 (23.3%) of the registered and 3 (16.7%) of the nonregistered businesses responded affirmatively,

whereas 1 (5.6%) of the latter indicated the use of these types of waste. The median waste amounts reported for registered and nonregistered businesses was 11 and 10 gallons per month, respectively.

- i) Other wastes: 7 (24.1%) and 3 (10.3%) of the registered businesses responded, respectively, affirmatively or "don't know" (DK), whereas only 2 (11.1%) of the nonregistered businesses reported the use of other forms of waste. The median amounts of waste per month was not recorded for this category.

From the statistical evidence presented in Figure 4.2, the majority of the registered (22, or 73.3%) and nonregistered (17, or 94.4%) businesses indicated that they produced waste oils. However, as indicated in Figure 4.3, the median amounts of waste oils produced by each business category was virtually equal at 50 gallons per month. Waste oils include products from automotive, industrial, fuel, and other oil products. While the minimum and maximum amounts of waste oils produced by registered businesses was one gallon and 500 gallons per month, respectively, comparable figures for nonregistered businesses were 10 and 7,500 gallons per month. Thus, based upon these results, it may be stated that the majority of nonregistered businesses in Benton County, Oregon, produce more waste oil than registered businesses.

The reason why most nonregistered businesses in Benton County produced more waste oils than registered businesses is not specifically clear. It may be speculated that the majority of the nonregistered businesses were involved in the types of businesses which generated automotive, industrial, or other types of oil wastes to a greater degree than the registered businesses. Another factor may be that for reason of anticipation of the increased regulation which could result from this type of investigation, the surveyed firms may not have responded accurately to the question. Moreover, since the current study was not based upon a random sample of busi-

nesses in Benton County, the responses cannot be regarded as representative of all Benton County businesses. Yet another underlying reason for the discrepancy in responses to this question was that some firms may not have been aware of the quantities of wastes produced, in addition to which the waste quantities may also have varied over time or between types of businesses. In fact, when business representatives were asked how much waste their firms produced, some of the respondents indicated that records of waste quantities were not maintained and that their responses were necessarily based upon estimates. That is, the businesses concerned may have produced either more or less quantities of wastes than indicated in their responses. However, for all SQGs, similar studies conducted on the production of major hazardous wastes have indicated that spent solvents were predominant. This type of waste includes the cleaning, degreasing, and stripping solvents used in metal work and plating shops or vehicle maintenance and equipment repair shops, and the solvents used to clean printing presses (Center for Hazardous Materials Research, 1987).

In addition to waste oils, "other combustible liquids" (i.e., those capable of burning at a flashpoint of 140°F or less, including discarded/recycled paints, varnishes, lacquers containing solvents, paint brush cleaners, etc.) was reported to be the second highest type of waste produced by registered businesses (16, or 53.3%). The median quantity for this waste category was seven gallons per month, at minimum and maximum figures, respectively, of one gallon and 1,200 gallons per month.

In terms of aqueous liquids, the median quantities (i.e., water soluble wastes, including acids and alkalis, bases, spent plating wastes, and photographic wastes) produced per month were 800 gallons at minimum and maximum quantities of, respectively, 2 gallons and 500 gallons. In general, for the current study, Benton County businesses reported significant amounts of waste oils and aqueous liquids, whereas the production of halogenated solvents (i.e., those containing chlorine,

fluorine, iodine, bromine, or chlorobenzene) or nonhalogenated solvents (i.e., those containing benzene, acetone, toluene, methanol, ethyl cellulose, and xylene), other combustibles/noncombustibles, organic or inorganic sludges, or other wastes was minimal.

Question 3

Question: Some organizations who produce wastes provide some kind of training to employees who handle wastes. Does your organization provide training to your employees?

As demonstrated in Figure 4.4 (p. 49), nearly all of the registered businesses (29, or 96.7%) indicated that they did provide training, whereas this was the case among only a sizeable majority (12, or 66.7%) of the nonregistered businesses.

With the passage of the OSHA law of 1970, the federal government assumed an active role in the description and enforcement of standards for safe and healthy workplaces (Levy & Wegman, 1988; Lincoln-Lancaster County Health Department, 1991). Worker education has also been facilitated by right-to-know laws and by the regulatory powers of the EPA, as based upon four major provisions (EPA, 1989):

- planning for chemical emergencies,
- emergency notification of chemical accidents and releases,
- reporting of hazardous chemical inventories, and
- toxic chemical release reporting.

In addition, the hazard communication rules of the State of Oregon (Oregon, Department of Insurance and Finance, 1989) state that employees must be made aware of the use of hazardous chemicals in their workplaces, must be informed about hazard communication requirements, and must be made aware of the uses of the Material Safety Data Sheet (MSDS). Based upon Oregon and federal hazardous waste training requirements, the majority (96.7%) of the registered businesses in

DOES YOUR ORGANIZATION PROVIDE HAZARDOUS WASTE TRAINING FOR EMPLOYEES?

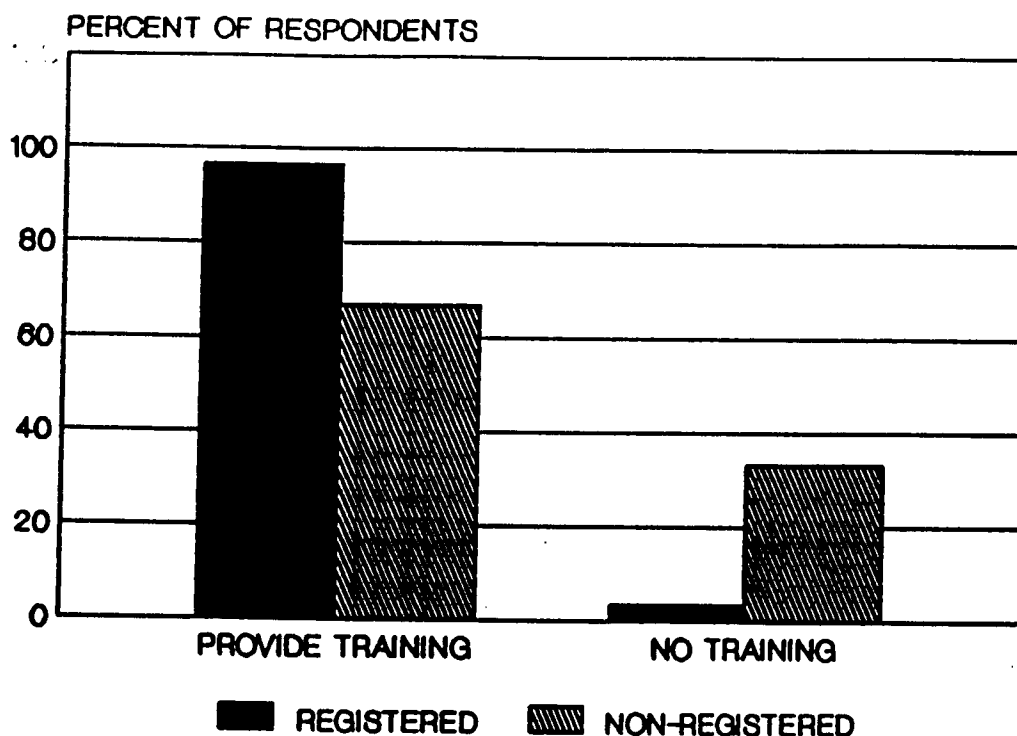


Figure 4.4. Provision of Hazardous Waste Training to Employees.

Benton County, Oregon, do provide training in the handling and management of hazardous wastes to their employees. To a lesser degree, this is also seemingly true of nonregistered businesses in Benton County. Moreover, it is important to note that SQGs are not required to meet requirements with respect to employee training, accident preparedness and prevention, and the development of written accident contingency plans that are as rigorous as those required for larger, fully regulated businesses (U.S. Code of Federal Regulations, 1991, 40 CFR 265). The SQG are required by law only to have a designated emergency coordinator, in addition to which they must assure that employees use appropriate waste handling and emergency procedures.

Question 3a

Question: Would you tell me what kind of training your organization provides to your employees?

When asked to specify the type of training provided to employees, a variety of responses were recorded, which were ultimately categorized into "specific" and "other" or general forms of training. The results, as indicated in Figure 4.5, indicated that among the registered business, 17 (58.6%) stated that they used specific forms, whereas 12 (41.4%) indicated the use of other (general) forms of training. Among the nonregistered businesses, 6 (50.0%) stated that specific forms of training were used, whereas the remaining 6 (50.0%) acknowledged the administration of general training. Thus, by only a small margin, the majority of the businesses in Benton County surveyed for the current study administered specific training practices to their employees.

The reason why the majority of registered business respondents indicated the use of specific forms or methods of training is perhaps based upon the fact that they are required by law to use specific and appropriate governmental forms, and thus to the fact that they are knowledgeable about which forms must be used. Nonregistered businesses are not required to complete specific government forms and thus may be presumed to be less knowledgeable about the requirements which accompany the use of these forms.

Examples of both specific and general training programs provided by the respondents to this survey, arrived at by categorizing the responses concerning the types of training provided to employees, are as indicated below:

WHAT KIND OF TRAINING DOES YOUR ORGANIZATION PROVIDE FOR EMPLOYEES?

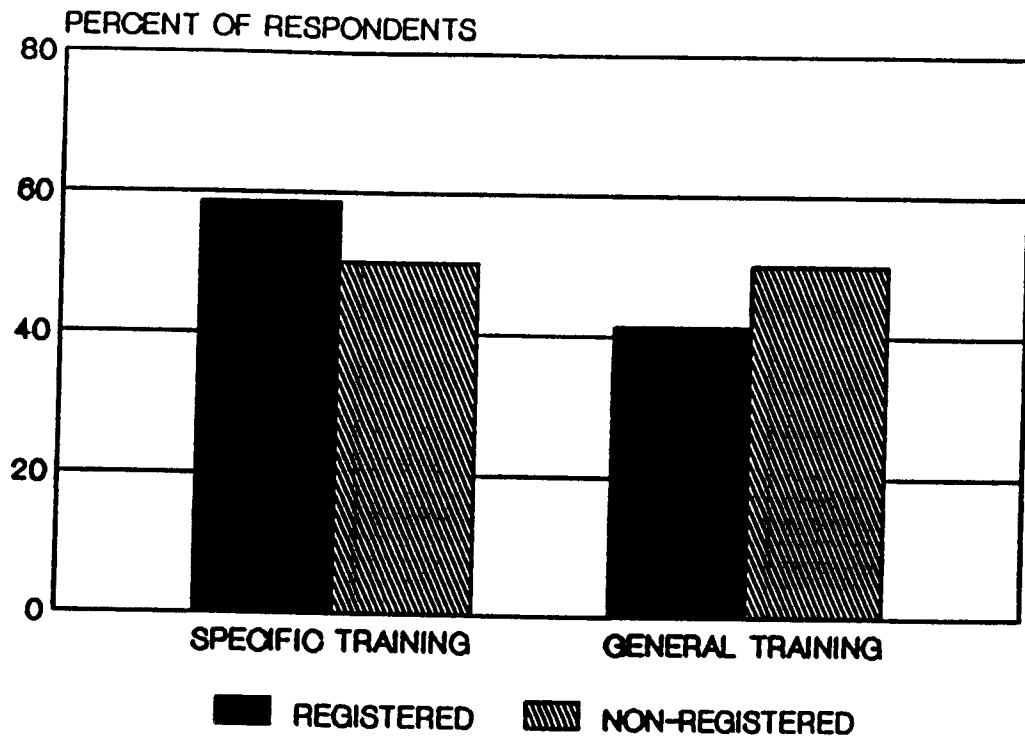


Figure 4.5. Type of Training Provided to Employees.

1) Specific training programs:

- Initial orientation and training in the hazardous waste communication laws;
- Training in use of the Material Safety Data Sheet;
- Specific departmental risk analysis and policy procedures;
- Blood-borne pathogen training;
- Pesticide use training;
- DEQ management seminar on substances which constitute hazardous wastes;
- OSHA program training;

- EPA certification (40 classroom hrs) in hazardous waste handling; and
 - Annual 8-hr refresher course training, mandatory at superfund sites.
- 2) General training programs:
- Films, cassettes, books, and meetings;
 - Informal on-the-job training;
 - Seminars provided by managers;
 - Training provided by hired consultants;
 - Annual training sessions;
 - Distribution of printed handouts;
 - Monthly meetings during each work shift; and
 - On-going outside consulting.

Question 4

Question: I have a list of disposal facilities that some organizations use to discard their hazardous wastes. Please tell whether or not your company uses this method.

As shown in Figure 4.6, the majority of the nonregistered businesses in Benton County reported disposing of their hazardous wastes through the method of:

- 1) return to supplier, 14 (77.8%),
- 2) recycle on site, 13 (72.2%),
- 3) send to Treatment, Storage, and Disposal Facility, 12 (66.7%),
- 4) garbage or landfill, 6 (33.3%),
- 5) evaporation, 5 (27.8%), and
- 6) sale of wastes, 5 (27.8%).

Less than six percent of the nonregistered businesses indicated that they used either sewage facilities, DEQ permits, treatment on site, burning, or other forms of disposal. Septic tanks and dry wells were not used as a means of disposal by any of the Benton County businesses.

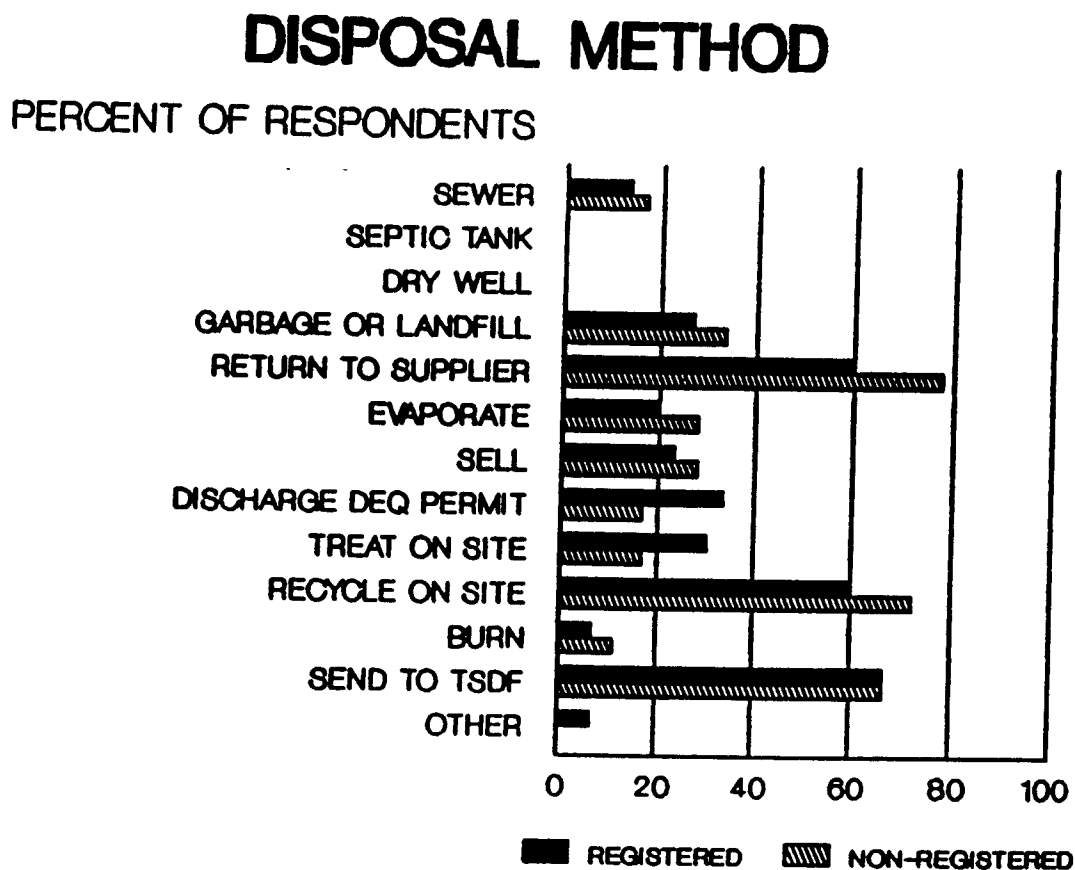


Figure 4.6. Methods of Disposal in Benton County.

Among registered businesses, the majority of the respondents indicated the disposal of hazardous wastes using the following methods:

- 1) send to TSDF, 20 (66.7%),
- 2) return to supplier, 18 (60.0%),
- 3) recycle/reclaim on site, 18 (60.0%),
- 4) discharge under DEQ permit, 10 (33.3%),

- 5) garbage or landfill, 8 (26.7%),
- 6) sale of wastes, 7 (23.3%), and
- 7) evaporation, 6 (20.0%).

Less than seven percent of the registered businesses indicated use of the methods of either burning, use of the sewage system, evaporation, or other forms of disposal. None of the registered businesses indicated the use of either septic systems or dry wells as a means of disposal. The percentage of respondents who indicated the use of either burning, sewage system, evaporation, or dry wells as a means of disposal would appear to be underreported. A similar study conducted by Deyle (1989) indicated that 32 percent of SQGs disposed of hazardous wastes in public sewers or septic tanks. Underreporting by respondents may be attributed to a variety of reasons. One primary reason may be due to the sensitivity of the study. Businesses may not want to be identified by regulatory agencies, and they may also want to be perceived as practicing what is politically and environmentally correct during this era of environmental consciousness.

Responses specific to the types of disposal facilities used were as follows:

- a) Sewer: 4 (13.3%) of the registered and 3 (16.7%) of the nonregistered businesses indicated the use of sewers as a disposal method.
- b) Septic tank: All 48 respondents (100.0%) indicated that they did not use septic tanks for purposes of disposal.
- c) Dry well: All 48 respondents (100.0%) indicated that they did not use dry wells for purposes of disposal.
- d) Garbage/landfill: 8 (26.7%) of the registered and 6 (33.3%) of the nonregistered businesses indicated the use of garbage services/sanitary landfills as a disposal method.

- e) Return to supplier: 18 (60.0%) of the registered and 14 (77.8%) of the nonregistered businesses indicated that this method was used to dispose of hazardous wastes.
- f) Evaporate: 6 (20.0%) of the registered and 5 (27.8%) of the nonregistered businesses indicated that they used methods of evaporation to disposal of hazardous wastes.
- g) Sale: 7 (23.3%) of the registered and 5 (27.8%) of the nonregistered businesses indicated that they sold their hazardous wastes to others.
- h) Discharge under DEQ permit: 10 (33.3%) of the registered and 3 (16.7%) of the nonregistered businesses indicated that they disposed of hazardous wastes under a DEQ permit.
- i) Treat on site: 9 (30.0%) and 1 (3.3%) of the registered businesses indicated, respectively, affirmative responses or "don't know" (DK) to the question whether they treated hazardous wastes on site; 3 (16.7%) of the nonregistered businesses responded affirmatively.
- j) Recycle or reclaim on site: 18 (60.0%) and 1 (3.3%) of the registered businesses indicated, respectively, affirmative responses or "don't know" (DK) to the question whether they recycled or reclaimed hazardous wastes on site; 13 (72.2%) of the nonregistered businesses responded affirmatively.
- k) Burn: 2 (6.7%) of the registered and 2 (11.1%) of the nonregistered businesses indicated that burning was used as a means to dispose of wastes.
- l) Send to hazardous waste treatment, storage, and disposal facility: 20 (66.7%) and 1 (3.3%) of the registered businesses indicated, respectively, affirmative responses or "don't know" (DK) to the question of whether they send wastes to treatment, storage, and disposal

facilities, whereas 12 (66.7%) of the nonregistered businesses responded affirmatively.

Similar studies conducted by Deyle (1989) indicated that

in the aggregate, smaller generators rely to a greater extent on commercial facilities located offsite for waste treatment, recycling, and disposal. Analysis of data from a 1985 national survey of smaller generators indicates that approximately 60 percent of all smaller generators ship some of their waste offsite, while 54 percent treat, recycle, or dispose of some of their wastes onsite. (p. 6)

This study further indicated that 32 percent of smaller generators were disposing of hazardous wastes in public sewers or septic tanks. According to Bozeman, Deyle, O'Leary and Schuller (1986), systematic data on the types of firms most likely to violate waste disposal regulations were lacking. It was nonetheless stated that the SQG were more widely believed to commit violations than LQG. However, the claim that the SQG were more likely than the LQG to dispose of wastes improperly is credible, but evidence in support of this position was seemingly limited.

Question 5

Question: Do you transport your hazardous wastes or have a transporter to transport your hazardous wastes to a disposal facility?

The results indicated that a total of 26 (86.7%) registered and 16 (88.9%) nonregistered businesses used commercial transporter services to dispose of hazardous wastes, and that a majority of the respondents either had their wastes transported or themselves transported their wastes to a disposal facility (Figure 4.7, p. 57).

However, businesses were not asked to identify specific disposal facilities in Benton County to which they may have transported their wastes for disposal.

DO YOU HAVE YOUR HAZARDOUS WASTES TRANSPORTED TO A DISPOSAL FACILITY?

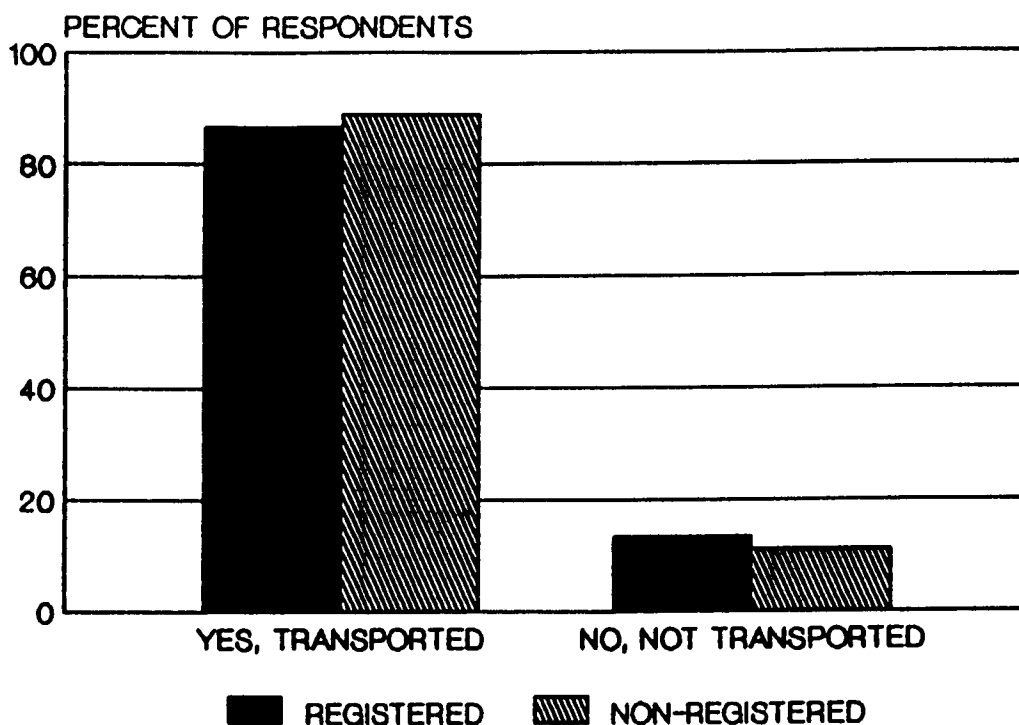


Figure 4.7. Transportation of Hazardous Wastes to a Disposal Facility.

Question 5a

Question: What kind of information or paper work is involved in the transportation procedures?

Responses to the question were categorized into specific and general types. Among the registered businesses, 15 (60.0%) stated that they used the specific forms (i.e., manifest forms), while 10 (40.0%) indicated the use of other forms (i.e., general receipts). Among the nonregistered businesses, 6 (37.5%) indicated the use of specific forms, while 10 (62.5%) stated that they used other or general forms (Figure 4.8). Whereas the majority of the registered SQG in Benton County used specific forms, the majority of the nonregistered businesses used general forms. The reason

for this disparity may reflect the fact that the registered SQG are required by the law to use specific or governmental forms, and are thus subject to regulation to a greater degree than the nonregistered businesses. This requirement may serve to make the registered businesses more knowledgeable about the use of the specific forms required.

WHAT KIND OF PAPER WORK IS INVOLVED IN THE TRANSPORTATION PROCEEDURE?

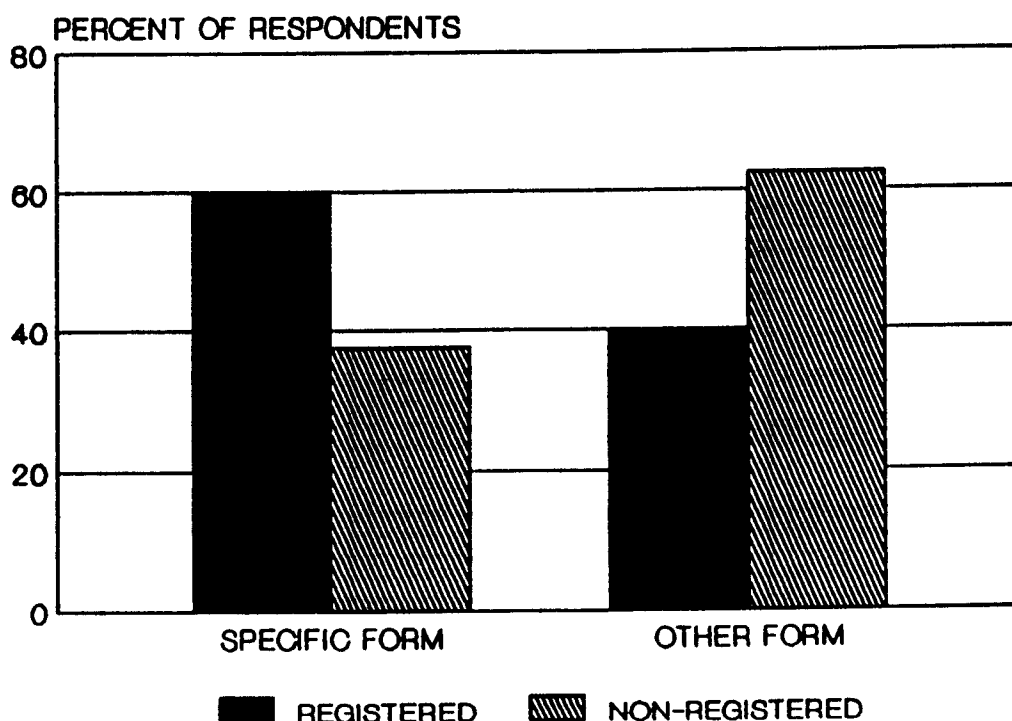


Figure 4.8. Administrative Requirements for Use of the Transportation Procedure.

Examples of the specific/governmental and general forms are indicated below:

1) Specific forms:

- use of the uniform hazard manifest form identifying the generator, the transporter, and the receiving company,
- description of the waste and the quantity of hazardous waste,

- use of proper labels, or
- inclusion of sample analysis.

2) General forms:

- use of general nongovernmental receipt forms (i.e., a Safety Kleen agency receipt when waste was picked up),
- waste hauling agencies complete all administrative procedures and respondents not involved (e.g., hauling agencies test chemicals, pump it out, then provide producer with a receipt),
- hazardous wastes collected in tanks and transported without prior verbal or written notification, or
- hazardous waste tanks not labeled.

A similar national survey of voluntary adherence to manifest and container labeling requirements by both SQGs and CEGS has indicated that only six percent of businesses in these categories indicated the use of the federal manifest, while only 25 percent reported the use of any type of container label (Ruder, Wells, Battaglia, & Anderson, 1985). In the case of the Benton County SQGs, a number of the respondents indicated (1) that they produced minimal quantities of hazardous wastes, and (2) that the amounts produced were handled by contractors and/or business associations who assumed responsibility for proper manifest administration, container labeling, and transportation.

Question 6

Question: I am going to read you a list of potentially hazardous waste products. As I read each one please tell me if your company recycles that waste? About how much of that waste is recycled per month?

Results of the responses to the first part of the question are summarized in Figure 4.9, and as follows:

PRODUCTS RECYCLED

PERCENT OF RESPONDENTS

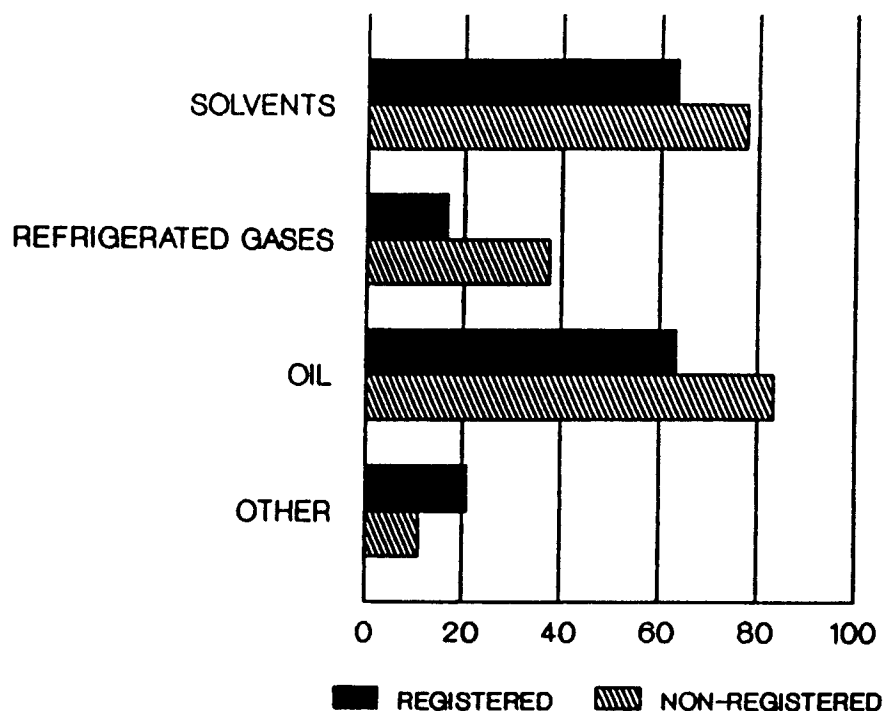


Figure 4.9. Hazardous Waste Products Recycled in Benton County.

- a) Recycle solvents: 19 (63.3%) of the registered and 14 (77.8%) of the nonregistered businesses stated that they recycled solvents. Among the registered SQG, the median quantity of solvents recycled was 15 gallons per month, in contrast to 10 gallons per month recycled by the nonregistered businesses.
- b) Refrigerated gases: 5 (16.7%) and 2 (6.7%) of the registered businesses indicated, respectively, an affirmative response or "don't know" (DK) with respect to these substances, whereas 3 (16.7%) of the nonregistered businesses responded affirmatively. For the registered businesses, the median quantity recycled per month was 7.5 gallons, in

contrast to 14.5 gallons recycled by nonregistered businesses per month.

- c) Oils: 19 (63.3%) of the registered and 15 (83.3%) of the nonregistered businesses stated that they recycled oils. One of the nonregistered businesses indicated a "don't know" response. The median amount of oils recycled by the registered businesses was 27 gallons per month, in contrast to the recycled amount of 55 gallons per month by the nonregistered businesses.
- d) Other: 6 (20.7%) of the registered and 2 (11.1%) of the nonregistered businesses indicated that other products, such as tires or antifreeze, were recycled. Median quantities were not calculated for this category due to large variations in the units of measurement.

Overall results for the quantities recycled, expressed in median gallons per month, are shown in Figure 4.10 (p. 62). From the above information, as shown in Figs. 4.9 and 4.10, it may be stated that the majority of the SQGs in Benton County recycled waste products in this category in the following order of importance:

- 1) The majority of the respondents indicated that both solvents and oils (19 each, or 63.3%) were recycled. The median per month for solvents was 15 gallons at a minimum of 1 gallon and a maximum of 200 gallons; comparable figures for oils were 27 gallons, 2 gallons, and 500 gallons, respectively.
- 2) The next highest category was "other" reported by 6 (20.7%) of the businesses. Medians for this category were not calculated.
- 3) The third-ranked substance was refrigerated gas, recycled by 5 (16.7%) of the businesses. The median for this category was 7.5 gallons per month with a minimum of 4 gallons per month and a maximum of 200 gallons per month.

MEDIAN QUANTITY OF HAZARDOUS WASTE RECYCLED PER MONTH

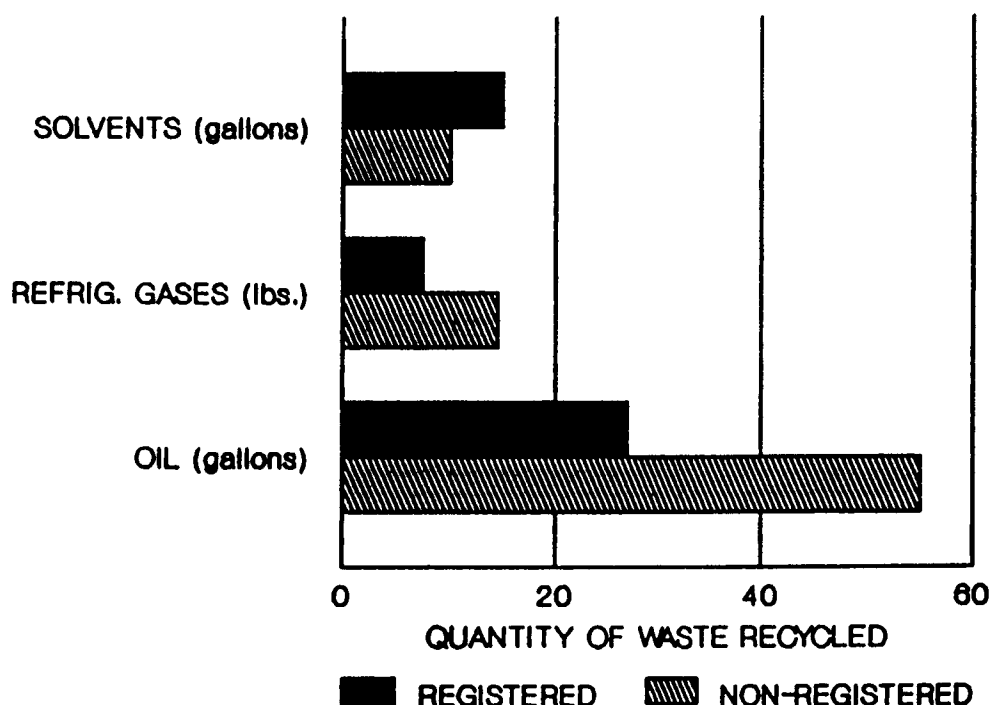


Figure 4.10. Median Quantities of Hazardous Wastes Recycled Per Month.

Compared to the registered businesses, the nonregistered businesses reported substantial differences, particularly with respect to the median, minimum, and maximum quantities reported recycled per month. First, the majority of the latter respondents (15, or 83.3%) indicated that oils were recycled. The median amount, at 55 gallons per month, was far higher than the figure for registered businesses, in addition to which the minimum and maximum quantities per month, respectively, 1 gallon and 7,500 gallons, reflected a much broader range than for the registered businesses. For the nonregistered SQG, the second highest response (14, or 77.8%) was for solvents. For these substances, the median quantity recycled per month, 10 gallons, was less than the comparable quantity for registered businesses, whereas the minimum to maximum range, from 1 gallon to 500 gallons, was in excess of the

comparable quantities for the registered businesses (Fig. 4.10). The third highest number of respondents (3, or 16.7%) was for refrigerated gases, at a median quantity of 14.5 gallons per month subject to minimum and maximum quantities of, respectively, 4 gallons and 25 gallons per month. Finally, respondents for the "other" category (2, or 11.1%), including such products as batteries, antifreeze, and tires, indicated the lowest percentage of recycled products. As noted above, median quantities were not calculated for this category.

Question 7

Question: Waste Reduction and Management Program (WRAMP) is defined as a program defined to assist businesses and industries to manage waste streams and implement pollution prevention strategies. As I read the following list of WRAMP activities, please tell me whether or not it might interest your company.

The results of responses to this question are indicated in Figure 4.11 (p. 64). Specific areas of interest were reported as follows:

- a) Waste reduction literature: 25 (83.3%) of the registered and 13 (72.2%) of the nonregistered businesses responded affirmatively.
- b) Use of WRAMP library: 18 (60.0%) and 1 (3.3%) of the registered businesses responded, respectively, affirmatively or "don't know," whereas 10 (55.6%) of the nonregistered businesses indicated an interest in this resource.
- c) Information on regulation: 23 (76.7%) of the registered and 11 (61.1%) of the nonregistered businesses indicated an interest in this program.

INTEREST IN WASTE REDUCTION AND MANAGEMENT PROGRAM (WRAMP)

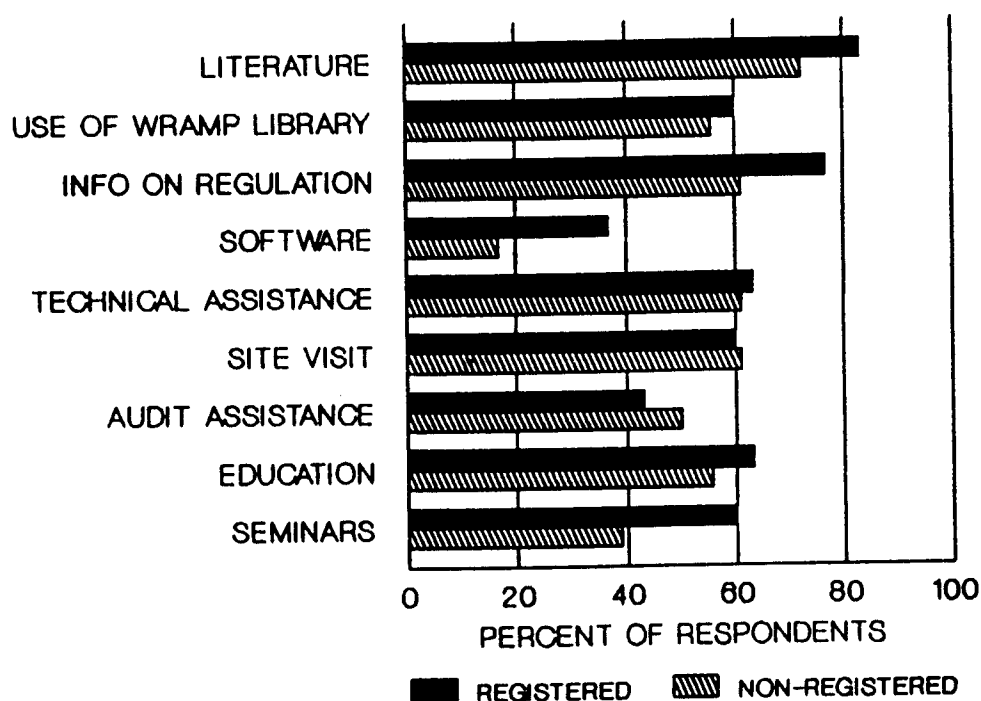


Figure 4.11. Interest Expressed in the Waste Reduction and Management Program.

- d) Waste management and environmental regulation software: 11 (36.7%) of the registered and 3 (16.7%) of the nonregistered businesses indicated an interest in this resource.
- e) Technical assistance for waste reduction: 19 (63.3%) of the registered and 11 (61.1%) of the nonregistered businesses stated that they were interested in obtaining technical assistance for waste management.
- f) WRAMP site visit to identify waste reduction opportunities: 18 (60.0%) and 1 (3.3%) of the registered indicated, respectively, an affirmative or "don't know" response, whereas 11 (61.1%) of the nonregistered businesses responded affirmatively.

- g) Waste reduction audit assistance: 13 (43.3%) and 1 (3.3%) of the registered indicated, respectively, a positive response or "don't know" to this program, whereas 9 (50.0%) of the nonregistered businesses responded affirmatively to this program.
- h) Employee and management education: 19 (63.3%) and 1 (3.3%) of the registered indicated, respectively, a positive response or "don't know" to interest in this program, whereas 10 (55.6%) of the nonregistered businesses responded positively.
- i) Seminar on waste minimization: 18 (60.0%) of the registered and 7 (38.9%) of the nonregistered businesses responded positively to this program.

From Fig. 4.11, it was indicated that the top three programs chosen by registered SQG businesses in Benton County were, in order of importance: waste reduction literature, information on regulation, and technical assistance tied with employee and management education. Waste reduction literature was also selected as the primary area of interest by nonregistered SQG, with a virtual tie between information on regulation, technical assistance, and site visits for the second order of importance in the identification of waste reduction opportunities.

The program that attracted the least amount of interest from both registered and nonregistered SQG was waste management and regulation software. For those companies which indicated an interest in the WRAMP program, the most interesting reason given for an absence of interest in the program was that some businesses wanted to avoid government interference in their activities and they further believed that equivalent programs were available through their business affiliations and associations. A similar study conducted on the WRAMP program by Vail (1991) found that most businesses were interested in programs in the following order of importance: 1) waste reduction literature (50%), 2) information on regulations (34%),

3) seminars on waste minimization (32%), and 4) technical assistance for waste reduction (31.1%). For SQGs, federal and state regulators charged with responsibility for the use of public resources place emphasis upon waste reduction by the administration of assistance programs based upon the hierarchy of: waste reduction, waste recycling, and waste treatment. Within this hierarchy, the greatest priority is placed upon efforts to achieve waste reduction, to the end of limiting the amount of hazardous wastes that must then be managed (EPA, 1988c).

Question 8

Question: In your organization's effort to comply with state and federal laws and regulations that apply to waste products you may produce, how much of a problem is the following:

- a) complexity or inflexibility of state regulation,
- b) lack of time to stay informed of applicable regulations,
- c) technical difficulty of determining if wastes are hazardous,
- d) high cost of determining if wastes are hazardous,
- e) access to hazardous waste management technology information,
- f) identifying transporters with hazardous waste permits,
- g) identifying treatment or disposal facilities with hazardous waste permits,
- h) high cost of hazardous waste treatment and disposal at permitted facilities and transportation to such facilities,
- i) high cost of waste management technical consultants, and
- j) unavailability of hazardous waste management technical experts within your organization.

Summaries of the responses are shown, respectively, for each of the above problem areas in the order given above. To each problem area, respondents were

asked to indicate "very," "somewhat," "not," or "don't know/not available" in response to the magnitude of the problem for their company.

- a) **Complexity or inflexibility of state regulation (Figure 4.12):** The majority of the registered SQG in Benton County indicated a split response. Half of the respondents that indicated a problem in this area (11, or 36.7%) indicated "very" and half indicated "somewhat." The remainder of the respondents (8, or 26.7%) indicated no problem in this area. Among nonregistered respondents, the majority (9, or 50%) indicated that state regulation was only "somewhat" of a problem, whereas 5 (27.8%) stated that these regulations did not cause a problem.

HOW MUCH OF A PROBLEM IS COMPLEXITY OR INFLEXIBILITY OF STATE REG

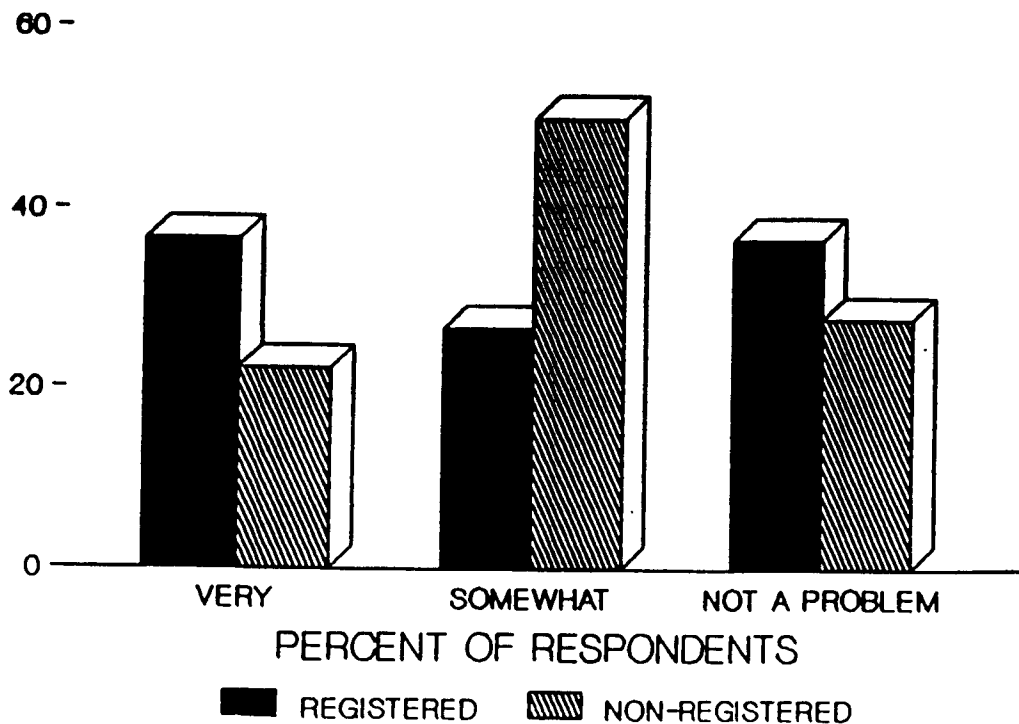


Figure 4.12. Problems With State Regulation.

- b) **Lack of time to stay informed (Figure 4.13):** The majority of registered SQGs in Benton County were equally divided (11, or 36.7%) between those who stated this was "somewhat" of a problem and those who stated that it was not a problem. The remainder (8, or 27.7%) responded that time to stay informed was "very" much of a problem. Among the nonregistered SQGs, responses were also divided between those who stated that time was "somewhat" of a problem (7, or 38.9%) and those who stated that time was "very" much a problem (4, or 22.2%).

HOW MUCH OF A PROBLEM IS LACK OF TIME TO STAY INFORMED OF REGULATIONS

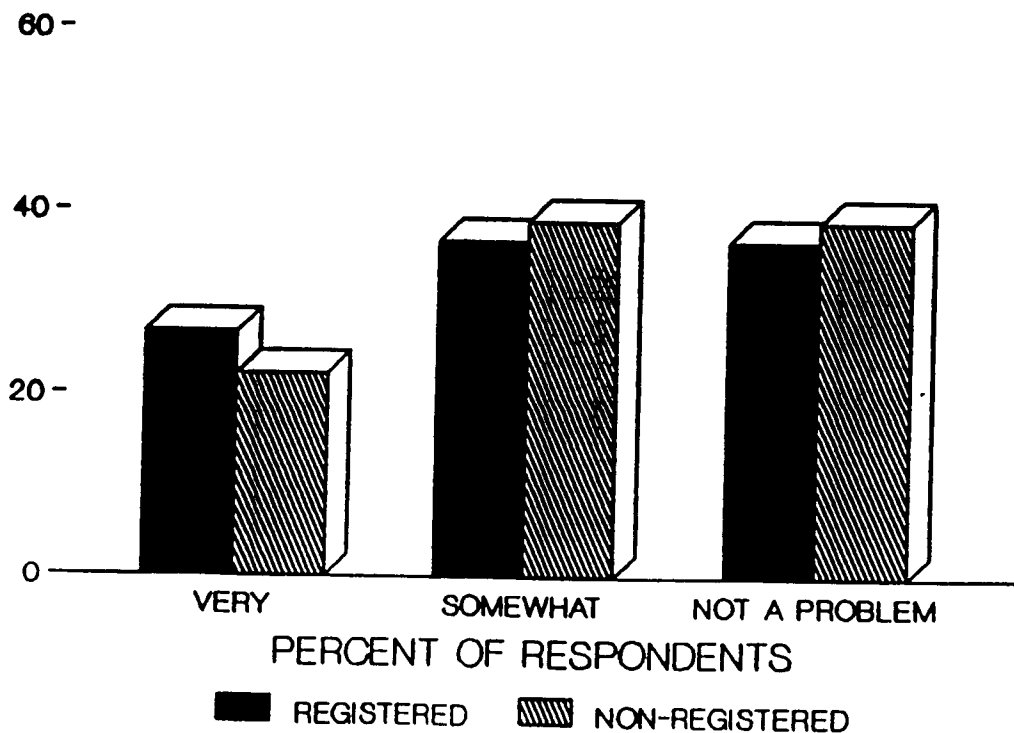


Figure 4.13. Remaining Informed About Regulations.

- c) Technical difficulties of determining if wastes are hazardous (Figure 4.14): Half of each the registered and half of the nonregistered (respectively, 15 and 9, or 50.0% in each business category) SQG stated that technical difficulties were "not" a problem, whereas one-third of each type, respectively, 10 and 6 respondents, indicated that this area was only "somewhat" of a problem. Only 5 (16.7%) of the registered and 3 (16.7%) stated that this area was "very" much of a problem.

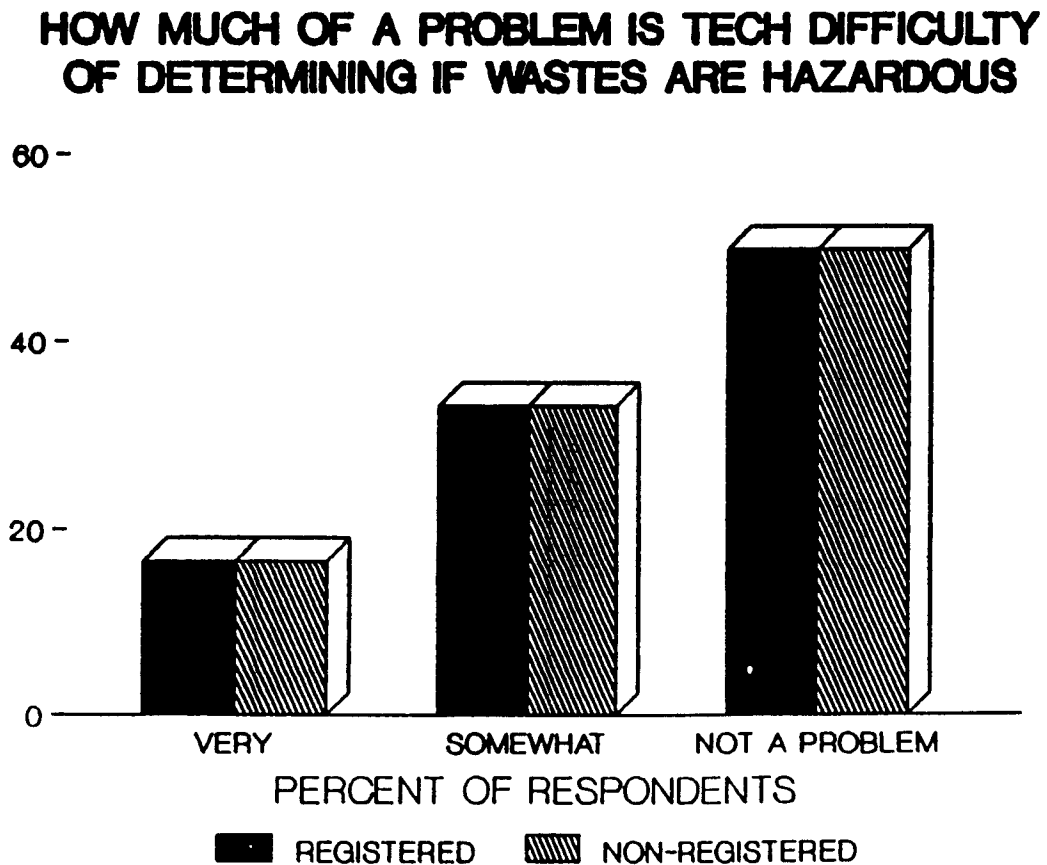


Figure 4.14. Technical Difficulty of Determining Status of Hazardous Wastes.

- d) High cost of determining if wastes are hazardous (Figure 4.15, p. 70): The majority of the registered (14, or 46.7%) and nonregistered (10,

or 55.6%) of the SQG stated that high costs were "not" a problem, followed by 11 (36.7%) of the registered and 6 (33.3%) of the non-registered businesses which stated that costs were "somewhat" of a problem. Only 14 (13.3%) of the registered and 2 (11.1%) of the nonregistered SQG indicated that costs were "very" much a problem.

HOW MUCH OF A PROBLEM IS HIGH COST OF DETERMINING IF WASTES ARE HAZARDOUS

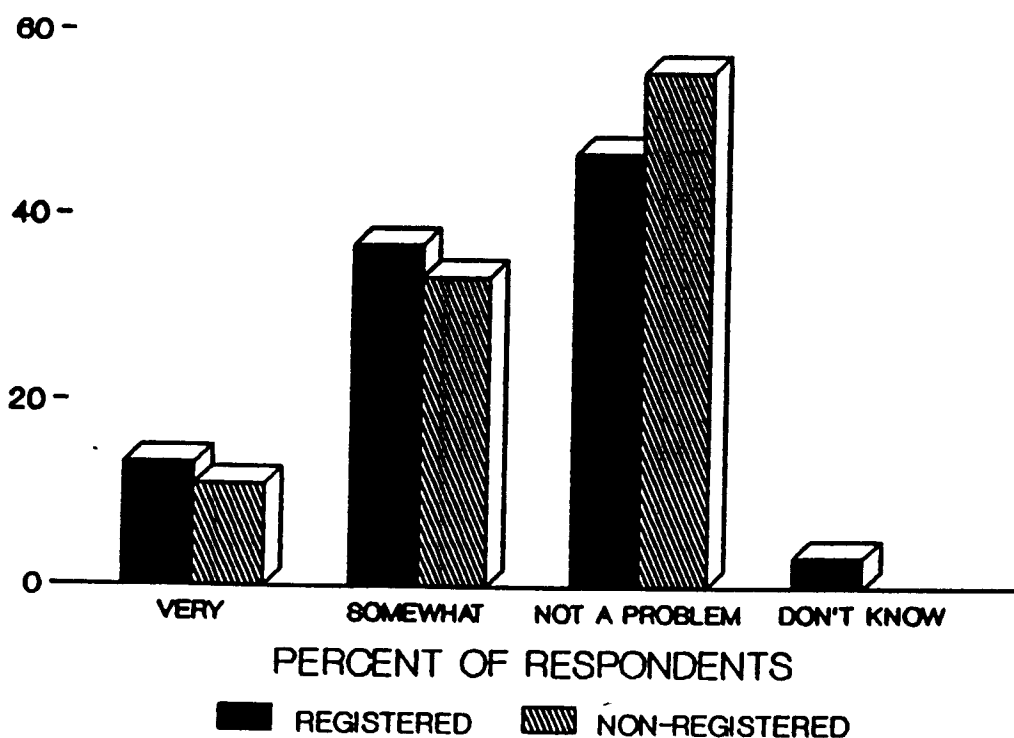


Figure 4.15. Costs of Determination of Status of Hazardous Wastes.

- e) Access to hazardous waste management technology information (Figure 4.16, p. 71): The majority of the registered (23, or 76.7%) and nonregistered (11, or 61.1%) SQG stated that this was "not" a problem, followed by 7 (23.3%) of the registered and 6 (33.3%) of the nonregistered that stated that access to information posed "somewhat"

of a problem. None of the registered SQG indicated that this was "very" much of a problem, whereas only 1 (5.6%) of the nonregistered SQG indicated the same response.

HOW MUCH OF A PROBLEM IS ACCESS TO HAZARDOUS WASTE MANGEMENT INFORMATION

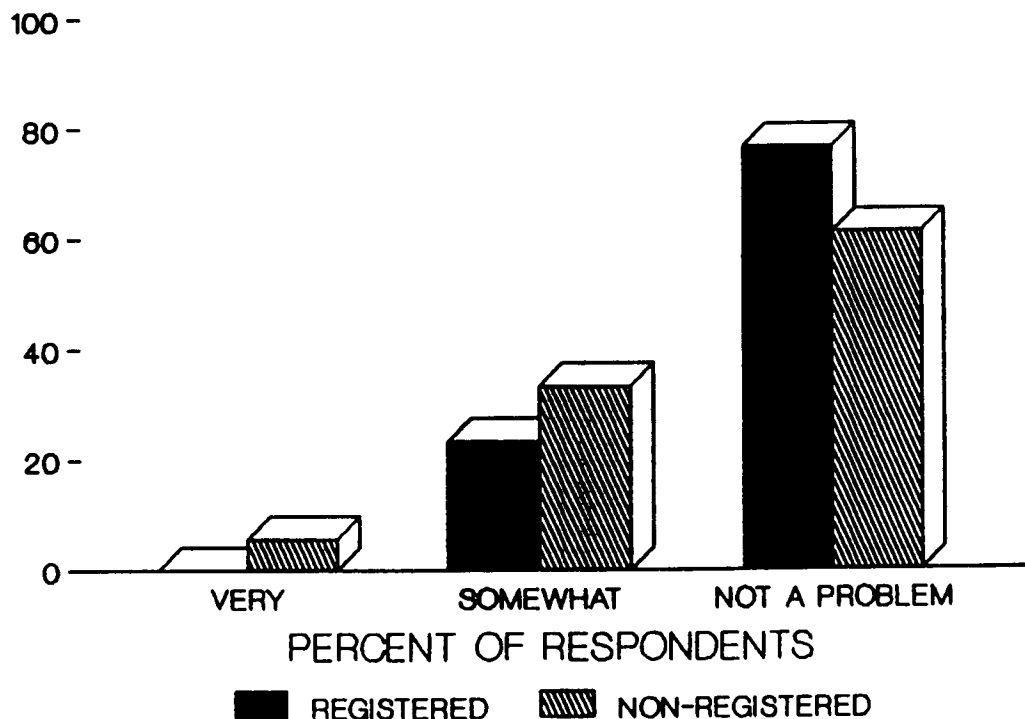


Figure 4.16. Problems of Access to Hazardous Waste Information.

- f) Identifying transporters with hazardous waste permits (Figure 4.17, p. 72): The majority of the registered (25, or 83.3%) and nonregistered (13, or 72.2%) SQG in Benton County stated that identifying transporters was "not" a problem. None of the respondents felt that this area was "very" much a problem, and only 3 (10.0%) of the registered and 4 (22.2%) of the nonregistered SQG felt that it was "some-what" of a problem.

HOW MUCH OF A PROBLEM IS IDENTIFYING TRANSPORTERS WITH PERMITS

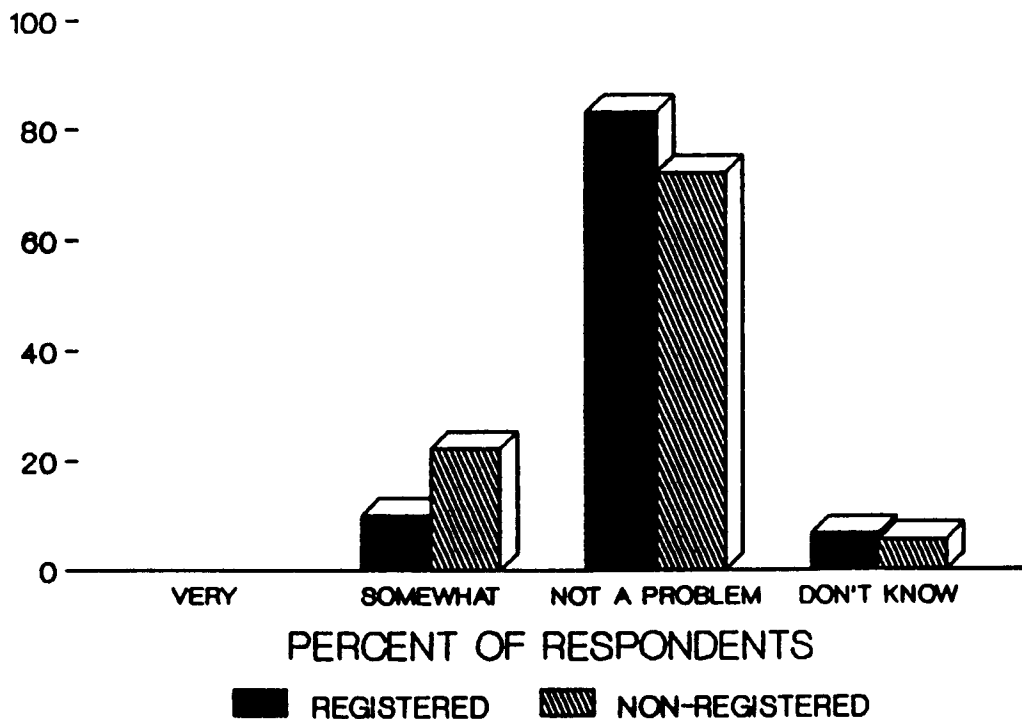


Figure 4.17. Problem of Identifying Transporters With Permits.

- g) Identifying treatment or disposal facilities with hazardous waste permits (Figure 4.18, p. 73): The majority of the registered (26, or 86.7%) and nonregistered (15, or 83.3%) SQG businesses felt that identifying treatment/disposal facilities was "not" a problem. Less than 12 percent of both the registered and nonregistered businesses stated that this area posed "somewhat" of a problem. Overall, less than two percent stated that it posed "very" much of a problem, while another six percent responded that they "didn't know" the seriousness of the problem.

HOW MUCH OF A PROBLEM IS IDENTIFYING TDF'S WITH HAZARDOUS WASTE PERMITS

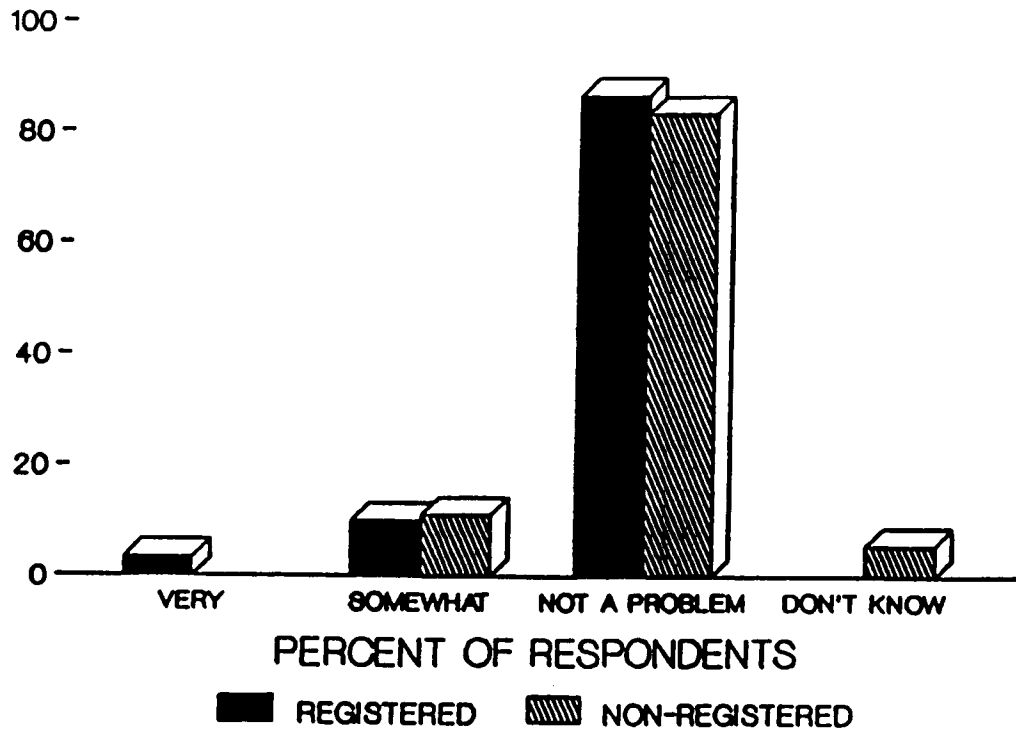


Figure 4.18. Problem of Identifying TDF.

- h) High costs of hazardous waste treatment and disposal at permitted facilities and transportation to such facilities (Figure 4.19, p. 74): Half of the registered (15, or 50.0%) SQG felt that the high costs of treatment/disposal was "very" much a problem, whereas only four percent of the nonregistered SQG responded similarly. On the other hand, five (16.7%) of the registered and six (33.3%) of the nonregistered SQG felt that this area posed "somewhat" of a problem. Those who stated that it was "not" a problem or that they "didn't know" included 10 (33.3%) of the registered and 7 (38.9%) of the nonregistered businesses. The services fees for hazardous waste treatment and disposal at permitted facilities is believed to be costly, and this was

indicated by the 50 percent of the respondents who believed it to be very much a problem. Disposal costs, including transportation and administrative costs, range from \$150 to \$750 per 55-gallon drum. Charges for wastes that require complex blending before they can be used as fuels range from \$300 to \$500 per drum (Schwartz & Pratt, 1990).

HOW MUCH OF A PROBLEM IS HIGH COST OF TRANSPORTATION & DISPOSAL AT TDF'S

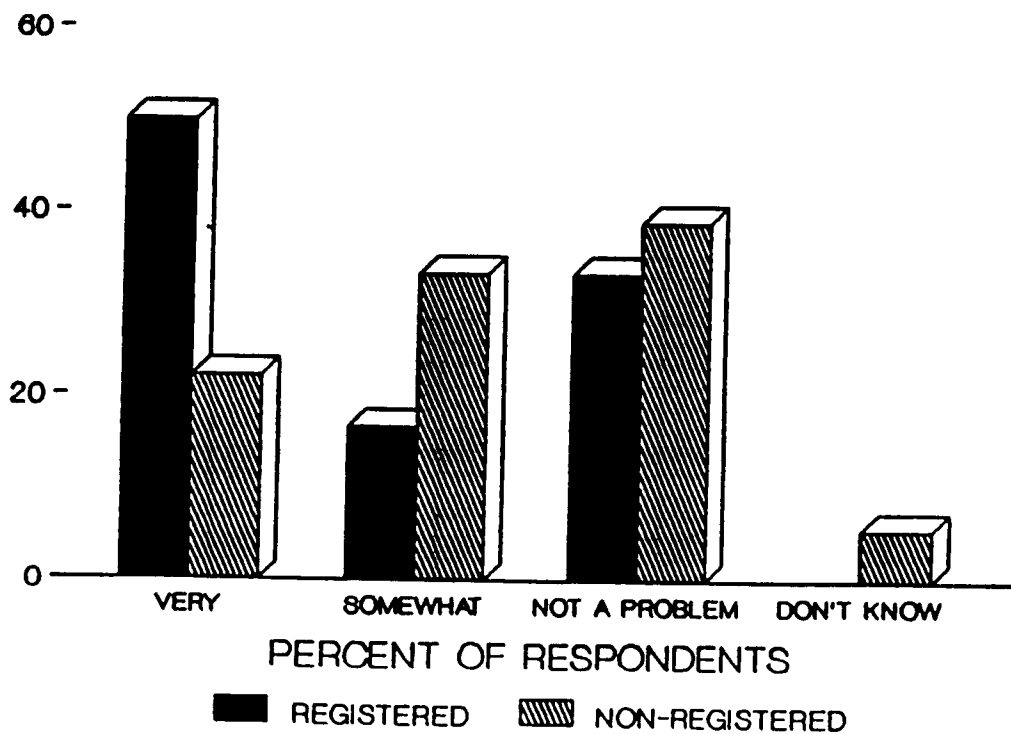


Figure 4.19. Costs of Disposal at a TDF.

- i) High cost of management technical consultants (Figure 4.20, p. 75): The majority of the registered (18, or 60.0%) and nonregistered (10, or 55.6%) SQG in Benton County felt that the high costs of consultants were "not" a problem. At the same time, 6 (20.0%) of the

registered and 4 (22.2%) of the nonregistered SQG felt that it was "very" much a problem, whereas less than two percent stated that it was "not" a problem or that they "didn't know" the magnitude of the problem.

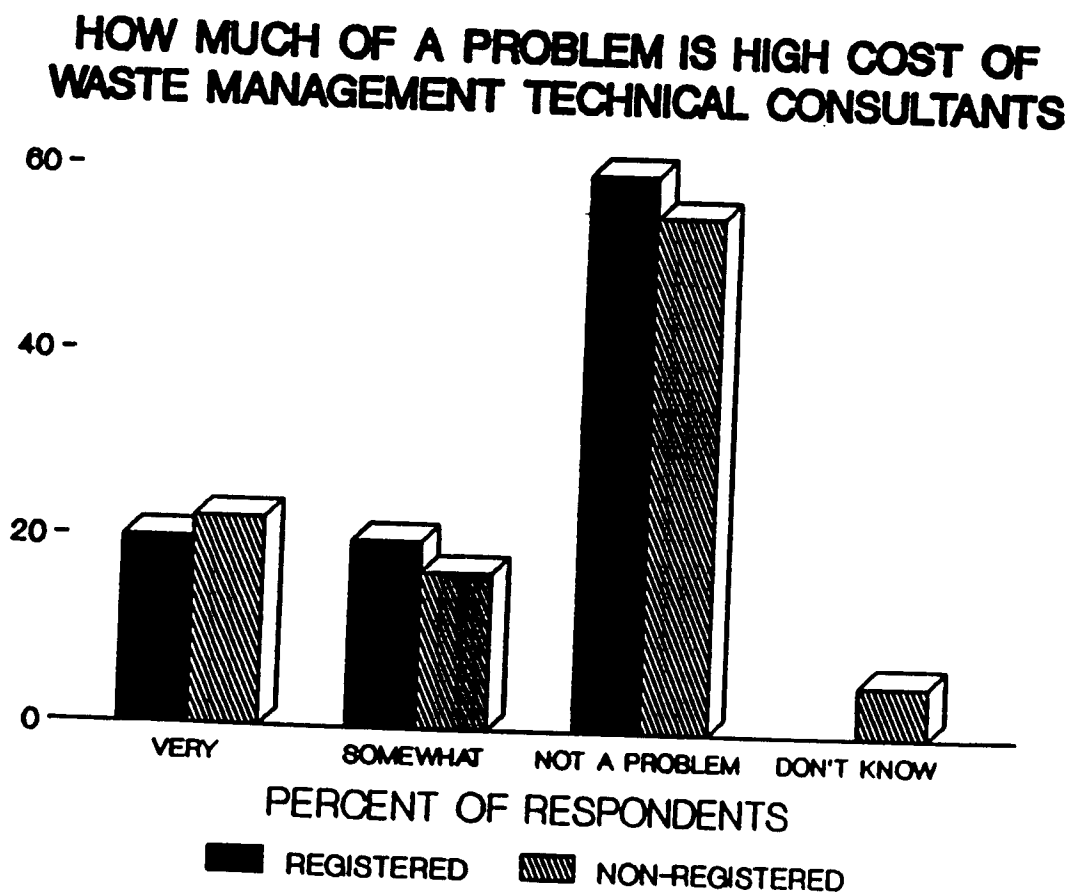


Figure 4.20. Costs of Consultant Advice.

- j) Unavailability of hazardous waste management technical experts within your organization (Figure 4.21, p. 76): The majority of the registered (18, or 60.0%) and nonregistered (12, or 66.7%) SQG stated that their lack of experts was "not" a problem. However, 8 (26.7%) of the registered and 3 (16.7%) of the nonregistered SQG felt that this was "very" much a problem.

HOW MUCH OF A PROBLEM IS LACK OF TECHNICAL EXPERTS IN YOUR ORGANIZATION

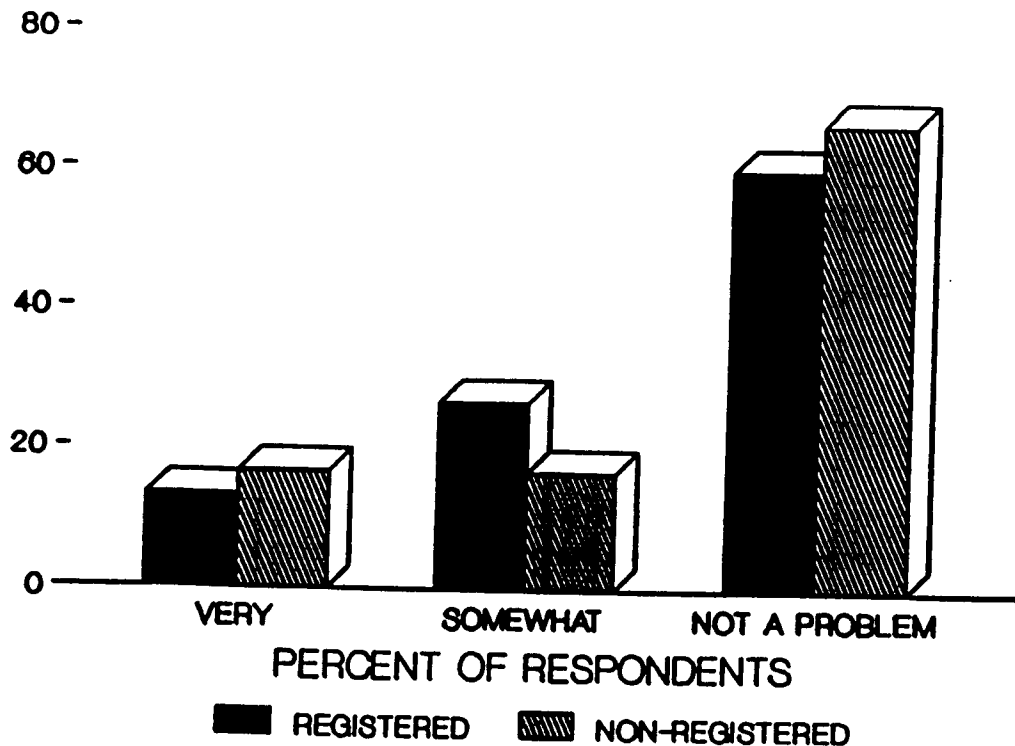


Figure 4.21. Problem of Availability of Technical Experts Within Organization.

Overall, it has been stated that environmental and hazardous waste regulation present complex legal and technical issues that are difficult to solve for the average SQG business. A similar study has provided evidence which supports the assumption that small businesses have insufficient time, money, and expertise to fully comply with environmental regulation. This study also stated that the knowledge of hazardous waste regulations is likely to be a significant constraint on regulatory compliance (Small Business Association of England, 1983).

As previously indicated, Deyle (1989) determined that access to information, regulatory complexity or inflexibility, and lack of time to remain informed served as significant constraints on the ability to comply with appropriate regulations. How-

ever, when the same question was presented to Benton County SQGs, in the context of the problem areas which served as possible barriers to compliance, the majority of the respondents indicated that the possible responses were "not a problem" (Figs. 4.13 to 4.21). Further inquiry among the respondents indicated that their companies were involved with either the use or production of hazardous wastes only to limited extents, or that whatever quantities of hazardous wastes were produced were handled for disposal by contracting firms (e.g., Safety Kleen) hired for this specific purpose.

Question 9

Question: The State of Oregon and the federal government have designated certain kinds of waste products as hazardous. Please tell me whether you think each of the following statements is true or false for organizations that generate such hazardous wastes.

Responses to each of the statements which accompanied this question, expressed as either "true," "false," or "don't know," are indicated below in the order presented. A summary of overall responses is provided in Figure 4.22 (p. 78).

- a) They would not be liable if their wastes were removed from their property by a second party:

	<u>Registered</u>	<u>Nonregistered</u>
True	6 (20.0%)	4 (22.2%)
False	23 (76.7%)	14 (77.8%)
Don't know	1 (3.3%)	none

CORRECT RESPONSES TO STATEMENTS REGARDING GOVT HAZARDOUS WASTE POLICY

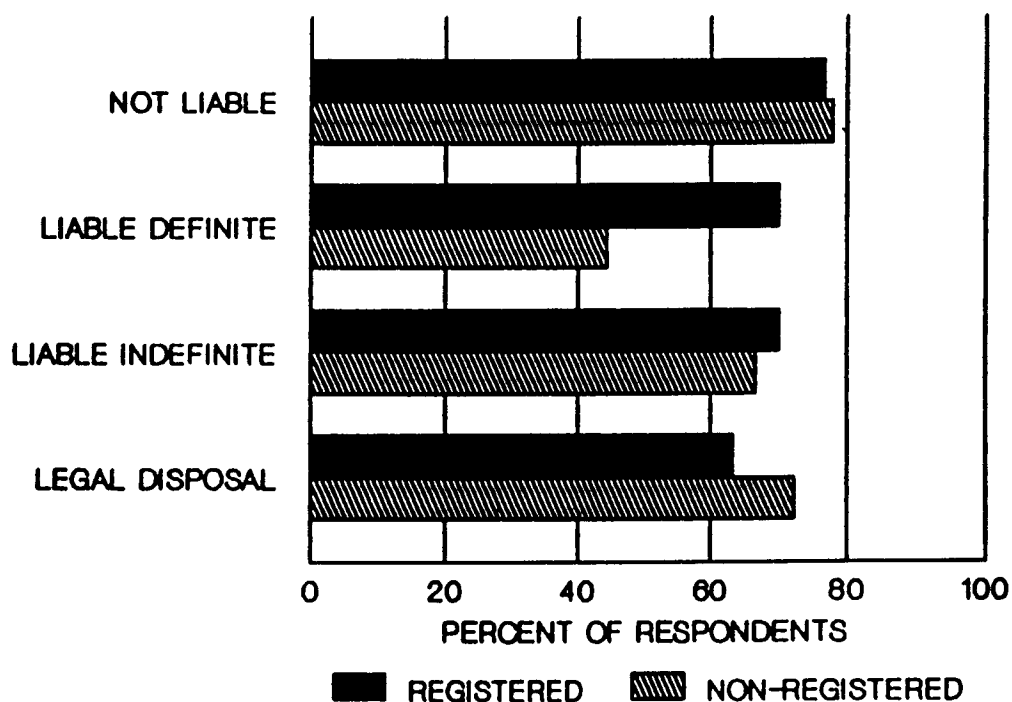


Figure 4.22. Correct Responses to Statements Regarding Government Hazardous Waste Policies.

- b) They would be liable if their wastes were delivered to a second party by themselves or another transporter, but the liability would not extend indefinitely:

	<u>Registered</u>	<u>Nonregistered</u>
True	7 (23.3%)	5 (27.8%)
False	21 (70.0%)	8 (44.4%)
Don't know	2 (6.7%)	5 (27.8%)

- c) They would be liable regardless of how their wastes were disposed, and the liability would extend indefinitely:

	<u>Registered</u>	<u>Nonregistered</u>
True	21 (70.0%)	12 (66.7%)
False	7 (23.3%)	6 (33.3%)
Don't know	2 (6.7%)	none

- d) Under Oregon state regulation, any organization that produces less than 220 pounds (100 kg) of a nonacute but hazardous waste in a calendar month may legally dispose of that waste in a landfill that is permitted for dry industrial waste:

	<u>Registered</u>	<u>Nonregistered</u>
True	8 (26.7%)	2 (11.1%)
False	19 (63.3%)	13 (72.2%)
Don't know	3 (10.0%)	3 (16.7%)

From Fig. 4.22, it may be seen that the majority of the registered (23, or 76.7%) and nonregistered (14, or 77.8%) businesses in Benton County provided the correct response, stating that they would be liable if their wastes were removed from their property by a second party. Overall, less than two percent of the respondents stated that they didn't know the correct response, or that it was not applicable to their situation.

One the question of whether or not the liability would extend indefinitely, the majority of the registered (21, or 70.0%) and only 8 (44.4%) of the nonregistered SQGs provided the correct response, stating that the liability would extend indefinitely. Overall, approximately five percent of the SQGs stated that they didn't know the answer or that it was not applicable to their situation.

To the question of whether or not they would be liable regardless of how their wastes were disposed, and that the liability would be indefinite, the majority of

the registered (21, or 70.0%) and nonregistered (12, or 66.7%) SQGs responded correctly in the affirmative. Less than two percent of the total number stated that they either didn't know or that the situation was not applicable to their situation.

Finally, on the issue of the legal disposal of nonacute but hazardous wastes in a landfill, the majority of the registered (19, or 63.3%) and nonregistered (13, or 72.2%) SQGs stated that it was not legal to dispose of hazardous wastes in a landfill. Overall, a total of six percent stated that they "didn't know" the answer or that the question was not applicable to their situation.

Empirical studies of the awareness among small businesses of issues of liability for the removal, transportation, and disposal of hazardous wastes have been few in number. However, one recent study has indicated that businesses are aware that they can be sued under the authority of a number of federal statutes, including: CERCLA, or the "Superfund"; the RCRA; and by virtue of state and municipal ordinances (O'Leary, 1989). CERCLA was enacted in 1980 to clean up abandoned hazardous waste disposal sites, in addition to which the liabilities for hazardous site owners, operators, waste transporters, and generators were specified. The act also stated that when it was not clear whose wastes were responsible for damages, the government could proceed against any individuals or groups potentially liable for the total cost of the clean-up for which each was jointly or individually liable.

The RCRA also provided for the regulation of hazardous wastes from generation to disposal (O'Leary, 1989). According to the RCRA, if the past or present handling, storage, treatment, transportation, or disposal of any waste presented a condition of endangerment, the EPA was authorized to bring suit against any individual or organization determined to have contributed to the problem. Thus, with respect to the overall issue of liability, Benton County SQGs responded to each question with varying degrees of accuracy (Fig. 4.22). Overall, the majority of the SQGs provided the correct responses, which may serve as an indication that they

were reasonably knowledgeable about legal liabilities arising from the improper management of wastes. However, knowledge of the conditions of liability may not be in consonance with efforts by the SQGs to observe legal requirements for the proper management and disposal of hazardous wastes. In point of fact, several examples of the extent of illegal dumping of hazardous wastes were previously cited in Chapter 2.

Summary

This chapter has provided a description of the responses to the survey conducted for this study relative to the questionnaire items. From the DEQ data list, a total of 30 hazardous waste handlers were identified. Data obtained from the State Fire Marshal list included 18 companies which reported that they handled such waste products. The combination of these two lists resulted in an overall total of 48 businesses, all of which agreed to participate in the current investigation. The remainder were eliminated due either to duplicated entries on the two lists, nonexistence of the companies, the fact that the businesses were located outside of Benton County boundaries, or for reason of noncompliance and reclassification. Of the total of 48 respondents, 30 were registered businesses and 18 of the businesses were not registered. Among the registered businesses, 10 (33.3%) were classified as SQGs and 20 (66.7%) were classified as CEGs. Among the nonregistered businesses, 6 (33.3%) were classified as SQGs, whereas 12 (66.7%) were classified as CEGs.

The study instrument included several questions and subquestions concerned with hazardous waste management and disposal issues. Findings with respect to each question and subquestion were obtained, based upon an analysis of the responses provided by the questionnaire respondents.

CHAPTER 5

SUMMARY, CONCLUSIONS, AND RECOMMENDATIONS

Summary

It has generally been believed that one of the obvious areas of neglect in the development and evolution of modern industrialized societies has been the manner in which hazardous waste disposal is managed. In support of this claim, several examples of neglectful practices were considered. One response to this situation was that the U.S. Congress passed the Resource Conservation and Recovery Act (RCRA) of 1976, encompassing three major programs (i.e., Subtitles C, D, and I). The EPA, as authorized by this and other enabling acts, has developed identification criteria for hazardous wastes and appropriate listings have thus been included in the U.S. Code of Federal Regulations. Three categories of hazardous waste generators, including fully regulated, small quantity, and conditionally exempt small quantity generators, were classified, based upon the amounts and characteristics of the chemicals used or produced.

To address the issue of hazardous waste generation and other solid waste concerns, the RCRA of 1976 was subsequently amended in 1986. At present, several additional federal and numerous state legislative enactments have been issued to regulate the production and management of hazardous wastes to minimize their impact upon human health and the environment. Some of these enactments include CERCLA (the "Superfund"), FIFRA, the Clean Air Act, and the Clean Water Act. Most state enactments and regulations are in accordance with and operate within the framework provided by federal hazardous waste regulations.

With respect to SQGs and CEGs, the State of Oregon has issued an appropriate number of legislative enactments (e.g., Senate Bills 184 and 241, and House Bills 2246 and 3514), which as subsequently administered serve to provide workshops on issues of waste management, clarify the regulation of waste tires, and modify current advance notice requirements prior to the assessment of civil penalties for certain violations, among other considerations. Specific state-based activities thus authorized include public hearings on proposed rules for underground storage tanks, the conduct of statewide training workshops, and the establishment of the governor's "Toxic Use Reduction Award" program to encourage waste reduction. Other Oregon policy programs include the State Fire Marshal's annual hazardous wastes survey and an additional waste management survey. As noted above, illegal disposals are believed to be rampant among SQGs and CEGs and have been evidenced by survey results from Florida, the Texas Department of Health, and by household surveys in Colorado and Massachusetts. The principal reasons given for the illegal disposal of hazardous wastes include lack of information, complexity of the regulations, cost factors, and lack of enforcement.

To control hazardous wastes, SQGs must acquire an EPA identification number, prepared disposal manifests in accordance with federal regulations, and properly package and label wastes for transportation. Similarly, transporters, treatment, storage, and disposal facilities must also acquire EPA identification numbers to operate and to handle wastes.

The purpose of the current investigation, subject to the stated limitations and based upon the results of a survey conducted in Benton County (Oregon), was to assess current management and disposal practices for hazardous wastes among SQGs and CEGs. Assessment procedures included: Identification of registered and non-registered businesses, identification of specific types and quantities of hazardous wastes generated, and assessment of current levels of awareness of hazardous wastes

with respect to pertinent regulations and safe environmental practices. Data was gathered in cooperation with the State of Oregon DEQ, the Oregon Fire Marshal, and the Benton County Environmental Health Division. From lists provided by these sources, a total of 48 businesses who agreed to participate in the current investigation were selected for the survey, including 30 registered and 18 nonregistered businesses. One-third of each of these two classifications were SQGs, whereas the balance were classified as CEGs.

A letter of introduction was mailed to the selected businesses to inform them of an in-person visitation and the nature of the research. The in-person interview was conducted by the researcher, using a prepared questionnaire. This instrument was pretested for content validity through review by Benton County environmental health professionals, a representative of the Corvallis Waste Disposal Company, the Oregon State University Department of Statistics, and by other specialists knowledgeable in specific areas of this study. Survey questions focused upon a number of specific activities, including determination of whether or not organizations producing hazardous wastes provide some form of training to their employees who handle such wastes. Information gathered from the respondents was entered into readable computer language and analyzed as a descriptive statistical study with the use of an IBM PC and appropriate analytic software.

Conclusions

This investigation involved the administration of several questions and sub-questions for determination of a profile of hazardous waste management and disposal practices among SQGs in Benton County. From analysis of the responses to the survey questions, it was concluded that the findings strongly suggest that SQGs and CEGs in Benton County, Oregon, use or generate wastes that are potentially hazar-

dous to human health and the environment. These wastes include, but are not confined to, aqueous liquids, halogenated solvents, and other forms of waste such as batteries, acids and alkalis. It should also be noted that while the majority of the respondents who attested to the production of hazardous wastes stated that they provided waste handling and disposal training to their employees, a substantial number of the respondents also indicated that they did not provide such training. However, even in those cases in which it was asserted that a training program was provided, it was not within the purview of the current study to investigate such programs.

With respect to the types and quantities of some of the wastes produced (e.g., waste oils or halogenated solvents, p. 43), some respondents were reluctant to commit to firm estimates. This may have indicated lack of familiarity with the type of solvents or products in use or wastes generated as a result of use in their firms. As a result, some of the respondents replied in the negative to be safe, or to avoid the perception that they were not knowledgeable about the products in use in their firms. Some of those who responded in the affirmative relied on best-guess estimates to respond to the question. These patterns were clearly observed in the in-person interviews conducted by the researcher.

From the statistical evidence presented in Figure 4.2, 73.3 percent of the registered and 94.4 percent of the nonregistered businesses in Benton County indicated that they produced waste oils, but the median amount of waste oils produced by both the SQGs and the CEGs was virtually equal at 50 gallons per month. Though it may be stated that the majority of the nonregistered businesses in Benton County produced more waste oil than the registered businesses, an overall comparison of SQGs and CEGs for the current study does not provide a clear comparison or convincing evidence that nonregistered businesses, by virtue of their regulatory exemption, are practicing illegal hazardous waste management and disposal procedures to a greater

degree than regulated businesses, who are presumably subject to regulation. The findings also do not support the concept that because some businesses are subject to higher degrees of regulation, they are therefore in a better position to practice safe hazardous waste management and disposal procedures than those businesses which are subject to lesser degrees of regulation. Overall, due to the sensitivity of the study, fear of self-incrimination is believed to be one of the principal reasons why some respondents were so cautious and careful in answering these types of questions.

The results of the survey also indicated that while the SQG and CEG respondents reported the disposition of hazardous wastes through the methods of return to the supplier, recycling on-site, shipment to a TSDF, evaporation, and the sale of wastes, a substantial number of the respondents stated that their hazardous wastes were in landfill garbage for pick-up, sewage facilities, or other forms of disposal. This finding was supported in an interview conducted with the City of Corvallis Water Operation Supervisor (personal communication, June 1992). When asked whether businesses in Benton County were dumping hazardous wastes into the sewer system or septic systems, he stated that "an acceptable pH level is between 6.0 to 9.0—outside this range it is considered unacceptable. We have had infrequent dumps that have elevated the influent pH to as high as 10.5 for up to two hours." Overall, this city official stated his belief that there was a high level of environmental and health awareness among Benton County businesses. At the same time, he added that Oregon State University (OSU), an institution which was included within the parameters of the current study, generated tremendous amounts of chemicals and he further placed in question OSU management and disposal practices. It may be noted that prior to the conduct of this interview, upon inspection by the DEQ the University was fined \$2,500 for violations of storage, shipping, and improper usage of hazardous waste manifest regulations (Kelley, 1992). Subsequent to this interview, the

OSU maintenance plant facility burned to the ground, causing the burning and release of dangerous chemicals into the ground and into the air (Regan, 1992).

Survey findings also suggested that while the majority of the respondents (i.e., 72% of the registered businesses) demonstrated an interest in increased availability of waste reduction literature, use of the WRAMP library (60% of the registered businesses), and information on regulation and other programs, other respondents were equally skeptical about the impact of such programs. The fear of increased government interference through subjection to new levels of official monitoring and regulation was expressed. In the area of knowledge of the state and federal laws and regulations that apply to hazardous wastes, the study findings suggested that the complexity and/or inflexibility of the regulations and the lack of available expertise and monetary resources, coupled with the impact of potential liability issues, were some of the principal constraints experienced by SQGs and CEGs in Benton County.

Recommendations

The present study examined current hazardous waste management and disposal practices among small quantity generators in Benton County, Oregon. Data on the actual numbers of registered and nonregistered SQGs gathered from the Oregon DEQ and State Fire Marshal was determined to be of questionable accuracy. It was stated by a representative of the DEQ that the actual numbers and proportions of SQGs and CEGs in the State of Oregon remain unknown factors (personal communication, 1992). This may also be true of other state and local jurisdictions within the United States, and this situation has a possible relationship to the fact that SQGs and CEGs, in particular, have been exempted from certain hazardous waste regulatory requirements.

Therefore, for reason of this limitation upon the availability of accurate data, it was not possible to conduct random sampling in Benton County that would be accurately representative of businesses in the SQG and CEG categories. For long-term administrative and policy-making purposes, further research is thus suggested for the following specific areas:

- 1) The number of SQGs and CEGs in Benton County;
- 2) Identification of the numbers and types of businesses represented by application of the Standard Industrial Classification Code;
- 3) Identification of the specific types of hazardous wastes generated or used by these producers;
- 4) Assessment of current management and disposal practices among these types of businesses; and

Based upon the findings in the above areas of proposed research, it is further recommended that specific programs to limit and/or reduce the amounts of hazardous wastes generated by SQGs and CEGs in Benton County be considered. The proposed purpose of such programs would be to limit and/or reduce the risk of adverse human health and environmental damage effects in Benton County. Recommendations for the achievement of hazardous waste source reduction and safe disposal should include appropriate consideration in the areas of public policy, monitoring and enforcement strategies, public education, and continuing research. Recommendations in each of these areas are considered in the following sections.

Public Policy

The State of Oregon has recently enacted a number of innovative legislative measures in the effort to assist SQGs and CEGs with hazardous waste management and disposal practices. These measures, as reviewed in Chapter 2, include SB-184, SB-241, HB-2246, and HB-3515. Specifically, the latter bill placed the State of Ore-

gon among the first of the states within the United States to mandate the institution of pollution prevention programs which encompassed: a) Preparation of inventories for all hazardous chemicals used or in use, b) encouragement of the use of fewer toxic and additional nontoxic chemicals, c) limitation of purchases to stocks of only those products for which a need can be demonstrated, d) reduction of hazardous waste emissions, e) improvement of the efficiency of equipment operation, and f) recovery and recycling of hazardous wastes on-site.

Since the greater part of these measures represent programs instituted only within the last two years, the effectiveness of actual program implementations, budget allocations, and overall program evaluations may not be determined in the near future. To establish the effectiveness of such programs, future research is recommended to: a) ascertain the effectiveness of legislative proposals, b) determine the nature of problems encountered in program implementation, and c) develop alternative policy procedures for the further implementation of hazardous waste management and disposal practices throughout the State of Oregon.

Monitoring and Enforcement Strategies

Data on the illegal dispositions of hazardous wastes are difficult to collect. Similarly, generator surveys similar to the current investigation, may not lead to reliable estimates of the magnitude and effects of illegal disposal. In part, this may be because hazardous waste users and/or producers are unwilling to disclose the true state of hazardous waste management and disposal practices for reason of fear of official and governmental retribution. Thus, city and county governments, in cooperation with the State of Oregon, should implement effective monitoring and enforcement strategies based upon the following guidelines, as adopted from similar measures instituted in Los Angeles County, California, and in the states of Massachusetts and Pennsylvania (Hammit & Reuter, 1988):

- 1) Conduct intensive inspection of a large sample of generators using the Internal Revenue Service (IRS) Taxpayer Compliance Measurement Program. In this program, each third year the IRS selects a stratified random sample of income tax returns for intensive audit. The purpose is to develop an audit strategy for those taxpayers with a high rate of non-compliance with current regulations, a principle which could be equally applied to users/producers of hazardous wastes who are suspected of similar noncompliance.
- 2) Use informants as a source of information: Since potential violators are great in number and reflect a wide business diversity, policies to stimulate informed "tips," such as the extension of rewards to those providing accurate information, could be of value.
- 3) Continuous monitoring of sewer systems and storm drain channels could provide evidence of the amounts of illegally disposed hazardous wastes, thus providing a means to identify sources and violators and to assure successful prosecutions.

Resources for these types of regulatory programs could be obtained from the use of revenues gained from generator registration fees or from the administration of criminal and/or civil penalties for violations, as well as from federal resources for programs administered in cooperation with federal hazardous waste programs.

Public Education

Public education must be continuously aimed at increasing consumer awareness of the potential dangers that hazardous wastes pose to human health and environmental safety. City and county governments, in cooperation with state governments, should intensify specific educational programs directed at both SQGs and

CEG. These types of programs should include: a) On-site hazardous waste minimization methods and b) off-site hazardous waste management and recycling options.

Clark-Skamania Counties, in cooperation with the State of Washington, have apparently implemented a successful on-site and off-site hazardous waste management program for small businesses (Washington, Department of Ecology, 1992). It is suggested that Oregon counties, and Benton County specifically, could institute similar programs based upon consideration of the following principles:

- 1) Education which emphasizes the substantial direct and indirect savings which SQGs and CEGs could achieve through the minimization of hazardous wastes. For example, saving could be achieved through: a) reduced waste transportation and disposal costs, b) reduced waste storage and handling costs, c) reduced purchases of raw materials, d) reduction of pollution liability insurance costs, e) avoidance of fines and/or clean-up costs, and f) reduced costs of reporting and/or manifest administration.
- 2) Hazardous waste minimization could be enhanced through the simple practice of waste stream segregation, improved management and personnel practices, improved housekeeping measures, raw materials substitutions, changes in technologies used in manufacturing/fabrication procedures, materials reuse, and recycling.
- 3) Off-site hazardous waste management and recycling options could be based upon the fact that some manufacturers and sellers of hazardous products will take back the waste materials generated from the use of such products. A list of vendors who provide such services is available from the DEQ (Hazardous and Solid Waste Division) through a toll-free telephone service. Examples of such products include solvents and thinners, vehicle batteries, antifreeze products, paints, pesticides, empty pes-

ticide containers, and empty drums and containers which are variously recycled be vendors.

Continuing Research

One of the best means to determine the effectiveness of hazardous waste policies, monitoring and enforcement strategies, and public education in the State of Oregon would be to authorize periodic evaluations to assess program effectiveness at county and regional levels in cooperation with the DEQ. These types of studies should determine the impact of hazardous waste management and disposal programs with respect to: a) increased program awareness by SQG and CEG businesses, b) increased use of safe hazardous waste management and disposal practices by SQG and CEG businesses, and c) the decreased frequency or elimination of illegal hazardous waste disposal practices.

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APPENDICES

Appendix A
**Oregon State Fire Marshal Hazardous
Substance Employer Survey**

1989 - 1990
HAZARDOUS SUBSTANCE EMPLOYER SURVEY
OREGON STATE FIRE MARSHAL

Account Number _____

TO COMPLETE OR MAKE CORRECTIONS: DO NOT USE PEN OR PENCIL. TYPE CHANGES OR ADDITIONS ONLY IN THE APPROPRIATE COLORED AREAS TO THE RIGHT OR BELOW THE PREPRINTED DATA IN SECTIONS A, B AND C.

SECTION A**HAZARDOUS SUBSTANCE PRESENCE** (Enter the appropriate number, either 1, 2 or 3 in the box to the left)

1. No hazardous substances are used at this site in any way. Type the number 1 in the box to the left. Complete Sections B and C.
2. Hazardous substances are used at this site by our company, but do not meet reporting requirements. Type number 2 in the box to the left. Complete Sections B and C.
3. Hazardous substances are used at this site by our business in reportable quantities. Type number 3 in the box to the left. Complete all parts of the form, Sections A, B and C.

SECTION B**DEMOGRAPHIC DATA** (Please type the following information in the shaded areas if it is not preprinted. See instructions page 3 and 4 for guidance.)

1. SIC CODE(S) Enter all that apply to business SIC 1 SIC 2 SIC 3

2. TYPE OF BUSINESS:

3. DATE FORM COMPLETED:

4. EMPLOYER NAME:

5. BUSINESS NAME:

6. SITE ADDRESS:

CITY:

COUNTY:

STATE:

ZIP CODE:

BUSINESS PHONE:

DUN & BRADSTREET No:

Dept. or Div:

7. MAILING ADDRESS

CITY:

COUNTY:

STATE:

ZIP CODE:

8. NUMBER OF EMPLOYEES AT THIS SITE:

9. EMERGENCY ASSISTANCE CONTACT PERSON FOR THIS SITE:

CONTACT PHONES:
DAY

NIGHT

10. RESPONSIBLE FIRE DEPARTMENT:

11. SPECIAL EMERGENCY PROCEDURES: (See instructions, page 4. Use additional pages as necessary)

12. ARE STORAGE BUILDINGS/TANKS/AREAS PLACARDED ACCORDING TO NFPA 70417 (YES or NO)

SECTION C**PERSON COMPLETING FORM**

SIGNATURE _____

PRINT NAME _____

THE NAME AND SIGNATURE OF THE PERSON RESPONSIBLE FOR COMPLETION OF THE FORM. THIS PERSON WILL BE CONTACTED TO ANSWER ANY QUESTIONS NEEDING CLARIFICATION.

DO NOT DUPLICATE THIS FORM
REQUEST ADDITIONAL COPIES IF YOU MUST REPORT FOR MORE THAN ONE SITE

TYPE ALL ANSWERS

THE ABOVE DATA IS:

CORRECT AS SHOWN

CORRECTIONS ARE MADE

THIS SHEET MUST BE SIGNED AND RETURNED

HAZARDOUS SUBSTANCE EMPLOYER SURVEY

OREGON STATE FIRE MARSHAL

SECTION D

SUBSTANCE INFORMATION

DO NOT DUPLICATE THESE SHEETS. REQUEST ADDITIONAL COPIES IF NEEDED. TYPE ALL DATA IN SHADED AREAS

PURE COMMON NAME/TRADE NAME:

MIXTURE CHEMICAL NAME OF
HAZARDOUS INGREDIENT IN HIGHEST CONCENTRATION:

<input type="checkbox"/> CORRECT <input type="checkbox"/> AS SHOWN <input type="checkbox"/> CORRECTIONS AS INDICATED <input type="checkbox"/> DELETE	APPROX. YR/MT USE TABLE 1	UNIT OF MEASURE USE TABLE 2	HAZ. MAT. CODE USE TABLE 3	HAZ. MAT. CODE USE TABLE 3	HAZ. MAT. YEAR CODE USE TABLE 3	HAZARDOUS ON SITE 3 DIGIT NO.	STORAGE CODE USE TABLE 4 & 5	HAZARD CLASS 1 USE TABLE 6	CAS NO. (IF KNOWN)
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STORAGE LOCATIONS (BE SPECIFIC)

UN/NA NO.

PURE COMMON NAME/TRADE NAME:

MIXTURE CHEMICAL NAME OF
HAZARDOUS INGREDIENT IN HIGHEST CONCENTRATION:

<input type="checkbox"/> CORRECT <input type="checkbox"/> AS SHOWN <input type="checkbox"/> CORRECTIONS AS INDICATED <input type="checkbox"/> DELETE	APPROX. YR/MT USE TABLE 1	UNIT OF MEASURE USE TABLE 2	HAZ. MAT. CODE USE TABLE 3	HAZ. MAT. CODE USE TABLE 3	HAZ. MAT. YEAR CODE USE TABLE 3	HAZARDOUS ON SITE 3 DIGIT NO.	STORAGE CODE USE TABLE 4 & 5	HAZARD CLASS 1 USE TABLE 6	CAS NO. (IF KNOWN)
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STORAGE LOCATIONS (BE SPECIFIC)

UN/NA NO.

PURE COMMON NAME/TRADE NAME:

MIXTURE CHEMICAL NAME OF
HAZARDOUS INGREDIENT IN HIGHEST CONCENTRATION:

<input type="checkbox"/> CORRECT <input type="checkbox"/> AS SHOWN <input type="checkbox"/> CORRECTIONS AS INDICATED <input type="checkbox"/> DELETE	APPROX. YR/MT USE TABLE 1	UNIT OF MEASURE USE TABLE 2	HAZ. MAT. CODE USE TABLE 3	HAZ. MAT. CODE USE TABLE 3	HAZ. MAT. YEAR CODE USE TABLE 3	HAZARDOUS ON SITE 3 DIGIT NO.	STORAGE CODE USE TABLE 4 & 5	HAZARD CLASS 1 USE TABLE 6	CAS NO. (IF KNOWN)
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STORAGE LOCATIONS (BE SPECIFIC)

UN/NA NO.

PURE COMMON NAME/TRADE NAME:

MIXTURE CHEMICAL NAME OF
HAZARDOUS INGREDIENT IN HIGHEST CONCENTRATION:

<input type="checkbox"/> CORRECT <input type="checkbox"/> AS SHOWN <input type="checkbox"/> CORRECTIONS AS INDICATED <input type="checkbox"/> DELETE	APPROX. YR/MT USE TABLE 1	UNIT OF MEASURE USE TABLE 2	HAZ. MAT. CODE USE TABLE 3	HAZ. MAT. CODE USE TABLE 3	HAZ. MAT. YEAR CODE USE TABLE 3	HAZARDOUS ON SITE 3 DIGIT NO.	STORAGE CODE USE TABLE 4 & 5	HAZARD CLASS 1 USE TABLE 6	CAS NO. (IF KNOWN)
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STORAGE LOCATIONS (BE SPECIFIC)

UN/NA NO.

Appendix B

EPA Notification of Hazardous Waste Activity

Please print or type with SLTTE form 112 characters per inch in the unshaded areas only.

Form Approved OMB No. 2000-0020 4 copies 8 3/8" x 11" GSA No. 0746-1PA-01

United States Environmental Protection Agency
Washington, DC 20460

EPA Notification of Hazardous Waste Activity

Please refer to the instructions for filing this form when a notification is required. The information requested here is required by the 112(c)(1) of the Resource Conservation and Recovery Act.

For Official Use Only

Comments

C1

Installation's EPA ID Number

Approved for

Date Received

mo

day

year

I. Name of Installation

II. Installation Mailing Address

Street or P.O. Box

City or Town

State

ZIP Code

III. Location of Installation

Section or Block Number

City or Town

State

ZIP Code

IV. Installation Contact

Name and Title (last, first, and middle initial)

Phone Number (area code and number)

V. Ownership

A. Name of Installation's Legal Owner

B. Type of Ownership (owner only)

VI. Type of Regulated Waste Activity (Mark 'X' in the appropriate boxes. Refer to instructions.)

A. Generating Waste Activity

☐ 1a Generator ☐ 1b Less than 1,000 kg/yr.

☐ 2 Transporter

☐ 3 Transfer/Storage/Disposal

☐ 4 Underground Injection

☐ 5 Market or Burn Hazardous Waste Fuel

☐ 6 Generator Marking to Burner

☐ 7 Other Markers

☐ 8 Burner

B. Used Oil Fuel Activities

☐ 9 Oil-Specification Used Oil Fuel

☐ 10 Generator Marking to Burner

☐ 11 Other Markers

☐ 12 Burner

☐ 13 Specification Used Oil Fuel Markers for On-site Burner

☐ 14 Who First Claims the Oil Meets the Specification

VII. Waste Fuel Burning: Type of Combustion Device (Mark 'X' in all appropriate boxes to indicate type of combustion device(s) in which hazardous waste fuel or oil-specification used oil fuel is burned. See instructions for definitions of combustion devices.)

☐ A Utility Boiler ☐ B Industrial Boiler ☐ C Industrial Furnace

VIII. Mode of Transportation (transporters only — enter 'X' in the appropriate box(es))

☐ A Air ☐ B Rail ☐ C Highway ☐ D Water ☐ E Other (specify)

IX. First or Subsequent Notification

Mark 'X' in the appropriate box to indicate whether this is your installation's first notification of hazardous waste activity or a subsequent notification. If this is not your first notification, enter your installation's EPA ID Number in the space provided below.

☐ A First Notification ☐ B Subsequent Notification (provide EPA ID Number)

C. Installation's EPA ID Number

EPA Form 6700-12 (Rev. 11-85) Previous edition is obsolete. Continue on reverse.

ID - For Official Use Only											
C										F, A, C	
W										I	
X. Description of Hazardous Wastes (continued from front)											
A. Hazardous Wastes from Nonspecific Sources. Enter the four-digit number from 40 CFR Part 261.31 for each listed hazardous waste from nonspecific sources your establishment handles. Use additional sheets if necessary.											
1	2	3	4	5	6	7	8	9	10	11	12
B. Hazardous Wastes from Specific Sources. Enter the four-digit number from 40 CFR Part 261.32 for each listed hazardous waste from specific sources your establishment handles. Use additional sheets if necessary.											
13	14	15	16	17	18	19	20	21	22	23	24
25	26	27	28	29	30	31	32	33	34	35	36
C. Commercial Chemical Product Hazardous Wastes. Enter the four-digit number from 40 CFR Part 261.33 for each chemical substance your establishment handles which may be a hazardous waste. Use additional sheets if necessary.											
37	38	39	40	41	42	43	44	45	46	47	48
D. Listed Infectious Wastes. Enter the four-digit number from 40 CFR Part 261.34 for each hazardous waste from hospitals, veterinary hospitals, or medical and research laboratories your establishment handles. Use additional sheets if necessary.											
49	50	51	52	53	54	55	56	57	58	59	60
E. Characteristics of Regulated Hazardous Wastes. Mark 'X' in the boxes corresponding to the characteristics of regulated hazardous wastes your establishment handles. (See 40 CFR Parts 261.21 - 261.24)											
<input type="checkbox"/> 1 Ignitable (D001) <input type="checkbox"/> 2 Corrosive (D002) <input type="checkbox"/> 3 Reactive (D003) <input type="checkbox"/> 4 Toxic (D004)											
XI. Certification											
I certify under penalty of law that I have personally examined and am familiar with the information submitted in this and all attached documents, and that based on my inquiry of those individuals immediately responsible for obtaining the information, I believe that the submitted information is true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment.											
Signature				Name and Official Title (Type or Print)				Date Signed			

Appendix C
Uniform Hazardous Waste Manifest

Part 262, Appendix

40 CFR Ch. I (7-1-88 Edition)

Please print or type. Form designed for use on one (1) 2-inch typewriter. Form Approved OMB No. 2080-0030 (Rev. 9-29-89)

UNIFORM HAZARDOUS WASTE MANIFEST		1. Generator's US EPA ID No.		Manifest Document No.		2. Page 1 of		Information in the shaded areas is not required by Federal law.					
3. Generator's Name and Mailing Address						A. State Manifest Document Number							
4. Generator's Phone ()						B. State Generator's ID							
5. Transporter 1 Company Name						C. State Transporter's ID							
6. US EPA ID Number						D. Transporter's Phone							
7. Transporter 2 Company Name						E. State Transporter's ID							
8. US EPA ID Number						F. Transporter's Phone							
9. Designated Facility Name and Site Address						G. State Facility's ID							
10. US EPA ID Number						H. Facility's Phone							
11. US DOT Description (including Proper Shipping Name, Hazard Class, and ID Number)						12. Consignee		13. Total Quantity		14. Unit (Vol./Wt.)		15. Waste No.	
						No. Type							
J. Additional Descriptions for Manifests Listed Above						K. Handling Codes for Manifests Listed Above							
16. Special Handling Instructions and Additional Information													
<p>16. GENERATOR'S CERTIFICATION: I hereby declare that the contents of this shipment are fully and accurately described above by proper shipping name(s) and are classified, packed, marked, and labeled, and are in all respects in proper condition for transport by highway according to applicable international and national government regulations.</p> <p>If I am a large quantity generator, I certify that I have a program in place to reduce the volume and toxicity of waste generated to the degree I have determined to be economically practicable and that I have selected the practicable method of treatment, storage, or disposal currently available to the extent that minimizes the present and future threat to human health and the environment. OR, if I am a small quantity generator, I have made a good faith effort to minimize the waste generated and select the best waste management method that is available to me and that I can afford.</p>													
Printed/Typed Name						Signature				Month Day Year			
17. Transporter 1 Acknowledgment of Receipt of Materials						Signature				Month Day Year			
Printed/Typed Name						Signature				Month Day Year			
18. Transporter 2 Acknowledgment of Receipt of Materials						Signature				Month Day Year			
Printed/Typed Name						Signature				Month Day Year			
19. Discrepancy Indication Space													
20. Facility Owner or Operator Certification of receipt of hazardous materials covered by this manifest except as noted in item 19													
Printed/Typed Name						Signature				Month Day Year			

Part 262, Appendix

40 CFR Ch. I (7-1-88 Edition)

Please print or type. (Form designed for use on white (12-inch) paper.)

Form Approved OMB No. 1000-0029 (April 8-80)

UNIFORM HAZARDOUS WASTE MANIFEST		1. Generator's US EPA ID No.		Manifest Document No.		2. Page 1 of		Information in this manifest must be received by Federal Govt.	
3. Generator's Name and Mailing Address						A. State Manifest Document Number			
4. Generator's Phone ()						B. State Generator's ID			
5. Transporter 1 Company Name						C. State Transporter's ID			
6. Transporter 1 US EPA ID Number						D. Transporter's Phone			
7. Transporter 2 Company Name						E. State Transporter's ID			
8. Transporter 2 US EPA ID Number						F. Transporter's Phone			
9. Designated Facility Name and Site Address						G. State Facility's ID			
10. Designated Facility's US EPA ID Number						H. Facility's Phone			
11. US DOT Description including Proper Shipping Name, Hazard Class, and ID Number						12. Containers	13. Total Quantity	14. Unit (kg/lb)	15. Waste No.
						No.	Type		
a.									
b.									
c.									
d.									
J. Additional Descriptors for Materials Listed Above						K. Handling Codes for Wastes Listed Above			
16. Special handling instructions and Additional information									
<p>16. GENERATOR'S CERTIFICATION: I hereby declare that the elements of this certification are fully and accurately recorded above by proper shipping name and are classified, packed, marked, and labeled, and are in all respects in proper condition for transport by highway according to applicable international and national government regulations.</p> <p>If I am a large quantity generator, I certify that I have a program in place to reduce the volume and toxicity of waste generated to the degree I have determined to be economically practicable and that I have selected the practicable method of treatment, storage, or disposal currently available to me which minimizes the present and future threat to human health and the environment, OR, if I am a small quantity generator, I have made a good faith effort to minimize my waste generation and select the best waste management method that is available to me and that I also affirm.</p>									
Printed/Typed Name						Signature			
						Month Day Year			
17. Transporter 1 Acknowledgment of Receipt of Materials						Signature			
Printed/Typed Name						Month Day Year			
18. Transporter 2 Acknowledgment of Receipt of Materials						Signature			
Printed/Typed Name						Month Day Year			
19. Discrepancy Indication Space									
20. Facility Owner or Operator Certification of receipt of hazardous materials covered by this manifest except as noted in item 18.									
Printed/Typed Name						Signature			
						Month Day Year			

Appendix D
Letter of Introduction

**ENVIRONMENTAL HEALTH DIVISION**

Health Department
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June 17, 1992

Dear Mr./Ms:

I am writing on behalf of the Benton County Environmental Health Division. We are in the process of conducting a survey of small quantity generators within the county. We would appreciate your cooperation in completing this much needed project and assisting us in building a partnership between the county and small quantity generators.

An Environmental Issues Task Force has identified the issue of small quantity hazardous waste management and disposal practices as one of the top priorities in Benton County. We have created a plan for household hazardous waste disposal and would like to do the same for small quantity hazardous waste disposal as well. Your assistance in the development of this plan is a vital part of this process.

Benton County has employed OSU graduate student, Petene Gebrevold, who is conducting the project as part of his doctoral thesis. This is being done in cooperation with OSU Department of Public Health. He will be contacting you within the next week or two to set up an appointment to meet with you. The entire face to face meeting should take no longer than 30 minutes. Please feel free to contact me at 757-6841 if you have any questions regarding this upcoming project.

Sincerely,

Robert Wilson, R.S.
Benton County Environmental Health Director

Appendix E

Current Practices of Hazardous Waste Management Among Small Quantity Generators in Benton County

"Hello, I'm Fetene Gebrewold, I'm working on a survey for Benton County Environmental Health Department and I'd like to ask you some interesting questions, if you don't mind. Your business was chosen for our survey along with several other small businesses in Benton County, and your participation is essential for the accuracy of this study. All information that you give us is strictly confidential and the results are tabulated as a whole, not for any one person. If you have any questions after we have finished, please feel free to ask questions and the study will be explained personally to you."

Int: Record date _____

INT: RECORD DATE, TIME, AND RESULT OF EACH ATTEMPT TO CONTACT IN THE TABLE BELOW. NOTE APPOINTMENTS IN TIME OF RECALL COLUMN. BE SURE TO CALCULATE LENGTH OF INTERVIEW.

Date	Time	Interviewer	Result (See Codes)	Time of Recall

Code for results: NH = Not home
 WR = Will return (when?)
 REF = Refused (explain)
 PIC = Partially completed
 COMP = Interview completed

☐

Substitution

Length of completed interview _____ (minutes)

Verified by _____

1. I have a list of activities that typically use or generate waste that is potentially hazardous. As I read each one, please tell me whether or not it is performed at your location. (INT: READ LIST AND RECORD RESPONSE).

	YES	NO	DK/NA
a. Retail sales.....	1	2	3
b. Commercial transportation.....	1	2	3
c. Manufacturing that uses solvents.....	1	2	3
d. Cleaning/degreasing with solvents.....	1	2	3
e. Cleaning with acids and/or caustics....	1	2	3
f. Plating (electro plating, electroless plating, plastic plating) (Thin metal coating).....	1	2	3
g. Extruding (Pressing metal or plastic by forcing thru a die).....	1	2	3
h. Soldering (To become united or restore by soldering).....	1	2	3
i. Anodizing (Electrolytic action to coat metal).....	1	2	3
j. Pickling/rustproofing (Solution for preserving).....	1	2	3
k. Etching of metals, glass, wood or other products.....	1	2	3
l. Metal fabricating, cutting/machine metal.....	1	2	3
m. Producing circuit and printed wire board.....	1	2	3
n. Application of coatings/finishing.....	1	2	3
o. Painting.....	1	2	3
p. Blending/formulating of chemicals or compounds.....	1	2	3

For purposes of this survey, definitions of the different waste types are as follows:

OILS- -automotive oils, industrial oils, fuel oils, and others

AQUEOUS LIQUIDS- -water soluble wastes including acids and alkalis (bases or caustics), cyanides, spent plating wastes, and photographic wastes.

HALOGENATED SOLVENTS- -solvents containing chlorine, fluorine, iodine, or bromine, chlorobenzenes, trichloroethylene, and methylene chloride

NON-HALOGENATED SOLVENTS- -other solvents such as benzene, acetone, toluene, methanol, ethyl cellulose, and xylene

OTHER COMBUSTIBLE LIQUIDS- -liquids capable of being burned, with a flashpoint of less than 140°F (60°C) such as discarded or recycled paints, varnishes, and lacquers that contain solvents, stripping agents, paint brush cleaners, epoxy resins, rubber cements, marine glues, and waste inks containing solvents

OTHER NONCOMBUSTIBLE LIQUIDS- -nonflammable liquids with a flashpoint greater than 140°F (60°C) such as liquid paint wastes without solvents, washing and rinsing solutions containing pesticides or heavy metals (arsenic, barium, cadmium, lead, mercury, selenium, or silver)

ORGANIC SLUDGES AND SOLIDS- -sludges and solids containing organic wastes, including oily residues, solvent still bottoms, filtration residues from dry cleaning operations, and waste water treatment sludges containing pentachlorophenol or creosote

INORGANIC SLUDGES AND SOLIDS- -dusts, sludges, and solids with heavy metals, sludges from ink formation, sludges from photographic processes, paint residues, pesticide containers, and waste water treatment sludges containing heavy metals.

2. I have a list of waste types which is potentially hazardous. As I read each waste type, please tell me whether or not your organization produces it. The first one is (INT: READ AND RECORD RESPONSE AND IF YES ASK):

And about how much of that waste is produced per month? (INT: BE SURE TO GET AMOUNT AND UNIT THEN CONTINUE WITH THE NEXT WASTE TYPE)

	DK/NA	NO	YES	QUANTITY/UNIT
a. Oils.....	1	2	3	_____/____
b. Aqueous liquids....	1	2	3	_____/____
c. Halogenated solvents.....	1	2	3	_____/____
d. Non-halogenated solvents.....	1	2	3	_____/____
e. Other liquids that are combustible....	1	2	3	_____/____
f. Other liquids that are not combustible.....	1	2	3	_____/____
g. Organic sludges or solids.....	1	2	3	_____/____
h. Inorganic sludges or solids.....	1	2	3	_____/____
i. Other wastes (identify) _____	1	2	3	_____/____
_____	1	2	3	_____/____

3. Some organizations who produce hazardous and other wastes provide some kind of training to employees who handle wastes. Does your organization provide training to your employees?

DK/NA.....1
NO.....2
YES.....3

- 3a. Would you tell me what kind of training your organization provides to your employees? (Probe!)

4. I have a list of disposal facilities that some businesses use to discard their hazardous wastes. As I read the list, please tell me whether or not your company uses this method.

	YES	NO	DK/NA
a. Sewer.....	1	2	3
b. Septic tank.....	1	2	3
c. Dry well.....	1	2	3
d. Garbage/landfill.....	1	2	3
e. Return to supplier.....	1	2	3
f. Evaporate.....	1	2	3
g. Sell.....	1	2	3
h. Discharge under a DEQ Permit (Department of Environmental Quality).....	1	2	3
i. Treat on site.....	1	2	3
j. Recycle or reclaim on site.....	1	2	3
k. Burn.....	1	2	3
l. Send to hazardous waste treatment/storage, and or disposal facility.....	1	2	3
m. Other - identify.....	1	2	3

5. Do you transport your hazardous waste or have a transporter to transport your hazardous waste to a disposal facility?

DK/NA.....1
NO.....2
YES.....3

- 5a. What kind of information or paper work is involved in the transportation procedures? (Probe!)

6. I am going to read you a list of potentially hazardous waste products. As I read each one please tell me if your company recycles that waste ...? (INT: READ AND RECORD RESPONSE AND IF YES ASK:)

And about how much of that waste is produced per month? (INT: BE SURE TO GET AMOUNT AND UNIT THEN CONTINUE WITH THE NEXT WASTE TYPE)

	DK/NA	NO	YES	QUANTITY/UNIT
a. Paper.....	1	2	3	_____/____
b. Corrugated cardboard.....	1	2	3	_____/____
c. Pallets.....	1	2	3	_____/____
d. Containers (drums, etc.).....	1	2	3	_____/____
e. Aluminum.....	1	2	3	_____/____
f. Steel.....	1	2	3	_____/____
g. Other metals.....	1	2	3	_____/____
h. Plastics.....	1	2	3	_____/____
i. Glass (Jars, etc.).	1	2	3	_____/____
j. Foam rubber.....	1	2	3	_____/____
k. Fabric.....	1	2	3	_____/____
l. Solvents.....	1	2	3	_____/____
m. Refrigerated gases.	1	2	3	_____/____
n. Oil.....	1	2	3	_____/____
o. Food waste.....	1	2	3	_____/____
p. Other.....	1	2	3	_____/____
q. Other.....	1	2	3	_____/____
r. Other.....	1	2	3	_____/____

For the purposes of this survey, Waste Reduction and Management Program (WRAMP) is defined as a program designed to assist businesses and industries to manage waste streams and implement pollution prevention strategies.

7. As I read the following list of WRAMP programs and activities, please tell me whether or not it might interest your company.

	YES	NO	DK/NA
a. Waste reduction literature.....	1	2	3
b. Use of WRAMP library.....	1	2	3
c. Information on regulation.....	1	2	3
d. Waste management and environmental regulations soft ware.....	1	2	3
e. Technical assistance for waste reduction.....	1	2	3
f. WRAMP site visit to your company to identify waste reduction opportunities.....	1	2	3
g. Waste reduction audit assistance.....	1	2	3
h. Employee and management education.....	1	2	3
i. Seminars on waste minimization.....	1	2	3

8. In your organization's effort to comply with state and federal laws and regulations that apply to waste products you may produce, how much of a problem is the following: very, somewhat, not. The first one is . . .

	VERY	SOME- WHAT	NOT	DK/NA
a. Complexity or inflexibility of state regulation.....	1	2	3	4
b. Lack of time to stay informed of applicable regulations.....	1	2	3	4
c. Technical difficulty of determining if wastes are hazardous.....	1	2	3	4
d. High cost of determining if wastes are hazardous.....	1	2	3	4
e. Access to hazardous waste management technology information.....	1	2	3	4
f. Identifying transporters with hazardous waste permits.....	1	2	3	4
g. Identifying treatment or disposal facilities with hazardous waste permits.....	1	2	3	4
h. High costs of hazardous waste treatment disposal at permitted facilities and transportation to such facilities.....	1	2	3	4
i. High cost of waste management technical consultants.....	1	2	3	4
j. Unavailability of hazardous waste management technical experts within your organization.....	1	2	3	4

9. The State of Oregon and the Federal Government have designated certain kinds of waste products as hazardous. Please tell me whether you think each of the following statements is true or false for organizations that generate such hazardous wastes:

	TRUE	FALSE	DK/NA
a. They would not be liable if their wastes were removed from their property by a second party.....	1	2	3
b. They would be liable if their wastes were delivered to a second party by themselves or another transporter, but the liability would not extend indefinitely.....	1	2	3
c. They would be liable regardless of how their wastes were disposed, and the liability would extend indefinitely.....	1	2	3
d. Under Oregon State regulation, any organization that produces less than 220 pounds (100 kg) of a non-acute but hazardous waste in a calendar month may legally dispose of that waste in a landfill that is permitted for dry industrial waste....	1	2	3

10. According to the U. S. Environmental Protection Agency, a business is classified as a fully regulated generator, small quantity generator, or conditionally exempt small quantity generator. Which one best describes your business?

Fully regulated generator.....	1
Small quantity generator.....	2
Conditionally exempt small quantity generator.....	3
Other.....	4
Refused.....	5

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