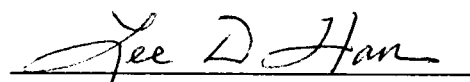
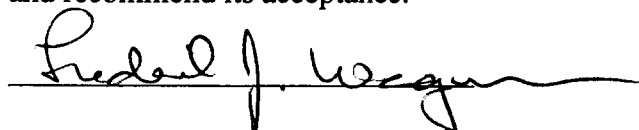
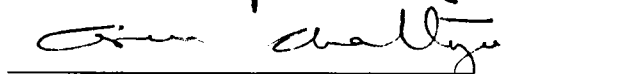


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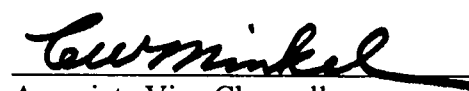
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EVALUATION OF THE HAZARDOUS MATERIALS TRANSPORTATION
REGISTRATION AND FEE ASSESSMENT PROGRAM

A Thesis

Presented for the

Master of Science

Degree

The University of Tennessee, Knoxville

DeAnna Flinchum

May 1995

DEDICATION

This thesis is dedicated to my husband

Wayne Flinchum

and to my parents

Mr. and Mrs. Gary Galloway

ACKNOWLEDGMENTS

I would like to thank my major professor, Dr. Lee Han and my committee members, Drs. Fred Wegmann and Arun Chatterjee, for their guidance and confidence. My thanks must also encompass my husband Wayne and my parents, because without the encouragement from the home front, I would not have made it this far. The journey would have been much more difficult without funding and help from Science Applications International Corporation (SAIC) in Oak Ridge, so I also thank Mr. Ralph Best, Ms. Ruth Maddigan and Mr. Paul Shelton for their assistance and support over the past year.

ABSTRACT

In 1992, the Research and Special Programs Administration (RSPA) started a registration program for shippers and carriers transporting any one of five specific categories of hazardous materials. The registration program required that a fee of \$300 be submitted annually, along with the registration form. The original estimate of 160,000 registrants and a subsequently revised estimate of 100,000 registrants, would have covered the funding for the Interagency Hazardous Materials Public Sector Training and Planning Grants Program. The actual registration number of 26,000 will not generate enough funds to cover this program. The RSPA is considering changing the fee schedule from a flat \$300 fee to a sliding scale based on the number of activities engaged in and the quantities of materials shipped or carried. This new proposed sliding fee schedule is more complicated than the current fee schedule. Complaints from industry leaders have stated that the current registration requirements are unclear as to who should register and who should not, and that there are no directions or information written in layman's terminology. The RSPA is basing the need for a change on a registration rate that it believes is 90 percent. This research shows that the registration rate for Tennessee is much lower than 90 percent. The research did contain bias and possible sources of error, but a registration rate of 77 percent is obtained assuming no error and a bias rate resulting from the survey questionnaire.

The training and planning grant program is a necessity if hazardous materials transportation incidents are to be handled correctly and efficiently. With out an increase in

funding, these grants will not be obligated. The most straightforward and inexpensive approach used to increase the registration rate would be to enforce the registration regulations and to increase the prosecution of those companies found in violation.

This research shows that the registration rate is considerably lower than 90 percent for Tennessee. Because the RSPA believes the registration rate is approximately 90 percent, the approach to raising the necessary funding is vastly different than if the RSPA believed that the registration rate was 50 percent. Enforcement and prosecution of companies found in violation of the regulations would not have a large impact on the funding if the registration rate was 90 percent. Therefore, the RSPA is not considering the most economically feasible alternative because it is felt that it would not help solve the problem.

The RSPA must raise funds to support the emergency planning and training grants fund through some means. The registration rate for the U.S. should be evaluated and not just approximated by looking at outreach, compliance efforts, and the results of ROADCHECK-93 [1].

Future research in this area should encompass a larger geographic area, or even the entire U.S., and utilize a combined source of RSPA information and commercial information, such as American Business Lists. By using a simple questionnaire and adjusting the sample size according to the bias rates that were determined through similar techniques as demonstrated in this research, the registration rate for the geographic region or the U.S. could be determined fairly easily. This information would allow the RSPA to base future changes of the regulations on fact.

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LIST OF ABBREVIATIONS

CA	Company Answer
DOT	Department of Transportation
EPA	Environmental Protection Agency
FHWA	Federal Highways Administration
FRA	Federal Railroads Administration
HMIS	Hazardous Materials Information System
HMTRFAP	Hazardous Materials Transportation Registration and Fee Assessment Program
HMTUSA	Hazardous Materials Transportation Uniform Safety Act
IHMPSTPGP	Interagency Hazardous Materials Public Sector Training and Planning Grants Program
IATA	International Air Transport Association
ICC	Interstate Commerce Commission
NPRM	Notice of Proposed Rulemaking
OHM	Office of Hazardous Materials
OMC	Office of Motor Carriers
RSPA	Research and Special Programs Administration
SARA	Superfund Amendments and Reauthorization Act
SIC	Standard Industrial Classification

CHAPTER I

INTRODUCTION

Background

In July of 1992, as mandated by Congress in the 1990 amendments to the Hazardous Materials Transportation Uniform Safety Act (HMTUSA), the Department of Transportation (DOT) added a new subpart G to Title 49, Code of Federal Regulations part 107. This subpart established a national registration program requiring persons, engaged in the offering for transportation and transportation of specific categories and quantities of hazardous materials, to obtain a certificate of registration annually. This registration program has two main objectives: (1) to generate a fund to sponsor emergency responder training programs, and (2) to inventory those players involved in the hazardous materials transportation industry so that enforcement can be properly directed.

The registration process is accomplished by filing a hazardous materials registration statement form (DOT form F 5800.2), along with a registration fee of \$300. From the \$300 registration fee, \$250 is used to fund the Interagency Hazardous Materials Public Sector Training and Planning Grants Program. This is a nationwide emergency response planning and training grant program for states, local governments and Indian tribes. The remaining \$50 is used to offset DOT processing costs. The Research and Special Programs Administration (RSPA) oversees this registration process and is

responsible for maintaining records on hazardous materials transportation, including the primary source of hazardous materials transportation safety data in the United States, the Hazardous Materials Information System (HMIS).

The five categories of hazardous materials that are governed by the new subpart G are: 1) a highway route controlled quantity of a radioactive material; 2) more than 55 pounds of Division 1.1, 1.2, or 1.3 explosive material in a single motor vehicle, rail car, or freight container; 3) any package containing more than one liter of a material classified as extremely toxic by inhalation, including only those in Hazard Zone A of either Division 2.3 or Division 6.1; 4) a hazardous material in bulk packaging, container, or tank with a capacity of at least 3,500 gallons, or more than 468 cubic feet; or 5) a shipment of 5,000 pounds or more of a single class of hazardous material for which placarding is required.

Statement of Problem

Approximately 26,000 shippers and carriers have registered yearly with the DOT since 1992. This number is well below the original estimate of 160,000 and a subsequently revised estimate of 100,000. The methodology used to determine the original estimate of 160,000 registrants is detailed in the Regulatory Evaluation (Appendix A). The criteria by which this rate is determined are the toxic-release computerized inventory maintained by the Environmental Protection Agency (EPA) and the HMIS maintained by the RSPA. A revised estimate of 100,000 registrants appeared in

the October 10, 1991 Federal Register. No explanation of the decrease in the expected registration was given.

Pre-planned and announced road checks were conducted during ROADCHECK-93, a one day nationwide inspection effort sponsored by the Federal Highway Administration (FHWA). These road checks indicated that approximately 88 percent of the 2,300 placarded trucks inspected were registered and had proof on board. Of the 12 percent that did not have proof on board, 80 percent had registered totaling an overall carrier registration rate of 97.6 percent. However, due to the announcement of these road checks, the registration rate among carriers may be overestimated, and the registration rate among shippers is unknown.

Under the 1990 reauthorization of the HMTUSA, DOT must provide funding for the Interagency Hazardous Materials Public Sector Training and Planning Grants Program (IHMPSTPGP) to aid states in preparing for hazardous materials emergencies. To administer the program and reimburse states for private sector response training, HMTUSA authorized \$12.8 million to be spent annually, from 1993 through 1998 [2]. The revised estimate of 100,000 registrants would more than cover this cost, but the actual registrants of 26,000 will not. If the number of registrants does not increase by more stringent enforcement of the regulation or by increasing the industry's knowledge of the regulation, the DOT will need to lower the amount of funding, increase the amount of the registration fee, or possibly consider broadening the scope of the hazardous materials currently covered under the regulations.

About the Study

This research was considered a pilot study in that it was bounded by specific restrictions and was limited to a specific area. This research involved evaluating the registration rate among shippers and carriers of the aforementioned five categories of hazardous materials within the state of Tennessee and was restricted by certain time and funding constraints.

Two data bases were obtained from the RSPA in order to establish an approximate number hazardous materials shippers and carriers within Tennessee to be used as the population for the survey sample. The first data base contained the companies within Tennessee that had actually registered for 1994-1995. The second data base was the original mail out-which listed the addresses of companies within Tennessee that the RSPA considered possible registrants. These data bases contained 525 entries and 1,727 entries, respectively (Appendix B and C).

In order to evaluate the registration rate within Tennessee, a survey questionnaire was developed and distributed. The survey gathered general demographic data along with information on the registration program. The data were then analyzed to uncover patterns among registrants and non-registrants. If Tennessee's high registration rate reflects a national trend, the DOT may feel it is necessary to increase the registration fee to raise the \$12.8 million required to cover funding for the planning and training grant program. On the other hand, a low registration rate in Tennessee, may prompt the DOT to increase enforcement and/or make changes to the registration program.

CHAPTER II

REVIEW OF THE PROGRAM

Introduction

A hazardous material for this study is defined as any substance or material that has been determined by the Secretary of Transportation, or anyone authorized by the Secretary, to be capable of posing an unreasonable risk to health, safety and property when transported in commerce [3]. Recent studies conducted by the Federal government indicate that there are between five and six million chemicals being transported which are considered hazardous and this number is growing at a rate of about 6,000 chemicals per month [4]. The number of commodities that are perceived as being hazardous, including some of the aforementioned chemicals, is estimated to be between 33,000 and 36,000 [5]. These commodities are regulated by the Environmental Protection Agency (EPA), the DOT, and the International Air Transport Association (IATA). These hazardous materials range from poisons and radioactive materials to paint and hairspray and are known by 183,000 different names [4]. The vast, and ever increasing, amount of hazardous materials that are currently on the market expands the amount of information that must be processed by the emergency responders at the scene of a hazardous materials incident. Increasing emergency responders qualifications and training will improve their ability to

respond quickly and effectively in the event that a hazardous materials incident occurs.

Thus, decreasing the amount of contamination and risk to the general public.

Approximately 4 billion tons of regulated hazardous materials are transported each year within the U.S., and almost 500,000 movements of hazardous materials occur each day. Approximately 10,000 to 20,000 truck transportation incidents and 1,000 to 1,500 rail incidents occur each year that involve release of a hazardous material or result in a circumstance that threatens a release, and to which public-sector emergency responders are dispatched [6]. RSPA data indicate that the number of incidents involving hazardous materials sharply increased during the past three years, magnifying the role of hazardous materials in society and increasing the chance of public exposure to the materials. This increase in hazardous material incidents illustrates the need to improve and increase the emergency responders training in the event that an event involving hazardous materials occurs. Funding for this increase in emergency responders training is provided by the Hazardous Materials Transportation Registration and Fee Assessment Program (HMTRFAP).

From the estimated \$12.8 million that could have been generated annually from the HMTRFAP (based on the flat fee schedule), \$5 million would have been apportioned to the states to formulate a planning program. States would be eligible for a planning grant to develop, improve, and implement emergency plans under Title III of the Superfund Amendments and Reauthorization Act (SARA). At least 75 percent of the grant money would have gone to local emergency planning commissions. The federal government would have provided 80 percent of the funds necessary to implement the program, and the

state would have provided the remaining 20 percent [7]. These grants would have been allocated based on the number of hazardous material facilities within the state, types and amounts of hazardous materials transported, population at risk, frequency and number of incidents reported during the preceding year, and whether or not the state imposes fees on transporters of hazardous materials [2]. A training grant program was also to have been funded from the annual registration fees at \$7.8 million per year. States were eligible for the money to train public sector employees to respond to hazardous materials incidents and to provide training to local responders, including volunteers. The 80/20 funding split also applied to the training grant program.

Shippers and carriers of five specific categories of hazardous materials are required to register annually and pay the \$300 fee. The five specific categories of hazardous materials are **(1)** any highway route-controlled quantity of a class 7 (radioactive) material; **(2)** more than 55 pounds (25 kilograms) of a Division 1.1, 1.2, or 1.3 (explosive) material in a motor vehicle, rail car, or freight container; **(3)** More than 1.06 quarts (1 liter) per package of a material extremely toxic by inhalation (Division 2.3, Hazard Zone A, or Division 6.1, Packing group I, Hazard Zone A); **(4)** A hazardous material in a bulk packaging having a capacity equal to or greater than 3,500 gallons (13,248 liters) for liquids or gases or more than 468 cubic feet (13.24 cubic meters) for solids; and **(5)** A shipment, in other than a bulk packaging, of 5,000 pounds (2,268 kilograms) gross weight or more of a class of hazardous materials for which placarding of a vehicle, rail car, or freight container is required for that class. Examples of the hazard classes and divisions are listed in Table 1:

Table 1

Examples Of Hazard Classes and Divisions

CLASS/DIV	CLASS	EXAMPLES	DESCRIPTION OF HAZARD
7	Radioactive	Uranium-235	Specific activity levels
1.1	Explosives	Black powder	Mass explosion
1.2	Explosives	Charges for rocket motors	Projection hazard
1.3	Explosives	Fireworks, Type C	Fire with minor blast or projection
2.3	Poison Gas	Chlorine	Poison Inhalation Hazard
6.1	Poisonous Material	Parathion liquid	Toxic to humans

Shipments of hazardous materials can be classified as bulk or non-bulk. Bulk shipments are defined by DOT as single packages exceeding 119 gallons for liquids, 882 pounds for solids, and 1,000 pounds for gases. Bulk shipments are usually gases or liquids which are transported in tank cars, tank trucks, barge tankers, and intermodal tanks. Tank trucks can hold between 2,000 and 10,000 gallons, rail tank cars can hold as much as 35,000 gallons. Intermodal tanks, which are usually transported on flatbed trucks, flat railcars, and barges, can hold approximately 5,000 gallons. Non-bulk shipments are transported in drums, cylinders, boxes, and smaller packages.

Regulatory Background

The HMTUSA was signed into law in November 1990, after sixteen years of effort by manufacturers, the transportation sector, and the government. The HMTUSA 1) gives federal agencies the right to preempt conflicting state and local technical regulations;

2) ensures that local and state routing standards conform to federal standards; 3) improves training, registration, and permitting requirements; 4) initiates a study of vehicle placarding to identify carriers of hazardous materials; and 5) mandates better cooperation between shippers and carriers [8].

This research covers only the third goal listed in the HMTUSA: that of improving training, registration, and permitting requirements. William Kenworthy, a regulatory lawyer, stated that this registration program's purpose is twofold. The first is to generate a fund from which emergency responders may be trained. The second is to increase the knowledge of who is involved in the hazardous materials transportation industry so that enforcement can be properly directed [9].

On October 10, 1991, the RSPA issued a Notice of Proposed Rulemaking (NPRM) in the Federal Register [10]. This NPRM outlined the new national registration program for shippers and carriers of hazardous materials and hazardous materials package manufacturers. The NPRM provided general guidelines for the registration program, offered options, and asked for comments on the rule. The NPRM stated that the initial deadline for registration would be May 31, 1992, and the fees collected would be not less than \$250 nor more than \$5,000. These fees were to cover the \$12.8 million that was appropriated for the Interagency Hazardous Materials Public Sector Training and Planning Grants Program.

There were three options listed for fee collection. Option one based the fee on the annual net income of the company (Table 2). Option two would have based the registration fee on the number of activities, such as radioactive shipments or bulk shipments, that a company was involved in each year (Table 3).

Table 2

Fee Options Based on Annual Income

Annual net income	Annual Registration and Processing Fee
Less than \$500,000	\$300
\$500,000 - \$1,000,000	\$550
\$1,000,001 - \$2,500,000	\$1,050
\$2,500,001 - \$5,000,000	\$2,550
\$5,000,001 or more	\$5,050

Table 3

Fee Option Based on Number of Activities Engaged In

Number of activities	Annual Registration and Processing Fee
One	\$300
Two	\$550
Three	\$1,050
Four	\$2,050
Five	\$4,050
Six	\$5,050

Option three was to impose a flat fee that would have most likely been below \$1,000. The flat fee was the easiest approach to administer and the easiest for registrants to follow since they would not need to calculate their annual fees. The NPRM also proposed a registration year of June 1 through May 31.

On July 9, 1992, the RSPA published the Final Rule for the registration program [11]. The flat fee option of \$300 was chosen for several reasons. It was the most simple and straightforward fee schedule possible, it would be easily understood by the regulated parties, and was easily administered and enforceable. The flat fee option also minimized paperwork burdens on industry and the government. The proposal in the NPRM to include certain package manufacturers in the registration program was not adopted, and foreign offerors of hazardous materials would be exempt from registration until June 30, 1994.

A notice of filing requirements was issued in the Federal Register on February 23, 1993 [12]. This notice listed the penalties for failure to register and pay the annual registration fee. The penalty for failure to file can be up to \$25,000 per day plus late fees and interest.

The RSPA issued another NPRM on January 30, 1995 [1]. This NPRM proposed changes to the current registration and fee assessment program. These changes will alter the \$300 flat fee associated with registration in order to increase the amount of funding for the training and planning grant program. A new fee schedule based on hazardous materials activities has been proposed as shown in Table 4.

Type of hazardous material	Quantity	Total annual fee
Radioactive Material	1 or more packages	\$5,050
Explosive Material	22,046 pounds or more	\$5,050
	2,205-22,045 pounds	\$2,550
	55-2,204 pounds	\$300
Extremely Toxic By Inhalation	3,500 gallons or more	\$5,050
	119-3,500 gallons	\$2,550
	1.06 quart-118 gallons	\$300
Bulk-Hazardous Material	8 or more tank cars, or 24 diff. other bulk packaging	\$5,050
	4-7 different tank cars, or 12-23 diff. other bulk packaging	\$2,550
	1-3 different tank cars, or 1-11 diff. other bulk packaging	\$500
Non-Bulk Hazardous Material	one or more of 5,000 pounds or more	\$300
No Prior Hazmat Movements	Will offer in the upcoming year one of the above	\$300

Table 4

Fee Option Based on Hazardous Materials Activities

It is unclear at this time whether or not the new NPRM will be accepted by the general transportation industry. Industry representatives are upset at the new proposal, mainly because the new schedule does not seem fair and is confusing. Most industry representatives would like to see the scope of the regulations expanded and the inclusion of packaging manufacturers rather than imposing a new and complicated fee schedule.

The RSPA believes the registration rate is approximately 90 percent; thus prompting it to consider changing the fee schedule. There has been some concern about the registration rate and no analysis has actually shown that the rate is 90 percent. The lack of analysis, and the fact that changes obviously need to be made in the registration program, prescribe an investigation into the actual registration rate. The following chapter describes the methodology utilized in determining a registration rate for Tennessee.

CHAPTER III

METHODOLOGY

Introduction

The Hazardous Materials Transportation Registration and Fee Assessment Program (HMTRFAP) has averaged approximately 26,000 registrants per year nationwide, since 1993. The expected number of registrants was previously estimated to be about 100,000 per year. This large discrepancy has raised questions concerning the registration rate among shippers and carriers of hazardous materials, and concerns about the pool of funds which were to be used to help states plan for emergencies and train the emergency preparedness teams. In order to have a better understanding of the hazardous materials transportation arena and the registration rate with the HMTRFAP, this study examined shippers and carriers of hazardous materials located within the state of Tennessee.

Design of the Study

Three options were identified for obtaining the registration rate in Tennessee. The first option considered was to contact a company that researches specific industries and generates comprehensive mailing lists. An example of such a company is American Business Lists. These comprehensive lists can be grouped by Standard Industrial Classification (SIC), by state, by manufacturers, and by industry groups. Specifications for each of these categories would have allowed companies like American Business Lists to

tailor lists specifically towards the needs of this research. These lists would have been used to determine the population size for a mailout containing a survey questionnaire. The second option considered was to survey carrier personnel at rest areas and truck stops within Tennessee. The third option examined was to use the data bases furnished by the RSPA containing the companies they felt would be possible registrants, and use this source as the population for a mailout containing the survey questionnaire.

The first option was not financially feasible due to the limited scope and resources of the research and the second option would obtain information only on carriers that were passing through Tennessee and no information on shippers within Tennessee. Therefore, the RSPA data bases were used for this study.

The RSPA made available two data bases. The first data base contained the 525 companies within Tennessee that had registered for the 1994-1995 registration year. The second data base contained 1,727 companies in Tennessee that the RSPA considered to be possible registrants. The RSPA used the second list to distribute information and registration forms in 1992. For the entire U.S., over 81,000 brochures were distributed. The list was compiled from multiple sources which are listed in Table 5.

The second data base containing the 1,727 companies was sorted multiple times according to address, city, and phone number in order to determine if there were any duplications. After sorting processes were completed, a total of 129 companies were identified as duplications, leaving 1,598 companies of interest. These companies were then compared to the first data base which contained a total of 525 registered companies. It was found that 211 companies, or 40 percent, that were registered were not included in

Table 5

RSPA Mailing List Sources

DOT	
	RSPA/Office of Hazardous Materials (OHM) Exemptions Holders
	RSPA/OHM Explosive Manufacturers
	RSPA/OHM Cargo Tank Inspector, Repairers, Manufacturers
	RSPA/OHM Holders of Special Approvals
	RSPA/OHM Shippers from form 5800.1 since January, 1990
	RSPA/OHM Carriers from form 5800.1 since January, 1990
	Federal Highways Administration (FHWA)/Office of Motor Carriers (OMC) Census
	Federal Railroads Administration (FRA) Railway Operator Listing
	Association of American Railroads: Rail Car Repair and Service Facility Operators
	U.S. Coast Guard
Other Federal Agencies	
	Environmental Protection Agency (EPA) Hazardous Waste Inventory Files
	EPA RCRIS National Oversight Waste Transporters
	Federal Maritime Commission Non-Vessel-Operating common carriers
	Interstate Commerce Commission (ICC) Listing of Companies with at least \$1 Million in Insurance
Non-Governmental Sources	
	Chemical Manufacturers Association
	Hazardous Waste Directory

the 1,598 companies that comprised the revised RSPA mailing list. The 211 companies that were overlooked in the RSPA's original mailing were added to the 1,598 companies for a total of 1,809. Because there were 211 companies, or 40 percent, that were registered but not included in the RSPA's mailing list, the possible hazardous materials shippers and carriers population for Tennessee could be as much as 2,663. The actual number of shippers and carriers within Tennessee is unknown and the viable source for company listings and addresses was through the RSPA.

Tennessee ranks sixth among the 50 states and U.S. territories for the number of hazardous materials incidents in 1993 (Figure 1). A hazardous materials incident is defined as occurring when;

1) as a direct result of a hazardous material:

- a person is killed,
- a person receives injuries requiring hospitalization,
- estimated damages exceed \$50,000,
- an evacuation of the general public for one hour or more,
- one or more transportation arteries is closed for one hour or more,
- the operational flight pattern or routine of an aircraft is altered, or

2) fire, breakage spillage or suspected contamination occurs involving radioactive material or an etiological agent, or

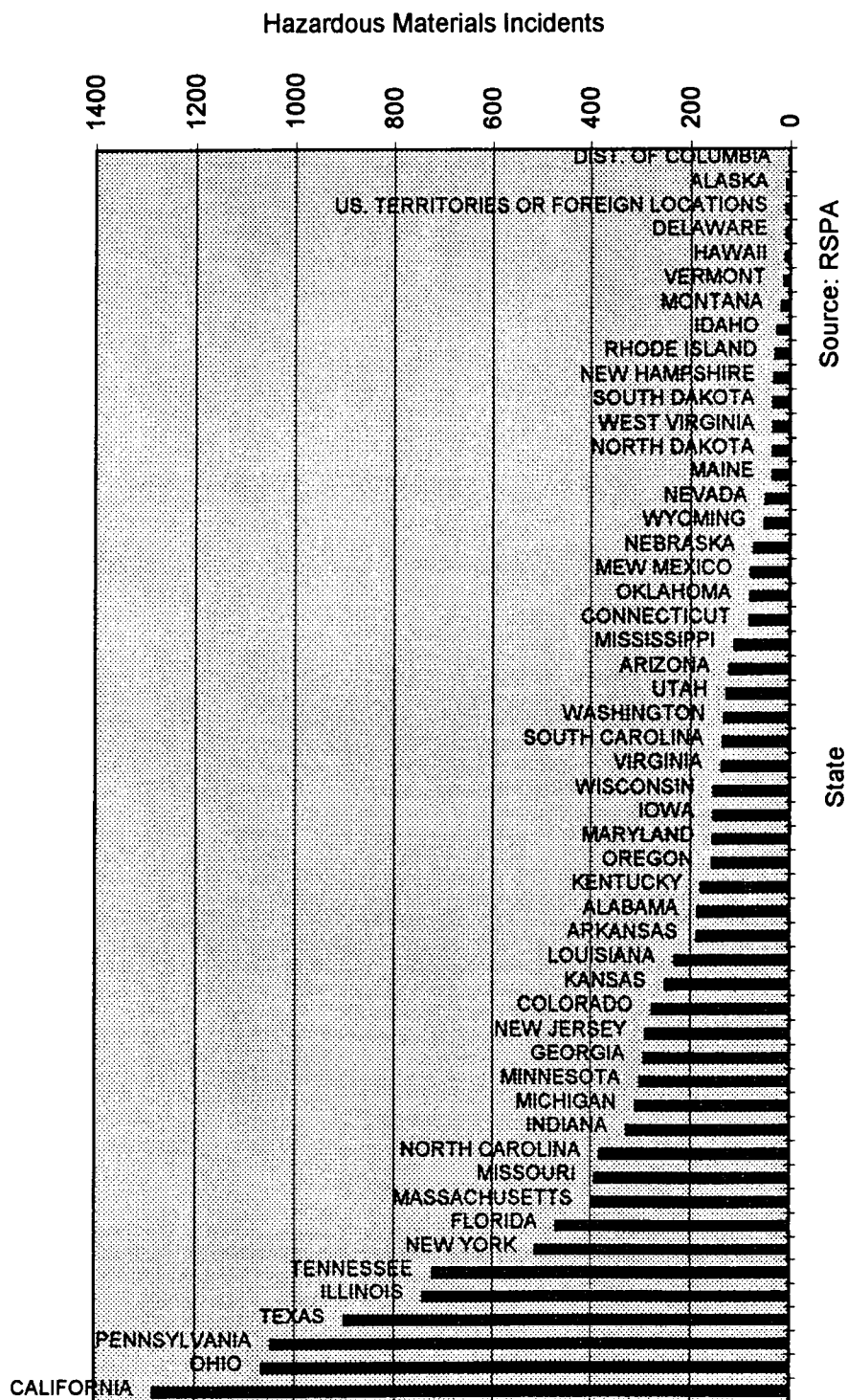


Figure 1

Hazardous Materials Incidents by State - 1993

- 3) a release of a marine pollutant in a quantity exceeding 119 gallons or 882 pounds,
or
- 4) there has been an unintentional release from a package or any quantity of
hazardous waste has been discharged during transportation [13].

The high ranking indicates that there is a fair amount of hazardous materials being transported within Tennessee. This research involved analyzing companies that were physically located within Tennessee, not those transporting hazardous material through the state. In 1993, 76 percent of all incidents that occurred in the U.S. were related to the loading or unloading process and only 19 percent occurred during the actual transportation between origin and destination (Figure 2). The high incident occurrence rate for the handling phase supports the approach of evaluating only those shipments originating and terminating within Tennessee. Those shipments transported through Tennessee, with both origins and destinations in other states, were thus excluded from this study.

A survey questionnaire (Appendix D) was developed to obtain general demographics and information on the hazardous materials registration program for companies within the state of Tennessee. The Federal Register states that each separately incorporated subsidiary must register and pay a fee separate from its parent company. However, a parent company may submit a separate registration statement on behalf of and for each of its subsidiaries subject to the registration program. If branch offices or plant locations of a company are not separately incorporated, the company is required to submit only one registration statement and pay a single fee [14]. Question 1 was designed to

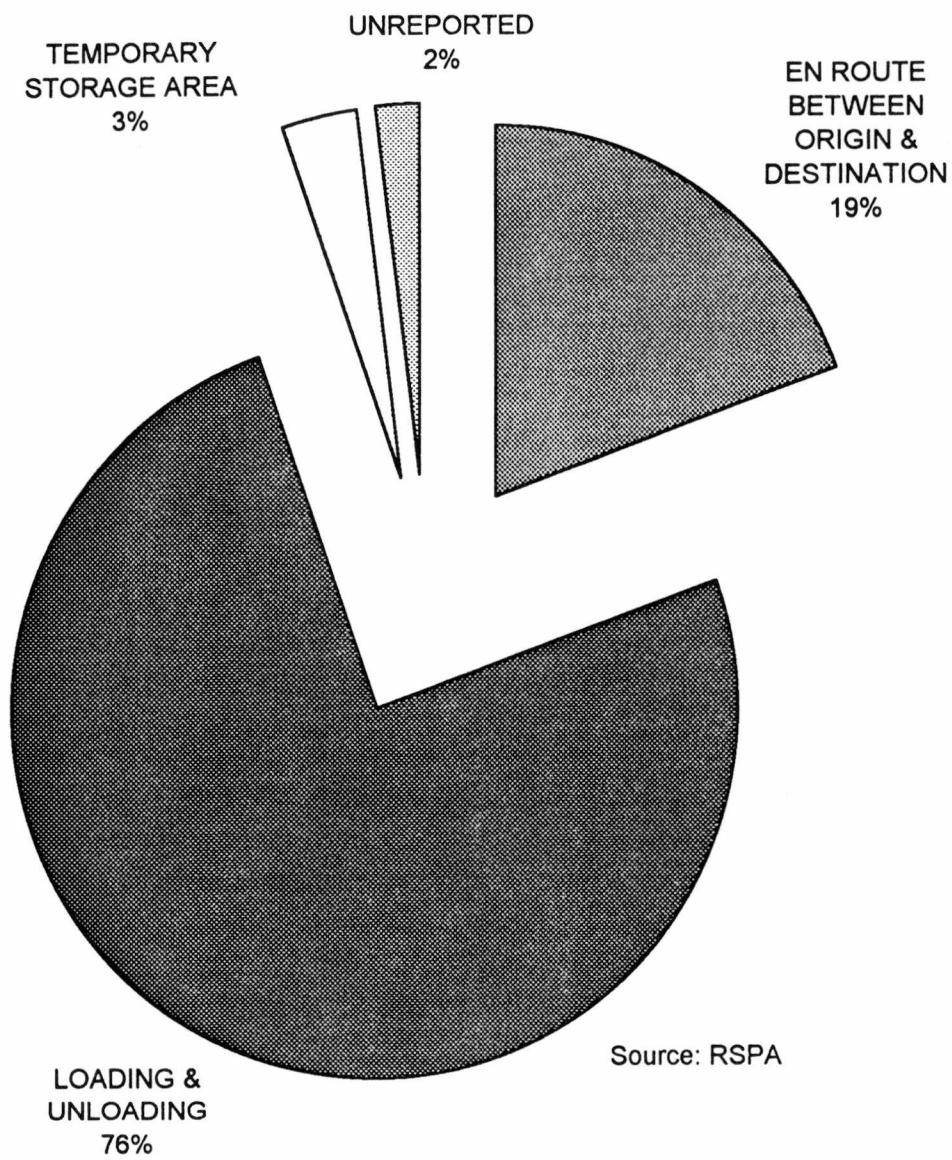


Figure 2
Transportation Incident by Phase

determine the possibility of a parent company's registering for branch sites and subsidiaries. Companies established after the registration program was established might be less likely to understand the requirements or be unaware of the requirements. The second question, asked the year the facility was established, and was used to identify the number of companies that had been established since the regulation was passed. General information about the company such as size, market, industrial classification, etc. was obtained in Questions 3 through 7. In order to determine what categories of materials, if any, were shipped or carried; if the companies had registered; and if the company shipped hazardous materials but had not registered, why they had not registered, Questions 8, 9, and 10 were asked. This information was critical in determining the registration rate for the registration program within Tennessee.

The number of surveys distributed was determined by using the following formula [15] and is summarized in Table 6:

$$n = \frac{N}{\left(\frac{d}{Z}\right)^2 * \left(\frac{N}{(p * (1 - p))}\right) + 1} \quad [\text{Eq. 1}]$$

Where: N = Population size

d = Confidence Interval

Z = Factor from normal dist. table showing confidence level

p = Probability of "yes" or "no" Answer = 0.5 (to find highest value

p=0.5)

n = Sample size

Table 6

Estimated Random Sample Size

Confidence Level	Confidence Interval	Population Size	No. of Responses	Response Rate	Sample Size
95%	+/- 5%	1,809	317	50.0%	634
87.5%	+/- 5%	1,809	207	50.0%	414
95%	+/- 10%	1,809	91	50.0%	182
87.5%	+/- 10%	1,809	57	50.0%	114
95%	+/- 5%	1,809	317	25.0%	1,268
87.5%	+/- 5%	1,809	207	25.0%	828
95%	+/- 10%	1,809	91	25.0%	364
87.5%	+/- 10%	1,809	57	25.0%	228

The scope and limited resources of this research dictated the maximum number of surveys, approximately 450, that could be distributed. This number fell between the 95 percent, +/- 10 percent and 87.5 percent, +/- 5 percent levels for the 25 percent response rate, as shown by the shaded area in Table 6. A total of 459 companies were randomly selected for this survey from the RSPA's list of 1,809.

The survey questionnaire was distributed with a cover letter (Appendix E) that briefly explained the purpose of the study and stated that the results were to be kept confidential. The questionnaire was formatted so that the return postage was guaranteed and the respondents needed only to fold and staple to return.

From the 459 questionnaires distributed, 33 were not deliverable due to an incorrect address or an expired forwarding order. This reduced the sample size to 426 surveys. A total of 106 completed surveys were returned yielding a response rate of 25 percent.

As stated previously, 33 surveys were returned because they were undeliverable, due to an incorrect address, an expired forwarding order or no forwarding order. These 33 undelivered surveys constitute seven percent of the total mailout and is considered average even for specialized companies such as American Business Lists.

Utilizing the data obtained from the 106 completed survey questionnaires, the population of hazardous materials shippers and carriers within the state of Tennessee was estimated. Given the population of hazardous materials shippers and carriers, the percentage of registered shippers and carrier was obtained, thus allowing the determination of the registration rate for shippers and carriers of hazardous materials within Tennessee.

In addition to determining the registration rate for Tennessee, general demographic data were evaluated for trends and patterns involving registered respondents versus non-registered respondents.

Formula Derivation

Specific formulas needed to be derived in order to determine the registration rate for Tennessee. Using the Venn Diagram in Figure 3, the sets of data involved in this research are depicted more clearly.

The data set variables (including those listed in Figure 3) used to derive the formulas were organized in a cross-tabulation format for easier dissemination (Tables 7 and 8).

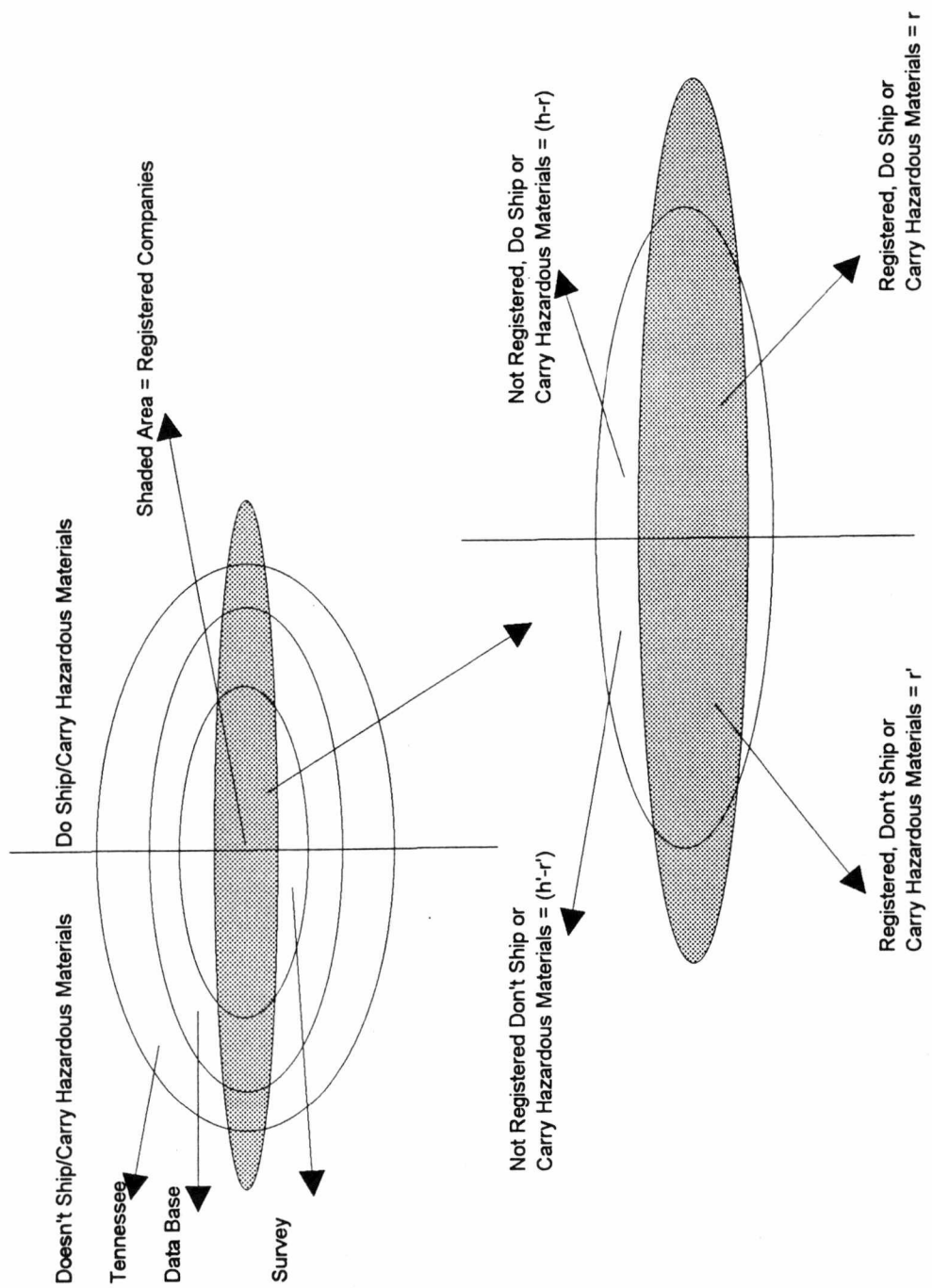


Figure 3
Venn Diagram

Table 7

RSPA Variables

RSPA Data		SHIPS/CARRIES HAZMAT			
REGISTERED		YES	NO	TOTAL	TOTAL MAILED
	YES	(r_1)	(r_1')	(r_d)	(f_{y1})
	NO	$(h_1 - r_1)$	$(h_1' - r_1')$	$(S_1 - r_d)$	(f_{n1})
	TOTAL	(h_1)	(h_1')	(S_1)	

Table 8

Company Answer (CA) Variables

		SHIPS/CARRIES HAZMAT			
REGISTERED		YES	NO	TOTAL	TOTAL MAILED
	YES	(r_2)	(r_2')	(r_c)	(f_{y2})
	NO	$(h_2 - r_2)$	$(h_2' - r_2')$	$(S_2 - r_c)$	(f_{n2})
	TOTAL	(h_2)	(h_2')	(S_2)	

There are two sets of data variables as shown in these two tables. Two sets of data variables were needed because the company answers for the number of companies that ship/carry hazardous materials and have registered, $[(r_1)$ and $(r_2)]$, are different than what the RSPA data shows. Therefore, both sets of data were analyzed independently.

Table 7 shows that (r_1) denotes companies that have registered and do ship or carry hazardous materials according to the RSPA data, $(h_1 - r_1)$ denotes the companies

that have not registered but do ship or carry hazardous materials according to the RSPA data, etc. The same principle was used in Table 8.

Due to bias in the return rate between those companies which had registered and those that had not, for both the RSPA data and the CA data, an adjustment factor of β was developed. Assuming that the response rate for (r_1) and (r_1') is equal and that the response rate for $(h_1 - r_1)$ and $(h_1 - r_1')$ is equal in both the RSPA data and the CA data, then:

$$\beta_1 = \frac{\frac{r_d}{f_{y1}}}{\frac{S_1 - r_d}{f_{n1}}} \quad [\text{Eq. 2}]$$

$$\beta_2 = \frac{\frac{r_c}{f_{y2}}}{\frac{S_2 - r_c}{f_{n2}}} \quad [\text{Eq. 3}]$$

β defines how many times more likely those companies that have registered are to respond than those companies that have not registered.

Within the surveys that were returned, there were some companies that stated that they did not ship or carry any of the five categories of hazardous material, but that the company had registered. Because there were some companies that registered, but did not need to, two registration rates were calculated: a gross registration rate, α' , that included those registrants that should have registered and those registrants that should not have registered; and a real registration rate, α , that included only those registrants that should

have registered. The total number of companies that responded that were registered is denoted by r_d .

$$\text{For the RSPA data, } \alpha' (\text{gross registration rate}) = \frac{r_1 + r_1'}{(h_1 - r_1) + r_1 + r_1'}$$

$$\text{adjusting for bias } \alpha' = \frac{1}{1 + \frac{(h_1 - r) * \beta_1}{r_d}} \quad [\text{Eq. 4}]$$

$$\text{For the RSPA data, } \alpha (\text{real registration rate}) = \frac{r_1}{(h_1 - r_1) + r_1}$$

$$\text{adjusting for bias } \alpha = \frac{1}{1 + \frac{(h_1 - r) * \beta_1}{r_1}} \quad [\text{Eq. 5}]$$

Substituting variables from Table 8 for CA data, the same formulas can be utilized to determine the gross and real registration rates. The return rates between those companies that had registered and those companies that had not registered varied, and an adjustment factor of β was developed and shown in Equations 4 and 5.

The value of β included those companies that did not ship hazardous materials, but the RSPA's main concern is only with the group of companies that do ship hazardous materials. Because this bias rate was unable to be determined, a range of values, β' , was substituted for β in Equations 4 and 5. The β' values indicate the amount of bias in the survey results between those companies that ship or carry hazardous material and have registered and those companies that ship or carry hazardous materials and have not registered. The bias rate is assumed to be as high or higher than those shown by the

survey results. A value of ten for β' would indicate that those companies that ship or carry hazardous materials and have registered are ten times more likely to respond than those companies that ship or carry hazardous materials and have not registered. These formulas are as follows:

RSPA Data

$$\text{Gross Registration Rate} = \alpha' = \frac{1}{1 + \frac{h_1 - r_1}{\left(\frac{r_1}{\beta'}\right) + \left(\frac{r_1}{\beta}\right)}} \quad [\text{Eq. 6}]$$

$$\text{Real Registration Rate} = \alpha = \frac{1}{1 + \left(\frac{h_1 - r_1}{\frac{r_1}{\beta'}} \right)} \quad [\text{Eq. 7}]$$

Again the same formulas can be utilized to evaluate the CA data by substituting the variables from Table 8 for the variable from Table 7.

Chapter IV, Data Analysis, examines the survey results in greater detail and utilizes the formulas listed above to determine an approximate value for the registration rate within Tennessee.

CHAPTER IV

DATA ANALYSIS

Introduction

A total of 459 companies were mailed the survey questionnaire with a cover letter explaining the purpose of the survey and directions on completing and returning the survey. From the 459 surveys distributed, 33 were undeliverable due to an incorrect address or an expired forwarding order. Due to the 33 undeliverable surveys, the sample size was reduced to 426 surveys. A total of 106 completed surveys were returned yielding a response rate of 25 percent.

Demographic Analysis

The survey results (Appendix F) supplied general demographic data on potential registrants within Tennessee. The general demographics that were obtained included facility type, founding date of company, employment size class, etc., and are summarized in Appendix G.

The first question dealt with facility type and showed that 41 percent were considered a company. Of the 41 percent, the registered/non-registered split was about 50/50. Of the facilities that were classified as branch sites, 80 percent had not registered. Since the regulations state that if branch offices or plant location of a company are not separately incorporated, the company is required to submit only one registration statement and pay a single fee [14]; therefore, this high percentage is not considered unreasonable.

The results from the second question revealed that the majority of the companies were established after 1980, and that companies that were founded after the regulation was passed in 1992 were three times more likely to be registered than not. This information shows that companies established since the registration program began were no less informed about the registration program than those companies that were established prior to the registration programs implementation.

The responses to question 3 showed that carriers were four times more likely to register than not, and shippers were two times more likely to not register. If speculation is made as to why shippers are less likely to register, it could be due to the fact that inspections are made much more frequently on carriers than are made on shippers, but it could also be assumed that since carrier customers change daily, they are more likely to deal with a hazardous materials.

The RSPA's registration form lists 21 industrial classifications, as did the survey questionnaire. SIC codes and major industrial classifications were requested from the survey participants. The results from question 5 indicate that more than 50 percent of the registrants are within three industrial classification categories (i.e.: carriers; gas, fuel oil, and propane sales/delivery; and wholesale and retail trade). From the 21 industrial classifications that were listed, three categories had a zero response rate. Those categories were: apparel & other textile products; printing & publishing; and mining-metal & non-metal. Six SIC categories had responses, but were not listed on the registration form or the survey form. These categories are potential areas for further investigation.

Questions 8 and 9 are directly related to the registration program. Question 8 listed the five categories of materials that are involved with the registration program and asked the respondent to mark the category(ies) that they shipped or carried, and question 9 asked if the respondents had registered. If the respondent marked any of the five categories of materials, the answer for question 9 should have been "yes" if they had registered.

The survey was designed so that those who had registered received a different form than those who had not registered. The survey form with the answer "yes" listed first for question 9 was distributed to those which the RSPA data base showed were registered. The survey form with the answer "no" listed first for question 9 was distributed to those that the RSPA data base showed were not registered. The results from this question were quite interesting. There were twelve companies that stated that they were registered, but according to the RSPA data, they are not. The different answers to question 9 were analyzed separately, the first being the data according to RSPA, and secondly, the data according to CA data.

Data Exploration

The data obtained from the returned surveys was organized in a cross-tabulation format for easier dissemination (Tables 9 and 10).

Table 9

RSPA Data

SHIPS/CARRIES HAZMAT									
REGISTERED		YES		NO		TOTAL		TOTAL MAILED	
	YES	39	(r_1)	10	(r_1')	49	(r_d)	125	(f_{y1})
	NO	18	$(h_1 - r_1)$	39	$(h_1' - r_1')$	57	$(S_1 - r_d)$	301	(f_{n1})
	TOTAL	57	(h_1)	49	(h_1')	106	(S_1)	426	

Table 10

CA Data

SHIPS/CARRIES HAZMAT									
REGISTERED		YES		NO		TOTAL		TOTAL MAILED	
	YES	51	(r_2)	6	(r_2')	57	(r_c)	125	(f_{y2})
	NO	6	($h_2 - r_2$)	43	($h_2 - r_2'$)	49	($S_2 - r_c$)	301	(f_{n2})
	TOTAL	57	(h_2)	49	(h_2')	106	(S_2)	426	

Survey return rates were determined by dividing the number of return surveys by the total number distributed. The variables are listed in Tables 9 and 10:

RSPA Data Return Rate

$$\text{"Yes Registered"} = \frac{r_d}{f_{n1}} = 39 \% \quad [\text{Eq. 8}]$$

$$\text{"No Registered"} = \frac{S_1 - r_d}{f_{n1}} = 19 \% \quad [\text{Eq. 9}]$$

CA Data Return Rate

$$\text{"Yes Registered"} = \frac{r_c}{f_{y2}} = 46 \% \quad [\text{Eq. 10}]$$

$$\text{"No Registered"} = \frac{S_2 - r_c}{f_{n2}} = 16 \% \quad [\text{Eq. 11}]$$

The variables f_y and f_n represent the total number of surveys mailed out to "yes" registered and "no" registered companies. The return rate varied between the RSPA data and the CA data, shown by a comparison between Eq. 8 and Eq. 10, and a comparison between Eq. 9 and Eq. 11, therefore, both sets of data were analyzed independently.

The return rate for "yes" and "no" forms, for both RSPA data and CA data, indicates that the return rate for companies not registered much lower than those registered, indicating bias, which was expected.

There are some companies that registered that were not required to register. The total number of these companies is denoted by r_1 ' and r_2 ' in Tables 6 and 7. Two separate registration rates have been calculated to account for the registration of these companies. The gross registration rate includes those companies that registered but did not need to and those companies that were required to register and did register. The real registration rate includes only those companies that have registered and were required to register. A β value to adjust for bias, for both RSPA data and Company data, was determined using the following formulas:

RSPA Data

$$\beta_1 = \frac{\frac{r_d}{f_{y1}}}{\frac{S_1 - r_d}{f_{n1}}} = 2.1 \quad [\text{Eq. 2}]$$

CA Data

$$\beta_2 = \frac{\frac{r_c}{f_{y2}}}{\frac{S_2 - r_c}{f_{n2}}} = 2.8 \quad [\text{Eq. 3}]$$

The β formula adjusts for the bias between the “yes” registered respondents and the “no” registered respondents. For RSPA data, “yes” respondents were approximately two times more likely to respond than were “no” respondents. For CA data, “yes” respondents were approximately three times more likely to respond than “no” respondents.

Using β as an adjustment factor of $\beta_1 = 2.1$ or $\beta_2 = 2.8$, the following formulas that were derived in Chapter III are used to determine the gross and real registration rates:

RSPA Data

$$\text{Gross Registration Rate} = \alpha_1 = \frac{1}{1 + \frac{(h_1 - r_1) * \beta_1}{r_d}} = 57 \% \quad [\text{Eq. 4}]$$

$$\text{Real Registration Rate} = \alpha_1 = \frac{1}{1 + \frac{(h_1 - r) * \beta_1}{r_1}} = 51 \% \quad [\text{Eq. 5}]$$

CA Data

$$\text{Gross Registration Rate} = \alpha_2' = \frac{1}{1 + \frac{(h_2 - r_2) * \beta_2}{r_c}} = 77 \% \quad [\text{Eq. 4a}]$$

$$\text{Real Registration Rate} = \alpha_2 = \frac{1}{1 + \frac{(h_2 - r_2) * \beta_2}{r_2}} = 75 \% \quad [\text{Eq. 5a}]$$

The value of β , as determined in Eq. 2 and Eq. 3, included those companies that did not ship or carry hazardous materials, but the RSPA's main concern is with the group of companies that do ship hazardous materials. Because the bias rate excluding those companies that did not ship or carry hazardous materials was unable to be determined, a range of values, β' , was substituted for β . The β' values indicate the amount of bias in the survey results between those companies that ship or carry hazardous material and have registered and those companies that ship or carry hazardous materials and have not registered. Using the following formulas and a varying value for β' , a range of registration rates was obtained:

RSPA Data

$$\text{Gross Registration Rate} = \alpha' = \frac{1}{1 + \frac{h_1 - r_1}{\left(\frac{r_1}{\beta'}\right) + \left(\frac{r_1'}{\beta}\right)}} \quad [\text{Eq. 6}]$$

$$\text{Real Registration Rate} = \alpha = \frac{1}{1 + \left(\frac{h_1 - r_1}{\frac{r_1}{\beta'}} \right)} \quad [\text{Eq. 7}]$$

From equations 6 and 7 above, the registration rate for gross registration ranged from 33 percent to 57 percent as shown in Figure 4. The registration rate range for real registration was from 18 percent to 51 percent as also shown in Figure 4.

The formulas for gross and real registration rate for CA data were as follows:

CA Data

$$\text{Gross Registration Rate} = \alpha_2' = \frac{1}{1 + \frac{h_2 - r_2}{\left(\frac{r_2}{\beta'} \right) + \left(\frac{r_2'}{\beta} \right)}} \quad [\text{Eq. 6a}]$$

$$\text{Real Registration Rate} = \alpha_2 = \frac{1}{1 + \left(\frac{h_2 - r_2}{\frac{r_2}{\beta'}} \right)} \quad [\text{Eq. 7a}]$$

From formulas 6a and 7a above, the registration rate for gross registration ranged from 55 percent to 77 percent and the registration rate for real registration ranged from 46 percent to 75 percent. These ranges are both shown in Figure 5.

The main difference between the RSPA data and the CA data is that the RSPA data was compared against the data base showing those companies that had actually

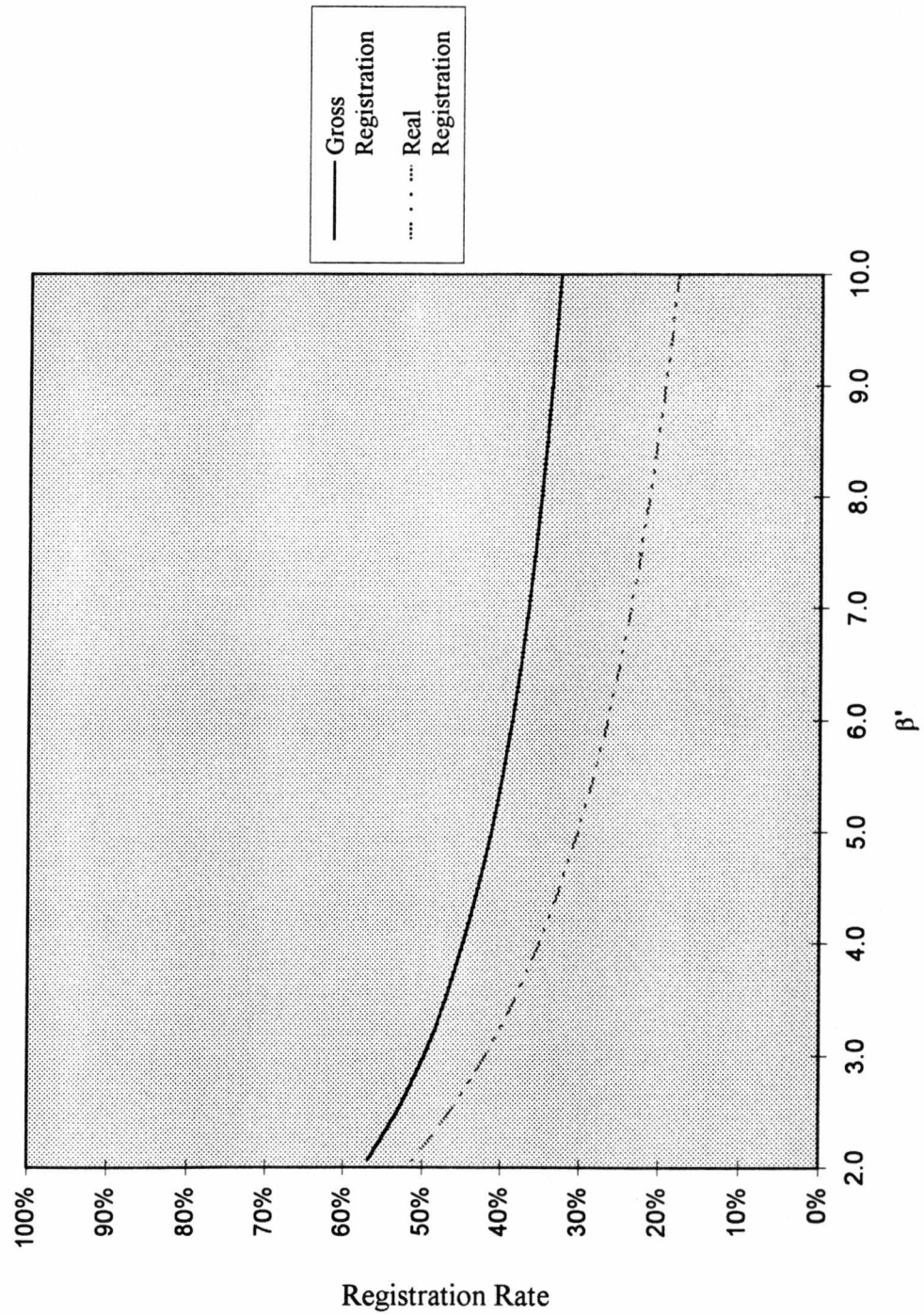


Figure 4
Variable Bias Rate vs. Gross & Real Registration Rates for RSPA Data

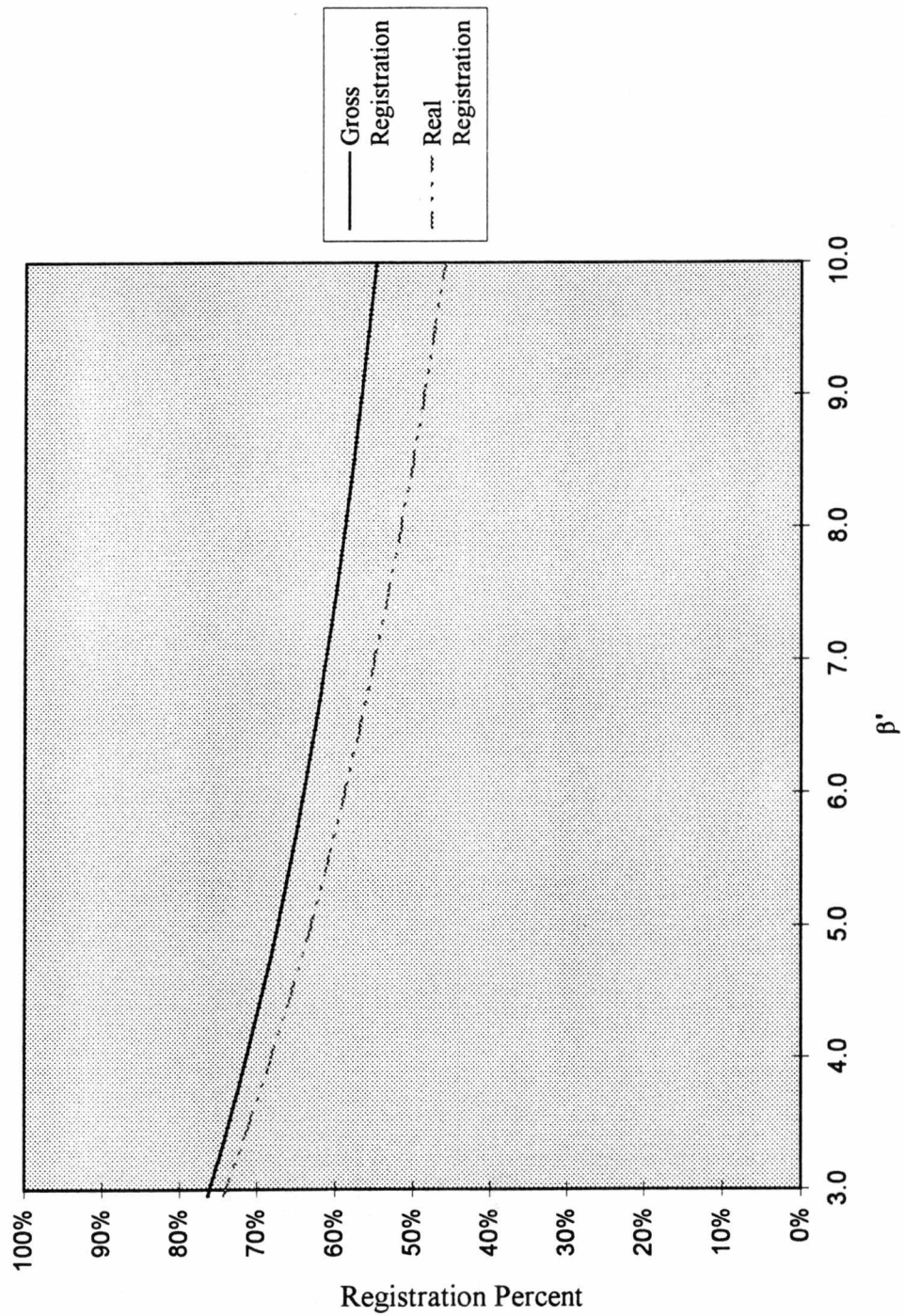


Figure 5

Variable Bias Rate vs. Gross & Real Registration Rates for CA Data

registered and paid the registration fee. The survey respondents were able to answer question 9 with the answer that best suited their needs or that they personally felt was correct. The respondents were not aware that the answer to the question was already known. It is unknown why the respondents answered differently than the RSPA data. Possibilities for these varying answers include a general lack of knowledge about the registration program, confusion about the program, or that the truth was not an answer they wanted to put in writing. From these possibilities, it is obvious that there was a potential source of error within the survey results for the CA data; therefore, a value of ρ was incorporated into formulas 6a and 7a:

CA Data

$$\text{Gross Registration Rate} = \alpha_2' = \frac{1}{1 + \frac{h_2 - r_2}{\left(\frac{r_2 * \rho}{\beta'}\right) + \left(\frac{r_2'}{\beta}\right)}} \quad [\text{Eq. 8}]$$

$$\text{Real Registration Rate} = \alpha_2 = \frac{1}{1 + \left(\frac{\frac{h_2 - r_2}{r_2 * \rho}}{\beta'}\right)} \quad [\text{Eq. 9}]$$

Where ρ is an adjustment factor between 0.75 and 1 that accounts for errors in within the survey results.

As was the case with β' , the amount of error is unknown, but the difference between the “yes” ships/carries column in Table 9 and 10 is only 21 percent. Because the error would not be expected to be much below what the actual data shows, the values for

ρ ranged between 0.75 and 1, with 0.75 depicting the case where there is 25 percent error in the data. The results from equations 8 and 9 are shown in Figures 6 and 7 and in Appendix H.

These figures graphically illustrate that with an increase in β' and a decrease in ρ , the registration rate decreases. For Figure 6, if the bias rate, β' , is 5.00 times and the error, ρ , is 0.87, the expected registration rate would fall within the 40 percent to 50 percent range. If the bias is 2.80 times and the error is 0.81, the range would be 50 percent to 60 percent. An ideal situation would involve no bias and no error, but both of these scenarios are unlikely. The likelihood that these two events will occur is slim thus dictating that a range of values, not an exact value for the registration rate, will be determined. These determinations are discussed in the following chapter.

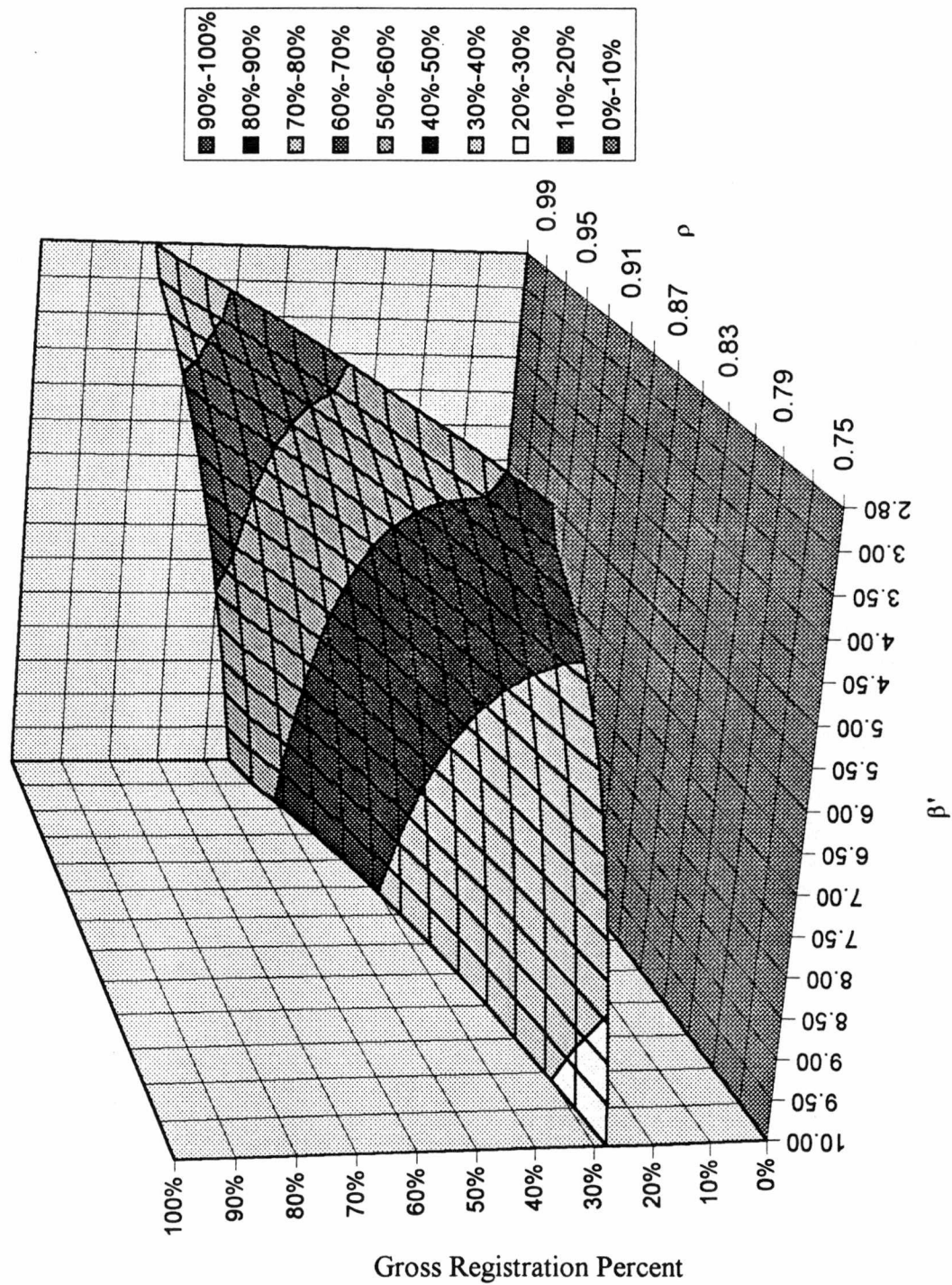


Figure 6

Gross Registration Percent Based on Variable Bias and Error

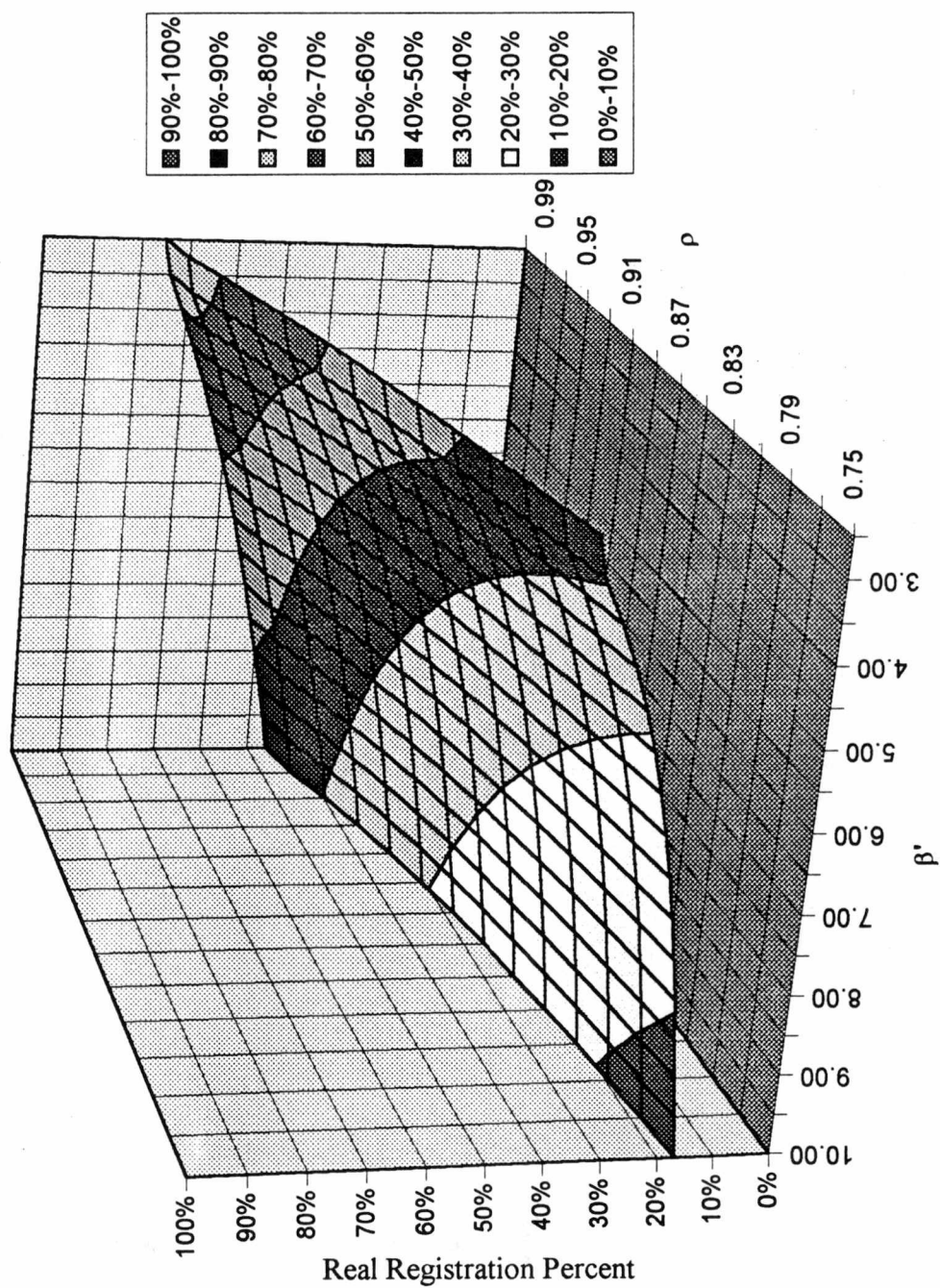


Figure 7

Real Registration Percent Based on Variable Bias and Error

CHAPTER V

DISCUSSION

Introduction

This research revolved around a specific geographic region, using data supplied by a government agency, and working under a limited scope. Due to these factors, there are areas that need to be addressed and/or explained. These areas include legal issues, a critique of the methodology and the RSPA data bases, and a critique of the data analysis. The results that were obtained through the analysis of data obtained from completed questionnaires need to be evaluated and be used to make a limited projection of the future direction of the registration program.

Legal Implications

Shippers and carriers of the five categories of hazardous materials that have been described in previous chapters are required by law to register with the federal government. If a company has not registered and ships any of the five categories of hazardous materials, it is subject to civil penalties up to \$25,000 for each day a covered function is performed. The legal obligation to register for a year in which any of the specified activities is conducted does not end with the registration year [12]. These legal implications most likely had an impact on the survey resulting in only a 25 percent response rate. The potential legal concerns and any related difficulties that were associated with this research were unavoidable, and so long as these factors and

difficulties were recognized and dealt with accordingly, the results obtained through the data analysis is supportable.

Critique of the Methodology

The data bases received from the RSPA were compiled using the actual registrants in Tennessee as of October 1994, and multiple industry and governmental sources.

Although these sources are a good start, they do not encompass the entire range of companies that ship and carry hazardous materials within Tennessee. A more complete source of information might have come from commercial sources such as American Business Lists. These sources offer lists of addresses and company names that can be categorized by multiple options, one being by SIC codes. These company names and addresses are obtained through telephone directories and other public sources, and then information is verified over the phone to increase the accuracy. Although the RSPA's list was approximately three to four years old, it still provided a solid foundation for the questionnaires.

Critique of Analysis

The analysis of the results from the questionnaire was based on a low response rate, biased results and a degree of error. Even though these conditions existed, they were not ignored and each area was specifically addressed. A low response rate was expected due to the legal implications that were previously mentioned. The questionnaires were

straightforward, simple, and confidential with return postage provided. Without these criteria, the response rate would have been far lower.

Sources for greater concern were bias and potential sources for error. The companies which had registered were two to three times more likely to respond to the questionnaire than those companies which had not registered. To address the problem of bias, a β value was used to show the possible variations in registration rate. The β variable was defined as the number of times more likely that registered companies would be to respond to the questionnaire than non-registered companies. The value of β included those companies that did not ship hazardous materials, but the RSPA's main concern is only with the group of companies that do ship hazardous materials. Because this bias rate was unable to be determined, a range of values, β' , was incorporated into equations 6 and 7. The β' values indicate the amount of bias in the survey results between those companies that ship or carry hazardous material and have registered and those companies that ship or carry hazardous materials and have not registered. The bias rate is assumed to be as high or higher than those shown by the survey results. A value of ten for β' would indicate that those companies that ship or carry hazardous materials and have registered are ten times more likely to respond than those companies that ship or carry hazardous materials and have not registered. The β' value was limited to 2.1 on the lower bound. If the actual bias is less than 2.1, the registration rate is actually higher than shown in the results, therefore a bias rate of 2.1 is a conservative value. The actual bias rate for only those companies that ship or carry hazardous materials is an unknown factor, but by using these values for β' , a range of registration rates was developed.

Errors between the RSPA data and the CA data could have resulted from misunderstanding of questions by the respondents, answering the questions dishonestly, mistakes in answering the questions, or that the sample was not random. These sources of error were accounted for by using a ρ value. Again, the actual error rate is an unknown factor, but using a range of values for ρ , a range of registration rates was developed.

If these two variables, ρ and β' , are combined, the range of registration rate can be seen as previously shown in Figures 6 and 7. A low registration rate is developed when ρ is 0.75 and when β' is 10, conversely, a high registration rate can be found when ρ is 1 and β' is 2.1. These values range from an approximate low registration rate of 17 percent to an approximate high registration rate of 90 percent although both of these values seem to be unlikely.

There is a wide range of registration rates based on two variables, β' and ρ . These variables are not known, but based the range can be narrowed based on questionnaire results.

Results

A supportable range between 40 percent and 60 percent registration rate was determined from the data analysis. The most likely registration rate is approximately 45 percent to 50 percent. After speaking with industry representatives, it is clear that they feel the registration rate is not as high as it should be. According to the representatives, the main factors responsible for the low registration rate is the lack of enforcement from the DOT and confusing regulations. If this range of 45 percent to 50 percent were true

for the entire U.S., the national registration total should be approximately 57,000. With a 95 percent compliance rate, the funding for the IHMPSTPGP would be covered.

Therefore, enforcement and prosecution of companies in violation of the regulation could eliminate the funding problem.

There are companies that do not realize that there is a registration program and yet are required by law to register. Other companies do not understand the registration requirements. There are also companies that know there is a registration program and understand the regulations, but know that there is a slim to zero chance they would be caught transporting or shipping any of the five categories of materials.

The RSPA states that approximately 60 enforcement actions have been initiated throughout the U.S. and that 18 state enforcement agencies have issued more than 250 citations for failure to register [1]. These enforcement actions and citations are in conjunction with other federal regulation violations and have resulted in no monetary settlements, and therefore, are not a threat to companies that ship or carry hazardous materials.

The other main concern that industry representatives voiced was that regulations for the registration program are confusing and that it is hard to disseminate all the information which it contains. It was suggested that the RSPA should have distributed a condensed version of the regulations explaining the registration program in layman's terminology and that information sessions be held periodically around the nation to explain changes and answer industry questions.

Future Directions

The original mailing list obtained from RSPA only contained approximately half of the companies that have registered within Tennessee, yet the RSPA believes that the registration rate for the nation is approximately 90 percent. This estimate is based solely on the fact that there have been mass mail-outs from a mailing list that is obviously incomplete; that enforcement actions and citations are forcing companies to comply, although there is no monetary incentive for these non-registrants to do so; and that during the ROADCHECK-93, (Chapter I) most carriers were in compliance. The estimated registration rate of 90 percent seems overly optimistic since it is not based on supportable information.

Even though the RSPA has no supportable information, they are basing future regulatory changes on this information. The RSPA stated in the Federal Register on July 9, 1992, that they had chosen the flat fee for several reasons. It was the most simple and straightforward fee schedule possible; it would be easily understood by the regulated parties; it was easily administered and enforceable; it minimized paperwork burdens on industry and the government; and it also provided the maximum relief possible for small businesses [11]. Now the RSPA is proposing a graduated fee based on activities engaged in and quantities shipped or carried. The graduated fee system is very complicated and goes against all of the criteria that the flat fee was based on.

The RSPA believes the registration rate is approximately 90 percent, and therefore chose not to consider other possible options. These options included 1) raising the flat

fee, 2) expand the scope of the registration program, and 3) actually increase inspections and enforce the regulation.

Raising the flat fee to \$500 per company would cover the \$12.8 million that is needed to fund the emergency response planning and training grants. An increase of \$200 per company per year would not be detrimental to small businesses.

Expanding the scope of the registration program could be accomplished by removing the required minimum quantities or by expanding the base of companies to include those that manufacture packaging used in the transportation of hazardous materials.

The RSPA considers 250 citations over the past three years for the U.S. commendable [1]. This equals out to about two citations per state, per year. This does not seem like a step toward enforcing the regulation. If the RSPA would physically audit companies and fine violators the maximum penalty, it would not be long before word of mouth would enhance the probabilities that most, if not all, companies were aware of the regulations and register if they met the registration criteria.

CHAPTER VI

CONCLUSIONS

In 1992, the RSPA started a registration program for shippers and carriers that transported any of five specific categories of materials. An original estimate of 160,000 and a subsequently revised estimate of 100,000 registrants, would have covered the needed \$12.8 million required to fund the Interagency Hazardous Materials Public Sector Training and Planning Grants Program. The actual registration number of 26,000 does not generate enough funds to cover this program. The RSPA is considering changing the fee schedule from a flat \$300 fee to a sliding scale based on the number of activities engaged in and the quantities of materials shipped or carried. The new proposed sliding fee schedule is complicated and difficult to understand. Complaints from industry leaders have mentioned that the current registration is difficult to understand and that there are no directions and information written in layman's terminology. The RSPA is basing the need for a change on a registration rate that they believe is 90 percent. This research shows that the registration rate for Tennessee is much lower than 90 percent. The research did contain bias and possible sources of error, but a supportable registration rate range of 40 percent to 60 was determined through the data analysis. Additional research should be conducted to determine a more accurate estimate of a nationwide registration rate before changes are made to the existing regulations. Using the information gathered to complete this research, determining a national registration rate would not be an enormous task.

The training and planning grant program is a necessity if the safety of hazardous materials transportation is to increase, and without an increase in funding, these grants will not be obligated. The RSPA should not change the fee schedule until simpler, less bureaucratic methods are attempted. Changing the fee schedule will increase the cost and lessen the effectiveness and enforceability of the regulations. The recommended approach to increase the registration rate would be to enforce the registration regulations and to increase the prosecution of those companies found in violation.

This research shows that the registration rate is considerably lower than 90 percent for Tennessee. The RSPA must raise funds to support the emergency planning and training grants fund through some means. The registration rate for the U.S. should be evaluated and not just assumed. Future research in this area should encompass a larger geographic area or even the entire U.S. and utilize a combined source of RSPA information and commercial information, such as American Business Lists. By using a simple questionnaire and adjusting the sample size according to the bias rates that were determined through this research, the registration rate for the geographic region or the U.S. could be determined fairly easily. This information would allow the RSPA to base future changes of the regulations on fact and not speculation.

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BIBLIOGRAPHY

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APPENDICES

APPENDIX A - REGULATORY EVALUATION

Docket HM - 208

Hazardous Materials Transportation Registration and Fee Assessment Program

Attachment 1. A.

POTENTIAL UNIVERSE OF SHIPPERS, CARRIERS AND IMPORTERS SUBJECT TO PROGRAM.

Based on the best available data, it is estimated that:

1. there is a 99.0 % probability that the number of shippers and carriers subject to the annual registration program is greater than equal to: 40,000.
2. there is a 80.0 % probability that the number of shippers and carriers subject to the annual registration program is greater than equal to: 100,000.
3. there is a 20.0 % probability that the number of shippers and carriers subject to the annual registration program is greater than equal to: 500,000.
4. there is a 1.0 % probability that the number of shippers and carriers subject to the annual registration program is greater than equal to: 1,000,000.

These values may be considered as representative of the cumulative probability distribution characterizing the universe of shippers and carriers subject to the mandatory registration program. They lead to an expected value of approximately 160,000 shippers and carriers being subject to the registration program, e.g., the point-estimate that 100,000 shippers and carriers will be subject to the registration program is .60; the point-estimate that the number is 500,000 is .19, etc.

The 99.0 % probability estimate that the number of shippers and carriers subject to the annual registration program is greater than equal to 40,000 is based on the following two sources:

- 1) the toxic-release computerized inventory covering 328 separate and distinct hazardous materials maintained by the Environmental Protection Agency, EPA (See: The 1987 Toxic-Release Inventory. Executive Summary, EPA, June 1989). It is important to note

that there are more than 30,000 separate and distinct hazardous materials which annually are shipped in the United States, and thus the facilities identified in the EPA toxic-release inventory represent a small sample size ($328/30,000 = .01$) of the universe of all hazardous materials shippers.

2) the Hazardous Materials Incident Reporting System (HMIS), maintained by RSPA and covering all incidents reported to RSPA by interstate carriers and shippers since the HMIS was established in 1971. Here it is important to note that this data base is not robust for purposes of identifying shippers or carriers who engage in the transportation of hazardous materials on an infrequent or very limited basis. This is because shippers or carriers who transport or cause to be transported in commerce a hazardous material on an infrequent basis, say once a year, are not likely to be involved in a reportable hazardous materials incident for a long period of time: actually on average but once over a 25,000 year interval (that is, given an average truck accident rate of 1.0×10^{-6} per mile; an average shipment distance of 200 miles; and the conditional probability of a hazardous materials spill, given an accident, of 0.20, the probability of a reportable highway transit incident is 4.0×10^{-5} per year; or one reportable incident over a 25,000 year interval). Thus, the hazardous materials computerized incident data base significantly understates the potential number of small shippers and carriers that annually transport or cause to be transported or shipped hazardous materials. Intrastate highway carriers of hazardous materials are currently exempted from incident reporting requirements (with a few exceptions, e.g., incidents involving hazardous substances and wastes).

It should be noted that virtually all of the 39,000 farm units in the United States with gross annual incomes in excess of \$500 thousand, and some portion of 74,000 farm units with gross annual incomes between \$250 and \$500 thousand may be presumed to use a nurse tank in their operations, and thus may be subject to the registration program.

The probability estimates that the number of shippers and carriers potentially subject to the registration program is equal to/greater than 500,000 and 1,000,000, respectively, are based on the following considerations. First, chemicals and petroleum products, many of which are hazardous materials, are present to some degree in virtually every industry in the United States. Thus, the companies operating within these industries are potential shippers or carriers of hazardous materials at some time during the year. Second, as estimated by the Occupational Safety and Health Administration (OSHA), in 1985, there were approximately 1.9 million establishments, operating within 52 two and three digit SIC defined industrial classifications, storing or utilizing 375 hazardous substances (which are a subset of all hazardous materials) which had a potential for generating hazardous exposure for their attendant workers (Docket H-0201; 20960 FR Vol. 53, No. 109, June 7, 1988). Given a weighted average of 2 to 1, this leads to a rough estimate of 1.0 million domestic companies that may be potentially subject to the registration program.

APPENDIX B - DATABASE SAMPLE OF MAILING LIST

COMPANY	ADDRESS	CITY	ST	ZIP	PHONE
3-D MOTOR FREIGHT INC	PO BOX 13465	MEMPHIS	TN	38113	9019461365
7/11 INSTALLATION & SERVICE INC	PO BOX 24203	NASHVILLE	TN	37202	6152428211
A & J PAINTING INC	4632 EAST HOLMES ROAD	MEMPHIS	TN	38118	9013658223
A & M EXPRESS INC	2915 SOUTH WILCOX DR	KINGSPORT	TN	37660	
A & R SUPPLY CO INC	296 SOUTH PAULINE	MEMPHIS	TN	38104	9015270338
A & S BUILDING SYSTEMS	HWY 23W	CARYVILLE	TN	37714	
A AND I WAREHOUSE	3183 TRANQUILLITY DRIVE	MEMPHIS	TN	38116	
A G HEINS CO INC	116 HEINS STREET	KNOXVILLE	TN	37921	6155255363
A J METLER HAULING & RIGGING INC	BOX 3430	KNOXVILLE	TN	37927	6156883900
A-1 SIGNS INC	PO BOX 247	DICKSON	TN	37055	6154462836
A-WELDERS & MEDICAL SUPPLY INC	124 MORELIA AVE NW	KNOXVILLE	TN	37917	6155228350
A. E. STALEY MFG. CO.	198 BLAIR BEND DR.	LOUDON	TN	37774-9499	6154585681
A. O. SMITH AUTOMOTIVE PRODUCT	52 A. O. SMITH RD.	MILAN	TN	38358	9016865301
AAA COOPER TRANSPORTATION	1100 VISCO DRIVE	NASHVILLE	TN	37210	
AAA INDUSTRIAL SERVICES	3826 WHITES CREEK PIKE	NASHVILLE	TN	37207	
AAA SERVICES	207 SOUTH 12TH ST	NASHVILLE	TN	37206	
AAF ENVIRONMENTAL-SNYDER GENER	2000 TAMM ST.	BROWNSVILLE	TN	38012	9017721123
AARBERG PRINTING INKS	500 TILTHAMMER RD	KINGSPORT	TN	37660	
ABB COMBUSTION ENGINEERING SYS	911 W. MAIN ST.	CHATTANOOGA	TN	37402	6157527300
ABB COMBUSTION ENGINEERING TUB	500 W. 26TH ST.	CHATTANOOGA	TN	37408	6157527300
ABC EXPRESS INC	PO BOX 890	LEBANON	TN	37087	6154495250
ABESTOS ABATEMENT ASSOCIATES INC	PO BOX 5266	CHATTANOOGA	TN	37406	6156981898
ABLE CARTAGE CO INC	64 UNITED DR	JACKSON	TN	38305	9016683072
ACCU-CAST INC.	1911 CRUTCHFIELD ST.	CHATTANOOGA	TN	37406	6156224344
ACCURATE ARMS CO INC	RTE 1 BOX 167	MCWEEN	TN	37101	6157294207
ACE ENTERPRISES INC	1514 RIVERSIDE DR	CHATTANOOGA	TN	37406	6156226284
ACE HARDWARE OF CHATT.	4921 HWY 58	CHATTANOOGA	TN	37416	6158996306
ACE TRUCKING INC	PO BOX-3183	JACKSON	TN	38303	9014225505
ACTIVATED METALS AND CHEMICALS INC	PO BOX 32	SEVIERVILLE	TN	37862	6154537177
ADM MILLING CO.	430 CENTRAL AVE. N.E.	CLEVELAND	TN	37311	9134919400
ADM MILLING CO. INC.	1120 KING ST.	CHATTANOOGA	TN	37403	9134919400
ADVANCE GOLFCART & BATTERY	504 E BROADWAY	LENOIR CITY	TN	37771	6159884653
ADVANCE PAPER CO	PO BOX 72637	CHATTANOOGA	TN	37407	6156225126
ADVANCE TRANSFORMER CO.	HWY. 62E	WARTBURG	TN	37887	6153466621
ADVANCED PLASTICS INC	7360 COCKRILL BEND BLVD	NASHVILLE	TN	37209	6152260030
*1 AEROJET	P O BOX 399	JONESBOROUGH	TN	37659-0000	6157531349
AEROQUIP CORP.	309 EDDY LN. P.O. BOX 665	FRANKLIN	TN	37064	6157941573
AEROQUIP CORP.	955 INDUSTRIAL PARK DR	GAINESBORO	TN	38562	6152680283
AFFILIATED TRANSPORT INC	3001 SOUTH HICKORY STREET	CHATTANOOGA	TN	37407	6156988280
AFG INDUSTRIES INC. BLUE RIDGE	1450 LINCOLN ST.	KINGSPORT	TN	37662	6152297200

*1=Co. Registered but not on RSPA's original list
 R=Survey not delivered
 Other=State of Co. Headquarters

*1	AFG INDUSTRIES INC. GREENLAND	AFG RD. FACTORY NO. 7	CHURCH HILL	TN	37642	6153576121
	AGRICULTURAL & INDUSTRIAL WARE	3185 TRANQUILITY DRIVE	MEMPHIS	TN	38116-0000	9013322961
	AHLSTROM FILTRATION INC.	105 W. 45TH ST.	CHATTANOOGA	TN	37409	6158214090
	AIR PRODUCTS & CHEMICALS INC	440 INDUSTRY DR.	KINGSPORT	TN	37662	6152477193
	AIR-MAZE CORP.	ROCKWELL DR. P.O. BOX 1270	GREENEVILLE	TN	37744-1270	6156394154
	AIRCO	4551 N ACCESS RD	HIXSON	TN	37343	6158774503
	AIRCO INDUSTRIAL GASES	4301 HURRICANE CREEK BLVD	ANTIOCH	TN	37013-2223	6156415700
	ALABAMA - TENNESSEE EXPRESS INC	50 EAST 29TH	CHATTANOOGA	TN	37410	6157561620
*1	ALABAMA OIL & GAS CO INC	19 DEPOT ST	SPARTA	TN	38583*0000	6138363347
	ALADDIN INDUSTRIES INC.	1124 MENZLER RD.	NASHVILLE	TN	37210	6157483000
	ALAN FREIGHT SERVICE	PO BOX 10022	NASHVILLE	TN	37224	6157263448
	ALCAN ALCAN RECYCLING DIV.	1605 RAILROAD AVE.	SHELBYVILLE	TN	37160	6156840300
	ALCO CHEMICAL CORP.	909 MUELLER DR. P.O. BOX 5401	CHATTANOOGA	TN	37406	6156291405
	ALCOA	HALL RD. PO BOX 9138	ALCOA	TN	37701	6159772780
*1	ALCOA SPECIALTY CHEMICALS INC	1840 LINDEN INDUSTRIAL DR	NASHVILLE	TN	37209-0000	6153508331
	ALEXANDER PAPER	HIGHWAY 57 SOUTH	PICKWICK DAM	TN	38365	9016895214
	ALL AMERICAN INDUSTRIAL SERVIC	6116 AIRWAYS BLVD	CHATTANOOGA	TN	37421	
	ALL-STATE TRMT PEST CONTRL CO	2753 RANGELINE RD	MEMPHIS	TN	38128	
*	ALLEN IRON WORKS & SUPPLY CO INC	PO BOX 27167	MEMPHIS	TN	38127	9013532100
	ALLEN PETROLEUM PRODUCTS INC	1014 W MAIN ST	GREENVILLE	TN	37744	6156383141
*1	ALLEY CASSETTY TRUCKING	711 FESSLEERS IN	NASHVILLE	TN	37210-0000	6152447196
*1	ALLIANCE MANUFACTURING CO	820 ESTHER LANE	MURFREESBORO	TN	37133-0000	2143308671
	ALLIED FLOORING SUPPLY	3500 WORKMAN RD	KNOXVILLE	TN	37921	6155842386
	ALLIED GRAPHICS INC.	906 S. 3RD ST.	MEMPHIS	TN	38106	9017745302
	ALLIED MEDICAL INC	690 S MENDENHALL RD	MEMPHIS	TN	38117	9016833343
	ALLIED-SIGNAL INC. BENDIX GELA	375 BELVEDERE DR.	GALLATIN	TN	37066	6154513665
	ALLIED-SIGNAL INC. BENDIX-FMD	20TH ST. P.O. BOX 2610	CLEVELAND	TN	37311	6154780700
*	ALL WORTH INC	101 S PARK AVE	MT PLEASANT	TN	38474	6153793215
*1	ALPHA/OWENS-CORNING	860 HIGHWAY 57 EAST PO BOX 370	COLLIERVILLE	TN	38027*0370	9018532450
	ALUMANODICS INC.	1417 POPLAR LN.	NASHVILLE	TN	37210	6152550364
	AM-TRANS INC	PO BOX 702	LEBANON	TN	37087	6154446627
	AMANA REFRIGERATION INC.	1810 WILSON PKY.	FAYETTEVILLE	TN	37334	3196222142
*	AMERICAN BATTERY COMPANY INC	1823 ELM HILL PIKE	NASHVILLE	TN	37210	6158830005
	AMERICAN COLORS INC.	1201 HALEY RD.	MURFREESBORO	TN	37130	6158963008
*	AMERICAN COMMERCIAL LIQUID TERMINAL	427 WEST ILLINOIS AVE	MEMPHIS	TN	38106-0000	812-288-0471
	AMERICAN CYANAMID CO	A & I WISE PO BOX 9205	MEMPHIS	TN	38109	
	AMERICAN DIVERSIFIED CONSTRUCTION INC	PO BOX 718	WHITES CREEK	TN	37189	6158761000
*	AMERICAN ECOLOGY RECYCLE CENTER	109 FLINT ROAD	OAK RIDGE	TN	37830*7033	615-482-5532
	AMERICAN ELECTRIC	260 DENNIS ST.	ATHENS	TN	37303	6157456588
	AMERICAN ENERGY SERVICES INC	327 HANNAH DRIVE	KNOXVILLE	TN	37840	6154352269
	AMERICAN GREETINGS CORP.	1236 AMERICAN WAY	RIPLEY	TN	38063	9016353000

*=Company Registered

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	AMERICAN INDUSTRIAL WASTE CO	INDUSTRIAL DR	WHITE BLUFF	TN	37187	
*	AMERICAN MFG. CO.	3600 N. HAWTHORNE ST.	CHATTANOOGA	TN	37406	6156241191
	AMERICAN NATIONAL CAN CO	1209 NEW TULLAHOMA HWY.	SHELBYVILLE	TN	37160	3123993786
	AMERICAN OLEAN TILE CO.	96 AMERICAN DR.	JACKSON	TN	38301-2768	9014241314
	AMERICAN PAPER & TWINE CO	PO BOX 90348	NASHVILLE	TN	37209	6153509000
*	AMERICAN RESOURCE RECOVERY CORPORATION	901 EAST BODLEY AVENUE	MEMPHIS	TN	38106-7614	901-774-2050
	AMERICAN STEEL DRUM COMPANY	HWY 55, P.O. BOX 264	SUMMITVILLE	TN	37382	6157280157
*	AMTROL INC.	1630 CORPORATE PL.	NASHVILLE	TN	37086	6156417731
	ANCHOR SWAN INC. ANCHOR SWAN D	1921 N. BROAD ST.	LEXINGTON	TN	38351	9019684281
	ANDERSON HICKEY CO.	RT. 1 711 SUMROW ST.	HALES	TN	38040	9018367513
	ANDREWS DISTRIBUTING CO INC	PO BOX 17557	NASHVILLE	TN	37217	6153991776
	APAC-TENNESSEE INC - HARRISON DIVISION	PO BOX 359 226 GILL STREET	ALCOA	TN	37701-0000	6159833100
*1	APAC-TENNESSEE INC - MEMPHIS DIVISION	PO BOX 112	MEMPHIS	TN	38107-0000	9015232464
	APCOM INC.	125 SOUTHEAST PKY. P.O. BOX 68	FRANKLIN	TN	37068-1149	6157945574
*	APPALACHIAN OIL CO INC	RT. 3	BLOUNTVILLE	TN	37617	6153235235
	APPLIED COATING INC	PO BOX 51490	KNOXVILLE	TN	37950	6156901471
	AQUA GLASS CORP. MAIN PLANT	INDUSTRIAL PARK	ADAMSVILLE	TN	38310	9016320911
*	AQUA-CHEM INC. WATER TECHNOLOG	3001 E. JOHN SEVIER HWY.	KNOXVILLE	TN	37914	6155442065
*	AQUAPHASE LABS INC	133 LEE ETNA DR	GALLATIN	TN	37066	
R	AQUATEC CHEMICAL INTERNATIONAL INC	314 SPEARS AVE	CHATTANOOGA	TN	37405	6157567555
	AQUATECH INC.	914 RED RD.	MC MINNVILLE	TN	37110	6155285184
*	ARB ENTERPRISES INC	PO BOX 765	CHATTANOOGA	TN	37401	6156244429
	ARCADIAN CONTINENTAL TRAFFIC S	PO BOX 341669	MEMPHIS	TN	38184-1669	
*	ARCADIAN CORPORATION	6750 POPLAR AVENUE, SUITE 600	MEMPHIS	TN	38138-7419	9107585218
*	ARCADIAN OHIO LP	6750 POPLAR AVE SUITE 600	MEMPHIS	TN	38138*7419	901-758-5220
	ARCATA GRAPHICS	451 ARCATA BLVD	CLARKSVILLE	TN	37040	6155344400
	ARCATA GRAPHICS BAIRD WARD NAS	THOMPSON LN. & POWELL AVE.	NASHVILLE	TN	37230-5127	6153850460
	ARCATA GRAPHICS HAWKINS	KINGSPORT PRESS RD.	NEW CANTON	TN	37642	6153720000
*	ARCATA GRAPHICS KINGSPORT	PRESS & ROLLER STS.	KINGSPORT	TN	37660	6153781000
	ARKANSAS FREIGHTWAYS INC	100 E 29TH ST	CHATTANOOGA	TN	37410	
	ARKANSAS FREIGHTWAYS INC	401 WINCHESTER ROAD	MEMPHIS	TN	38109	
	ARLINGTON OIL CO INC	11891 HW 70	ARLINGTON	TN	38002	9018672289
*1	ARMOR ENVIRONMENTAL SERVICES INC	2403 PARK PLUS DRIVE	COLUMBIA	TN	38401-9900	6153812320
	ARMSTAR	307 INDUSTRIAL PARK BLVD.	LENOIR CITY	TN	37771	6159864040
	ARROW TRANSFER AND STORAGE COMPANY	PO BOX 1636	CHATTANOOGA	TN	37401	6152677615
	ASEA BROWN BOVERI POWER T & D	RT. 1 HWY. 412	ALAMO	TN	38001	9016965561
R	ASH MCNEIL WELDING SUPPLY CO	PO BOX 25027	NASHVILLE	TN	37203	6152552786
R	ASP INTERNATIONAL INC	PO BOX 4200	CLEVELAND	TN	37320	6154781126
	ASSOCIATED RUBBER CO.	1050 NORTHWOOD DR.	HUNTINGDON	TN	38344	9019862271
	ASSURED CASTING CORP.	300 INDUSTRIAL PARK DR.	ROGERSVILLE	TN	37857	6152728911
	AT DISTRIBUTORS	802 ROZELLE AVENUE	MEMPHIS	TN	38104	9012787211

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R=Survey not delivered

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APPENDIX C- DATABASE SAMPLE OF TENNESSEE REGISTRANTS

Company	Address	City	State	Zip	Name	Phone
A & M EXPRESS INC	2915 S WILCOX DR	KINGSFORD	TN	37660*0000	R RUSSELL BAILEY	615-349-6664
A & R SUPPLY CO INC	296 S PAULINE ST	MEMPHIS	TN	38104-3224	JOHN A BRADY	901-527-0338
A J METLER HAULING & RIGGING	1300 DUTCH VALLEY ROAD	KNOXVILLE	TN	37918-3430	DAN R MOORE	615-688-3900
A-WELDERS & MEDICAL SUPPLY INC	124 MORELIA AVE NW	KNOXVILLE	TN	37917*0000	GLENN E MADGETT	615-522-8350
ABLE CARTAGE INC	64 UNITED DAR	JACKSON	TN	38305-0000	DEWAYNE MCHAFEEY	901-668-3072
ACCURATE ARMS COMPANY	ROUTE 1 BOX 167	JACKSON	TN	37101-9608	RICHARD C BAISCH	615-729-4207
ACE TRUCKING INC	2203 HY 70 EAST	JACKSON	TN	38305-0000	TROY STUCKEY	901-422-5505
ADVANCED PLASTICS INC	7360 COCKRILL BEND BLVD	NASHVILLE	TN	37209-1058	ROY T BRUCE	615-350-6500
AEROJET	P O BOX 399	JONESBOROUGH	TN	37659-0000	RICHARD S WILLIAMS	615-753-1349
AGRICULTURAL & INDUSTRIAL WARE	3185 TRANQUILITY DRIVE	MEMPHIS	TN	37659-0000	GERHARD E GEHRKE	901-332-2961
ALABAMA OIL & GAS CO INC	19 DEPOT ST	SPARTA	TN	38583*0000	ARLIN STULTS	615-836-3347
ALCOA SPECIALTY CHEMICALS INC	1840 LINDEN INDUSTRIAL DR	NASHVILLE	TN	37209-0000	PAT CAMPBELL	615-350-8331
ALLEN PETROLEUM CO OF EAST TN INC	1014 W MAIN STREET	GREENEVILLE	TN	37743-0000	CAROL A ESTEPP	615-638-4341
ALLEY CASSETTY TRUCKING	711 FESSLER IN	NASHVILLE	TN	37210-0000	ROBIN FROST	615-244-7196
ALLIANCE MANUFACTURING CO	820 ESTHER LANE	MURFREESBORO	TN	37133-0000	ED MCMAHON	214-330-8671
ALLWORTH INC	101 SOUTH PARK DRIVE	MOUNT PLEASANT	TN	37133-0000	BILLY C LANCE	615-379-3215
ALPHA OWENS-CORNING	860 HIGHWAY 57 EAST PO BOX	COLLIERVILLE	TN	38027*0370	THOMAS A SHOW	901-853-2450
AMERICAN BATTERY CO	1823 ELM HILL PK	NASHVILLE	TN	37210-0000	ROBERT J TAYLOR JR	615-883-0005
AMERICAN COMMERCIAL LIQUID	427 WEST ILLINOIS AVE	MEMPHIS	TN	38106-0000	BARRY T DYER	812-288-0471
AMERICAN ECOLOGY RECYCLE CENTER	109 FLINT ROAD	OAK RIDGE	TN	37830*7033	MICHAEL L STRINGFIELD	615-482-5532
AMERICAN MANUFACTURING COMPANY	3600 N HAWTHORNE	CHATTANOOGA	TN	37406-0000	ROBERT A SNYDER	615-624-1191
AMERICAN RESOURCE RECOVERY	901 EAST BODLEY AVENUE	MEMPHIS	TN	38106-7614	LOREN D CONGER	901-774-2050
AMTROL INC	1630 CORPORATE PL INTER	LAVERGNE	TN	37086*0000	ED ALLEN	615-641-7731
APAC-TENNESSEE INC - HARRISON	PO BOX 359 226 GILL STREET	ALCOA	TN	37701-0000	CHARLES B ESPRITU	615-983-3100
APAC-TENNESSEE INC - MEMPHIS	PO BOX 112	MEMPHIS	TN	38107-0000	JOHN M BRYANT	901-523-2464
APPALACHIAN OIL CO INC	C S 1500 HWY 75	BLOUNTVILLE	TN	37617-0000	JOHN F MCCOY	615-323-5235
AQUA CHEM INC WATER TECH DIV	3001 E JOHN SEVIER HWY	KNOXVILLE	TN	37914-4824	DEBRA THOMPSON	615-544-2065
AQUAPHASE LABORATORIES INC	375-B MAPLE ST PO BOX 7	GALLATIN	TN	37066-0000	DIANE M METZGAR	615-452-6796
ARB ENTERPRISES INC	PO BOX 765	CHATTANOOGA	TN	37401-0000	A REECE BOLTON	615-624-4429
ARCADIAN CORPORATION	6750 POPLAR AVE SUITE 600	MEMPHIS	TN	38138-7419	WILLIAM L WALDROP	901-758-5220
ARCADIAN OHIO LP	6750 POPLAR AVE SUITE 600	MEMPHIS	TN	38138*7419	WILLIAM L WALDROP	901-758-5220
ARCATA GRAPHICS KINGSFORD	PO BOX 1967	KINGSFORD	TN	37662*0000	ERIC MILLER	615-357-2101
ARMOR ENVIRONMENTAL SERVICES INC	2403 PARK PLUS DRIVE	COLUMBIA	TN	38401-9900	TONY LIVENGOD	615-381-2320
ATOMIC FIREWORKS INC OF TENNESSEE	P O BOX 190	SOUTH PITTSBURG	TN	37380-0000	LESLIE H PRICE	615-837-7916
AUTOZONE INC	3030 POPLAR AVE	MEMPHIS	TN	38111-0000	STEVE HORNE	901-325-4454
AVERITT EXPRESS INC	518 OLD KENTUCKY RD	COKEVILLE	TN	38502*3166	JOHN WALTON	615-526-3306
AZTEX ENTERPRISES	5222 MIDDLE BROOK PIKE	KNOXVILLE	TN	37921-0000	MICHAEL KOPP	615-588-5357
B & A OIL CO	920 N MILITARY AVE	LAWRENCEBURG	TN	38464-0000	FRANK BAGGETT	615-762-4837
B & S CARTAGE	2875 RUDDER RD	MEMPHIS	TN	38118-6610	BILLY W PORTER	901-366-6948
B J WELDING SUPPLY	RT 1 BOX 91 D	LA FOLLETTE	TN	37666-0000	CLARENCE L ORICK	615-562-7861
B K HARGROVE & MID SOUTH	2765 PROFIT DRIVE	MEMPHIS	TN	37666-0000	B K HARGROVE	901-332-8600
B & H FREIGHT SERVICES	210 1/2 SHIPP AVENUE	CHATTANOOGA	TN	37410-0000	DANA FONTAINE	615-266-4410
BAKER & BAKER OIL CO INC	ROUTE 2 BOX 23	SELMER	TN	38375-0000	CAROL K BAKER	901-645-5261
BAKER ENERGY INC	121 MOBILE ST	JACKSON	TN	38301-0000	K F BAKER	901-427-5548
BARBARA STRICKLAND LEVCON INC	PO BOX 437	MEMPHIS	TN	00000-0000	BARBARA STRICKLAND	901-946-1625
BARBER OIL CO INC	659 WEST MAIN	HOHENWALD	TN	38462-0000	DON BARBER	615-796-3395

Company	Address	City	State	Zip	Name	Phone
BASIC RESOURCES INC	9041 EXECUTIVE PARK DR STE	KNOXVILLE	TN	37923-4603	CHARLES M GRAU	615-690-8727
BEACH OIL COMPANY INC	PO BOX 3010	CLARKSVILLE	TN	37043-0000	STEPHEN M SEAY	615-358-9303
BELL CARTAGE COMPANY	318 WINCHESTER ROAD	MEMPHIS	TN	38109-0000	CLIFTON G HOLLIS	901-332-5290
BENCO SALES INC	123 STOUT DR PO BOX 1215	CROSSVILLE	TN	38557-1215	BENNY BIXENMAN	615-484-9578
BENDIX ATLANTIC INFLATOR COMPANY	1601 MIDPARK ROAD	KNOXVILLE	TN	37921-0000	ROY G BRWON	615-558-4015
BENJAMIN L STEVENS & NATIONWIDE	750 ECONOMY DR	CLARKSVILLE	TN	37043-0000	BENJAMIN L STEVENS	615-358-3044
BENTEX SERVICES INC	3020 SEABOARD DRIVE POB	NASHVILLE	TN	37222-1807	M T DORRIS	615-254-1231
BENTON OIL SERVICE INC	4831 BONNY OAKS DRIVE	CHATTANOOGA	TN	37416-0000	BENTON OIL SERVICE INC	615-892-5211
BESWAY SYSTEMS, INC	PO BOX 682	MADISON	TN	37115*	KATHY C FOWLER	615-865-8310
BETTER BILT ALUMINUM PRODUCTS	704 12TH AVENUE	SMYRNA	TN	37167-0277	TONY PRESTON	615-455-4161
BF GOODRICH AEROSPACE CLEVELAND	201 MITCHELL BLVD PO # 1270	TULLAHOMA	TN	37388-0000	DAVID C ALLEN	615-455-4557
BILLY ESPEY OIL CO INC	583 EAST MAIN ST	HUNTINGDON	TN	38344-0000	CAROLYN M ESPEY	901-986-3053
BIONOMICS, INC	P O BOX 817	KINGSTON	TN	37763-0000	JOHN MCCORMICK	615-376-0053
BIRMINGHAM NASHVILLE EXPRESS INC	PO BOX 100417	NASHVILLE	TN	37224-0000	LARRY M LAWSON	615-242-2501
BISHOP BROTHERS EXPRESS INC	PO BOX 752453	MEMPHIS	TN	38141-0000	BEVERLY BISHOP	901-794-7537
BLEDSOE FARMERS COOPERATIVE	PO BOX 296	PIKEVILLE	TN	37367-0000	MARGARET B MYERS	615-447-2105
BOB GREGORY CO INC	141 SPENCE LANE	NASHVILLE	TN	37210-0000	RICHARD M DAWSON	615-883-9150
BOB MCGAUGHEY LUMBER SALES INC	7000 N 1ST ST	MILAN	TN	38358-0000	NANCY GREEN	901-686-0815
BOWEVIL EXPRESS INC	RT 1 BOX 101-A	HENDERSON	TN	38340*0000		000-000-0000
BOWMAN BROTHERS INC	PO BOX 356 521 N FRONT ST	ROCKWOOD	TN	37854-0356	S L BOWMAN	615-354-0600
BREWERS PRINTING INK OF TENNES	1957 NOLENSVILLE RD	NASHVILLE	TN	37211-0000	LEO F SURPRENANT	404-696-8799
BRIDGESTONE FIRESTONE INC	50 CENTURY BLVD	NASHVILLE	TN	37214-0000	GERALD J DORINGO	615-872-1853
BROOKS WELDING SUPPLY CO INC	PO BOX 11247	CHATTANOOGA	TN	37401-0000	DORIS DONNING	615-756-6122
BROWN GALVANIZING CORP	4104 S CREEK RD EAST	CHATTANOOGA	TN	37406-0000	LEON T DODSON	615-698-2451
BROWN GOBBLE DBA GOBBLE TRUCKI	706 HIGH STREET	LAWRENCEBURG	TN	38464-0000	BROWN GOBBLE	615-762-5123
BROWNE LABORATORIES INC	PO BOX 22817	CHATTANOOGA	TN	37422-2817	DANA RICH	615-698-7777
BRYAN OIL CO INC	PO BOX 6 E VOLNEY ST	TULLAHOMA	TN	37388-0006	JACK H BRYAN	615-455-2442
BRYCE CORPORATION	4505 OLD LAMAR	MEMPHIS	TN	38181*0338	BRUCE ANGNER	901-369-4462
BUCKEYE CELLULOSE CORPORATION	PO BOX 8407	MEMPHIS	TN	38108-0407	JOEL BARNES	901-320-8479
BUCKMAN LABORATORIES INC	1256 N MCLEAN BLVD	MEMPHIS	TN	38108-0000	EMILY MCEVOY	901-272-8360
BULK STORAGE INC	1749 MALLORY LANE SUITE 300	BRENTWOOD	TN	37027-0000	JAMES H SEPULL	216-888-6500
BULL MARKET INC	E378 CARRIAGEHOUSE DRIVE	JACKSON	TN	38305-0000	MURL KENNAMORE	901-664-5250
C & C OXYGEN COMPANY	3615 ROSSVILLE BLVD	CHATTANOOGA	TN	37407-0000	DANNY L PAYNE	615-867-2369
C & T REFINERY INC	P O BOX 240457	CHARLOTTE	TN	28224-0457	SCOT WARREN JANSEN	704-523-0414
C AND C TRUCKING	PO BOX 94	CRUMP	TN	38327-0000	CONNIE FROST	901-632-0382
C O JOHNSON OIL CO	PO BOX 9240	KNOXVILLE	TN	37920-0000	TERESA SETTLE	615-573-4534
CALLOWAY OIL COMPANY	PO BOX 6618	MARYVILLE	TN	37802-6618	TOMMY F HUNT	615-982-3266
CALSONIC YOROUZU CORPORATION	395 MT VIEW INDUSTRIAL	MORRISON	TN	37357-0000		000-000-0000
CALSTRON CORPORATION	P O BOX 38473	GERMANTOWN	TN	38183-0473	RICHARD L MODLIN	901-274-6662
CANNON EDQUIPMENT SOUTHEAST INC	950 RIVERSIDE DR P O BOX 1446	CHATTANOOGA	TN	37401-1446	DON HHARMON	615-752-1000
CANTER OIL COMPANY INC	815 W LANE STREET	SHELBYVILLE	TN	37160-0607	R L LEDLOW JR	615-684-5322
CARE PETROLEUM INC	208 BAKER AVE PO BOX 725	DYERSBURG	TN	38025-0725	WILLIAM R RECTOR	901-285-4861
CARGO LOGISTICS COMPANY INC	5564 UNIVERSAL DRIVE	MEMPHIS	TN	38118-0000	JOHN P MCDONALD	901-360-1200
CARRIER TRUCK REPAIR	P O BOX 544	GREENEVILLE	TN	37744-0544	CARRIER TRUCK REPAIR	615-521-1420
CARROLL FARMERS COOPERATIVE	875 EAST MAIN STREET	HUNTINGDON	TN	38344-0000	ROBERT LOVETT	901-986-8271
CASSIE MOTOR LINES INC	202 HIGHWAY 641 SOUTH	PURYEAR	TN	38251*0000	BILLY J GALLIMORE	901-247-3236

Company	Address	City	State	Zip	Name	Phone
CASTING MATERIALS COMPANY	1610 CARTER STREET	CHATTANOOGA	TN	37402-0000	ERNIE C ANTEN	615-756-0011
CEDAR CHEMICAL CORP	5100 POPLAR AVE	MEMPHIS	TN	38137*2414	C D OWEN	901-684-5374
CENTRAL OIL CO	701 1/2 MORRISON RD POB 311	MCMINNVILLE	TN	37110-0000	WILLIAM J HARRIS	615-473-6521
CHANCELLOR'S SON INC	7474 RALEIGH LAGRANGE	CORDOVA	TN	38018-0000	WILLIAM R GROVE	901-754-2063
CHARLES BAILEY TRUCKING INC	PO BOX 2998	COOKEVILLE	TN	38502-2998	PAUL E BAILEY	615-738-5065
CHATTEN INC	1715 WEST 38TH STREET	CHATTANOOGA	TN	37409*0000	WALTER J LUDWIG	615-821-4571
CHEMICAL SPECIALTIES INC	149 WEST TRIGG AVENUE	MEMPHIS	TN	37106*2699	R E HELTON	901-948-0357
CHEROKEE OIL COMPANY INC	233 NEW BEASON WELL ROAD	KINGSFORT	TN	37660-0000	MARY D WEBER	615-288-2011
CHEROKEE PRODUCTS INC	PO BOX 727	JEFFERSON CITY	TN	37760-0000	DON G MILLER	615-546-6761
CHROMA-TEK	920 HIGHWAY 57 EAST PO BOX	COLLIERVILLE	TN	38027-0000	THOMAS A SHOW	901-853-2450
CIRCLE DELIVERY SERVICES INC	PO BOX 100595 125 CADEN DR	NASHVILLE	TN	37224*0595	GREGORY B BROWN	615-256-1394
CLASSIC PETROLEUM SERVICES INC	P O BOX 707 106 W CYPRESS ST	SELMER	TN	38375*0707	DAVID M WEAVER	901-645-3431
CLEO INC	4025 VISCOUNT	MEMPHIS	TN	38118-0000	TOM BROWN	901-369-6392
CLEVELAND EXPRESS INC	460 SOUTH LEE HWY S W	CLEVELAND	TN	37311-0000	PRESTON T SNEAD	615-472-4545
CLEVELAND OIL COMPANY INC	1440 FREDERICK STREET	CLEVELAND	TN	37311-0000	BOB RYNER	615-472-3289
CLINCH MOUNTAIN TRANSPORT INC	99 RT 2 DRY VALLEY RD	THORN HILL	TN	37881*0099	SHEILA BROWN	615-767-3610
COASTAL SUPPLY CO., INC.	1031 LEE ST	KNOXVILLE	TN	37917-0000	RONALD E KENNEDY	615-637-9262
COCKE FARMERS COOPERATIVE	464 WEST BROADWAY	NEWPORT	TN	37821-0000	PHILLIP L HAWK	615-623-2331
COFFMAN OIL CO INC	P O BOX 1241	MORRISTOWN	TN	37816-1241	ROCKY STOOKSBURY	615-586-0681
COLEMAN EXPLOSIVES INC	P O BOX 211	LIVINGSTON	TN	38570-0000	JOHNNY COLEMAN	615-823-7345
COLLINS OIL CO INC	PO BOX 2456	CLEVELAND	TN	37320-2456	FAYE L COLLINS	615-472-8770
COLUMBUS MCKINNON CORPORATION	PO BOX 110 306 RUSH STREET	LEXINGTON	TN	38351-1210	JOHN H MEHL	901-968-5271
COMBS INDUSTRIAL SERVICE INC	1501 BAPTIST WORLD CENTER	NASHVILLE	TN	37207*0000	HARVEY W COOMBS	615-228-3901
COMTRAK INC	PO BOX 750897	MEMPHIS	TN	38175-0897	MICHAEL J BRUNS	901-541-8000
CONE OIL CO INC	195 NORTH FIRST STREET	NASHVILLE	TN	37213-0000	FULTON GREER	615-255-2654
CONE SOLVENTS INC	240 GREAT CIRCLE RD SUITE	NASHVILLE	TN	37228*0000	FULTON GREER	615-255-2654
CONSOLIDATED OIL CO INC	210 KNOXVILLE AVE	LEBANON	TN	37087-0000	ROBERT W KING	615-444-0321
CONSUMERS GASOLINE STATIONS INC	PO BOX 23309	NASHVILLE	TN	37087-0000	HEZ A THOMPSON III	615-259-3226
COOPER AIR FREIGHT SERVICE INC	1081 ARKANSAS STREET	MEMPHIS	TN	38106-0000	DENISE GRIST	901-775-5007
COSMOLAB INC	1100 GARRETT ROAD	LEWISBURG	TN	37091-0000	TERRY HILL	615-359-6253
COVENANT TRANSPORT INC	PO BOX 22997	CHATTANOOGA	TN	37422-0000	MIKE AWER	615-629-0393
COX OIL CO INC	623 PERKINS	UNION CITY	TN	38261-0000	JANET HAWLEY	901-885-6444
CROCKETT FARMERS COOPERATIVE	314 W MAIN ST	ALAMO	TN	38001*0000	CARMACK ARNOLD	901-696-5527
CROZIER OIL CO INC	1143 TROTWOOD AVE	COLUMBIA	TN	38401-0000	JOHN JACKSON	615-388-5374
CUMBERLAND OIL CO	7260 CENTENNIAL BLVD	NASHVILLE	TN	37209-0000	D VANCE HARRELSON	615-350-7333
CUMBERLAND SWAN-CUMBERLAND	ONE SWAN DRIVE	SMYRNA	TN	37167*0000	TERRY AXUM	615-459-8900
CUMBERLAND TRANSPORT CO INC	HWY 1275	DUNLAP	TN	37327-0000	ALFRED MYERS JR	615-949-4029
CWM CHEMICAL SERVICES INC	5485 TAY FOR DR	MILLINGTON	TN	38053-0000	MITCH OSBORNE	901-353-5291
D & L TRUCKING CO INC	3433 STONE	MEMPHIS	TN	38118-0000	PEGGY D LOOSIER	901-775-2632
DANNY HERMAN TRUCKING INC	P O BOX 55	MOUNTAIN CITY	TN	37683-0055	MONIKA BURGESS	615-727-9061
DAVID BOWEN KILGORE OPERATIONS	KILGORE DRIVE	TOONE	TN	00000-0000	DAVID BOWEN	901-658-5231
DEAN OIL CO INC	11TH AVE EAST	SPRINGFIELD	TN	37172-0000	CLYDE DEAN	615-384-8473
DELTA INDUSTRIAL COATING INC	5700 COMMANDER DRIVE	ARLINGTON	TN	38002-0000	DIANNE POSEY	901-867-9000
DENNIS J MILLS FLEETGUARD INC	HWY 111 RT 1 BOX 346	SPARTA	TN	38583*0000	DENNIS J MILLS	615-528-9524
DEPARTMENT OF ENERGY FUSRAP	151 LAFAYETTE DRIVE PO BOX	OAK RIDGE	TN	37830-0350	TAMMY L PRESSNELL	615-576-0434
DICKSON FARMERS COOPERATIVE	705 HENSLEE DR	DICKSON	TN	37055*0000	PHIL BUEKNER	615-446-2343

APPENDIX D - SURVEY QUESTIONNAIRE

SURVEY

This survey is being conducted to determine the degree of compliance with Title 49, Code of Federal Regulations Part 107 Subpart G, and is designed to ensure anonymity.

1. Do you consider your facility a: (check all that apply)
- ☐ Parent Company - with more than one facility ☐ Branch Site
- ☐ Holding Company ☐ Subsidiary
- ☐ Company - with only one facility
2. What date was your facility established in Tennessee?
3. Are you a shipper or carrier of hazardous materials?
- ☐ Shipper ☐ Carrier ☐ Both ☐ Neither
4. If your establishment has facility's at more than one location, do the other locations ship or carry hazardous materials?
- ☐ Yes ☐ No ☐ No Other Locations

5. Please choose your facility's major industrial classification and SIC Code from the table on the back of this sheet and list below (if more than one classification or SIC Code is applicable, choose the classification(s) that cause(s) you to ship or carry hazardous materials)

6. What is the Approximate Employment Size Class for your facility? (average annual number of employees at your location)
- ☐ 1-4 ☐ 5-9 ☐ 10-19 ☐ 20-99
- ☐ 100-249 ☐ 250-499 ☐ 500-999 ☐ 1000 +

7. Which term describes the scope of your business' market? (choose the term that describes the majority of your transactions)
- ☐ Local ☐ Regional ☐ National ☐ Global

8. From the following categories of materials described in 49 CFR Part 107 Subpart G, check all that your facility ships or carries, and estimate the number of loads shipped/carried per year:

- | | Loads per Year |
|---|----------------|
| ☐ Division 1.1, 1.2, 1.3 (class A or class B explosives) | |
| ☐ Highway route controlled quantity of a radioactive material | |
| ☐ Division 2.3 or 6.1 (designated by DOT as a Poison Inhalation Hazard Zone A) | |
| ☐ A bulk hazardous material of at least 3500 gallons or 468 cubic feet | |
| ☐ Non-bulk hazardous materials in excess of 5000 pounds in one load | |
| ☐ None of the above | |

9. If you checked any of the five categories listed in Question 8, has your facility filed a Hazardous Materials Registration Statement with the Department of Transportation for the current year?
- ☐ No ☐ Yes

10. If you answered 'No' to question 9, why has your facility not registered?
- ☐ Do not ship or carry any of the five categories of hazardous materials listed in Question 8
- ☐ A parent company handles the registration
- ☐ Company was unaware of the regulations
- ☐ Regulations are unclear as to who needs to register
- ☐ The \$300 fee
- ☐ DOT isn't enforcing regulation
- ☐ Only ship one or two loads a year
- ☐ Paper work is too time consuming
- ☐ Other

Please use this section for clarifications/explanations of any of the survey questions and/or for remarks regarding the Hazardous Materials Registration requirements.

Please mail or fax this form back to the University of Tennessee by Friday, February 3rd. Thank you very much for your time.

DEANNA FLINCHUM
The University of Tennessee
Transportation Center
340 S. Stadium Hall
Knoxville, TN 37916-9989

Phone: (615) 481-2938
Fax: (615) 481-8591

APPENDIX E - SURVEY COVER LETTER

January 19, 1995

Dear Transportation Professional:

I am a University of Tennessee graduate student and I am currently working on my thesis which involves trying to determine the compliance rate for the Hazardous Materials Transportation; Registration and Fee Assessment Program. The enclosed survey is designed to assist me in determining the degree of compliance among shippers and carriers of hazardous materials within Tennessee. This survey will be kept completely confidential and answers will be reported only in a summarized format. The address list used for this mailing was compiled from multiple sources and I apologize for any errors. Please take the time, approximately ten minutes, to complete this survey.

Please staple or tape and return this postage paid survey by Friday, February 3rd, or feel free to fax the completed survey to (615) 481-8591.

Thank you for taking the time out of your day to complete this survey.

Sincerely,

DeAnna Flinchum
The University of Tennessee
Transportation Center
340 S. Stadium Hall
Knoxville, TN 37996-0700

Enclosure

APPENDIX F - SURVEY RESPONSES

#	Question 1	Question 2	Question 3	Question 4	Question 5	Question 6	Question 7	Question 8	Loads Year	Yes/No Form	Question 9	Question 10
1	parent company	1972	both	yes	473	100-249	national	5		yes	yes	na
2	branch site	1992	shipper	yes	473	1-4	global	0		yes	no	do not ship
3	parent company			no other loc		500-999	local	0		no	no	na
4	parent company	1971	both	yes	5084-35	20-99	regional	1	1200	no	no	not to limit
5	parent company	1965	both	yes	517	10-19	local	4		no	yes	na
6	branch site	1987	shipper	yes	50,51	20-99	local	0		no	no	na
7	subsidiary	1988	neither	no		10-19	regional	0		no	no	na
8	company	1927	carrier	no other loc	421,422,492,598,50,51	5-9	local	4		yes	yes	na
9	parent company	1971	carrier	yes	4731	1000+	regional	3, 4		yes	yes	na
10	parent company	1990	shipper	yes	24, 26	250-499	global	4	500	yes	yes	na
11	company	1945	both	no other loc	492	10-19	local	4		yes	yes	na
12	parent company	1955	neither	no	30	1000+	national	0		no	no	na
13	branch site		neither			20-99	regional	0		no	no	na
14	parent company	1955	both		50, 51	10-19	regional	4		no	yes	na
15	company	1945	carrier			20-99	local	4		yes	yes	na
16	parent company	1972	carrier	no	29	20-99	regional	4	1300	no	no	co unaware
17	parent company		neither	no		250-499	national	0		no	no	na
18	parent company		carrier	yes	421	250-499	national	3, 5	5, 20	yes	yes	na
19	holding company	1978	carrier	no other loc		5-9	local	4		yes	yes	na
20	company	1975	shipper	no other loc	3442	100-249	national	5	4	yes	yes	na
21	company	1978	carrier	no other loc	421	20-99	regional	5	50-75	yes	yes	na
22	branch site	1972	shipper	yes	3647	500-999	national	0		no	no	na
23	parent company		carrier	yes	421	100-249	national	5	30	yes	yes	na
24	subsidiary		neither	no		250-499	national	0		no	no	na
25	company	1971	neither	no other loc	15,16,17	20-99	local	0		no	no	na
26	company	1974	neither		34	250-499	regional	0		no	no	na
27	branch site	1983	shipper	yes	3732	250-499	national	5		yes	yes	na
28	branch site	1967	carrier	yes	421	5-9	local	4	1300	yes	yes	na
29	branch site	1980	shipper	yes	20	100-249		5	10	no	no	parent co
30	branch site		neither		30	500-999	global	0		no	no	na
31	subsidiary	1968	shipper	no	3369	20-99	national	5		yes	yes	na
32	company	1968	shipper	no	422	10-19	regional	5	3000	yes	yes	na
33	branch site	1938	neither	no	421	1-4	regional	0		no	no	na
34	branch site	1984	neither	no	20	1000+	national	0		no	no	na
35	company	1982	carrier	no other loc	421	20-99	national	5	50	yes	yes	na
36	company	1992	carrier	no other loc	421	20-99	national	5	50	yes	yes	na

APPENDIX G - SURVEY RESPONSES SUMMARY

QUESTION 1 - Do you consider your facility a:			
	Non-Registered	Registered	Total
BRANCH SITE	15	4	19
COMPANY	20	23	43
HOLDING CO.	1	1	2
PARENT CO.	17	16	33
SUBSIDIARY	4	5	9
QUESTION 2 - What date was your facility established in Tennessee?			
	Non-Registered	Registered	Total
1800'S	2	0	2
1900-1940	3	6	9
1941-1960	12	8	20
1961-1980	14	16	30
1981-1991	14	9	23
1992-PRESENT	1	3	4
DATA NOT AVAILABLE	11	7	18
QUESTION 3 - Are you a shipper or carrier of hazardous materials?			
	Non-Registered	Registered	Total
SHIPPER	15	8	23
CARRIER	6	26	32
BOTH	9	12	21
NEITHER	25	3	28
DATA NOT AVAILABLE	2	0	2
QUESTION 4 - If your establishment has facilities at more than one location, do the other locations ship or carry hazardous materials?			
	Non-Registered	Registered	Total
YES	18	19	37
NO	18	6	24
NO OTHER LOC.	16	21	37
DATA NOT AVAILABLE	5	3	8
QUESTION 5 - Please list your facility's major Industrial Classification:			
	Non-Registered	Registered	
Petroleum & Refining	3	1	
Explosives	1	1	
Apparel & Other Textile Products	0	0	
Paper, Wood & Allied Products	5	2	
Printing & Publishing	0	0	
Food & Kindred Products	2	1	
Rubber & Plastic Products	2	1	
Electrical & Electric Equipment	2	1	
Chemical & Allied Products	2	3	
Carrier	5	16	
Warehousing	3	4	
Freight Forwarding	0	4	
Transportation Repair Facility	1	1	
Agriculture & Support Services	4	1	
Mining-Metal & non-metal	0	0	
Oil & Gas Extraction	1	1	
Gas, Fuel Oil, Propane Sales & Del.	6	11	
Non-trans. Repair Facility	0	1	
Construction, All Types	8	1	
Wholesale or Retail Trade	15	14	

Hazardous Waste Services	1	0	
OTHER			
Furniture	1	0	
Fabricated Metal Products	2	3	
Communication	1	0	
Electric, Gas, Sanitary Services	1	0	
Primary Metal Industries	0	1	
Transportation Equipment	1	1	
Data Not Available	10	8	
QUESTION 6 - What is the approximate size class for your facility?			
	Non-Registered	Registered	Total
1-4	4	4	8
5-9	3	5	8
10-19	9	7	16
20-99	16	18	34
100-249	6	6	12
250-499	9	5	14
500-999	3	2	5
1000+	6	2	8
DATA NOT AVAILABLE	1	0	1
QUESTION 7 - Which term describes the scope of your business' market?			
	Non-Registered	Registered	Total
LOCAL	12	13	25
REGIONAL	23	17	40
NATIONAL	14	13	27
GLOBAL	7	5	12
DATA NOT AVAILABLE	2	0	2
QUESTION 8 - From the following categories of materials, check all that your facility ships or carries:			
NO HAZMAT TRANSPORTED	49		
DIVISION 1.1, 1.2, 1.3	6		
HRQ RAM	0		
DIVISION 2.3, 6.1	6		
BULK	30		
NON-BULK	21		
	112		
QUESTION 9 - If you checked any of the of the five categories of hazardous materials in Question 8, has your facility filed a Hazardous Materials Registration Statement with the DOT for the current year?			
	YES	NO	
FORM	49	57	
ANSWER	42	41	
QUESTION 10 - If you answered "No" to Question 9, why has your facility not registered?			
PARENT CO. HANDLES REGISTRATION	4		
\$300 FEE	1		
COMPANY UNAWARE OF REGULATIONS	3		

APPENDIX H - RESULTS FROM COMBINED BIAS RATES AND ERROR RATES

Gross Registration Rate -	Company Data																			
β'	p	0.75	0.77	0.79	0.81	0.83	0.85	0.87	0.89	0.91	0.93	0.95	0.97	0.99	1					
10.00		28%	29%	30%	32%	33%	35%	36%	38%	40%	43%	46%	49%	53%	55%					
9.50		29%	30%	31%	32%	34%	35%	37%	39%	41%	44%	47%	50%	54%	56%					
9.00		29%	30%	32%	33%	34%	36%	38%	40%	42%	45%	48%	51%	54%	57%					
8.50		30%	31%	32%	34%	35%	37%	39%	41%	43%	46%	49%	52%	56%	58%					
8.00		31%	32%	33%	34%	36%	38%	40%	42%	44%	47%	50%	53%	57%	59%					
7.50		31%	33%	34%	35%	37%	39%	41%	43%	45%	48%	51%	54%	58%	60%					
7.00		32%	34%	35%	36%	38%	40%	42%	44%	46%	49%	52%	55%	59%	61%					
6.50		33%	35%	36%	38%	39%	41%	43%	45%	48%	50%	53%	57%	60%	62%					
6.00		34%	36%	37%	39%	41%	42%	45%	47%	49%	52%	55%	58%	62%	64%					
5.50		36%	37%	39%	40%	42%	44%	46%	48%	51%	54%	57%	60%	64%	66%					
5.00		37%	39%	40%	42%	44%	46%	48%	50%	53%	56%	58%	62%	65%	67%					
4.50		39%	41%	42%	44%	46%	48%	50%	52%	55%	58%	61%	64%	67%	69%					
4.00		41%	43%	44%	46%	48%	50%	52%	55%	57%	60%	63%	66%	69%	71%					
3.50		43%	45%	47%	49%	51%	53%	55%	57%	60%	63%	65%	69%	72%	74%					
3.00		46%	48%	50%	52%	54%	56%	58%	60%	63%	66%	68%	71%	74%	76%					
2.80		48%	49%	51%	53%	55%	57%	60%	62%	64%	67%	70%	73%	76%	77%					

VITA

DeAnna Lynn Flinchum was born in Boston, Massachusetts on November 12, 1968. She grew up in Oak Ridge, Tennessee and graduated from Oak Ridge High School in 1987. The following August she enrolled at The University of Tennessee, Knoxville, and in August of 1991 she received her Bachelor of Science in Logistics and Transportation. In August of 1993 she returned to The University of Tennessee, Knoxville, and in May 1995 received a Master of Science degree in Civil Engineering with a specialty in Transportation Engineering.

She is currently employed as a transportation analyst at SAIC, in Oak Ridge, Tennessee.