United States
Environmental Protection Agency
Air

Office of Air Quality
Planning and Standards
Research Triangle Park, NC 27711

EPA 456/R-99-006
August 1999

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EMISSIONS AND PREVENTION/CONTROL TECHNIQUES FOR AUTOMOBILE BODY SHOPS IN CIUDAD JUAREZ, MEXICO

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Emissions and Prevention/Control Techniques for Automobile Body Shops in Ciudad Juarez, Mexico

U.S.-Mexico Border
Information Center on Air Pollution

CICA

Centro de Información sobre Contaminación de Aire en la Frontera de la EE. UU.-México

Sponsored by

Clean Air Technology Center (MD-12)
Information Transfer Group
Information Transfer and Program Integration Division
Office of Air Quality Planning and Standards
U.S. Environmental Protection Agency
Research Triangle Park, NC 27711

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Emissions and Prevention/Control Techniques for Automobile Body Shops in Ciudad Juarez, Mexico

Prepared By:

John D. Jeffery
Dr. Mark Sager
Science Applications International Corporation
1710 Goodridge Drive
Post Office Box 1303
McLean, Virginia 22102

EPA Contract No. 68-D3-0030
Work Assignment No. III-98

Project Manager

Robert J. Blaszczak
Clean Air Technology Center (MD-12)
Information Transfer Group
Information Transfer and Program Integration Division
Office of Air Quality Planning and Standards
U.S. Environmental Protection Agency
Research Triangle Park, NC 27711

Prepared for

U.S.-Mexico Border Information Center on Air Pollution/
Centro de Información sobre Contaminación de Aire
en la Frontera de la EE.UU.-México (CICA) (MD-12)
U.S. Environmental Protection Agency
Research Triangle Park, NC 27711

EPA REVIEW NOTICE

This report has been peer and administratively reviewed by the U.S. Environmental Protection Agency. This review was coordinated by the U.S.-Mexico Information Center on Air Pollution / Centro de Informacion Sobre Contaminacion de Aire Para la Frontera entre EE.UU. Y México (CICA). In addition, CICA coordinated review of this report with other agencies that participated in the study, including: the *Dirección de Desarrollo Urbano y Ecología, Ciudad Juárez, México*; and the *Instituto Nacional de Ecoligía, Secretaría de Medio Ambiente, Recursos Naturales y Pesca, México*. Mention of trade names or commercial products does not constitute endorsement or recommendation for use.

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PREFACE

The U.S.-Mexico Border Information Center on Air Pollution *(Centro de Información sobre Contaminación de Aire Para la Frontera entre EE.UU.-México,* or ***CICA***) was established by the U.S. Environmental Protection Agency (U.S. EPA), Office of Air Quality Planning and Standards (OAQPS) to provide technical support and assistance in evaluating air pollution problems along the U.S.-Mexico Border. These services and products are available at no cost to Federal, State and Local Agencies and universities in Mexico. Others can use these services depending on available resources. *CICA* provides ready access to U.S. EPA information and expertise. It draws on professional staff from the EPA's OAQPS and Office of Research and Development (ORD). Private contractors also are available when appropriate.

CICA SERVICES

CICA provides assistance in the following ways:

- **LINES OF COMMUNICATIONS**
  CICA offers bilingual communication services (English & Spanish)
  TELEPHONE: Toll-Free from Mexico only: (800) 304-1115 (Spanish)
  From other locations: (919) 541-1800 (Spanish)
  or (919) 541-0800 (English)
  FAX: (919) 541-0242
  E-Mail: catcmail@epa.gov

- **ON-LINE ASSISTANCE**
  Internet World Wide Web (*CICA* Web)
  http://www.epa.gov/ttn/catc/cica/

- **ENGINEERING ASSISTANCE / TECHNICAL GUIDANCE**

- **GUIDANCE DOCUMENTS AND TECHNICAL TOOLS**

- **INTERNATIONAL TECHNOLOGY TRANSFER CENTER FOR GLOBAL GREENHOUSE GASSES**

This CICA technical assistance project resulted from a request from the Dirección de Desarrollo Urbano y Ecología (DDUE), Unidad Adminstrativa Lic. Benito Juarez (the local environmental agency in Ciudad Juárez, México). The DDUE requested CICA's assistance in determining emissions from and identifying appropriate pollution prevention and control techniques for automobile body repair shops in Ciudad Juárez. This report is the result of that effort. It provides information on auto body paint shops in Ciudad Juárez, México gathered through a survey of these facilities, done in cooperation with the DDUE, and evaluates feasible pollution prevention and control measures to reduce emissions of volatile organic compounds

(VOC) at these facilities. The report includes data on the operation, paint and solvent use, emissions, and prevention and control measures at these facilities.

ACKNOWLEDGMENTS

The authors want to thank the *Dirección Municipal de Desarrollo Urbano y Ecología* (the local environmental agency in *Ciudad Juárez, México*), its director *Ing. Oscar Ibañe* and *Biologo Abraham Aquino* for their help in identifying the auto body shops surveyed in this effort and for their assistance in providing local engineering students from *Ciudad Juárez* to conduct the survey.

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ACRONYMS AND SPANISH TERMS

BACT	Best Available Control Technology
CATC	Clean Air Technology Center, OAQPS, EPA
CICA	U.S.-Mexico Border Information Center on Air Pollution; *Centro de Información sobre Contaminación de Aire en la Frontera EE.UU.-México*
DDUE	*Dirección de Desarrollo Urbano y Ecología*; the local environmental agency in *Ciudad Juaréz, México*
E-Mail	Electronic Mail
EPA	U.S. Environmental Protection Agency
Home Page	A WWW site
HVLP	High Volume Low Pressure
LAER	Lowest Achievable Emission Rate
NADB	North American Development Bank
OAQPS	Office of Air Quality Planning and Standards, EPA
ORD	Office of Research and Development, EPA
RACT	Reasonable Available Control Technology
RBLC	RACT/BACT/LAER/Clearinghouse
SAIC	Science Applications International Corporation
TNRCC	Texas Natural Resource Conservation Commission
VOC	Volatile Organic Compound
WWW	Internet World Wide Web

INTRODUCTION

The Office of Air Quality Planning and Standards of the United States Environmental Protection Agency sponsors and implements the U.S. - Mexico Border Information Center on Air Pollution (Centro de Información sobre Contaminación de Aire en la Frontera EE.UU.-México, or **CICA**). One function of this center is to provide assistance to State agencies on both sides of the U.S.-Mexico border to improve ambient air quality in the border region.

Emissions of Volatile Organic Compounds (VOC) from automobile body repair shops are believed to be significant and to contribute to ozone nonattainment in El Paso, Texas and to violations of ozone air quality standards in *Ciudad Juárez*, Mexico. The Dirección de Desarrollo Urbano y Ecología (DDUE), (the local agency in *Ciudad Juárez*, Mexico) requested CICA's assistance in determining emissions from and identifying appropriate pollution prevention and control techniques for automobile body repair shops in *Ciudad Juárez*.

This project is also supported by the City of El Paso, the Texas Natural Resource Conservation Commission (TNRCC), and Region VI of the U.S. Environmental Protection Agency in Dallas, Texas. During the completion of this work, every effort was made to coordinate with all of the sponsoring and supporting agencies to ensure that there was no duplication of effort, and that information collected by any of the other agencies was used to support the objectives of this project.

OBJECTIVES

This effort is a continuation of preliminary work that was completed earlier to collect information on operations at, and potential emissions from, the significant auto body repair shops operating in *Ciudad Juárez*. The specific objectives of this work are:

- Review the existing data from the previous study and develop a plan to supplement that data to provide the necessary information to calculate potential emissions from those facilities
- Collect information for the remaining auto body repair shops that were not included in the first study
- Assemble these data into a consistent database suitable for estimating the total potential emissions from auto body repair operations in *Ciudad Juárez*
- Based on that review, recommend options for pollution prevention and control measures to reduce the emissions of VOC from these operations in the *Ciudad Juárez* - El Paso area and in the U.S. - Mexico border area in general.

The following tasks were completed to achieve the objectives:

- Discussions and conference calls were conducted between all sponsoring and supporting agencies to determine the level of detail included in the existing data, and to ensure that all pertinent information collected previously was applied to this study.
- A detailed and comprehensive questionnaire was developed to collect all significant information that could be applied to the development of emissions estimates and the identification of cost-effective pollution prevention and control measures applicable to this source category.
- Conversations were held with the DDUE and other agencies to identify all of the significant auto body repair operations in the *Ciudad Juárez* area.
- Arrangements were made with local engineering students to complete the interviews and fill in the questionnaires. The students were provided training on techniques and procedures for the completion of survey questionnaires.
- The data collected through the survey were assembled into a database and summarized in formats that are suitable for estimating and tracking emissions.
- Information on suitable pollution prevention and emissions control techniques applicable to this source category was assembled.
- Information on total paint sales was collected from the major paint distributors in the *Ciudad Juárez* area to serve as an independent check on reported paint and solvent use data and to augment the emissions estimation procedures.
- All of the information collected in the study was included in this report and the report was generated in both English and Spanish for distribution to the sponsoring and supporting agencies.

BACKGROUND

In previous studies sponsored through both TNRCC and EPA's Region VI offices, information was collected on the operations at approximately 200 auto body repair shops in *Ciudad Juárez* over the period 1993-1994. These data were collected through a survey in which operators of some of the significant auto body repair shops were interviewed and a standard questionnaire was completed. It was not possible to review the actual questionnaire that was used in that study, but the database that was compiled as a result of that work was made available. The information included in that database was reviewed and, based on that review, a list of more specific questions was developed and a new questionnaire was prepared. The new questionnaire included specific questions concerning the types of detergents, cleaners, solvents and paints, including primers, color coats, and finish coats, used at the facilities so that an estimate of the solvent content and potential VOC emissions could be calculated. The questionnaire also included questions about paint and solvent storage and waste handling operations, and control measures in place at the facilities.

During preliminary coordination efforts it was discovered that a second effort, sponsored by the City of El Paso had also been completed. This effort was completed by Dr. Octavio Chávez under contract to the TNRCC and in cooperation with some local environmental groups in the El Paso - *Ciudad Juárez* area. Several conversations were held with Dr. Chávez, and representatives of CICA to understand completely the data that were already available and to determine if this study was necessary. After a complete review of the data that were available through the previous studies, it was determined that additional information was necessary to provide a consistent and comprehensive database of information that could be used to estimate VOC emissions from these facilities. All parties agreed that the new questionnaire developed under this effort would be used to collect the more detailed information from all of the auto body shop facilities in *Ciudad Juárez*. The new survey conducted for this project included those shops that had been included in the previous studies and those that had not been included in any of the previous studies. Based on conversations with Dr. Chavez and Mr. Aquino of the DDUE, the first two surveys collected information from approximately 150-200 auto body shops. There is still no confirming information which would allow for a crosscheck of the two pervious surveys to see if the same sources or if new sources were interviewed as part of the survey. The list used for this project was provided by DDUE and SAIC was told it contained 200 sources. Whether these were new sources or were the original 200 is not known. Of the 200 sources, over 150 were visited and questionnaires from these sources make up the data found in this report. The findings of this report are based entirely on the results of the information collected during the September 1996 survey. A copy of the questionnaire used in this study is included as Appendix A.

APPROACH AND METHODOLOGY

REVIEW OF PREVIOUS EFFORTS

Although this project was initiated at the request of DDUE, it was discovered early in the project that a significant amount of work related to the objectives of this assignment had already been completed by other groups working in coordination with DDUE. It was necessary to review the data and techniques used to collect information in the earlier efforts to determine if the correct procedures and methodologies had been used and if any of the collected information was of use to this project.

The previous efforts were known to have collected information from approximately 200 sources. While not tailored as a VOC usage survey, the information that had been collected was useful in establishing rough estimates of both the number of sources and the potential emissions from these sources. At no time during this project was there any definitive determination of the exact number of auto body shops operating in the Juarez area. From conversations with DDUE and Dr. Chávez, the number never exceeded 300 and was more likely in the 150 to 250 range. This fluctuation is caused by economic factors and not environmental related issues. As was found in all of the surveys, the vast majority (approximately 95%) of the shops are very small in size (less than 6 jobs per week). The new survey was based on a list provided by DDUE and given directly to the students used to perform the actual questionnaire work. At no time was this list made available to EPA or SAIC. As a result, no correlation was made between previous efforts and those being conducted for the new survey. It was therefore not possible to determine if any of the shops visited during the new survey were “repeats” or “new” sources. The original intent was to collect information from any remaining sources that had not been visited in any of the previous survey efforts. This number was estimated to be approximately 100 shops. It was hoped that this new survey would serve as an independent database that could support the estimation of emissions magnitude and to estimate the temporal and seasonal distribution of emissions from this source category.

DEVELOPMENT OF THE SURVEY AND DATABASE

The questionnaire was finalized, translated into Spanish and distributed to the U.S. and Mexican supporting and sponsoring agencies. The final questionnaire is included as Appendix A. Discussions continued with Mr. Abraham Aquino of the DDUE in *Ciudad Juárez* to identify a group of students who could complete the survey and to schedule a convenient time for training these students. These negotiations were completed and the training of students was conducted by SAIC during the week of September 9, 1996. At the same time, the SAIC representative visited the three major suppliers of paint and other solvents used in the preparation and painting of auto bodies and parts in *Ciudad Juárez*. The survey was completed in September and October of 1996. A total of 156 facilities were visited and data collected for each of these facilities. Delays were experienced in the delivery of the data due to conflicts in work and holiday schedules of the

U.S. and Mexican project participants. The data were made available, translated into English and delivered to EPA in late December 1996.

All of the translated questionnaires were reviewed, and the data useful in the development of emissions estimates and in identification and evaluation of pollution prevention and emissions control opportunities were entered into a database in EXCEL® format. A copy of the final database is provided as Appendix B, and electronic copies have been made available to EPA.

OVERVIEW OF THE QUESTIONNAIRE RESULTS

A total of 156 auto body repair shop questionnaires were completed and returned to SAIC. Copies of the questionnaires are available in both Spanish and English. The shops range in size from 1 to 6 employees, and reported completing from one job per week to 14 jobs per week. A job is defined for the purposes of this report as any application of paint to an automotive fixture. It includes small touch-up or spot repairs and ranges all the way to a complete repaint of an entire vehicle. Over 90% of the shops reported only small spot repairs, however, a limited number of the larger shops did report a small number of full car repainting jobs. Average employee experience was quite variable, ranging from a minimum of less than a month to a maximum of more than 10 years.

Table 1 presents a summary of the total amounts of each type of paint reported for all of the shops included in the survey. The data indicate that lacquer and enamel paints, and to a lesser extent urethane paints, dominate the paint use for the shops in *Ciudad Juárez*.

TABLE 1. SUMMARY OF PAINT USE IN THE SURVEY

PAINTING STEP	PRIMER COATS	TOP COATS	CLEAR COATS
TOTAL QUANTITY	51,688 liter/year	48,854 liter/year	41,522 liter/year
PERCENT LACQUER	20%	19%	20%
PERCENT ENAMEL	55%	60%	56%
PERCENT WATER BASE	7%	7%	8%
PERCENT URETHANE	15%	14%	15%
PERCENT OTHER	3%	0%	1%

In almost all cases, the survey indicated that paint is applied in these shops using standard air guns. A total of 7 shops indicated the use of high-volume, low pressure (HVLP) spray guns exclusively, and an additional 37 shops indicated that they use a mix of HVLP and standard air

guns. One shop indicated the use of an electric gun and one indicated a special application method, but the details were not provided. Expanded use of HVLP spray guns could improve transfer efficiency and reduce the amount of paint used to complete the typical job. This would reduce emissions between 10 and 20 percent. This reduction would not be as much as could be achieved through the installation of capture and control devices. The best possible reduction for these devices is in the 70-90 percent range.

The survey asked questions about the use of solvents for surface preparation and in cleaning up both spray guns and work areas after each job was completed. One part of the survey was designed to collect information on the amount and type of solvent used in surface preparation. Only 44 of the shops reported the use of solvents in surface preparation activities. The remaining 112 or 72% indicated the use of detergents to clean surfaces prior to repair work and painting. Each of the shops, however, reported some solvent use in the section on preparation activities. In all, the total amount of solvent use reported in that section of the survey was 1,012.5 liters per week. Of the 44 shops that reported the use of solvent for preparations, the type of solvent used is given below:

- 22 indicated the use of thinner,
- 7 indicated use of petroleum distillates,
- 3 indicated the use of blends,
- 2 indicated the use of gasoline,
- 1 indicated the use of xylene,
- 1 indicated the use of all solvents listed, and
- 7 indicated some solvent that was not listed, but did not specify which solvent.

A question was also asked about solvent use in clean up activities after a job is completed. These activities would include cleaning the spray guns, and any other clean up of spilled paint or spray that adhered to surfaces in the shop. One hundred forty-eight, or 95% of the shops reported the use of thinner for these clean up activities. Four shops indicated the use of a blend, two indicated the use of a strong unspecified solvent, one shop each reported the use of a substance called mezcal, and one indicated the use of a creme. The amount of solvent used ranged from a low of 0.1 liter per job to a high of 5 liters per job. In most cases, the shops reported 0.5 to 1 liter of solvent used in cleanup activities per job. The total amount of solvent used in clean up activities was estimated by multiplying the amount of solvent used per job by the average number of jobs completed per week. The total amount of solvent used in clean up activities, using that approach, was calculated to be 458.6 liters per week.

The survey also asked questions about painting operations. Specifically, shops were asked to indicate whether or not they used a spray paint booth, enclosed and ventilated area, or open areas for painting. Given the high percentage of combined enamel, lacquer and urethane coatings, the data would imply a similar high usage of spray booths or controlled areas to ensure proper curing of the painted parts. The survey results concerning paint booths and other enclosures for painting operations were contradictory in some cases. A total of 110 of the shops

indicated that they do not use a booth. Some of those did indicate that they paint in an enclosed or semi-enclosed area. Many of those reported some form of ventilation system to exhaust paint fumes to the exterior of the enclosure, but some did not indicate any ventilation system at all.

Forty-three shops indicated the use of a spray paint booth; however, seven of those also indicated that there was no ventilation system associated with the booth. It is highly unlikely that painting is performed in an enclosed booth without any ventilation. Another 28 of the shops reported the use of a booth, but did not report the use of any type of control equipment. This suggests that they used some enclosed area, but not what is commonly thought of as a spray paint booth in the United States. Several of the shops reported using some form of enclosure for painting operations, with an exhaust system and filters in line for control of the aerosol mist. These units were assumed to be uncontrolled for the purpose of reducing VOC emissions, since the VOC content of the paint would still evaporate from the filter and be exhausted to the ambient air. Two shops reported use of a booth with a ventilation system and extractors for control. One of the shops using an extractor reported a control efficiency of 90%. There is no way to determine, as part of this survey, what is meant by the use of the term "extractor" or to verify that control efficiency. The survey takers were not allowed to examine the devises and there may be a translation issue that equates "extractor" with exhaust fan. Even assuming that both of the shops using extractors had a VOC capture efficiency of 90 % and a control efficiency of greater than 90%, the overall impact to the entire survey results is insignificant. Their emissions were calculated with the assumption that all shops were uncontrolled for VOC emissions. In the shops that reported either a spray booth or an enclosure for painting, it is assumed that there is a protected area that is used to limit dust and other airborne contamination during paint application and curing.

Additional questions were asked about waste generation, waste disposal, and general comments on the operations and appearance of the shop. Total wastes generated for all shops are listed below:

- rags 223 kg/week
- sand paper 1,348 sheets/week
- paper 401 kg/week
- cans 603 cans/week
- tape 574 rolls/week

Every shop indicated that these wastes were disposed in the garbage and eventually taken to a garbage dump or landfill located in and serving the city of *Ciudad Juárez*. One hundred six of the shops were assessed as being generally neat in appearance. The remaining surveys indicated some waste paint, auto parts, or other materials laying about creating either a dirty and untidy appearance and a real or potential fire hazard.

The questionnaire also asked the shop to indicate at what time of year they do the most work. Higher emissions of VOC in late spring, summer and early fall would have more serious

effects on ozone air quality than emissions released during the winter months. Fifty-three of the shops indicated that there is no busier time and that operations continue all through the year. For those shops that did indicate a seasonal dependence, the distribution is provided below:

- 3 spring
- 54 summer
- 27 fall
- 19 winter

These results verify that the majority of the painting activity occurs at times that are conducive to ozone formation.

EMISSIONS ESTIMATES AND POSSIBLE CONTROLS

EMISSIONS CALCULATIONS

VOC emissions for paint use were estimated by applying an emission factor for all paints used. These emission factors were calculated from solvent content values for various paints used in auto body painting and refinishing. These data on solvent content were taken from information presented in "Reduction of Volatile Organic Compound Emissions from Automobile Refinishing" (EPA-450/3-88-009)[Ref. 1], and "Alternative Control Techniques Document: Automobile Refinishing" (EPA- 453/R-94-037)[Ref. 2]. The solvent content values in these reports were provided in units of pounds per gallon. These data were converted to grams per liter. The number of liters of paint used for each shop was multiplied by an appropriate solvent content factor. It was assumed that 100% of the solvent was released to the atmosphere. Table 2 lists a summary of the total amount of each paint type included in the survey, the emission factor applied, and the total emissions of VOC. The categories of paint use included in the survey did not match exactly with the paint categories included in the EPA documents. The reference for the emission factors and the assumptions for emission factors for categories that were not included in the documents are explained in Table 2.

VOC emissions from solvent use for both surface preparation activities and clean up activities are summarized in Table 3. The total amount of solvent used for these purposes as reported in the survey were multiplied by a solvent content factor of 768.11 gr/liter (6.41 lb/gallon). The solvent content value was taken from data presented in Table 4-3 of *Alternative Control Techniques Document: Automobile Refinishing*[Ref. 2] for data representative of typical U.S. nonattainment areas.

TABLE 2. SUMMARY OF VOC EMISSIONS FROM PAINTING OPERATIONS

Paint Category	Total Paint Use, liters/year	VOC Content, lb/gal	VOC Content, gr/liter	VOC Emissions, kg/year	VOC Emissions, tons/year
Primer Lacquer	10,270	6.0	718.96	7,383.72	8.12
Primer Enamel	28,613	5.1	611.13	17,486.26	19.24
Primer Waterbase	3,614	2.5	299.58	1,082.68	1.19
Primer Urethane	7,735	4.3	515.27	3,985.61	4.38
Primer Other (a)	1,456	7.0	838.81	1,221.31	1.34
Base Coat Lacquer	9,334	6.3	754.93	7,046.52	7.75
Base Coat Enamel	29,263	5.3	635.10	18,584.93	20.44
Base Coat Waterbase (b)	3,484	2.5	299.58	1,043.74	1.15
Base Coat Urethane	6,721	5.2	623.12	4,187.99	4.61
Base Coat Other (a)	52	7.0	838.81	43.62	0.05
Clear Coat Lacquer	8,164	6.4	766.12	6,254.60	6.88
Clear Coat Enamel	23,439	5.6	671.05	15,728.74	17.30
Clear Coat Waterbase (b)	3,172	2.5	299.58	950.27	1.05
Clear Coat Urethane	6,279	4.4	527.25	3,310.60	3.64
Clear Coat Other (a)	468	7.0	838.81	392.56	0.43
Total Emissions					97.57

Notes: Solvent content values are for paint type as sprayed taken from EPA-450/3-88-009[Ref. 1] (exception: for other paint categories see note (a)). Emissions calculated by multiplying total paint use times gr/liter VOC solvent content (assume 100% is volatilized).

(a) Solvent content for other paint categories taken from EPA453/R-94-031[Ref. 2], for specialty category

(b) All waterbase paint assumed to have same solvent content as that for waterbase primer

TABLE 3. SUMMARY OF EMISSIONS FROM SOLVENT USE ACTIVITIES

SOLVENT USE ACTIVITY	TOTAL SOLVENT USE, liters/year	SOLVENT CONTENT, gr/liter	EMISSIONS	
			kg/year	tons/year
Surface Preparation	52,650	768.11	40,441	44.48
Spray Gun and Area Clean Up	23,848	768.11	18,318	20.15
Total	76,498		58,759	64.63

Based on these assumptions and the data collected in the survey, the total VOC emissions estimated for auto body repair shops in *Ciudad Juárez* is 162.2 tons per year. During the initial planning for the project, it was estimated that there might be a total of 300 or more paint shops operating in *Ciudad Juárez*. If it is assumed that the shops included in the survey are representative of all the shops in Juarez, a good estimate of an upper limit for total VOC emissions from auto body repair shops in *Ciudad Juárez* can be derived by doubling that estimate. The doubling assumption is offered to account for potential under reporting of paint and/or solvent use, and to account for auto body shops that were not included in the survey. Therefore, an upper limit estimate for emissions is 324.4 tons per year.

COMPARISON OF CALCULATED EMISSIONS AND PAINT DISTRIBUTION ESTIMATES

During the period when the students were being trained to conduct the survey, meetings were held with three of the four major paint distributors in *Ciudad Juárez* to obtain an estimate of the total amount of paint that was sold in *Ciudad Juárez*. Paint and solvent sales data were also provided by the fourth distributor after the meetings were held. These data were collected to serve as a check on the paint and solvent use derived through the survey. The combined total amount of paint sold as estimated by the four distributors was 4,020 liters/month. This can be compared to a total use of paint, adjusted for the amount that was indicated to be purchased from the United States, from the survey of 9,179 liters/month. It must be kept in mind that there were no strict quality control procedures applied to either of these totals. The paint use data from the survey represent the best estimate of the average amount of paint used per month. A similar estimate of solvent sold was also obtained from the paint distributors. The data from the distributors indicate a total of 45,000 liters/month in solvent sales. The data from the survey indicate a total of 4,050 liters/month of solvent used in the auto body repair shops that took part in the survey.

Concerning the paint use data from the survey versus paint sold data from the distributors, it is likely that uncertainties in the data supplied through the two procedures are significant. Sources of uncertainty that affect the comparison include:

- differences in the assumptions used in each procedure; for example, it is possible that average use reported in the survey is being compared to actual sales for the previous month in the supply data.
- some of the paint use reported in the survey may have been purchased in a different month.
- there may be errors in the reporting of paint obtained through other suppliers, either in the United States or elsewhere in Mexico.

Given these and other possible uncertainties, the comparison between paint use data from the survey and paint sales data from the distributors is not considered to be extreme and lends some level of confidence in the reported data from the survey.

The differences between distributor sales and survey data for solvent use are more extreme, with a discrepancy of nearly an order of magnitude. As noted earlier in this report, these data imply that there are other uses of solvent sold by the distributors, and that only a fraction of that solvent sold is consumed by auto body repair shops in *Ciudad Juárez*. It is reasonable to assume that there could be several other possible users of the solvent sold through these distributors. Data included in the Control Technology Center report[1] provide an estimate that solvent use for surface preparation and clean up activities represent approximately 28% of total emissions from auto body repair activities. Furthermore, the Alternate Control Techniques document[2] presents an estimate of approximately 0.1 gallons, or 0.378 liters, of solvent use for each manual spray gun cleaning operation. The survey data suggest that 40% of the total emissions from paint shops in *Ciudad Juárez* result from solvent use activities, and most shops reported between 0.5 to 1.0 liters of solvent used for gun cleaning operations. Both methods of comparison are relatively consistent with typical operations in the United States and provide some degree of credibility to the survey data. These results certainly support the conclusion that some other solvent uses must be present to account for the order of magnitude discrepancy between the reported sales and auto body shop use data. More information would be required to verify any of these assumptions, but, in general, the results of this comparison are not sufficient to dispute the data generated through the survey.

It is historically common for shops to under report the use of solvents in either painting or clean up operations. Some shops may use an order of magnitude more than they report. This makes any correlation attempt to balance the amount of solvents sold to that used very difficult. In addition, there are a number of other paint and solvent end-users not associated with auto body repair shops; such as, heavy equipment production and/or repair, small parts painting, and general industrial solvent usage. Distributors of solvents that sell to auto body repair shops generally package their materials in small, easily handled containers. This makes them extremely attractive to other purchasers who do not want the added cost or inconvenience of a larger

container (e.g. 30 or 55 gal. drum). To further define the use of solvents through auto body repair shop purchases, the actual sales/purchase order invoices must be reviewed to determine which type of facility received each order of solvents. This determination was not part of this study, but could be undertaken in any future effort. Information on overall solvent purchases were given in an informal manner. Any future attempt to obtain more detailed information would likely require the direct involvement of Mexican environmental officials.

RECOMMENDATIONS FOR CONTROL OPTIONS

During the review of the completed survey forms, it became apparent that few, if any, of the auto body shops that responded to the survey keep detailed records of the work performed or the amount of paint used. There were also many cases of incompatible data relative to specifics, such as work load, work practices and paint and solvent use reported in the survey. In addition, the uncertainties discussed in the summary of the comparison of paint use and paint distribution are problematic. It is recommended that some form of standard reporting be implemented to record the volume of coatings sold each month, coatings used each month, cars painted each month, and percent VOC of average or specific coatings used in the auto body repair shops in *Ciudad Juárez*. These data could then be used to construct a reliable data base and improve the knowledge of base line conditions and possible reductions that could be identified through the implementation of low-cost measures. The current survey forms could be used as the basis for all subsequent data collection efforts. In terms of the quality of information obtained, the survey form itself is very complete in its' level of requested detail. More experienced (and therefore, more expensive) survey takers or inspectors might be able to collect more information from these sources. In addition the question of overall coating operations for the Juarez area should be addressed, as this survey indicates that auto body shops have a limited contribution to VOC emissions.

The vast majority of the sources included in the survey are quite small, making most command and control options unrealistic and cost inefficient. The use of TNRCC's low-cost paint/solvent recycling booth system would be too costly (over $10,000.) for all but a very few (e.g., less than 3 shops within all of *Ciudad Juárez*) to invest in and install. The reasons are two-fold: (1) limited available capital investment monies, and (2) inadequate volume to ensure return on investment. With less that six partial painting jobs a week in most shops, an investment in TNRCC's system would not return any of the invested capital within the useable life cycle of the equipment. Therefore, an alternate approach is recommended to address potential emissions reduction programs. Based on the information collected in the survey, a review of available materials and information, interviews with local environmental agency staff, and from experience gained in conducting inspections of auto body repair shops, three recommendations are offered to promote reductions in VOC emissions from these facilities. In order of estimated VOC

reductions, these recommendations are:

- general overall training and environmental awareness program (10-30%)
- spray equipment replacement & education program (10-30%)
- introduction of low VOC paints and solvents (20-70%)

The presentation of these recommendations is based on potential implementation and not reduction percentage.

The first recommendation is to educate owners and operators of auto body repair shops in *Ciudad Juárez*, of enhanced painting methods that could improve transfer efficiency, reduce solvent use, promote the use of low solvent content paints and thinners, the replacement of acrylic lacquers with enamels, the replacement of enamels and lacquers with urethane (these two replacements would require the use of spray booths and may not be economically feasible), and in overall environmental awareness. The estimated VOC reductions from such activities as mentioned above are very difficult to determine as they relate to individual usage and acceptance by the operators. The larger the number of operators participating in the program increases the reduction levels. There are a number of instructional materials, pamphlets, videos, and training courses available that could be given to, or used in formal training programs to help educate the owners and operators. Some of these materials are already translated into Spanish (e.g., spray operator's guide which is available in both Spanish and English in a comic book style presentation). Other materials would need to be translated and perhaps modified to fit the specific situations found in *Ciudad Juárez*. In addition, demonstrations on the most environmentally effective means of cleaning equipment with solvents, application methods, problems and solutions when using low solvent paints, and getting the most from the existing equipment could significantly improve the current situation.

The second recommendation is to implement a program to improve the overall transfer efficiency of painting operations. Based on figures from EPA's 1988 CTC report, replacement of conventional spray guns with HVLP equipment could reduce yearly VOC emissions by 32 percent. One approach would be to start a spray gun buy-back program. Under this scenario, this effort would involve a cooperative program involving both countries to jointly fund a pilot project to assist owners in upgrading their current equipment with state-of-the-art spray applicators. Owners would be required to attend formal classroom and hands on training to learn the proper use of newer painting techniques. Each owner might then be required to make small incremental payments back into a general program fund. Other investment and funding options including industry groups, Non Government Organizations (NGOs), environmental organizations, and the North American Development (NAD) Bank would need to be researched. None of these options has been investigated under the scope of this work, but each are options that could be considered.

The third recommendation involves a very complex and coordinated effort by both the United States and Mexico to make low VOC content paints and solvents more available in

Mexico. The estimated reduction in VOC emissions based on EPA's 1988 CTC report ranges from 15 percent for installation of a solvent recovery system to 54 percent when urethane replace lacquers and enamels. Combining replacement of coatings with water-based primers, and decreasing the use of high VOC solvents for clean-up operations, could reduce emissions 20-70 percent. The likelihood in achieving reductions at the higher end of the range is low as it would require major financial investments to be made by small coating operators, in all painting applications throughout the city of Juarez. A more reasonable estimate is 20-40 percent based on similar attempts conducted in the U.S. in the 1980s. This effort would require activities ranging from policy and regulatory based options, to education programs aimed at the general public to explain the reasons for the switch form existing coatings to alternative coatings. Under this approach suppliers of coatings would need to be brought into the program so that, over time, the use of VOC contenting solvents and coatings could be phased out. New regulations pertaining to the use of high VOC content coatings could be developed and implemented. Enforcement activities would need to be devised to ensure compliance with the new regulations and to track the effectiveness of those regulations. The cost of such a move away from the currently used coating methods and associated technologies has not been determined, but is estimated to greatly exceed the ability of the majority of the auto body shop operators to implement or upgrade to without financial assistance. The only complying reason to move towards such an effort, high VOC emissions from auto body repair shops, has not been proven from the findings of this survey. However, total VOC emissions from all coating and solvent usage within Juarez could justify such a plan of action.

REFERENCES

1. Control Technology Center, “Reduction of Volatile Organic Compound Emissions from Automobile Refinishing,” U.S. Environmental Protection Agency, EPA 450/3-88-009, October 1988.

2. Emissions Standards Division, “Alternative Control Techniques Document: Automobile Refinishing,” U.S. Environmental Protection Agency, EPA-453/R-94-031, April 1994.

APPENDIX A

SURVEY FORM USED IN THE STUDY

Survey Form for Assessment of Emissions from Automobile Refinishing Shops in Ciudad Juarez

Shop Number: _____ Date: _____
Surveyor: _____

General Information

How many employees work at the shop? _____
How long have the employees been working at the shop?

Average time _____ yr ___ month ____ weeks ____
Maximum _____ yr ___ month ____ weeks ____
Minimum _____ yr ___ month ____ weeks ____

How did employees learn this trade?

Number from Trade School _____
Number from previous job _____
Number trained at this shop _____

How many cars do you paint per week?

Partial Repairs: Average _____
Maximum _____ When? _____
Minimum _____ When? _____
Complete Repainting: Average _____
Maximum _____ When? _____
Minimum _____ When? _____

Normally how many days per week do you paint cars? _____
Normally what time of year do you have the most work? _____
the least work? _____

What type of record keeping is used to account for purchases of paint, solvent, materials, etc.

Operations Information

The following questions refer to operations to clean and prepare surfaces for painting.

Partial Refinishing jobs Detergent Washing Yes ____ No _____
Solvent Washing Yes ____ No _____
Full car repainting Detergent Washing Yes ____ No _____
Solvent Washing Yes ____ No _____
If solvent washing is used what kind of solvent do you use? Toluene _____
Xylene _____
Blend _____
Petroleum Distillates _____

Other Specify

Approximately how much solvent is used per **week, month year (circle one)?**
_____ liters
On average this solvent use represents how many partial refinishing jobs _____
full repainting jobs _____
What is done with the solvents used?
Left to evaporate _____
Recovered and reused _____
Recovered and disposed _____
Put down a drain _____
If solvents are reused, how are they cleaned?

If solvents are disposed, where are they taken?

If poured down a drain, where does the drain go?

Approximately how much grinding and sanding is done in repairs?

How much bond do you use per **week, month, year (circle one)?** _____ kilos
In a typical repair job? _____ kilos

The following questions refer to painting operations.

Give the amount of paint used per **week, month, year (circle one)** for base coat or primer coats.

lacquer _____ liters
enamel _____ liters
waterborne _____ liters
urethane _____ liters
other _____ liters, describe _____

Give the amount of paint used per **week, month, year (circle one)** for topcoats.

acrylic lacquer _____ liters
acrylic enamel _____ liters
waterborne _____ liters
polyurethane _____ liters
other _____ liters describe _____

Give the amount of paint used per **week, month, year (circle one)** in clear coats.

acrylic lacquer _____ liters

acrylic enamel _____ liters
waterborne _____ liters
polyurethane _____ liters
other _____ liters; describe _____

Where is the paint you used manufactured/purchased?
In Mexico _____ /_____percent
In United States _____ /_____percent
Other _____ /_____percent Where? _____

What type of spray gun do you use? If more than one give percents.
Standard air gun _____ high pressure low volume gun _____
Standard electric gun _____
other _____ describe _____

How do you paint? If more than one give percents.
Open air _____ Partial repainting jobs _____ % full car repainting ____ %
Enclosed booth _____ Partial repainting jobs _____ % full car repainting ____ %
In shelter without booth ____ Partial repainting jobs ____ % full car repainting __ %
Under roof not enclosed ____ Partial repainting jobs ____ % full car repainting___ %

If you use a booth do you have and exhaust or ventilation system? _____
If there is an exhaust or ventilation system explain how it works.

Is there any control device in the ventilation or exhaust system?

Do you use heaters to cure paint? _____ If yes, what fuels are used in heaters?
_____

What kind of paint storage and mixing devices are used?

What procedure do you use to clean up the spray guns and work area after job completion?
Solvents used to clean spray guns; type of solvent _____
Typical amount _____ liters

Waste Generation and Management

Do you generate waste? Quantities for

Rags Yes _____ No _____ How many kilos _____
Paint Yes _____ No _____ How many liters _____
Clean up
Solvent Yes _____ No _____ How many liters _____

Sand Paper	Yes _____	No _____	How much _____
Paper	Yes _____	No _____	How much _____
Cans	Yes _____	No _____	How many _____
Tape	Yes _____	No _____	How much _____

How do you dispose of wastes generated?

Rags _____
Paint _____
Clean Up
Solvent _____
Sand Paper _____
Paper _____
Cans _____
Tape _____

Miscellaneous To be completed by surveyor

Describe the general appearance of the shop? Is it neat and clean? Are there waste materials laying about? Do you consider there is an imminent fire hazard?

If there is an enclosed booth with any form of ventilation or exhaust system please look to see if there is any kind of control device present (e.g., filter, thermal incineration, catalytic incineration, carbon absorption, vapor recovery, water film, other. Explain the type of equipment if present and give an estimate of control efficiency.

Do you see evidence of waste paint or solvent being dumped on open ground or poured down a drain? If poured down a drain can you determine where the drain goes?

Comment on the appearance around the outside of the shop. Does it appear that the activities in the shop are affecting the surrounding area. Are there opportunities for citizens to have access to materials and waste products generated by the shop?

APPENDIX B

DATA TABLES FROM THE SURVEY DATABASE

The following emission factors were applied in Table B-1:

Paint Type	Emission Factors lb/gal	grams/liter
Primer Lacquer	6.0	718.96
Primer Enamel	5.1	611.13
Primer Water Base	2.5	299.58
Primer Urethane	4.3	515.27
Primer Other	7.0	838.81
Base Coat Lacquer	6.3	754.93
Base Coat Enamel	5.3	635.10
Base Coat Water Base	2.5	299.58
Base Coat Urethane	5.2	623.12
Base Coat Other	7.0	838.81
Clear Coat Lacquer	6.4	766.12
Clear Coat Enamel	5.6	671.05
Clear Coat Water Base	2.5	299.58
Clear Coat Urethane	4.4	527.25
Clear Coat Other	7.0	838.81

Notes: Emission factor for paints in other category are based on solvent content value of 7 lb./gal taken from ACT document (reference 2) as specified for specialty paints. No information had been given for the specifications for other paints and this assumption was used to represent newer paints with the maximum solvent content.

Emission factor for all water base paints is based on the solvent content for water base primer paints given in the CTC document (reference 1).

Table B-1 Paint Use Summary and Emissions Estimate

																	Total	
																Spray	Amount of	
	Primer Coat Paint Use in Liters per Week					Topcoat Paint Use in Liters per Weel					Clear Coats Paint Use in Liters per Week					Application	Paint Used	Primer
Shop Code	Lacquer	Enamel	Waterbase	Urethane	Other	Lacquer	Enamel	Waterbase	Polyurethane	Other	Lacquer	Enamel	Waterbase	Polyurethane	Other	Device	liters per week	Lacquer
1	0.00						4.00		4.00							air gun	8	0.00
2	0.00	2.00					2.00					2.00				air gun	6	0.00
3	0.00	2.00					4.00					2.00				air gun	8	0.00
4	0.00	2.50				1.00	2.00					1.00				air gun	6.5	0.00
5	0.00	4.50					4.50					1.00				air gun	10	0.00
6	0.00				1.00		1.00									air gun	2	0.00
7	0.00	2.00					3.00					2.00				air gun	7	0.00
8	0.00	1.00					4.00					4.00				air gun	9	0.00
9	0.00	1.00					1.00					0.50				air gun	2.5	0.00
10	0.00	1.00					1.00					4.50				air gun	6.5	0.00
11	5.00	5.00		5.00								3.00				air gun	18	3594.80
12	2.00	2.00				4.00	4.00				5.00					air gun	17	1437.92
13	0.00	2.00					2.00					5.00				air gun	9	0.00
14	0.00				1.00		2.00					1.00				air gun	4	0.00
15	0.00	5.00					5.00					3.00				hplv gun	13	0.00
16	0.00	4.00					4.00					2.50				air gun	10.5	0.00
17	0.00						10.00					0.50				air/hplv gun	10.5	0.00
18	0.00	1.00					3.00					1.00				air gun	5	0.00
19	0.00				3.00	1.50			4.50					3.00		air gun	12	0.00
20	1.00	2.00				2.00	5.00				3.00					air gun	13	718.96
21	0.00	4.00				4.00					4.00					hplv gun	12	0.00
22	0.00	6.00					6.00					6.00				hplv gun	18	0.00
23	0.00	2.00					4.00					1.00				air gun	7	0.00
24	0.00	6.00					6.00					6.00				air gun	18	0.00
25	0.00	8.00		0.50		4.00	4.00					2.00				air gun	18.5	0.00
26	0.00	4.00					4.00					2.00				air gun	10	0.00
27	0.00	1.50					3.00									air gun	4.5	0.00
28	0.00	1.00					1.00					1.00				air gun	3	0.00
29	0.00					3.00	2.00				4.00					air/hplv gun	9	0.00
30	0.00	3.00					3.00					2.00				air gun	8	0.00
31	0.00	8.00					3.00					3.00				air/hplv gun	14	0.00
32	2.00	1.00					4.00					1.00				air gun	8	1437.92
33	0.00	2.00		5.00		2.00	0.50				3.00			3.00		air gun	15.5	0.00
34	0.00	3.00					4.00					2.00				air gun	9	0.00
35	3.00	1.00	1.00	4.00		2.00	4.00	1.00	3.00		3.00	1.00	2.00	4.00		hplv gun	29	2156.88
36	4.00	6.00	1.00	4.00		3.00	6.00	1.00	4.00		2.00	5.00	1.00	3.00		air/hplv gun	40	2875.84
37	18.00	16.00	18.00	16.00		18.00	16.00	18.00	16.00		18.00	16.00	18.00	16.00		air/hplv gun	204	12941.28
38	4.00	1.00	2.00	3.00		2.00	1.00	1.00	4.00	1.00	2.00	1.00	1.00	4.00		air/hplv gun	27	2875.84
39	0.00	5.00	1.00	2.00		5.00	6.00	1.00	3.00			3.00	1.00	2.00		air gun	29	0.00
40	0.00	0.25					0.25					0.25				air gun	0.75	0.00
41	0.00	1.00	0.50				1.00		0.50					0.50		air/hplv gun	3.5	0.00
42	3.00	2.00				2.00	2.00				1.00	2.00				air gun	12	2156.88
43	20.00	5.00	2.00	10.00	18.00	10.00	5.00	2.00	8.00		2.00	1.00	1.00	5.00	9.00	hplv gun	98	14379.20
44	2.00	4.00	1.00	4.00		1.00	4.00	1.00	3.00		1.00	4.00	1.00	3.00		air/hplv gun	29	1437.92
45	2.00	10.00		5.00		1.00	9.00		5.00		2.00	9.00		5.00		air/hplv gun	48	1437.92
46	2.00	8.00				2.00	8.00				2.00	8.00					30	1437.92
47	1.00	2.00	1.00	4.00		1.00	2.00	1.00	5.00		1.00	1.00	2.00	4.00		hplv gun	25	718.96
48	2.00	4.00	2.00	4.00		2.00	4.00	1.00	4.00		1.00	4.00	1.00	3.00		air/hplv gun	32	1437.92

Table B-1 Paint Use Summary and Emissions Estimate

	Emissions gr/week (liters per week times paint class emission factor														
															Total All
	Primer	Primer	Primer	Primer	Topcoat	Topcoat	Topcoat	Topcoat	Topcoat	Clear Coat	Clear Coat	Clear Coat	Clear Coat	Clear Coat	Paints
Shop Code	Enamel	Waterbase	Urethane	Other (a)	Lacquer	Enamel	Waterbase	Urethane	Other, (c)	Lacquer	Enamel	Waterbase (d)	Urethane	Other (e)	(gr/week)
1	0	0	0	0	0	2540.4	0	2492.48	0	0	0	0	0	0	5032.88
2	1222.26	0	0	0	0	1270.2	0	0	0	0	1342.1	0	0	0	3834.56
3	1222.26	0	0	0	0	2540.4	0	0	0	0	1342.1	0	0	0	5104.76
4	1527.825	0	0	0	754.93	1270.2	0	0	0	0	671.05	0	0	0	4224.01
5	2750.085	0	0	0	0	2857.95	0	0	0	0	671.05	0	0	0	6279.09
6	0	0	0	838.81	0	635.1	0	0	0	0	0	0	0	0	1473.91
7	1222.26	0	0	0	0	1905.3	0	0	0	0	1342.1	0	0	0	4469.66
8	611.13	0	0	0	0	2540.4	0	0	0	0	2684.2	0	0	0	5835.73
9	611.13	0	0	0	0	635.1	0	0	0	0	335.525	0	0	0	1581.76
10	611.13	0	0	0	0	635.1	0	0	0	0	3019.725	0	0	0	4265.96
11	3055.65	0	2576.35	0	0	0	0	0	0	0	2013.15	0	0	0	11239.95
12	1222.26	0	0	0	3019.72	2540.4	0	0	0	3830.6	0	0	0	0	12050.90
13	1222.26	0	0	0	0	1270.2	0	0	0	0	3355.25	0	0	0	5847.71
14	0	0	0	838.81	0	1270.2	0	0	0	0	671.05	0	0	0	2780.06
15	3055.65	0	0	0	0	3175.5	0	0	0	0	2013.15	0	0	0	8244.30
16	2444.52	0	0	0	0	2540.4	0	0	0	0	1677.625	0	0	0	6662.55
17	0	0	0	0	0	6351	0	0	0	0	335.525	0	0	0	6686.53
18	611.13	0	0	0	0	1905.3	0	0	0	0	671.05	0	0	0	3187.48
19	0	0	0	2516.43	1132.395	0	0	2804.04	0	0	0	0	1581.75	0	8034.62
20	1222.26	0	0	0	1509.86	3175.5	0	0	0	2298.36	0	0	0	0	8924.94
21	2444.52	0	0	0	3019.72	0	0	0	0	3064.48	0	0	0	0	8528.72
22	3666.78	0	0	0	0	3810.6	0	0	0	0	4026.3	0	0	0	11503.68
23	1222.26	0	0	0	0	2540.4	0	0	0	0	671.05	0	0	0	4433.71
24	3666.78	0	0	0	0	3810.6	0	0	0	0	4026.3	0	0	0	11503.68
25	4889.04	0	257.635	0	3019.72	2540.4	0	0	0	0	1342.1	0	0	0	12048.90
26	2444.52	0	0	0	0	2540.4	0	0	0	0	1342.1	0	0	0	6327.02
27	916.695	0	0	0	0	1905.3	0	0	0	0	0	0	0	0	2822.00
28	611.13	0	0	0	0	635.1	0	0	0	0	671.05	0	0	0	1917.28
29	0	0	0	0	2264.79	1270.2	0	0	0	3064.48	0	0	0	0	6599.47
30	1833.39	0	0	0	0	1905.3	0	0	0	0	1342.1	0	0	0	5080.79
31	4889.04	0	0	0	0	1905.3	0	0	0	0	2013.15	0	0	0	8807.49
32	611.13	0	0	0	0	2540.4	0	0	0	0	671.05	0	0	0	5260.50
33	1222.26	0	2576.35	0	1509.86	317.55	0	0	0	2298.36	0	0	1581.75	0	9506.13
34	1833.39	0	0	0	0	2540.4	0	0	0	0	1342.1	0	0	0	5715.89
35	611.13	299.58	2061.08	0	1509.86	2540.4	299.58	1869.36	0	2298.36	671.05	599.16	2109	0	17025.44
36	3666.78	299.58	2061.08	0	2264.79	3810.6	299.58	2492.48	0	1532.24	3355.25	299.58	1581.75	0	24539.55
37	9778.08	5392.44	8244.32	0	13588.74	10161.6	5392.44	9969.92	0	13790.16	10736.8	5392.44	8436	0	113824.22
38	611.13	599.16	1545.81	0	1509.86	635.1	299.58	2492.48	838.81	1532.24	671.05	299.58	2109	0	16019.64
39	3055.65	299.58	1030.54	0	3774.65	3810.6	299.58	1869.36	0	0	2013.15	299.58	1054.5	0	17507.19
40	152.7825	0	0	0	0	158.775	0	0	0	0	167.7625	0	0	0	479.32
41	611.13	149.79	0	0	0	635.1	0	311.56	0	0	0	0	263.625	0	1971.21
42	1222.26	0	0	0	1509.86	1270.2	0	0	0	766.12	1342.1	0	0	0	8267.42
43	3055.65	599.16	5152.7	15098.58	7549.3	3175.5	599.16	4984.96	0	1532.24	671.05	299.58	2636.25	7549.29	67282.62
44	2444.52	299.58	2061.08	0	754.93	2540.4	299.58	1869.36	0	766.12	2684.2	299.58	1581.75	0	17039.02
45	6111.3	0	2576.35	0	754.93	5715.9	0	3115.6	0	1532.24	6039.45	0	2636.25	0	29919.94
46	4889.04	0	0	0	1509.86	5080.8	0	0	0	1532.24	5368.4	0	0	0	19818.26
47	1222.26	299.58	2061.08	0	754.93	1270.2	299.58	3115.6	0	766.12	671.05	599.16	2109	0	13887.52
48	2444.52	599.16	2061.08	0	1509.86	2540.4	299.58	2492.48	0	766.12	2684.2	299.58	1581.75	0	18716.65

Table B-1 Paint Use Summary and Emissions Estimate

																	Total	
																Spray	Amount of	
	Primer Coat Paint Use in Liters per Week					Topcoat Paint Use in Liters per Weel					Clear Coats Paint Use in Liters per Week					Application	Paint Used	Primer
Shop Code	Lacquer	Enamel	Waterbase	Urethane	Other	Lacquer	Enamel	Waterbase	Polyurethane	Other	Lacquer	Enamel	Waterbase	Polyurethane	Other	Device	liters per week	Lacquer
49	4.00	1.00		2.00		3.00	1.00		2.00		2.00	1.00		2.00		air/hplv gun	18	2875.84
50	1.00	5.00		10.00		1.00	4.00		8.00		1.00	5.00		6.00		hplv gun	41	718.96
51	2.00	4.00	2.00	8.00		1.00	4.00	2.00	7.00		1.00	2.00	3.00	6.00		air/elec gun	42	1437.92
52	0.00	9.00					5.00				5.00	14.00		4.00		air gun	37	0.00
53	2.00	4.00	1.00	2.00		1.00	4.00	1.00	2.00		1.00	4.00	1.00	2.00		special	25	1437.92
54	2.00	4.00	1.00	4.00		3.00	2.00	1.00			2.00	3.00	1.00	1.00		air gun	24	1437.92
55	10.00	5.00	7.00	10.00		8.00	4.00	7.00	10.00		5.00	2.00	1.00	4.00		air gun	73	7189.60
56	2.00	4.00	1.00	4.00		2.00	3.00	1.00	3.00		3.00	3.00	1.00	2.00		special	29	1437.92
57	3.00	4.00				3.00	4.00				2.00	2.00				air gun	18	2156.88
58	1.00	10.00	5.00	7.00			8.00	5.00	6.00			3.00	4.00	2.00		air/hplv gun	51	718.96
59	0.00				5.00		2.00					5.00				air gun	12	0.00
60	0.00	1.00					1.00					5.00				air/hplv gun	7	0.00
61	0.00	5.00					5.00					5.00				air gun	15	0.00
62	2.00	4.00	2.00	4.00		2.00	3.00	2.00	3.00		1.00	3.00	1.00	3.00		air gun	30	1437.92
63	0.00	8.00					8.00					8.00				air/hplv gun	24	0.00
64	2.00	3.00				1.00	3.00				2.00	2.00				air gun	13	1437.92
65	1.00	1.00				1.00	2.00				1.00	2.00				air gun	8	718.96
66	0.00			6.00					6.00					6.00		air gun	18	0.00
67	0.00	6.00					5.00					4.00				air gun	15	0.00
68	0.00	1.50					2.50					2.50				air/hplv gun	6.5	0.00
69	0.00	4.00					4.00					4.00				air gun	12	0.00
70	0.00	4.00					4.00									air/hplv gun	8	0.00
71	0.00	0.00				1.00	0.00				1.50	0.50		0.25		air/lp gun	3.25	0.00
72	0.00	8.00					8.00					4.00				air gun	20	0.00
73	0.00	1.00					1.00					1.00				air/hplv gun	3	0.00
74	0.00	4.00					4.00					3.00				air gun	11	0.00
75	0.00	5.00					5.00					5.00				air/hplv gun	15	0.00
76	1.00	1.00				1.00	2.00				1.00	2.00				air gun	8	718.96
77	0.00	8.00					6.00					4.00				air gun	18	0.00
78	2.00	4.00				3.00	3.00				2.00	1.00				air/hplv gun	15	1437.92
79	2.00	7.00					7.00				1.50	4.00				air/hplv gun	21.5	1437.92
80	0.00	2.00					5.50					2.00				air gun	9.5	0.00
81	0.00	7.00					9.00					4.00				air/hplv gun	20	0.00
82	0.00	10.00					6.00					6.00				air/hplv gun	22	0.00
83	8.00	6.00				2.50	4.00				2.50	3.00				air gun	26	5751.68
84	0.00	8.00					9.00					2.00				air gun	19	0.00
85	2.00	2.00					2.00					2.00				air/hplv gun	8	1437.92
86	1.00	1.00				1.00	1.00				2.00	2.00				air/hplv gun	8	718.96
87	0.00											2.00				air gun	2	0.00
88	0.00	3.00					3.00					2.00				air gun	8	0.00
89	2.00	3.00				1.00	1.00				1.00	1.00				air gun	9	1437.92
90	0.00	8.00					6.00					6.00				air gun	20	0.00
91	0.00	2.00					2.00					3.00				air gun	7	0.00
92	0.00	2.00					2.00					3.00				air gun	7	0.00
93	2.00	5.00					2.00				5.00					air/hplv gun	14	1437.92
94	0.00	2.00					2.00					2.00				air gun	6	0.00
95	3.00	3.00				3.00	2.00				3.00	4.00				air gun	18	2156.88
96	0.00	4.00					4.00					3.00				air gun	11	0.00

Table B-1 Paint Use Summary and Emissions Estimate

	Emissions gr/week (liters per week times paint class emission factor														
															Total All
	Primer	Primer	Primer	Primer	Topcoat	Topcoat	Topcoat	Topcoat	Topcoat	Clear Coat	Clear Coat	Clear Coat	Clear Coat	Clear Coat	Paints
Shop Code	Enamel	Waterbase	Urethane	Other (a)	Lacquer	Enamel	Waterbase	Urethane	Other, (c)	Lacquer	Enamel	Waterbase (d)	Urethane	Other (e)	(gr/week)
49	611.13	0	1030.54	0	2264.79	635.1	0	1246.24	0	1532.24	671.05	0	1054.5	0	11921.43
50	3055.65	0	5152.7	0	754.93	2540.4	0	4984.96	0	766.12	3355.25	0	3163.5	0	24492.47
51	2444.52	599.16	4122.16	0	754.93	2540.4	599.16	4361.84	0	766.12	1342.1	898.74	3163.5	0	23030.55
52	5500.17	0	0	0	0	3175.5	0	0	0	3830.6	9394.7	0	2109	0	24009.97
53	2444.52	299.58	1030.54	0	754.93	2540.4	299.58	1246.24	0	766.12	2684.2	299.58	1054.5	0	14858.11
54	2444.52	299.58	2061.08	0	2264.79	1270.2	299.58	0	0	1532.24	2013.15	299.58	527.25	0	14449.89
55	3055.65	2097.06	5152.7	0	6039.44	2540.4	2097.06	6231.2	0	3830.6	1342.1	299.58	2109	0	41984.39
56	2444.52	299.58	2061.08	0	1509.86	1905.3	299.58	1869.36	0	2298.36	2013.15	299.58	1054.5	0	17492.79
57	2444.52	0	0	0	2264.79	2540.4	0	0	0	1532.24	1342.1	0	0	0	12280.93
58	6111.3	1497.9	3606.89	0	0	5080.8	1497.9	3738.72	0	0	2013.15	1198.32	1054.5	0	26518.44
59	0	0	0	4194.05	0	1270.2	0	0	0	0	3355.25	0	0	0	8819.50
60	611.13	0	0	0	0	635.1	0	0	0	0	3355.25	0	0	0	4601.48
61	3055.65	0	0	0	0	3175.5	0	0	0	0	3355.25	0	0	0	9586.40
62	2444.52	599.16	2061.08	0	1509.86	1905.3	599.16	1869.36	0	766.12	2013.15	299.58	1581.75	0	17086.96
63	4889.04	0	0	0	0	5080.8	0	0	0	0	5368.4	0	0	0	15338.24
64	1833.39	0	0	0	754.93	1905.3	0	0	0	1532.24	1342.1	0	0	0	8805.88
65	611.13	0	0	0	754.93	1270.2	0	0	0	766.12	1342.1	0	0	0	5463.44
66	0	0	3091.62	0	0	0	0	3738.72	0	0	0	0	3163.5	0	9993.84
67	3666.78	0	0	0	0	3175.5	0	0	0	0	2684.2	0	0	0	9526.48
68	916.695	0	0	0	0	1587.75	0	0	0	0	1677.625	0	0	0	4182.07
69	2444.52	0	0	0	0	2540.4	0	0	0	0	2684.2	0	0	0	7669.12
70	2444.52	0	0	0	0	2540.4	0	0	0	0	0	0	0	0	4984.92
71	0	0	0	0	754.93	0	0	0	0	1149.18	335.525	0	131.8125	0	2371.45
72	4889.04	0	0	0	0	5080.8	0	0	0	0	2684.2	0	0	0	12654.04
73	611.13	0	0	0	0	635.1	0	0	0	0	671.05	0	0	0	1917.28
74	2444.52	0	0	0	0	2540.4	0	0	0	0	2013.15	0	0	0	6998.07
75	3055.65	0	0	0	0	3175.5	0	0	0	0	3355.25	0	0	0	9586.40
76	611.13	0	0	0	754.93	1270.2	0	0	0	766.12	1342.1	0	0	0	5463.44
77	4889.04	0	0	0	0	3810.6	0	0	0	0	2684.2	0	0	0	11383.84
78	2444.52	0	0	0	2264.79	1905.3	0	0	0	1532.24	671.05	0	0	0	10255.82
79	4277.91	0	0	0	0	4445.7	0	0	0	1149.18	2684.2	0	0	0	13994.91
80	1222.26	0	0	0	0	3493.05	0	0	0	0	1342.1	0	0	0	6057.41
81	4277.91	0	0	0	0	5715.9	0	0	0	0	2684.2	0	0	0	12678.01
82	6111.3	0	0	0	0	3810.6	0	0	0	0	4026.3	0	0	0	13948.20
83	3666.78	0	0	0	1887.325	2540.4	0	0	0	1915.3	2013.15	0	0	0	17774.64
84	4889.04	0	0	0	0	5715.9	0	0	0	0	1342.1	0	0	0	11947.04
85	1222.26	0	0	0	0	1270.2	0	0	0	0	1342.1	0	0	0	5272.48
86	611.13	0	0	0	754.93	635.1	0	0	0	1532.24	1342.1	0	0	0	5594.46
87	0	0	0	0	0	0	0	0	0	0	1342.1	0	0	0	1342.10
88	1833.39	0	0	0	0	1905.3	0	0	0	0	1342.1	0	0	0	5080.79
89	1833.39	0	0	0	754.93	635.1	0	0	0	766.12	671.05	0	0	0	6098.51
90	4889.04	0	0	0	0	3810.6	0	0	0	0	4026.3	0	0	0	12725.94
91	1222.26	0	0	0	0	1270.2	0	0	0	0	2013.15	0	0	0	4505.61
92	1222.26	0	0	0	0	1270.2	0	0	0	0	2013.15	0	0	0	4505.61
93	3055.65	0	0	0	0	1270.2	0	0	0	3830.6	0	0	0	0	9594.37
94	1222.26	0	0	0	0	1270.2	0	0	0	0	1342.1	0	0	0	3834.56
95	1833.39	0	0	0	2264.79	1270.2	0	0	0	2298.36	2684.2	0	0	0	12507.82
96	2444.52	0	0	0	0	2540.4	0	0	0	0	2013.15	0	0	0	6998.07

Table B-1 Paint Use Summary and Emissions Estimate

																	Total	
																Spray	Amount of	
	Primer Coat Paint Use in Liters per Week					Topcoat Paint Use in Liters per Weel					Clear Coats Paint Use in Liters per Week					Application	Paint Used	Primer
Shop Code	Lacquer	Enamel	Waterbase	Urethane	Other	Lacquer	Enamel	Waterbase	Polyurethane	Other	Lacquer	Enamel	Waterbase	Polyurethane	Other	Device	liters per week	Lacquer
97	0.00	0.50					0.50					0.50				air gun	1.5	0.00
98	1.00	3.00				1.00	3.00				0.50	3.00				air gun	11.5	718.96
99	0.00	3.00	0.00			0.00	2.00	0.00			0.00	4.00	0.00			air gun	9	0.00
100	0.00	1.00					1.00				1.00					air gun	3	0.00
101	0.00	1.00					1.00					1.00				air gun	3	0.00
102	0.00	3.00					3.00					3.00				air gun	9	0.00
103	0.00	1.00					1.00					1.00				air/hplv gun	3	0.00
104	0.00	2.00					2.00					2.00				air gun	6	0.00
105	0.00	1.00					1.00					1.00				air gun	3	0.00
106	0.00	1.00		0.25			1.00		0.25					1.00		air/hplv gun	3.5	0.00
107	1.00	1.00				1.00	1.00				1.00	1.00				air gun	6	718.96
108	0.00	1.00					1.00					1.00				air gun	3	0.00
109	0.00	2.00					2.00					1.00				air/hplv gun	5	0.00
110	0.00	1.00					1.00					1.00				air gun	3	0.00
111	0.00	1.00					1.00					1.00				air gun	3	0.00
112	0.00	2.00					2.00					2.00				air gun	6	0.00
113	1.00	1.00				1.00	1.00					1.00				air gun	5	718.96
114	1.00	2.00				1.00	2.00				1.00	2.00				air gun	9	718.96
115	0.00	3.00					3.00					3.00				air gun	9	0.00
116	0.00	12.00					12.00					12.00				air gun	36	0.00
117	0.50	2.00				0.50	2.00				0.50	2.00				air/hplv gun	7.5	359.48
118	1.50					1.50					1.50					air gun	4.5	1078.44
119	0.50	3.00				0.50	3.00					3.00				air gun	10	359.48
120	0.00	6.00					4.00					3.00				air gun	13	0.00
121	0.00	3.00					3.00					3.00		1.00		air gun	10	0.00
122	0.00	5.00					5.00					5.00				air/hplv gun	15	0.00
123	0.00	5.00					8.00					4.00				air gun	17	0.00
124	0.00	2.00					3.00					2.00				air gun	7	0.00
125	2.00	1.00				2.00	0.50				2.00	1.50				air gun	9	1437.92
126	1.00	5.00	2.00	1.00			4.00	1.00	2.00			4.00	2.00	2.00		special	24	718.96
127	0.00	2.00					3.00					1.00				air gun	6	0.00
128	18.00	16.00	18.00	16.00		18.00	16.00	18.00	16.00		18.00	16.00	18.00	17.00		air/hplv gun	205	12941.28
129	10.00	5.00	1.00	8.00			5.00	2.00			5.00	2.00	1.00			air/hplv gun	39	7189.60
130	4.00	4.00				3.00	4.00				2.00	2.00				air gun	19	2875.84
131	3.00	2.00				3.00	2.00				3.00	2.00				air gun	15	2156.88
132	1.00	2.00					1.00				1.00	3.00				air/hplv gun	8	718.96
133	0.00						0.00					5.00				air gun	5	0.00
134	0.00	5.00					3.00					3.00				air gun	11	0.00
135	0.00	4.00				4.00	4.00				1.00	1.00				air/hplv gun	14	0.00
136	0.00	4.00					6.00					3.00				air gun	13	0.00
137	0.00	3.00					4.00					2.00				air gun	9	0.00
138	1.00	3.00				2.00	2.00				2.00	1.00				air gun	11	718.96
139	2.00	6.00				2.00	6.00				1.00	3.00				air gun	20	1437.92
140	4.00	3.00				2.00	2.00				1.00	1.00				air gun	13	2875.84
141	0.00	5.00					5.00					5.00				air gun	15	0.00
142	1.00	3.00				1.00	2.00				3.00	6.00				air gun	16	718.96
143	0.00	5.00					6.00					4.00				air gun	15	0.00
144	0.00	6.00					5.00					6.00				air gun	17	0.00

Table B-1 Paint Use Summary and Emissions Estimate

	Emissions gr/week (liters per week times paint class emission factor														
															Total All
	Primer	Primer	Primer	Primer	Topcoat	Topcoat	Topcoat	Topcoat	Topcoat	Clear Coat	Clear Coat	Clear Coat	Clear Coat	Clear Coat	Paints
Shop Code	Enamel	Waterbase	Urethane	Other (a)	Lacquer	Enamel	Waterbase	Urethane	Other, (c)	Lacquer	Enamel	Waterbase (d)	Urethane	Other (e)	(gr/week)
97	305.565	0	0	0	0	317.55	0	0	0	0	335.525	0	0	0	958.64
98	1833.39	0	0	0	754.93	1905.3	0	0	0	383.06	2013.15	0	0	0	7608.79
99	1833.39	0	0	0	0	1270.2	0	0	0	0	2684.2	0	0	0	5787.79
100	611.13	0	0	0	0	635.1	0	0	0	766.12	0	0	0	0	2012.35
101	611.13	0	0	0	0	635.1	0	0	0	0	671.05	0	0	0	1917.28
102	1833.39	0	0	0	0	1905.3	0	0	0	0	2013.15	0	0	0	5751.84
103	611.13	0	0	0	0	635.1	0	0	0	0	671.05	0	0	0	1917.28
104	1222.26	0	0	0	0	1270.2	0	0	0	0	1342.1	0	0	0	3834.56
105	611.13	0	0	0	0	635.1	0	0	0	0	671.05	0	0	0	1917.28
106	611.13	0	128.8175	0	0	635.1	0	155.78	0	0	0	0	527.25	0	2058.08
107	611.13	0	0	0	754.93	635.1	0	0	0	766.12	671.05	0	0	0	4157.29
108	611.13	0	0	0	0	635.1	0	0	0	0	671.05	0	0	0	1917.28
109	1222.26	0	0	0	0	1270.2	0	0	0	0	671.05	0	0	0	3163.51
110	611.13	0	0	0	0	635.1	0	0	0	0	671.05	0	0	0	1917.28
111	611.13	0	0	0	0	635.1	0	0	0	0	671.05	0	0	0	1917.28
112	1222.26	0	0	0	0	1270.2	0	0	0	0	1342.1	0	0	0	3834.56
113	611.13	0	0	0	754.93	635.1	0	0	0	0	671.05	0	0	0	3391.17
114	1222.26	0	0	0	754.93	1270.2	0	0	0	766.12	1342.1	0	0	0	6074.57
115	1833.39	0	0	0	0	1905.3	0	0	0	0	2013.15	0	0	0	5751.84
116	7333.56	0	0	0	0	7621.2	0	0	0	0	8052.6	0	0	0	23007.36
117	1222.26	0	0	0	377.465	1270.2	0	0	0	383.06	1342.1	0	0	0	4954.57
118	0	0	0	0	1132.395	0	0	0	0	1149.18	0	0	0	0	3360.02
119	1833.39	0	0	0	377.465	1905.3	0	0	0	0	2013.15	0	0	0	6488.79
120	3666.78	0	0	0	0	2540.4	0	0	0	0	2013.15	0	0	0	8220.33
121	1833.39	0	0	0	0	1905.3	0	0	0	0	2013.15	0	527.25	0	6279.09
122	3055.65	0	0	0	0	3175.5	0	0	0	0	3355.25	0	0	0	9586.40
123	3055.65	0	0	0	0	5080.8	0	0	0	0	2684.2	0	0	0	10820.65
124	1222.26	0	0	0	0	1905.3	0	0	0	0	1342.1	0	0	0	4469.66
125	611.13	0	0	0	1509.86	317.55	0	0	0	1532.24	1006.575	0	0	0	6415.28
126	3055.65	599.16	515.27	0	0	2540.4	299.58	1246.24	0	0	2684.2	599.16	1054.5	0	13313.12
127	1222.26	0	0	0	0	1905.3	0	0	0	0	671.05	0	0	0	3798.61
128	9778.08	5392.44	8244.32	0	13588.74	10161.6	5392.44	9969.92	0	13790.16	10736.8	5392.44	8963.25	0	114351.47
129	3055.65	299.58	4122.16	0	0	3175.5	599.16	0	0	3830.6	1342.1	299.58	0	0	23913.93
130	2444.52	0	0	0	2264.79	2540.4	0	0	0	1532.24	1342.1	0	0	0	12999.89
131	1222.26	0	0	0	2264.79	1270.2	0	0	0	2298.36	1342.1	0	0	0	10554.59
132	1222.26	0	0	0	0	635.1	0	0	0	766.12	2013.15	0	0	0	5355.59
133	0	0	0	0	0	0	0	0	0	0	3355.25	0	0	0	3355.25
134	3055.65	0	0	0	0	1905.3	0	0	0	0	2013.15	0	0	0	6974.10
135	2444.52	0	0	0	3019.72	2540.4	0	0	0	766.12	671.05	0	0	0	9441.81
136	2444.52	0	0	0	0	3810.6	0	0	0	0	2013.15	0	0	0	8268.27
137	1833.39	0	0	0	0	2540.4	0	0	0	0	1342.1	0	0	0	5715.89
138	1833.39	0	0	0	1509.86	1270.2	0	0	0	1532.24	671.05	0	0	0	7535.70
139	3666.78	0	0	0	1509.86	3810.6	0	0	0	766.12	2013.15	0	0	0	13204.43
140	1833.39	0	0	0	1509.86	1270.2	0	0	0	766.12	671.05	0	0	0	8926.46
141	3055.65	0	0	0	0	3175.5	0	0	0	0	3355.25	0	0	0	9586.40
142	1833.39	0	0	0	754.93	1270.2	0	0	0	2298.36	4026.3	0	0	0	10902.14
143	3055.65	0	0	0	0	3810.6	0	0	0	0	2684.2	0	0	0	9550.45
144	3666.78	0	0	0	0	3175.5	0	0	0	0	4026.3	0	0	0	10868.58

Table B-1 Paint Use Summary and Emissions Estimate

																	Total	
																Spray	Amount of	
	Primer Coat Paint Use in Liters per Week					Topcoat Paint Use in Liters per Weel					Clear Coats Paint Use in Liters per Week					Application	Paint Used	Primer
Shop Code	Lacquer	Enamel	Waterbase	Urethane	Other	Lacquer	Enamel	Waterbase	Polyurethane	Other	Lacquer	Enamel	Waterbase	Polyurethane	Other	Device	liters per week	Lacquer
145	8.00	8.00				12.00	12.00				6.00	6.00				air gun	52	5751.68
146	1.00	1.00					1.00					5.00				air/hplv gun	8	718.96
147	2.00	3.00					1.00					7.00				air gun	13	1437.92
148	0.00	6.00					6.00					4.00				air gun	16	0.00
149	5.00	3.00				5.00	5.00					2.00				air gun	20	3594.80
150	0.00	5.00					5.00									air gun	10	0.00
151	0.00	9.00					9.00					5.00				air gun	23	0.00
152	0.00						7.00					7.00				air gun	14	0.00
153	0.00	0.50					0.50					0.50				air gun	1.5	0.00
154	0.00	9.00				9.00	9.00				5.00	9.00		6.00		air/lp gun	47	0.00
155	2.00	4.00				1.00	4.00				2.00	3.00				air gun	16	1437.92
156	0.00	4.00					4.00					3.00				air gun	11	0.00
total/week		550.25	69.50	148.75	28.00	179.50	562.75	67.00	129.25	1.00	157.00	450.75	61.00	120.75	9.00		2732	141994.60
total/year		28613.00	3614.00	7735.00	1456.00	9334.00	29263.00	3484.00	6721.00	52.00	8164.00	23439.00	3172.00	6279.00	468.00		142064	7383.72
																		8.12

Table B-1 Paint Use Summary and Emissions Estimate

	Emissions gr/week (liters per week times paint class emission factor														
															Total All
	Primer	Primer	Primer	Primer	Topcoat	Topcoat	Topcoat	Topcoat	Topcoat	Clear Coat	Clear Coat	Clear Coat	Clear Coat	Clear Coat	Paints
Shop Code	Enamel	Waterbase	Urethane	Other (a)	Lacquer	Enamel	Waterbase	Urethane	Other, (c)	Lacquer	Enamel	Waterbase (d)	Urethane	Other (e)	(gr/week)
145	4889.04	0	0	0	9059.16	7621.2	0	0	0	4596.72	4026.3	0	0	0	35944.10
146	611.13	0	0	0	0	635.1	0	0	0	0	3355.25	0	0	0	5320.44
147	1833.39	0	0	0	0	635.1	0	0	0	0	4697.35	0	0	0	8603.76
148	3666.78	0	0	0	0	3810.6	0	0	0	0	2684.2	0	0	0	10161.58
149	1833.39	0	0	0	3774.65	3175.5	0	0	0	0	1342.1	0	0	0	13720.44
150	3055.65	0	0	0	0	3175.5	0	0	0	0	0	0	0	0	6231.15
151	5500.17	0	0	0	0	5715.9	0	0	0	0	3355.25	0	0	0	14571.32
152	0	0	0	0	0	4445.7	0	0	0	0	4697.35	0	0	0	9143.05
153	305.565	0	0	0	0	317.55	0	0	0	0	335.525	0	0	0	958.64
154	5500.17	0	0	0	6794.37	5715.9	0	0	0	3830.6	6039.45	0	3163.5	0	31043.99
155	2444.52	0	0	0	754.93	2540.4	0	0	0	1532.24	2013.15	0	0	0	10723.16
156	2444.52	0	0	0	0	2540.4	0	0	0	0	2013.15	0	0	0	6998.07
total/week	336274.28	20820.81	76646.41	23486.68	135509.94	357402.53	20071.86	80538.26	838.81	120280.84	302475.79	18274.38	63665.44	7549.29	1705829.91
total/year	17486.26	1082.68	3985.61	1221.31	7046.52	18584.93	1043.74	4187.99	43.62	6254.60	15728.74	950.27	3310.60	392.56	88703.16
	19.23	1.19	4.38	1.34	7.75	20.44	1.15	4.61	0.05	6.88	17.30	1.05	3.64	0.43	97.57

TABLE B-2. SUMMARY OF SOLVENT USE EMISSIONS

		Prepartion			Clean Up	Total	Total
		Solvent	Clean Up	Clean Up	Solvent	Solvent	Solvent
	Number of	Amount,	Solvent	Solvent	Amount	Amount	Emissions
Shop Code	jobs (a)	liters per week	Type	Quantity, liter/job	liters per week	liters per week	grams per week
1	4	8	thinner	1.00	4.00	12.00	9217.32
2	3	5	thinner	0.50	1.50	6.50	4992.72
3	4	10	thinner	1.00	4.00	14.00	10753.54
4	2	3	thinner	0.25	0.50	3.50	2688.39
5	4	4.5	thinner	0.50	2.00	6.50	4992.72
6	3	4	thinner	0.25	0.75	4.75	3648.52
7	2	3	thinner	0.25	0.50	3.50	2688.39
8	2	5	thinner	0.50	1.00	6.00	4608.66
9	2	2	thinner	0.50	1.00	3.00	2304.33
10	3	4	thinner	0.25	0.75	4.75	3648.52
11	3	22	thinner	1.00	3.00	25.00	19202.75
12	8	10	thinner	0.50	4.00	14.00	10753.54
13	6	5	thinner	0.50	3.00	8.00	6144.88
14	3	4.5	thinner	0.50	1.50	6.00	4608.66
15	3	5	thinner	0.25	0.75	5.75	4416.63
16	5	5	thinner	0.25	1.25	6.25	4800.69
17	4	10	thinner	0.25	1.00	11.00	8449.21
18	5	5	thinner	0.50	2.50	7.50	5760.83
19	4	5	thinner	0.25	1.00	6.00	4608.66
20	6	8	thinner	0.50	3.00	11.00	8449.21
21	6	20	thinner	0.50	3.00	23.00	17666.53
22	4	15	thinner	0.25	1.00	16.00	12289.76
23	4	7.5	thinner	0.50	2.00	9.50	7297.05
24	2	12	thinner	0.50	1.00	13.00	9985.43
25	5	8	thinner	0.50	2.50	10.50	8065.16
26	3	10	thinner	0.50	1.50	11.50	8833.27
27	3	8	thinner	0.25	0.75	8.75	6720.96
28	2	5	thinner	0.25	0.50	5.50	4224.61
29	3	20	thinner	0.50	1.50	21.50	16514.37
30	3	5	thinner	0.50	1.50	6.50	4992.72
31	3	4	thinner	0.25	0.75	4.75	3648.52
32	4	5	thinner	0.50	2.00	7.00	5376.77
33	14	4	thinner	0.25	3.50	7.50	5760.83
34	5	4	thinner	0.25	1.25	5.25	4032.58
35	5	5	thinner	1.00	5.00	10.00	7681.10
36	5	15	thinner	1.50	7.50	22.50	17282.48
37	3		thinner	20.00	60.00	60.00	46086.60
38	6	12	thinner	0.50	3.00	15.00	11521.65
39	3	5	thinner	1.00	3.00	8.00	6144.88
40	1	1.5	thinner	0.15	0.15	1.65	1267.38
41	3	4	thinner	0.50	1.50	5.50	4224.61
42	3	4	thinner	1.00	3.00	7.00	5376.77
43	7	10	thinner	1.25	8.75	18.75	14402.06
44	4	10	strong	1.50	6.00	16.00	12289.76
45	4	5	thinner	2.00	8.00	13.00	9985.43
46	5	20	thinner	0.50	2.50	22.50	17282.48
47	5	10	thinner	1.50	7.50	17.50	13441.93
48	4	10	blend	1.00	4.00	14.00	10753.54
49	4	10	thinner	1.50	6.00	16.00	12289.76
50	3	10	thinner	2.00	6.00	16.00	12289.76
51	5	10	thinner	1.00	5.00	15.00	11521.65
52		9	thinner		0.00	9.00	6912.99
53	4	10	mezcal	2.50	10.00	20.00	15362.20

TABLE B-2. SUMMARY OF SOLVENT USE EMISSIONS

		Prepartion			Clean Up	Total	Total
		Solvent	Clean Up	Clean Up	Solvent	Solvent	Solvent
	Number of	Amount,	Solvent	Solvent	Amount	Amount	Emissions
Shop Code	jobs (a)	liters per week	Type	Quantity, liter/job	liters per week	liters per week	grams per week
54	4	20	blend	1.50	6.00	26.00	19970.86
55	5	10	thinner	1.50	7.50	17.50	13441.93
56	5	20	blend	2.00	10.00	30.00	23043.30
57	7	6	thinner	1.00	7.00	13.00	9985.43
58	3	20	strong	1.00	3.00	23.00	17666.53
59	4	14	thinner	0.25	1.00	15.00	11521.65
60	3	5	thinner	0.50	1.50	6.50	4992.72
61	3	10	thinner	0.50	1.50	11.50	8833.27
62	5	10	thinner	1.00	5.00	15.00	11521.65
63	6	4	thinner	0.50	3.00	7.00	5376.77
64	6	4	thinner	1.00	6.00	10.00	7681.10
65	4	2	thinner	0.50	2.00	4.00	3072.44
66	2	10	thinner	0.50	1.00	11.00	8449.21
67	3	5	thinner	0.50	1.50	6.50	4992.72
68	1	3	thinner	2.50	2.50	5.50	4224.61
69	3	6	thinner	0.50	1.50	7.50	5760.83
70	3	3	thinner	3.50	10.50	13.50	10369.49
71	10	4	creme	1.00	10.00	14.00	10753.54
72	5	5	thinner	0.50	2.50	7.50	5760.83
73	1	8	thinner	0.50	0.50	8.50	6528.94
74	4	4	thinner	0.50	2.00	6.00	4608.66
75	1	5	thinner	1.00	1.00	6.00	4608.66
76	3	2	thinner	0.50	1.50	3.50	2688.39
77	6	6	thinner	1.00	6.00	12.00	9217.32
78	4	8	thinner	1.00	4.00	12.00	9217.32
79	5	7	thinner	0.25	1.25	8.25	6336.91
80	5	3	thinner	0.50	2.50	5.50	4224.61
81	4	5	thinner	0.50	2.00	7.00	5376.77
82	5	4	thinner	0.50	2.50	6.50	4992.72
83	6	7	thinner	0.50	3.00	10.00	7681.10
84	6	3	thinner	0.50	3.00	6.00	4608.66
85	2	5	thinner	0.50	1.00	6.00	4608.66
86	5	12	thinner	0.25	1.25	13.25	10177.46
87	4	4	thinner	0.50	2.00	6.00	4608.66
88	4	3	thinner	1.00	4.00	7.00	5376.77
89	5	3	thinner	0.50	2.50	5.50	4224.61
90	5	5	thinner	0.50	2.50	7.50	5760.83
91	4	2	thinner	0.50	2.00	4.00	3072.44
92	4	2	thinner	0.50	2.00	4.00	3072.44
93	1	5	thinner	1.00	1.00	6.00	4608.66
94	5	2	thinner	0.30	1.50	3.50	2688.39
95	4	3	thinner	1.00	4.00	7.00	5376.77
96	5	8	thinner	0.50	2.50	10.50	8065.16
97	2	1.5	thinner	0.25	0.50	2.00	1536.22
98	8	6	r	0.30	2.40	8.40	6452.12
99	3	4	thinner	0.20	0.60	4.60	3533.31
100	2	3	thinner	0.20	0.40	3.40	2611.57
101	4	2	thinner	0.30	1.20	3.20	2457.95
102	5	4	thinner	0.20	1.00	5.00	3840.55
103	7	5	thinner	0.30	2.10	7.10	5453.58
104	4	5	thinner	0.30	1.20	6.20	4762.28
105	7	4	thinner	0.25	1.75	5.75	4416.63
106	4	6	thinner	0.50	2.00	8.00	6144.88

TABLE B-2. SUMMARY OF SOLVENT USE EMISSIONS

		Prepartion			Clean Up	Total	Total
		Solvent	Clean Up	Clean Up	Solvent	Solvent	Solvent
	Number of	Amount,	Solvent	Solvent	Amount	Amount	Emissions
Shop Code	jobs (a)	liters per week	Type	Quantity, liter/job	liters per week	liters per week	grams per week
107	4	3	thinner	0.10	0.40	3.40	2611.57
108	4	3	thinner	0.10	0.40	3.40	2611.57
109	3	4	thinner	0.50	1.50	5.50	4224.61
110	2	3	thinner	0.25	0.50	3.50	2688.39
111	3	3	thinner	0.12	0.36	3.36	2580.85
112	4	3	thinner	0.50	2.00	5.00	3840.55
113	5	6	thinner	0.25	1.25	7.25	5568.80
114	5	4	thinner	0.30	1.50	5.50	4224.61
115	3	5	thinner	0.20	0.60	5.60	4301.42
116	6	18	thinner	0.50	3.00	21.00	16130.31
117	8	6	thinner	1.00	8.00	14.00	10753.54
118	5	6	thinner	0.10	0.50	6.50	4992.72
119	4	5	thinner	0.50	2.00	7.00	5376.77
120	7	6	thinner	0.50	3.50	9.50	7297.05
121	3	8	thinner	1.00	3.00	11.00	8449.21
122	2	5	thinner	2.00	4.00	9.00	6912.99
123	3	3	thinner	0.75	2.25	5.25	4032.58
124	3	4	thinner	0.10	0.30	4.30	3302.87
125	1	5	thinner	0.50	0.50	5.50	4224.61
126	5	5	blend	0.50	2.50	7.50	5760.83
127	3	2	thinner	0.50	1.50	3.50	2688.39
128	5	5	thinner	0.50	2.50	7.50	5760.83
129	5	10	thinner	0.75	3.75	13.75	10561.51
130	6	5	thinner	0.50	3.00	8.00	6144.88
131	3	3	thinner	0.50	1.50	4.50	3456.50
132	1	5			0.00	5.00	3840.55
133	2	5	thinner	0.50	1.00	6.00	4608.66
134	3	4	thinner	0.50	1.50	5.50	4224.61
135	6	12	thinner	0.25	1.50	13.50	10369.49
136	3	5	thinner	0.50	1.50	6.50	4992.72
137	5	3	thinner	0.50	2.50	5.50	4224.61
138	3	4	thinner	0.50	1.50	5.50	4224.61
139	6	6	thinner	0.50	3.00	9.00	6912.99
140	6	3	thinner	0.50	3.00	6.00	4608.66
141	1	5	thinner	5.00	5.00	10.00	7681.10
142	4	2	thinner	0.50	2.00	4.00	3072.44
143	4	4	thinner	0.50	2.00	6.00	4608.66
144	5	5	thinner	0.75	3.75	8.75	6720.96
145	4	8	thinner	1.00	4.00	12.00	9217.32
146	3	5	thinner	0.25	0.75	5.75	4416.63
147	2	8	thinner	0.50	1.00	9.00	6912.99
148	4	6	thinner	0.75	3.00	9.00	6912.99
149	4	7	thinner	0.25	1.00	8.00	6144.88
150		0.25	thinner	0.25	0.00	0.25	192.03
151	4	5	thinner	0.50	2.00	7.00	5376.77
152	2	12	thinner	0.50	1.00	13.00	9985.43
153	1	0.75	thinner	0.50	0.50	1.25	960.14
154	4	20	thinner	1.00	4.00	24.00	18434.64
155	5	8	thinner	0.50	2.50	10.50	8065.16
156	4	6	thinner	0.50	2.00	8.00	6144.88
totals/week, liters		1012.50			458.61	1471.11	
total/year, liters		52650.00			23847.72	76497.72	

TABLE B-2. SUMMARY OF SOLVENT USE EMISSIONS

		Prepartion			Clean Up	Total	Total
		Solvent	Clean Up	Clean Up	Solvent	Solvent	Solvent
	Number of	Amount,	Solvent	Solvent	Amount	Amount	Emissions
Shop Code	jobs (a)	liters per week	Type	Quantity, liter/job	liters per week	liters per week	grams per week
a A job is defined as an individual					Total emissions gr/week		1129974.30
repair and painting job, the survey is					Total Emissions kg/year		58758.66
dominated by small spot repair jobs					Total Emissions tonnes/year		58.76
					Total Emissions Tons/year		64.63

TABLE B-3 Existing Control Equipment

Shop Code	Total Paint Use (liter/week)	Paint Booth Present	Ventilation Device	Control Device Type	Heat Cure In Use
1	8	No	No	No	No
2	6	No	No	No	No
3	8	No	No	No	No
4	6.5	No	No	No	No
5	10	No	No	No	No
6	2	No	No	No	No
7	7	No	No	No	No
8	9	No	No	No	No
9	2.5	No	No	No	No
10	6.5	No	No	No	No
11	18	Yes	Yes	No	No
12	17	Yes	Yes	No	Yes
13	9	Yes	Yes	Filter	No
14	4	No	No	No	No
15	13	No	Yes	Extractor	No
16	10.5	No	No	No	No
17	10.5	No	No	No	No
18	5	No	No	No	No
19	12	Yes	Yes	No	No
20	13	No	Yes	Filter	Yes
21	12	Yes	Yes	No	No
22	18	No	No	No	No
23	7	No	Yes	No	No
24	18	No	No	No	No
25	18.5	Yes	Yes	Extractor	No
26	10	No	Yes	No	No
27	4.5	Yes	Yes	Filter	No
28	3	Yes	No	No	No
29	9	No	Yes	No	No
30	8	No	No	No	No
31	14	No	No	No	No
32	6	No	No	No	No
33	17.5	No	No	No	No
34	9	No	No	No	No
35	29	No	No	No	No
36	40	No	No	No	Yes
37	204	Yes	Yes	Unknown	No
38	27	No	No	No	Yes
39	29	Yes	Yes	No	No
40	0.75	No	No	No	No
41	3.5	No	No	No	No
42	12	No	No	No	No
43	98	No	No	No	No
44	29	No	No	No	Yes
45	48	Yes	Yes	No	Yes
46	30	Yes	Yes	Filter	No

TABLE B-3 Existing Control Equipment

Shop Code	Total Paint Use (liter/week)	Paint Booth Present	Ventilation Device	Control Device Type	Heat Cure In Use
47	25	Yes	Yes	No	No
48	32	No	No	No	Yes
49	18	No	No	No	No
50	41	No	No	No	No
51	42	No	Yes	Unknown	Yes
52	37	Yes	No	Unknown	No
53	25	No	No	No	No
54	24	No	No	No	No
55	73	Yes	No	No	No
56	29	No	No	No	Yes
57	18	No	No	No	No
58	51	Yes	Yes	Unknown	Yes
59	12	Yes	Yes	Filter	No
60	7	Yes	No	No	No
61	15	Yes	Yes	No	No
62	30	Yes	Yes	Unknown	No
63	24	Yes	Yes	No	No
64	13	No	No	No	No
65	8	No	No	No	No
66	18	Yes	Yes	Filter	Yes
67	15	No	No	No	No
68	6.5	Yes	Yes	No	No
69	12	No	No	No	No
70	8	Mixed	No	No	No
71	3.25	Yes	Yes	Filter	Yes
72	20	No	No	No	No
73	3	Mixed	Yes	No	No
74	11	No	No	No	No
75	15	Yes	Yes	No	No
76	8	No	No	No	No
77	18	No	Yes	No	N/A
78	15	No	No	No	No
79	21.5	Yes	Yes	No	N/A
80	9.5	No	No	No	No
81	20	No	No	No	No
82	22	No	No	No	No
83	26	Yes	Yes	No	No
84	19	No	No	No	No
85	8	Yes	Yes	No	No
86	8	Yes	No	No	No
87	2	No	No	No	No
88	8	No	No	No	No
89	9	No	No	No	No
90	20	No	No	No	No
91	7	No	No	No	No
92	7	No	No	No	No

TABLE B-3 Existing Control Equipment

Shop Code	Total Paint Use (liter/week)	Paint Booth Present	Ventilation Device	Control Device Type	Heat Cure In Use
93	14	Yes	Yes	Unknown	Yes
94	6	No	No	No	No
95	18	No	No	No	No
96	11	No	No	No	No
97	1.5	No	No	No	No
98	11.5	No	No	No	No
99	9	No	No	No	No
100	3	No	No	No	No
101	3	No	No	No	No
102	9	No	No	No	No
103	3	No	No	No	No
104	6	No	No	No	No
105	3	No	No	No	No
106	3.5	No	Yes	No	N/A
107	6	No	No	No	No
108	3	Yes	Yes	Filter	Yes
109	5	No	No	No	No
110	3	No	No	No	No
111	3	No	No	No	No
112	6	No	No	No	No
113	5	No	Yes	No	No
114	9	No	No	No	No
115	9	No	No	No	No
116	36	No	No	No	No
117	7.5	No	No	No	No
118	4.5	Yes	Yes	No	No
119	10	No	No	No	No
120	13	No	No	No	No
121	10	No	No	No	No
122	15	Yes	Yes	No	No
123	17	No	No	No	No
124	7	No	No	No	No
125	9	No	No	No	No
126	24	No	No	No	No
127	6	No	No	No	No
128	205	Yes	Yes	Unknown	No
129	39	Yes	Yes	No	No
130	19	No	No	No	No
131	15	No	No	No	No
132	8	Mixed	No	No	No
133	5	Yes	Yes	No	No
134	11	No	No	No	No
135	14	Yes	No	No	No
136	13	No	No	No	No
137	9	No	No	No	No
138	11	No	No	No	No

TABLE B-3 Existing Control Equipment

Shop Code	Total Paint Use (liter/week)	Paint Booth Present	Ventilation Device	Control Device Type	Heat Cure In Use
139	20	No	No	No	No
140	13	No	No	No	No
141	15	No	No	No	No
142	16	No	No	No	No
143	15	No	No	No	No
144	17	No	No	No	No
145	52	No	No	No	No
146	8	No	No	No	No
147	13	No	No	No	No
148	16	No	No	No	No
149	20	Yes	Yes	No	No
150	10	Yes	Yes	Unknown	No
151	23	No	No	No	No
152	14	Yes	Yes	No	No
153	1.5	Yes	Yes	No	No
154	47	Yes	Yes	No	No
155	16	Yes	No	No	No
156	11	No	No	No	No

Table B-4. Waste Generation Summary

		Average	Season when		Wastes Generated				Comments
	Number of	Time on	Most Jobs	Rags	Sand Paper	Paper	Cans	Tape	
Shop Code	Employees	Job, months	are Done	(kg)	(sheets)	(kg)	(number)	(rolls)	
1	3	62	Steady	0.10	15	1.00	4	10	Untidy appearance, auto repair shop, open to public view
2	2	12	Summer	0.50	5	1.00	3	2	Neat in appearance,
3	3	12	Summer	2.00	10	1.00	3	2	Neat in appearance, no wastes other paint shops in area
4	2	6	Steady	0.50	3	1.00	3	2	Dirty walls, some paint on floor, not a hazard to public
5	2	72	Winter	0.25	10	1.00	3	3	Generally clean and tidy, equipped with fire extinguishers
6	1	4	Summer	0.25	8	2.00	12	2	Also auto repair shop, dirty and greasy, small paint shop use
7	1	2	Steady		4	1.00	2	2	Shop is small and crowded, but neat
8	1	12	Steady	1.00	8	2.00	6	4	Untidy appearance, painting is done outdoors, paint on floor
9	2	12	Steady	0.50	3	0.50		2	Shop is clean in appearance without much activity
10	2	2	Summer		1	0.25	1	1	Also auto repair shop, dirty and parts laying around
11	2	12	Summer	1.00	8	2.00		7	Neat in appearance, significant activity
12	2	24	Winter	6.00	30	5.00	5	4	Neat and clean, large shop neat and clean outside
13	1	12	Winter	1.00	10	1.00	7	3	Neat and clean, clean outside
14	1	1	Steady	1.00	12	1.00	6	3	Shop is in a garage of house, paint on floor, access to public
15	3	100+	Summer		10	0.50	6	3	Neat in appearance, next to a high school
16	2	1	Summer	0.50	8	1.00	3	3	Neat in appearance, operations may affect neighbors
17	2	100+	Summer	0.50	5	2.00	6	4	Shop is small, dirty and crowded, access to public
18	3	12	Steady	1.50	6	1.00		2	Untidy appearance, paint on floor, in residential area
19	2	3	Summer	0.50	10	2.00	8	3	Some paint wastes on floor
20	2	12	Summer	3.00	15	2.00	3	3	Neat and clean, in area with other paint shops
21	7	12	Winter	1.00	10	1.00		3	Neat and clean, in area with other paint shops
22	3	12	Steady	0.50	8	1.00	6	6	Untidy appearance, painting is done outdoors, paint on floor
23	4	60	Winter	1.50	10	1.00		4	Basically neat in appearance
24	2	100+	Steady	0.25	3	0.25		1	Untidy in appearance, in residential area, wastes poured in drain
25	2	100+	Steady	0.25	10	0.50	6	3	Neat in appearance,
26	2	12	Steady	0.50	8	2.00		2	Untidy in appearance,paint on floor
27	3	12	Summer		15	1.00	6	3	Untidy, also used for repair work, paint on floor, in res. zone
28	1	12	Steady	1.00	8	1.00	6	3	Dirty with car parts and oil around,
29	2	2	Steady	2.00	8	2.00	6	3	Neat in appearance, wastes poured down the drain
30	1	100+	Steady	1.00	8	1.00	8	3	Untidy in appearance, plastic, oil and paint on floor
31	4	12	Steady	4.00	10	1.00	3	8	Neat in appearance, paint poured down drain
32	2	100+	Winter	1.50	6	2.00	7	2	Untidy appearance, many materials on floor
33	2	2	Spring		4	4.00			Untidy appearance, considered a possible fire hazard
34	5	2	Steady	1.00	8	1.00		1	Neat in appearance, some wastes poured in drain
35	4	12	Summer		15		4	5	Neat in appearance, good appearance outside
36	6	12	Summer	0.25	10	5.00		5	Neat in appearance
37	4	2	Summer	0.25	20	4.00	4	6	Neat in appearance
38	2	12	Summer	0.50	10		5	10	Neat in appearance
39	2	19	Summer		10	5.00	10	2	Shop not observed
40	1	6	Steady	0.25	4	0.25	2	3	Neat in appearance
41	3	1	Winter		2	0.25	2	1.5	No comments
42	3	36	Fall	2.00	6	2.00	7	2	Neat in appearance
43	6	24	Summer	1.00	10	2.00	5	10	No comments
44	4	24	Summer	0.25	10	5.00	8	10	Neat in appearance
45	4	5	Steady	20.00	10		5	4	Untidy in appearance
46	4	12	Winter	1.00	20		5	5	Neat in appearance
47	4	24	Summer		10	10.00	5	4	Neat in appearance
48	3	12	Summer	0.25	5	4.00	6		Neat in appearance, in residential area nuisance to neighbors
49	2	12	Summer		15	9.00		5	Untidy in appearance
50	5	24	Steady	10.00	5	4.00		7	Neat in appearance
51	5	24	Summer	4.00	20	10.00		9	Untidy, possible fire hazard
52	1	1	Steady	0.50	10	0.50	5	2	Neat in appearance
53	6	12	Summer	5.00	10	5.00		5	Neat in appearance
54	3	12	Spring		20	10.00	4	10	Neat in appearance
55	4	18	Summer	10.00	20	4.00	6	2	Shop not observed
56	5	36	Summer	2.00	15	10.00	8	10	Neat in appearance
57	6	60	Summer	2.00	12	3.00	12	3	Neat in appearance
58	4	10	Summer		10	0.50	5	10	Neat in appearance, noise nuisance to neighbors
59	3	10	Summer	1.00	10		1	2	Neat in appearance
60	2	36	Winter		10	1.00	3	2	Neat in appearance
61	2	24	Steady	0.25	3	10.00	2	5	Neat in appearance
62	3	12	Steady	1.00	5	10.00	5	4	Neat in appearance
63	5	8	Steady	0.50	12	5.00	6	6	Neat in appearance
64	4	18	Steady	2.00	6	2.00	10	3	Neat in appearance
65	3	6	Winter	2.00	5	2.00	6	2	Neat in appearance
66	3	2	Fall		10	0.50	3	5	Neat in appearance
67	3	12	Fall	3.00	8	2.00	5	4	Neat in appearance
68	2	24	Steady	0.25	4	0.50	3	1	Neat in appearance
69	2	8	Fall	2.00	6	1.50	4	5	Neat in appearance
70	2	12	Winter	0.25	3	0.50	2	3	Neat in appearance, some rags laying about
71	2	100+	Summer	0.25	20	0.30		2	Neat in appearance
72	3	8	Fall		8	2.00	4	4	Neat in appearance
73	2	12	Summer	0.25	7	0.50	1	2	Neat in appearance

Table B-4. Waste Generation Summary

		Average	Season when		Wastes Generated				Comments
	Number of	Time on	Most Jobs	Rags	Sand Paper	Paper	Cans	Tape	
Shop Code	Employees	Job, months	are Done	(kg)	(sheets)	(kg)	(number)	(rolls)	
74	3	24	Fall	3.00	8	3.00	5	5	Neat in appearance
75	3	1	Summer	0.25	7	0.50	3	3	Neat in appearance
76	3	6	Fall	2.00	8	2.00	6	2	Neat in appearance
77	4		Winter	3.00	15	4.00	7	8	Neat in appearance
78	3	12	Winter	2.00	8	2.00	6	6	Neat in appearance
79	4	24	Fall	3.00	8	4.00	6	6	Neat in appearance
80	2	14	Fall	1.00	5	5.00		4	Untidy with some buckets and such laying about
81	2	12	Fall	3.00	10	3.00	8	6	Unitdy in appearance, cars blocking street
82	3	36	Fall	1.00	12	2.00	10	8	Neat in appearance
83	4		Fall	2.00	12	3.00	6	7	Neat in appearance
84	4	60	Fall	4.00	12	3.00	8	6	Neat in appearance
85	2	36	Steady						Neat in appearance
86	4	13	Fall	0.25	10	1.00	3	2	Neat in appearance
87	4	15	Steady	1.00	6	1.00	4	1	Untidy in appearance, wastes poured down the drain
88	3	24	Fall	1.00	6	2.00	5	5	Untidy and dirty in appearance
89	4	24	Fall		5	1.00	7	2	Neat in appearance
90	4	8	Fall						Neat in appearance
91	2	24	Steady	2.00	9	1.00	4	2	Untidy possible fire hazard, wastes laying about; poured in drain
92	2	24	Steady	2.00	9	1.00	4	2	Untidy with cans and other wastes laying about
93	2	6	Summer		12	0.50		3	Neat in appearance
94	2	25	Summer	1.00	8	10.00	3	2	No comments
95	3	12	Fall	2.00	6	2.00	7	2	Untidy disorganized, possible fire hazard
96	3	18	Summer	1.00	3	0.50	3	1	Untidy and dirty in appearance
97	1	24	Steady	1.00	3	2.00	2	1	Neat in appearance
98	2	36	Steady	4.00	12	3.00	6	8	Neat in appearance
99	2	12	Summer	1.00	3	0.50	2	3	Dirty in appearance
100	1		Summer		3	1.00	1	1	Operation is undertaken in open on street
101	2		Summer	3.00	6	6.00	3	2	Neat in appearance
102	3	12	Summer	2.00	10	8.00	5	6	Neat in appearance
103	3	48	Steady	3.00	30	2.00	6	4	Neat in appearance
104	2	24	Summer	1.00	4	1.00	3	1	Neat in appearance although run down
105	3	12	Steady	1.00	9	1.00	3	2	Untidy and dirty in appearance
106	3	36	Summer	1.00	5	2.00	3	2	No comments
107	3	24	Steady	0.50	5	1.00	1	2	Untidy in appearance
108	3	12	Steady	1.00	8	1.00	2	2	Neat in appearance
109	2	24	Steady	1.00	4	2.00	2	2	Neat in appearance
110	3	12	Summer	0.50	4	1.00	1	0.5	No comments
111	2	24	Steady	1.00	3	0.50		2	Generally clean and tidy
112	2	48	Summer	2.00	6	2.00	1	3	Untidy in appearance
113	3	12	Summer	0.50	8	0.50	1	2	Neat in appearance
114	2	12	Summer		10	0.50	3	2	Neat in appearance surrounded by walls
115	2	24	Summer	1.00	6	0.50	1	1	Neat in appearance
116	3		Steady	1.00	10	3.00	10	8	Untidy
117	3	48	Summer	4.00	20	3.00	4	3	Neat in appearance
118	5	48	Steady	1.00	8	1.00	5	1	Neat in appearance
119	4	24	Summer	1.00	6	2.00	2	2	Neat in appearance
120	3	24	Summer	0.50	10	0.25	2	2	Neat in appearance
121	2	36	Summer	1.00	6	1.00	1	1	No comments
122	3	7	Summer	0.25	7	0.50	4	3	Neat in appearance
123	0	36	Steady	3.00	12	3.00	5	5	Neat in appearance
124	3	12	Summer	0.20	6	0.25	2	1	No comments
125	N/A	2	Fall	8.00	2	5.00		6	Neat in appearance, some wastes dumped on ground
126	6	24	Summer		10	5.00		2	Neat in appearance
127	4	10	Fall	1.00	5	2.00	5	2	Untidy in appearance , some wastes poured down drain
128	4	2	Summer	4.00	20	4.00	4	6	Neat in appearance
129	3	5	Steady		10	0.25	2	2	N/A
130	6	36	Fall	3.00	10	3.00	12	3	Neat in appearance
131	3	10	Fall	1.00	5	1.00		1	Untidy in appearance, possible fire hazard
132	2	100+	Steady	0.50	2	35.00	1	1	Neat in appearance
133	2	1	Winter		5	1.00	3	2	Neat in appearance
134	5	36	Fall	1.00	12	1.00	7	2	Neat in appearance
135	3	100+	Steady	0.25	15	3.00	3	6	Neat in appearance
136	2	12	Steady	2.00	8	2.00	5	4	Neat in appearance
137	5	36	Steady	1.00	6	1.00	6	1	Untidy in appearance, surrounding area is dirty and untidy
138	3	12	Fall	2.00	5	1.00	6	1	Untidy in appearance
139	4	12	Fall	2.00	8	3.00	5	5	Neat in appearance
140	5	24	Steady		6	1.00	5	1	Neat in appearance
141	2	8	Winter		10	3.00	4	3	Neat in appearance
142	3	10	Steady	1.00	5	2.00	7	2	Neat in appearance
143	3	12	Steady	2.00	8	2.00	5	5	Untidy in appearance some wastes laying about
144	3	8	Steady	3.00	8	2.00	5	5	Neat in appearance
145	2	1	Steady	1.00	10	10.00	8	25	Neat in appearance
146	2	12	Winter		4	5.00		3	Untidy in appearance

Table B-4. Waste Generation Summary

		Average	Season when		Wastes Generated				Comments
	Number of	Time on	Most Jobs	Rags	Sand Paper	Paper	Cans	Tape	
Shop Code	Employees	Job, months	are Done	(kg)	(sheets)	(kg)	(number)	(rolls)	
147	3	14	Fall	1.00	3	4.00		3	Neat in appearance
148	3	12	Steady	2.00	8	2.00	5	4	Neat in appearance
149	2	36	Winter		4	4.00		5	Neat in appearance
150	1	100+	Steady		5	1.00	2	2	Neat in appearance
151	2	18	Winter	0.50	10	2.00	1	4	Neat in appearance
152	2	12	Summer	0.25	10	2.00	5	3	Neat in appearance
153	3	100+	Winter		1	0.10	2		Neat in appearance
154	3	2	Summer	1.00	10	6.00	2	8	Neat in appearance
155	5	36	Fall	6.00	14	4.00	8	8	Neat in appearance
156	3	14	Winter	2.00	14	5.00	7	6	Neat in appearance
total/week				223.05	1349	401.65	603	574	
total/year				11598.60	70148	20885.80	31356	29848	