440179049B

DEVELOPMENT DOCUMENT

for

PROPOSED EFFLUENT LIMITATIONS GUIDELINES, NEW SOURCE PERFORMANCE STANDARDS, AND PRETREATMENT STANDARDS

for the

PAINT FORMULATING POINT SOURCE CATEGORY

Douglas M. Costle
Administrator

Robert B. Schaffer
Director, Effluent Guidelines Division

John E. Riley
Chief, Wood Products and Fibers Branch

James R. Berlow
Project Officer

December, 1979

Effluent Guidelines Division
Office of Water and Waste Management
U.S. Environmental Protection Agency
Washington, D.C. 20460

ABSTRACT

This document presents the findings of an extensive study of the paint manufacturing industry for the purpose of developing effluent limitations for existing point sources and standards of performance for new sources and pretreatment standards for existing and new sources to implement Sections 301, 304, 306 and 307 of the Clean Water Act. The study covers approximately 1500 paint manufacturing facilities in SIC Group 2851.

Effluent limitation guidelines are set forth for the degree of effluent pollutant reduction attainable through application of best available technology economically achievable which must be attained by existing point sources by July 1, 1984. The standards of performance for new sources (NSPS) set forth the degree of effluent pollutant reduction that is achievable through the application of the best available demonstrated control technology, processes, operating methods, or other alternatives. Pretreatment standards for existing and new sources (PSES and PSNS) set forth the degree of effluent pollutant reduction that must be achieved in order to prevent the discharge of pollutants that pass through, interfere with, or are otherwise incompatible with the operation of POTW.

The proposed regulations for BAT, NSPS, PSES and PSNS are based on application of water use reduction, recycle of rinse water, and/or contract hauling to completely eliminate the discharge of pollutants from paint plants.

Supportive data, rationale, and methods of the proposed effluent limitation guidelines and standards of performance are contained in this document.

TABLE OF CONTENTS

Section		Page
I	CONCLUSIONS	1
II	RECOMMENDATIONS	3
III	INTRODUCTION	5
	PURPOSE AND AUTHORITY	5
	SUMMARY OF METHODOLOGY	7
	DATA AND INFORMATION GATHERING PROGRAM	9
	MAILING LIST DEVELOPMENT	9
	GENERAL DESCRIPTION OF INDUSTRY	11
	Number of Manufacturing Sites and Employment	11
	Paint Industry Sales	12
	Geographic Distribution of Paint Plants	12
	Age Distribution of Paint Plants	18
	Organization of Paint Companies	23
	Batch Sizes and Available Tankage	23
	Periods of Operation	23
	Water Usage	26
	Production Characteristics	26
	Raw Materials	40
	Standard Manufacturing Processes	44
	Solvent-Base Paint Operations	46
	Water-Base Paint Operations	48
	Other Manufacturing Operations	51
IV	INDUSTRY SUBCATEGORIZATION	53
	INTRODUCTION	53
	RATIONALE FOR SUBCATEGORIZATION	53
	RAW MATERIALS AND PRODUCTS	53
	PRODUCTION METHODS	53
	SIZE AND AGE OF PRODUCTION FACILITIES	54
	WASTEWATER CHARACTERISTICS	54
	TANK CLEANING TECHNIQUES	54
V	WATER USE AND WASTE CHARACTERISTICS	57
	WASTEWATER SOURCES	57
	Tank and Equipment Cleaning	57
	Other Pollutant Sources	62
	Wastewater Volume	63
	WASTEWATER CHARACTERIZATION	70
	Background	70
	Sampling Data	77
	Mass Loadings	97
	Data Comparisons	97
	Resampling	101

VI SELECTION OF POLLUTANT PARAMETERS 103
INTRODUCTION 103
METHODOLOGY 103
Raw Materials Evaluation 104
Raw Materials Survey 104
Sampling Program 107
Plant Location 107
Plant Size 107
Wastewater Treatment 110
Wastewater Generation 110
Historical Data 110
Toxic Pollutants 110
Direct Dischargers 110
SELECTION OF SAMPLING PLANTS 111
TOXIC POLLUTANTS 111
Pesticides and Metabolites 111
PCB's 112
Phenolic Compounds 113
Volatile Organic Toxic Pollutants 114
Halomethanes 114
Chlorinated Ethanes 115
Aromatic Solvents 116
Chloroaklyl Etheres 117
Dichloropropane and Dichloropropylene 117
Chlorinated Ethylenes 118
Miscellaneous Volatile Organics 119
Semi-Volatile Organic Toxic Pollutants 119
Polynuclear Aromatics (PNA's) 119
Chlorobenzenes 120
Phthalate Esters 120
Haloethers 121
Nitrosamines 122
Nitro-Substituted Aromatics Other than Phenols 122
Benzidine Compounds 122
Miscellaneous Semi-Volatile Organic Toxic Pollutants 122
Inorganic Toxic Pollutants 123
Conventional Pollutant Parameters 124
Nonconventional Pollutant Parameters 124

VII CONTROL AND TREATMENT TECHNOLOGY 125
IN-PLANT WASTEWATER CONTROL STRATEGIES 125
Wastewater Reduction 125
Wastewater Recycle 127
WASTEWATER DISPOSAL 131
WASTEWATER TREATMENT 133
Preliminary Treatment Systems 136
Physical-Chemical Treatment 136
Biological Treatment 141

	Other Wastewater Treatment Systems	142
	EFFECT OF PRODUCTION CHARACTERISTICS ON EFFLUENT QUALITY	146
	MASS BALANCE FOR THE PAINT INDUSTRY	146
VIII	COST, ENERGY, AND NONWATER QUALITY ASPECTS	151
	COSTS	151
	Historical Cost Information	151
	Cost Development	151
	Physical-Chemical Precipitation	157
	Physical-Chemical Pretreatment with Biological Treatment (aerated lagoon)	160
	Wastewater Recycle System	160
	Wastewater Disposal by Contract Hauling	172
	Manual Physical-Chemical Treatment System	172
	Wastewater Reduction System	172
	Cost Summary	178
	NONWATER QUALILTY ASPECTS	178
	Energy	178
	Sludge Quantity and Characteristics	178
	Solvent-Wash Subcategory	181
IX	EFFLUENT REDUCTION ATTAINABLE THROUGH THE APPLICATION OF THE BEST AVAILABLE TECHNOLOGY ECONOMICALLY ACHIEVABLE EFFLUENT LIMITATIONS GUIDELINES	183
	INTRODUCTION	183
	IDENTIFICATION OF BAT TECHNOLOGY	184
	In-Plant CONTROLS	184
	End-of-Pipe Controls	184
	Technology Options Available	184
	RATIONALE USED TO DEVELOP BAT EFFLUENT GUIDELINES	185
	SIZE, AGE, PRODUCTION METHODS, RAW MATERIALS AND PRODUCTS, TANK CLEANING TECHNIQUES	185
	ENGINEERING ASPECTS OF BEST AVAILABLE TECHNOLOGY ECONOMICALLY ACHIEVABLE	186
	NONWATER QUALITY ENVIRONMENTAL IMPACT	186
	TOTAL COSTS OF APPLICATION IN REGARD TO EFFLUENT REDUCTION BENEFITS	187
	BAT EFFLUENT GUIDELINES	187
	REGULATED POLLUTANTS	187
X	NEW SOURCE PERFORMANCE STANDARDS	189
	INTRODUCTION	189
	IDENTIFICATION OF NEW SOURCE PERFORMANCE STANDARDS	189
	RATIONALE USED TO DEVELOP NSPS EFFLUENT GUIDELINES	189
	SIZE, AGE, PRODUCTION METHODS, RAW MATERIALS AND PRODUCTS, TANK CLEANING TECHNIQUES	189
	ENGINEERING ASPECTS OF NEW SOURCE PERFORMANCE STANDARDS	189

	NONWATER QUALITY ENVIRONMENTAL IMPACT	190
	TOTAL COSTS OF APPLICATION IN REGARD TO EFFLUENT REDUCTION BENEFITS	190
	BAT EFFLUENT GUIDELINES	190
	REGULATED POLLUTANTS	190
XI	PRETREATMENT STANDARDS FOR EXISTING SOURCES	191
	INTRODUCTION	191
	IDENTIFICATION OF PRETREATMENT STANDARDS	192
	RATIONALE USED TO DEVELOP PRETREATMENT STANDARDS FOR EXISTING SOURCES	192
	SIZE, AGE, PRODUCTION METHODS, RAW MATERIALS AND PRODUCTS, TANK CLEANING TECHNIQUES	193
	ENGINEERING ASPECTS OF PRETREATMENT STANDARDS FOR EXISTING SOURCES	193
	NONWATER QUALITY ENVIRONMENTAL IMPACT	193
	TOTAL COSTS OF APPLICATION IN REGARD TO EFFLUENT REDUCTION BENEFITS	194
	PRETREATMENT STANDARDS FOR EXISTING SOURCES	194
	REGULATED POLLUTANTS	194
XII	PRETREATMENT STANDARDS FOR NEW SOURCES	197
	INTRODUCTION	197
	IDENTIFICATION OF NEW SOURCE PRETREATMENT STANDARDS	197
	RATIONALE USED TO DEVELOP PSNS EFFLUENT LIMITATIONS	197
	SIZE, AGE, PRODUCTION METHODS, RAW MATERIALS AND PRODUCTS, TANK CLEANING TECHNIQUES	197
	ENGINEERING ASPECTS OF NEW SOURCE PERFORMANCE STANDARDS FOR EXISTING SOURCES	197
	NONWATER QUALITY ENVIRONMENTAL IMPACT	198
	TOTAL COSTS OF APPLICATION IN REGARD TO EFFLUENT REDUCTION BENEFITS	198
	PRETREATMENT STANDARDS FOR NEW SOURCES	198
	REGULATED POLLUTANTS	198
XIII	ACKNOWLEDGEMENTS	199
XIV	REFERENCES	201
XV	GLOSSARY	205
	APPENDIX A	215
	APPENDIX B	229
	APPENDIX C	233
	APPENDIX D	239
	APPENDIX E	249
	APPENDIX F	259
	APPENDIX G	267
	APPENDIX H	331

LIST OF TABLES

Table No.	Title	Page
III-1	Number of Production Employees in Paint Plants (1976)	13
III-2	Paint Industry Profile - 1972 Census of Manufacturers	14
III-3	Estimated U.S. Shipments of Trade Sales By End Use (1974)	15
III-4	Estimated U.S. Shipments of Industrial Finishes by End Use (1974)	16
III-5	Geographical Distribution of Paint Plants	17
III-6	Shipments of Paint Manufacturing Plants By State	20
III-7	Distribution of Large Paint Plants By State	21
III-8	Paint Industry Breakdown by Age	22
III-9	Paint Plant Tankage	24
III-10	Total Paint Industry Tankage	25
III-11	Total Water Usage by the Paint Industry	27
III-12	Water Usage in Paint Plants	28
III-13	Production of Trade Sales Paint	30
III-14	Production of Industrial Sales Paint	31
III-15	Production of Allied Products	32
III-16	Production of Water-Base Paint	33
III-17	Production of Solvent-Base Paint	34
III-18	Production of Other Formulated Products	35
III-19	Production of White or Tint-Base Paint	36
III-20	Production of Color Paint	37
III-21	Usage of Inorganic Pigments by Paint Plants	38

III-22	Usage of Organic Pigments by Paint Plants	39
III-23	Allied Products Produced by the Paint Industry	41
III-24	Comparison of Primarily Water-Base and Primarily Solvent-Base Paint Production Plants	42
III-25	Toxic Pollutant Usage Trends	43
III-26	Slopes and Correlation Coefficients for Plots of Percent Toxic Pollutant Usage Versus Percent Industrial Sales or Percent Solvent-Base Production	45
III-27	Composition of Common Water-Base Paints	50
V-1	Methods of Tank Cleaning Used by Paint Plants	58
V-2	Amount of Water Used to Clean a Paint Tank	61
V-3	Other Pollution Sources	64
V-4	Wastewater Generation	65
V-5	Volume of Wastewater Generated by Paint Plants Producing Primarily Water-Base or Solvent-Base Paints	67
V-6	Wastewater Discharge by the Paint Industry	68
V-7	Volume of Wastewater Discharged by Paint Plants Producing Primarily Water-Base or Solvent-Base Paints	69
V-8	Wastewater Generation per Unit Volume of Water-Base Paint Produced	71
V-9	Wastewater Discharge per Unit Volume of Water-Base Paint Production	72
V-10	Constituents of Paint Manufacturing Plant Wastes in East Bay Municipal Utilities District Researched by NFIC-Denver	74
V-11	Summary of Sampling Data, NFIC-D, 1973	75
V-12	Summary of Data from Two Plants that Submitted Untreated and Treated Historical Analytical Data	76

V-13	Average Untreated Wastewater Concentrations From Seven Plants - Data Submitted with DCP's	78
V-14	Average Treated Wastewater Concentrations From Eight Plants - Data Submitted with DCP's	79
V-15	Characteristics of Paint Plants Sampled During 1976	80
V-16	Average Untreated and Treated Wastewater Concentrations - 1976 Paint Sampling Program	81
V-17	Average Untreated and Treated Wastewater Concentrations for Metals - 1976 Paint Sampling Program	82
V-18	Production Characteristics of Paint Plants Participating in 1977/1978 Sampling Program	83
V-19	Wastewater Characteristics of Paint Plants Participating in 1977/1978 Sampling Program	84
V-20	Wastewater Treatment Methods Used at Paint Sampling Plants	85
V-21	Toxic Pollutants Reported in Sampling Plant Raw Materials	86
V-22	Untreated Wastewater Data Summary - 1977/1978 Sampling Program	87
V-23	Treated Wastewater Data Summary - 1977/1978 Sampling Program	89
V-24	Sludge Data Summary - 1977/1978 Sampling Program	91
V-25	Intake (TAP) Water Data Summary 1977/1978 Sampling Program	93
V-26	Mass Loading from Untreated Paint Wastewater	98
V-27	Average Untreated Wastewater Concentrations	100
V-28	Results of Resampling at Six Plants (One Year Interval)	102
VI-1	Occurrence of Toxic Pollutants in Paint Raw Materials	105

VI-2	Raw Materials Containing Toxic Pollutants Used by the Paint Industry	108
VI-3	Distribution of Paint Plants in Major Metropolitan Areas	109
VII-1	Frequency of Tank Cleaning and Reuse of Paint Wastewater	130
VII-2	Wastewater Disposal Methods	132
VII-3	Handling of Off-Specification Paint	134
VII-4	Wastewater Treatment Methods	135
VII-5	Pollutant Removal Efficiency of Batch Physical-Chemical Treatment Systems	138
VII-6	Biological Treatment by Aerated Lagoon, at One Paint Plant	143
VII-7	Untreated Wastewater Characteristics from Plants with Different Production Characteristics	147
VII-8	Mass Balance for the Paint Industry Through Batch Physical-Chemical Treatment	149
VIII-1	Paint Industry - Dates of Wastewater Treatment System Installations	152
VIII-2	Paint Industry - Capital Costs of Installed Wastewater Treatment System in 1977 Dollars	153
VIII-3	Paint Industry Annual Operating Costs (1977) of Wastewater Treatment Systems	154
VIII-4	Cost (1977) of Sludge Wastewater Removal by Contract Hauler	155
VIII-5	Physical-Chemical Pretreatment System Design Data	158
VIII-6	Physical-Chemical Pretreatment Systems Capital Costs	159
VIII-7	Physical-Chemical Pretreatment Systems Operating Costs	161
VIII-8	Physical-Chemical Pretreatment with Biological	162

Treatment (Aerated Lagoon) Capital Costs

VIII-9 Physical-Chemical Pretreatment with Biological Treatment (Aerated Lagoon) Operating Costs 163

VIII-10 Wastewater Recycle System Design Data 164

VIII-11 Wastewater Recycle System with Contract Hauling of Unreused Wastewater Capital Costs 166

VIII-12 Wastewater Recycle System with Physical-Chemical Treatment of Unreused Wastewater Capital Costs 167

VIII-13 Wastewater Recycle System with Physical-Chemical Pretreatment and Biological Treatment of Unreused Wastewater Capital Costs 168

VIII-14 Wastewater Recycle System with Contract Hauling of Unreused Wastewater Operating Costs 169

VIII-15 Wastewater Recycle System with Physical-Chemical Treatment of Unreused Wastewater Operating Costs 170

VIII-16 Wastewater Recycle System with Physical-Chemical Treatment and Biological Treatment of Unreused Wastewater Operating Costs 171

VIII-17 Wastewater Disposal by Contract Hauling Capital Costs 173

VIII-18 Wastewater Disposal by Contract Hauling Operating Costs 174

VIII-19 Manually Operated Physical-Chemical Pretreatment Systems, Capital Costs 175

VIII-20 Manually Operated Physical-Chemical Pretreatment Systems, Operating Costs 176

VIII-21 Wastewater Reduction Through High Pressure Tank Pinsing 177

VIII-22 Summary of Costs for Various Wastewater Treatment Systems 179

VIII-23 Approximate Energy Usage for Various Wastewater Treatment Alternatives 180

LIST OF FIGURES

Figure No.	Title	Page
III-1	Geographical Distribution of Paint Manufacturing Sites	19
III-2	Flow Diagram of Manufacturing Process for Solvent-Base Paint	47
III-3	Flow Diagram of Manufacturing Processes for Water-Base Paint	49
VII-1	Flow Diagram for a Wastewater Recycle System	128
VII-2	Flow Diagram for a Batch Physical/Chemical Treatment System	137
VII-3	Flow Diagram for a Batch Physical-Chemical Pretreatment System Followed by Biological Treatment	145

SECTION I

CONCLUSIONS

For the purpose of establishing wastewater effluent limitation guidelines for existing sources and standards of performance for new sources, the paint manufacturing point source category has been subcategorized as follows:

1. Solvent-wash
2. Caustic and/or water-wash

Tank cleaning techniques constitute the only valid technical basis for subcategorization; raw materials and production methods are not valid bases for subcategorization except as they influence tank cleaning techniques. Production methods, size, age, and wastewater constitutents of paint manufacturing facilities were not found to be a basis for subcategorization.

The most significant pollutants and pollutant parameters appearing in the wastewater in terms of occurrence and concentration for the industry include: the conventional and nonconventional pollutants BOD_5, TSS, pH, COD, and oil and grease; and the following toxic pollutants:

Chromium (Total)	Carbon Tetrachloride
Copper (Total)	Ethylbenzene
Lead (Total)	Naphthalene
Mercury (Total)	Di (2-ethylhexyl) Phthalate
Nickel (Total)	Di-n-butyl Phthalate
Zinc (Total)	Tetrachloroethylene
Benzene	Toluene

All discharges of these pollutants will cease under proposed best available treatment economically achievable (BAT), new source performance standards (NSPS), and pretreatment standards for new and existing sources (PSNS and PSES).

The Agency estimates total investment costs for the proposed regulations (BAT, NSPS, PSNS, PSES) to be 10.8 million dollars. Associated annualized costs (including interest, depreciation, operation, and maintenance) are estimated to be 11 million dollars. Compliance with the regulations, assuming no increase in cost of paint, may lead to the closure of as many as 232 facilities (15.4% of all facilities). Associated with these closures would be the loss of approximately 1,160 jobs (less than 2% of industry employment).

Compliance with the proposed regulation will increase energy consumption by up to 12 million kWh/yr for recycle and high pressure washing technologies.

Generation of hazardous wastes subject to the Resource Conservation and Recovery Act (RCRA) may be as high as 150,000 to 300,000 metric tons per year. EPA expects no significant changes in terms of air emissions, noise, or radiation.

SECTION II

RECOMMENDATIONS

Based on the findings of this study, EPA recommends that wastewater effluent limitations attainable through the application of best available technology economically achievable (BAT) rest on reduction of water use, recycling of rinse water back into products, and/or contract hauling to completely eliminate the discharge of pollutants from all paint manufacturing facilities.

Similarly, EPA recommends that standards of performance for new sources (NSPS) and pretreatment standards for new and existing sources (PSNS and PSES) require complete elimination of pollutant discharges from paint manufacturing facilities.

SECTION III

INTRODUCTION

PURPOSE AND AUTHORITY

The Federal Water Pollution Control Act Amendments of 1972 established a comprehensive program to "restore and maintain the chemical, physical, and biological integrity of the Nation's waters," Section 101(a). By July 1, 1977, existing industrial dischargers were required to achieve "effluent limitations requiring the application of the best practicable control technology currently available" (BPT), Section 301(b)(1)(A); and by July 1, 1983, these dischargers were required to achieve "effluent limitations requiring the application of the best available technology economically achievable . . . which will result in reasonable further progress toward the national goal of eliminating the discharge of all pollutants" (BAT), Section 301(b)(2)(A). New industrial direct dischargers were required to comply with Section 306 new source performance standards (NSPS), based on best available demonstrated technology; and new and existing dischargers to publicly owned treatment works (POTW) were subject to pretreatment standards under Sections 307(b) and (c) of the Act. While the requirements for direct dischargers were to be incorporated into National Pollutant Discharge Elimination System (NPDES) permits issued under Section 402 of the Act, pretreatment standards were made enforceable directly against dischargers to POTW (indirect dischargers).

Although Section 402(a)(1) of the 1972 Act authorized the setting of requirements for direct dischargers on a case-by-case basis, Congress intended that, for the most part, control requirements would be based on regulations promulgated by the Administrator of EPA. Section 304(b) of the Act required the Administrator to promulgate regulations providing guidelines for effluent limitations setting forth the degree of effluent reduction attainable through the application of BPT and BAT. Moreover, Sections 304(c) and 306 of the Act required promulgation of regulations for NSPS, and Sections 304(f), 307(b), and 307(c) required promulgation of regulations for pretreatment standards. In addition to these regulations for designated industry categories, Section 307(a) of the Act required the Administrator to promulgate effluent standards applicable to all dischargers of toxic pollutants. Finally, Section 301(a) of the Act authorized the Administrator to prescribe any additional regulations "necessary to carry out his functions" under the Act.

The EPA was unable to promulgate many of these regulations by the dates contained in the Act. In 1976, EPA was sued by several environmental groups, and in settlement of this lawsuit EPA and the plaintiffs executed a "Settlement Agreement," which was approved by

the Court. This Agreement required EPA to develop a program and adhere to a schedule for promulgating for 21 major industries BAT effluent limitations guidelines, pretreatment standards, and new source performance standards for 65 "priority" pollutants and classes of pollutants. See Natural Resources Defense Council, Inc. v. Train, 8 ERC 2120 (D.D.C. 1976), modified March 9, 1979.

On December 27, 1977, the President signed into law the Clean Water Act of 1977. Although this law makes several important changes in the federal water pollution control program, its most significant feature is its incorporation into the Act of several of the basic elements of the Settlement Agreement program for toxic pollution control. Sections 301(b)(2)(A) and 301(b)(2)(C) of the Act now require the achievement by July 1, 1984, of effluent limitations requiring application of BAT for "toxic" pollutants, including the 65 "priority" pollutants and classes of pollutants which Congress declared "toxic" under Section 307(a) of the Act. Likewise, EPA's programs for new source performance standards and pretreatment standards are now aimed principally at toxic pollutant controls. Moreover, to strengthen the toxics control program, Congress added Section 304(e) to the Act, authorizing the Administrator to prescribe "best management practices" (BMP's) to prevent the release of toxic and hazardous pollutants from plant site runoff, spillage or leaks, sludge or waste disposal, and drainage from raw material storage associated with, or ancillary to, the manufacturing or treatment process.

In keeping with its emphasis on toxic pollutants, the Clean Water Act of 1977 also revised the control program for non toxic pollutants. Instead of BAT for "conventional" pollutants identified under Section 304(a)(4) (including biochemical oxygen demand, suspended solids, fecal coliform and pH), the new Section 301(b)(2)(E) requires achievement by July 1, 1984, of "effluent limitations requiring the application of the best conventional pollutant control technology" (BCT). The factors considered in assessing BCT for an industry include the costs of attaining a reduction in effluents and the effluent reduction benefits derived compared to the costs and effluent reduction benefits from the discharge of publicly owned treatment works (Section 304(b)(4)(B)). For nonconventional pollutants, Sections 301(b)(2)(A) and (b)(2)(F) require achievement of BAT effluent limitations within three years after their establishment or July 1, 1984, whichever is later, but not later than July 1, 1987.

The purpose of this report is to provide the technical data support for any BAT, BCT, NSPS, pretreatment standards for existing sources (PSES), and pretreatment standards for new sources (PSNS), which EPA may choose to issue for the unregulated segments of the paint industry, under Sections 301, 304, 306, 307 and 501 of the Clean Water Act.

SUMMARY OF METHODOLOGY

This document summarizes data concerned with wastewater generated by the paint industry. The initial task was to review previous EPA work on the industry; reports that provided background information included:

- "Waterborne Wastes of the Paint and Inorganic Pigments Industries, (1974)"(1).

This report was prepared for the EPA National Environmental Research Center, Office of Research and Development, Cincinnati by the Southern Research Institute (SRI) of Birmingham, Alabama. The document, referred to as the "SRI report," was published March, 1974 and was the first EPA effort to characterize the wastewater generation and practices of the paint industry. The data presented in the report were developed through a survey questionnaire sent to 153 paint plants in 1972. The SRI report was the basis for comparison with industry information compiled in the course of the current report.

- "Development Document for Effluent Limitations Guidelines and New Source Performance Standards for the Oil-Base Solvent-Wash Subcategories of the Paint and Ink Formulating Point Source Category, (1975)"(2)

Prepared by the EPA National Field Investigation Center in Denver (NFIC-D), this document served as the basis for the July 28, 1975 regulations (40 CFR 446) that set forth no discharge for BPT, BAT, NSPS and New Source Pretreatment Standards for the Oil-Base Solvent-Wash Subcategories. The information in this document was based on the SRI report and on data provided by the East Bay Municipal Utilities District (EBMUD) of Oakland, California about several paint plant wastewaters.

- "Draft Development Document for Effluent Limitations Guidelines, Pretreatment Standards, and New Source Performance Standards, Paint and Ink Formulating Point Source Categories, (1976)"(3)

This Draft Development Document, prepared by Burns and Roe for EGD, was never released. Referred to as the "1976 study",it provides additional detailed information related to wastewater management in those segments of the paint industry not covered by the July 28, 1975 no discharge regulations. The data presented in the 1976 report were based on a program of sampling and analysis at nine paint plants practicing physical-chemical or gravity settling treatment, as well as on numerous other plant visits and evaluations. Analytical data developed during this study were for conventional, nonconventional, and inorganic toxic pollutants.

"Assessment of Industrial Hazardous Waste Practices: Paint and Allied Products Industry, Contract Solvent Reclaiming Operations, and Factory Applied Coatings, (1976)"(4)

This document was prepared by the EPA Office of Solid Waste Management Programs. The report focused on the hazardous waste aspects of the paint industry and served as a good source of confirming information and comparison with survey data generated during the current study.

Review of these documents showed the need for additional information to profile the paint industry, as well as to properly quantify the impact of toxic pollutants as required by the Settlement Agreement.

Development of the needed information included the following tasks:

Industry survey;
Industry profile;
Wastewater sampling program;
Industry subcategorization;
Water use and wastewater characterization;
Selection of pollutant parameters;
Description of control and treatment technologies;
Cost data development.

First, EPA studied the paint formulating industry to determine whether differences in raw materials, final products, manufacturing processes, equipment, age and size of plants, water usage, wastewater constituents, or other factors required the development of separate effluent limitations and standards for different segments of the industry.

Next, EPA identified several distinct control and treatment technologies, including both in-plant and end-of-process technologies, which are in use or capable of being used in the paint formulating industry. The Agency compiled and analyzed historical data and newly generated data on the effluent quality resulting from the application of these technologies. The long term performance, operational limitations, and reliability of each of the treatment and control technologies were also identified. In addition, EPA considered the nonwater quality environmental impacts of these technologies, including impacts on air quality, solid waste generation, water scarcity, and energy requirements.

The Agency then estimated the costs of each control and treatment technology from unit cost curves developed by standard engineering analysis as applied to paint formulating wastewater characteristics. EPA derived unit process costs from model plant characteristics (production and flow) applied to each treatment process unit cost curve. These unit process costs were added to yield total cost at

each treatment level. After confirming the reasonableness of this methodology by comparing EPA cost estimates to treatment system costs supplied by the industry, the Agency evaluated the economic impacts of these costs.

Upon consideration of these factors, as more fully described below, EPA identified various control and treatment technologies as BAT, PSES, PSNS, and NSPS. The proposed regulations, however, do not require the installation of any particular technology. Rather, they require achievement of effluent limitations representative of the proper operation of these technologies or equivalent technologies.

The ultimate goal of this work was to provide sufficient data for rulemaking in the unregulated segments of the paint industry. The remaining sections of this document discuss the results of each task in detail.

DATA AND INFORMATION GATHERING PROGRAM

EPA surveyed the paint manufacturing industry through the Data Collection Portfolio (DCP). This consisted of a questionnaire and some explanatory material and was intended to gather data for the unregulated segments on the paint industry. The DCP was divided into seven sections:

- General Information
- Plant Operations
- Production Characteristics
- Tank and Equipment Cleaning (representing a major wastewater source in many paint plants)
- Other Wastewater Sources
- Wastewater Handling and Disposal
- Raw Materials

This final format, as depicted in Appendix A, represents several stages of development, including review by members of the National Paint and Coatings Association (NPCA) Water Quality Task Force and EPA.

MAILING LIST DEVELOPMENT

Rather than attempt to contact a small but statistically valid sample of the paint industry, it was determined that through the use of computerized marketing information services, virtually all paint manufacturing sites could be identified for receipt of a Data Collection Portfolio (DCP). To accomplish this, a copy of the Dun and Bradstreet (D&B) "Dun's Market Identifiers" computer data tapes was obtained. On these tapes, general business information is recorded according to Standard Industrial Classification (SIC) for essentially

all commercial establishments in the United States. For SIC 2851, Paint and Allied Products, the D&B tapes utilized contain 2,148 entries. In contrast to this, standard references, such as the 1972 Census of Manufacturers(7) indicated that only about 1600 operating paint plants existed in the United States at the time.

To avoid mailing DCP forms to inappropriate respondents, the D&B data were checked against two standard paint industry references: the 1975 Kline Guide to the Paint Industry(5) and the 1976 Paint Red Book(6). All sites listed under SIC 2851 on the D&B tapes were manually checked against these two references. The cross-check yielded a number of additions and deletions to the list. The resultant mailing list contained 2,778 names and addresses of potential paint manufacturing sites. While it was expected that the number of entries on this list exceeded the actual number of paint manufacturing sites due to duplications, incorrect addresses, plant closures and relocations, attempts at further refinements were not expected to be productive.

This final mailing list was computerized and transferred to address labels to facilitate distribution. Each address was given a unique code number to assure that each response would be appropriately catalogued.

Response to the survey varied. Of the 2,778 DCPs mailed out:

1,374 Portfolio questionnaires were returned and encoded on the data tapes.

616 Portfolios were marked "Not a Manufacturing Site" indicating that the portfolio was received by a corporate, retail, or other site not involved in paint manufacture.

63 Portfolios were mailed to paint manufacturers who were no longer in business.

58 Portfolios were duplicates mailed to operating paint production plants.

155 Portfolios were undeliverable and returned.

508 Nonrespondent; portfolios which were received by the site but not completed

4 Portfolios were returned after development of the computer tapes and were not included on data reports or profile information.

Twenty firms (about 4 percent of the total number of nonrespondents) were randomly selected for telephone interview. The results indicate that of the plants contacted, 30 percent manufacture paint (all of these plants have been classified as very small for the EPA economic analysis), and 30 percent do not manufacture paint. The remaining 40 percent could not be contacted at the address used on the mailing list. The telephone survey established that there are approximately 1500 paint plants.

All DCP respondents were instructed to answer survey questions pertaining to annual production or employment on the basis of their 1976 operations. For all other questions, the respondents were directed to provide information on the basis of current operations. Consequently, the bulk of the survey information used in the following profile of the industry is based on operation during mid-1977.

GENERAL DESCRIPTION OF THE INDUSTRY

The major products of the paint industry (SIC 2851) are (1) trade sales paints, also called architectural coatings, which are primarily off-the-shelf exterior and interior paints for buildings and other structures; and (2) industrial sales paints, also called chemical coatings, sold to manufacturers for factory application to such products as automobiles, aircraft, furniture, machinery, etc.

In addition to paints, the industry produces varnishes and lacquers, which consist of film-forming binders (resins or drying oils) dissolved in volatile solvents or dispersed in water. The industry also produces such allied products as putty, caulking compounds, sealants, paint and varnish removers, and thinners. These items are part of the "Allied Products" segment of SIC 2851.

Number of Manufacturing Sites and Employment

The number of paint manufacturing sites and overall paint industry employment could not be precisely fixed because of uncertainty associated with the DCP responses. The uncertainty stems from the fact that an exact description of the 508 nonrespondents could not be determined. However, based on the random survey of the nonrespondents, the total number of paint manufacturing sites is estimated to be 1,500. Furthermore, approximately 1,150 to 1,300 companies are estimated to operate these paint plants. As a comparison, the 1972 Census of Manufacturers put the total number of paint manufacturing sites at 1,599, down from 1,788 plants a decade earlier. Furthermore, a comparison of DCP responses with the Paint Red Book and the Kline Guide plant listings shows approximately 100 percent response to the DCP from the largest plants.

Based on the DCP responses, the number of employees involved in paint production during 1976 averaged about 43,000. The 1972 Census of Manufacturers placed the total paint industry employment at approximately 66,000 with 36,000 directly involved in paint production.

The DCP responses showed that the paint industry contains a large proportion of small plants. According to the DCP, 41 percent of the companies responding had less than 10 employees. A breakdown of plant size according to number of employees based on the Data Collection Portfolios is presented in Table III-1. Table III-2 presents a similar paint industry employment breakdown (as well as some sales data) from the 1972 Census of Manufacturers. According to the 1972 census, 39.3 percent of paint plants had less than nine employees. Comparison of the 1972 census data and the DCP responses indicates that the number of plants reporting over 100 employees declined during the 1970's by 27 percent, twice as great a decline as reported for the total number of plants.

Paint Industry Sales

DCP responses also revealed that despite their numerical domination of the industry, the smallest paint companies account for only 5% of industry sales; the four largest companies, on the other hand, accounted for 30% of paint sales in 1974.

In 1972, the Census of Manufacturers valued total paint production at $3.8 billion. According to the Kline Guide, for 1974 the value of trade sales products amounted to $1.87 billion and the value of industrial finishes was $1.8 billion, or a total of $3.67 billion. Shipments in 1974 were 1.8 billion liters (475 million gallons) of trade sales products and 1.7 billion liters, (457 million gallons) of industrial finishes, or a total of 3.5 billion liters (0.932 billion gallons). DCP responses indicate that the industry shipped about 3.8 billion liters (1 billion gallons) of paint in 1976 valued at approximately $4 billion. The quantity and value of shipments of trade sale products as reported in the Kline Guide are shown in Table III-3. Table III-4 depicts similar information for industrial finishes. Additional data on the dollar value of paint shipments from both the 1972 Census of Manufacturers and from the DCP responses are also presented in Table III-5.

Geographic Distribution of Paint Plants

The overall geographic distribution of paint plants is depicted in Figure III-1 and on Table III-6. Paint plants tend to be clustered around population centers, due to the expense of transporting paint long distances. As shown in Table III-6, five states (California, New Jersey, New York, Illinois, and Ohio) contain 626 plants, or 46

TABLE III-1

NUMBER OF PRODUCTION EMPLOYEES IN PAINT PLANTS (1976)

Number of Employees	Number of Plants	Percent of Total
0-10	562	40.9
11-20	286	20.8
21-30	134	9.8
31-40	64	4.7
41-50	66	4.8
51-60	49	3.6
61-70	30	2.2
71-80	15	1.1
81-90	19	1.4
91-100	19	1.4
101-150	52	3.8
Over 150	53	3.9
No Data	25	1.8
Total	1374	100%

Source: DCP

TABLE III-2

PAINT INDUSTRY PROFILE
1972 CENSUS OF MANUFACTURERS

Number of Employees	Number of Plants	Percent of All Plants	Value of Shipments ($million)	Percent of All Shipments
1-9	629	39.3	$ 125	3.3
10-19	283	17.7	208	5.4
20-49	347	21.7	581	15.2
50-99	196	12.3	748	19.6
Over 100	144	9.0	2,163	56.5
TOTAL	1599	100.0%	$3,825	100.0%

Source: 1972 Department of Commerce Census of Manufacturers

TABLE III-3

ESTIMATED U.S. SHIPMENTS OF
TRADE SALES BY END USE (1974)

End Use	Million Liters	Million Gallons	Million Dollars
Interior Finishes			
House paints			
Water emulsion			
Flat	473	125	$ 370
Semigloss	151	40	145
All purpose	49	13	35
Other	45	12	40
Total	719	190	590
Oil and alkyd			
Flat	38	10	40
Semigloss	57	15	70
High-gloss	57	15	90
Undercoaters, primers	19	5	20
Total	170	45	220
Miscellaneous[a]	114	30	110
Total interior	1003	265	920
Exterior Finishes			
House paints			
Water emulsion	341	90	330
Oil and alkyd	76	20	130
Enamels	38	10	65
Undercoaters, primers	38	10	35
Total	492	130	560
Miscellaneous[b]	57	15	105
Total exterior	549	145	665
Other Trade Sales Products			
Automotive refinishing	132	35	200
Traffic paints	95	25	60
Other[c]	19	5	26
Total other	246	65	286
Total, Trade sales	1798	475	$1,871

a-Includes stains, varnishes, seamless flooring and ceramic-like tile
b-Includes, barn, roof and fence coatings, bituminous products, metallic paints, stains and varnishes.
c-Mostly marine shelf goods.
Source: Estimates by C.H. Kline & Co., Copyright 1975.

TABLE III-4

ESTIMATED U.S. SHIPMENTS OF
INDUSTRIAL FINISHES BY END USE (1974)

	Million Liters	Million Gallons	Million Dollars
Transportation equipment			
Motor vehicles	246	65	$ 290
Marine	57	15	70
Railroad, aircraft, & other	57	15	40
	360	95	400
Industrial maintenance	208	55	220
Furniture			
Wood	189	50	125
Metal	95	25	90
	284	75	215
Prefinished stock			
Metal	114	30	140
Wood	76	20	65
	190	50	205
Metal decorating			
Packaging	189	50	170
Other	57	15	50
	246	65	220
Machinery and equipment[a]	114	30	120
Appliances	76	20	90
Packaging, exc. metal	38	10	35
Miscellaneous	215	57	296
TOTAL	1730	457	$1,801

a-- Includes data for insulating varnishes and magnet wire enamels

Source: C. H. Kline & Co., Copyright 1975.

TABLE III-5

GEOGRAPHICAL DISTRIBUTION OF PAINT PLANTS

EPA Region	Number of Plants: Total	0-20 Employees	20-100 Employees	Over 100 Employees	Not Indicated
Region I					
Connecticut	10	6	4	0	0
Maine	3	3	0	0	0
Massachusetts	54	36	16	1	1
New Hampshire	3	2	1	0	0
Rhode Island	5	4	1	0	0
Vermont	2	1	1	0	0
Total	77	52	23	1	1
Region II					
New Jersey	112	60	37	10	5
New York	109	84	17	6	2
Puerto Rico	6	3	2	1	0
Virgin Islands	0	0	0	0	0
Total	227	147	56	17	7
Region III					
Delaware	3	0	3	0	0
D.C.	0	0	0	0	0
Maryland	20	8	10	2	0
Pennsylvania	66	40	19	6	1
Virginia	13	6	7	0	0
West Virginia	4	3	1	0	0
Total	106	57	40	8	1
Region IV					
Alabama	12	6	4	2	0
Florida	69	59	8	0	2
Georgia	35	20	10	4	1
Kentucky	22	5	13	4	0
Mississippi	5	4	1	0	0
North Carolina	20	9	7	3	1
South Carolina	5	3	1	1	0
Tennessee	17	9	6	2	0
Total	185	115	50	16	4
Region V					
Illinois	106	50	38	15	3
Indiana	34	22	8	4	0
Michigan	47	25	16	5	1
Minnesota	19	12	6	1	0
Ohio	103	60	31	10	2
Wisconsin	34	26	6	1	1
Total	343	195	105	36	7
Region VI					
Arkansas	7	5	1	1	0
Louisiana	15	11	4	0	0
New Mexico	3	2	1	0	0
Oklahoma	9	7	1	0	1
Texas	58	34	18	6	0
Total	92	59	25	7	1
Region VII					
Iowa	13	8	4	1	0
Kansas	10	6	2	2	0
Missouri	51	30	16	5	0
Nebraska	2	2	0	0	0
Total	76	46	22	8	0
Region VIII					
Colorado	11	8	3	0	0
Montana	3	3	0	0	0
North Dakota	0	0	0	0	0
South Dakota	1	1	0	0	0
Utah	4	3	1	0	0
Wyoming	1	1	0	0	0
Total	20	16	4	0	0
Region IX					
Arizona	6	4	2	0	0
California	196	123	57	12	4
Hawaii	0	0	0	0	0
Nevada	1	1	0	0	0
Total	203	128	59	12	4
Region X					
Alaska	1	1	0	0	0
Idaho	2	2	0	0	0
Oregon	20	14	6	0	0
Washington	22	16	6	0	0
Total	45	33	12	0	0
Accumulative Total	1374	848	396	105	25

Source: DCP

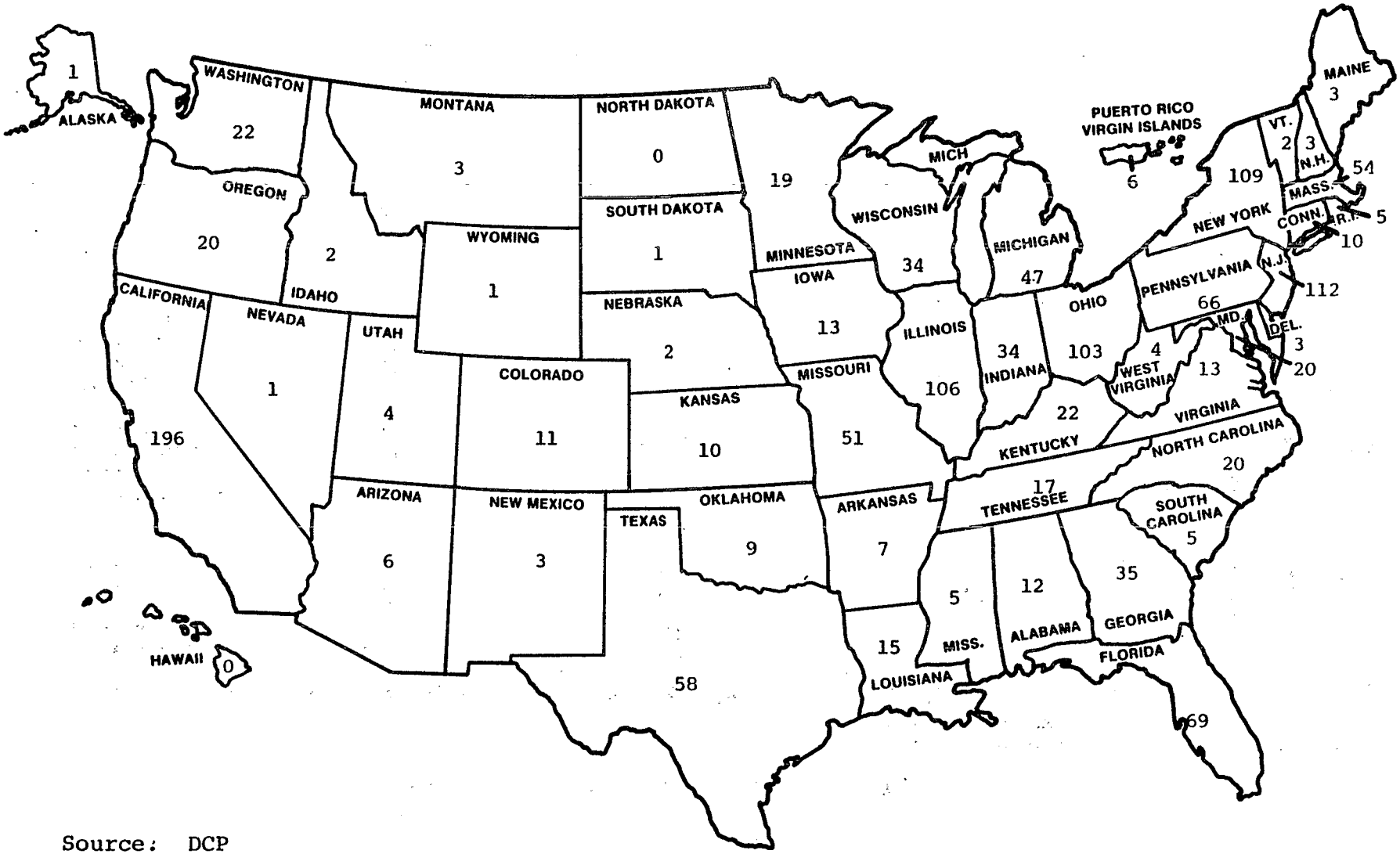
percent of the 1,374 plants responding to the DCP. Ten states have 67 percent of all paint plants within their boundaries and 20 states have 87 percent of all plants. The states with the largest concentration of plants also account for most of the dollar volume of paint shipments. Generally, the value of paint produced is proportional to the number of plants in a state; however, there are some exceptions. Illinois, for example, which is fourth in the number of paint plants, has more large plants than any other state and consequently is second only to California in paint shipments. New York and Florida, which have a preponderance of small paint plants, produce proportionally less paint per plant than average.

The 1972 census and DCP data on geographic distribution presented jointly in Table III-6 basically agree on a state-by-state basis. The 1972 census however, shows more industry concentration than do the DCP responses. shipments originate in 19 states, while the DCP shows those 19 states accounting for both 86 percent of shipments and 86 percent of plant sites. The value of paint shipments was calculated by multiplying the number of plants responding to each size range as designated in the DCP, by the midpoint of the dollar range. For the 111 plants indicating shipments of over $10 million, an assumed average value of $15 million per plant was used.

Large paint plants generally follow the distribution of the industry as a whole. A tabulation of the location by state, of plants with over 50, and over 100 employees is presented in Table III-7. The thirteen states on Table III-7 contained approximately 70 percent of all paint plant sites, 80 percent of all plants with over 50 employees, and 85 percent of all paint plants with over 100 employees. As with production volume, California and Illinois have the most large paint plants, followed by Ohio and New Jersey. These four states have 46 percent of the large paint plants vs. 38 percent of all plants and 42 percent of production value.

Age Distribution of Paint Plants

The paint industry breakdown by age of manufacturing facility is presented in Table III-8. A cross tabulation of plant age and number of employees included in Appendix B indicates that over 50 percent of the paint plants with over 100 employees are more than 30 years old (vs. 31 percent industry-wide), and less than one quarter of the plants with under ten employees are in facilities over 30 years old. Only 14 percent of large plants are in facilities less than ten years old, while 31 percent of small plants are in less than ten year old facilities (vs. 25 percent industry-wide).



Source: DCP

FIGURE III-1

GEOGRAPHICAL DISTRIBUTION OF PAINT MANUFACTURING SITES

TABLE III-6

SHIPMENT OF PAINT MANUFACTURING PLANTS BY STATE

State	Number of Plants	Percent of Plants	DCP Responses % of all Shipments by Dollar Value	1972 Census % of all Shipments by Dollar Value
California	196	14.3	13.7	13.0
New Jersey	112	8.2	8.2	10.5
New York	109	7.9	4.9	5.7
Illinois	106	7.7	11.4	13.2
Ohio	103	7.5	8.9	9.5
Florida	69	5.0	1.7	1.6
Pennsylvania	66	4.8	4.4	6.2
Texas	58	4.2	5.9	5.9
Massachusetts	54	3.9	2.2	1.8
Missouri	51	3.7	3.9	4.1
Michigan	47	3.4	4.3	5.6
Georgia	35	2.5	3.1	3.4
Indiana	34	2.5	2.1	1.6
Wisconsin	34	2.5	1.4	1.3
Kentucky	22	1.6	2.9	3.9
Washington	22	1.6	1.3	0.7
Maryland	20	1.5	2.4	2.1
North Carolina	20	1.5	2.7	1.9
Oregon	20	1.5	0.6	NA
Minnesota	19	1.4	0.6	1.0
All Others	177	12.9	13.4	17.11

Sources: DCP and 1972 Department of Commerce Census of Manufacturers

TABLE III-7

DISTRIBUTION OF LARGE PAINT PLANTS, BY STATE

State	Percent of All Paint Plants	Number of Plants with Over 100 Employees	Percent of Total	Number of Plants with Over 50 Employees	Percent of Total
Illinois	7.7	15	14.3	32	13.5
California	14.3	12	11.4	32	13.5
New Jersey	8.2	10	9.5	23	9.7
Ohio	7.5	10	9.5	22	9.3
New York	7.9	6	5.7	11	4.6
Pennsylvania	4.8	6	5.7	8	3.4
Texas	4.2	6	5.7	12	5.1
Michigan	3.4	5	4.8	12	5.1
Missouri	3.7	5	4.8	9	3.8
Georgia	2.5	4	3.8	7	3.0
Indiana	2.5	4	3.8	7	3.0
Kentucky	1.6	4	3.8	10	4.2
North Carolina	1.5	3	2.9	5	2.1
All Others	31.2	15	14.3	47	19.8
TOTAL	100%	105	100%	237	100%

Source: DCP

TABLE III-8

PAINT INDUSTRY BREAKDOWN BY AGE

Age	Number of Plants	Percent
Less than 3 years	67	4.9
3 to 5 years	102	7.4
6 to 10 years	168	12.2
11 to 20 years	321	23.4
21 to 30 years	268	19.5
Over 30 years	426	31.0
Did not answer	22	1.6
TOTAL	1374	100%

Source: DCP

Organization of Paint Companies

Of all paint plants responding to the DCP, 65 percent indicated that they were the only manufacturing location for that company. Twenty-three percent of the plants are branch plants of a multiple plant company, while 13 percent are divisions of a parent corporation. Less than one percent of the plants are captive manufacturing sites which produce paint solely for internal consumption. Of the plants responding that they were branch plants, divisions, or captive sites, almost 80 percent were set up as profit centers, while the remainder were cost centers. Twenty-two percent, or 301 plant sites, are part of publicly held corporations and 70 percent, or 963 plants, are privately held. The remaining eight percent of the industry falls under such other forms of organization as cooperatives, partnerships, or proprietorships, or did not answer the questions on company organization.

Batch Sizes and Available Tankage

In the paint industry, the primary plant operation is the blending of various size batches of paint. Paints are often custom-manufactured in batch sizes as small as 190 liters (50 gallons), or mass-manufactured in batches as large as 38,000 liters (10,000 gallons) or more. As part of the DCP, plants were asked how many tanks they had in various sizes. Table III-9, presents a summary of production tank sizes used in the paint industry.

EPA estimates the total available tankage for the industry to be approximately 30,000 tanks, as indicated in Table III-10. Half of the tankage in the industry is less than 950 liters (250 gallons) in size, accounting for about 12 percent of capacity. The majority of the industry's capacity is in tanks of 9,500 - 23,000 liters (2,500 - 6,000 gallons). Large paint plants (those with over 100 employees) have approximately 27 percent of all tanks, but have over 40 percent of total industry capacity.

Periods of Operation

The batch nature of paint manufacture makes it easy to start-up and shut-down production; consequently the industry primarily functions on a one shift per day, five days per week basis. Eighty-seven percent of the plants responding to the survey question concerned with shift operation indicated that they operate one shift per day, while nine percent operate two shifts, and only four percent operate three shifts. Almost 90 percent of the plants have eight-hour shifts, with the next most common shift lengths being seven hours and ten hours (four percent each). Over 80 percent of the plants responding to the survey operate five days per week, while six percent operate four days weekly. Only 24 plants (two percent) work more than five days per

TABLE III-9

PAINT PLANT TANKAGE

Tank Size	Number of Tanks					
	0	1-5	6-10	11-20	21-50	Over 50
	Number of Plants Responding					
Less than 250 gal.	106	466	232	182	187	72
251-500 gallons	160	433	151	95	70	19
501-1000 gallons	211	336	117	68	44	8
1001-1500 gallons	296	212	62	44	14	4
1501-2500 gallons	313	186	61	28	8	2
2501-6000 gallons	375	107	34	18	14	0
Over 6000 gallons	449	18	7	-	1	1

Source: DCP

TABLE III-10

TOTAL PAINT INDUSTRY TANKAGE

Tank Size (gallons)	Number of Tanks	Percent of Total Capacity	Percent of Tankage in the 105* largest Plants	Percent of Total Capacity in the 105* largest Plants
Less than 250	15,000	12	2.4	2.9
251 - 500	6,000	12	30	3.6
501 - 1000	4,000	16	40	6.4
1001 - 1500	2,000	13	50	6.5
1501 - 2500	1,500	16	50	8.0
2501 - 6000	1,000	23	60	13.8
Over 6000	200	8	15	1.2
Total	29,700	100		42.4

*105 plants have over 100 employees, see Table III-2

Source: DCP responses and Burns and Roe estimates

week, but 130 plants (ten percent) indicate work weeks of under four days. A breakdown of these 130 plants indicates that over 90 percent of these plants have less than ten employees, and over 95 percent of the plants have under 20 employees.

Almost all paint plants operate approximately 250 days per year. Thirty-nine percent of the plants indicated that they work between 201 and 250 days per year, and 41 percent work between 251 and 300 days. Of those giving the exact number of days, the four most common answers were 260, 250, 251, and 253 days per year. Twelve percent of the plants operate less than 200 days per year, and 6 percent operate over 300 days.

Water Usage

Total industry water usage is shown in Table III-11. Based on the DCP results, EPA estimates a daily water usage between 34 and 140 million liters (9 - 37 million gpd), with the most likely average falling between 76 and 95 million liters per day (20 - 25 million gpd). The 1971 SRI survey showed a usage of 284 to 310 million liters per day (75 - 82 million gpd), but that survey was based on a selected sampling of plants, weighted heavily toward plants with over 100 employees located in California. In recent years, these plants have instituted water conservation programs, which may partly explain the reduced calculated usage. The SRI questionnaire also included water used for resin production within paint plants, which the DCP did not. Resin plants generally use much greater amounts of cooling water than paint plants, which explains part of the difference in water consumption, and also explains the differences between the surveys in water usage for various purposes.

Water usage data for all paint plants also indicate that their highest water use is for cooling (24 percent), product (29 percent), and sanitary purposes (30 percent). Other uses include boiler feed water (seven percent), tank and equipment cleaning (eight percent), air pollution control (one percent), and miscellaneous (one percent). The percentage of water used for various purposes differs between small plants and large plants, and is shown in Table III-12. Plants with over 100 employees have a much greater percentage of noncontact cooling water than do small plants.

Production Characteristics

Data on total paint industry production were presented earlier in this section. The following paragraphs present some of the production characteristics, analyses, statistics, and interrelationships in more detail.

TABLE III- 11

TOTAL WATER USAGE BY THE PAINT INDUSTRY

Water Consumption (GPD)	Number of Plants	Percent
Less than 10,000	1100	80.1
10,000-25,000	78	5.7
25,000-50,000	52	3.8
50,000-100,000	22	1.6
100,000-500,000	26	1.9
Over 500,000	6	0.4
Did not Answer	90	6.6
TOTAL	1374	100.0

Source: DCP

TABLE III-12

WATER USAGE IN PAINT PLANTS

Use	Average of Plants with less than 20 employees (848 plants)	Average of Plants with 20 - 100 employees (306 plants)	Average of Plants with over 100 employees (105 plants)	Average of all plants
Used in Product	33%	24%	17%	29%
Cooling	16%	35%	44%	24%
Boiler Feed Water	6%	7%	9%	7%
Tank Cleaning	9%	6%	9%	8%
Sanitary	34%	26%	18%	30%
Air Pollution Control	1%	1%	2%	1%
Other	1%	1%	1%	1%
Total	100%	100%	100%	100%

Source: DCP

Approximately half of the plants in the paint industry specialize primarily in either trade sales paints or industrial sales paints. The other half of the plants produce both types of coatings, with a wide variety of fractional mix. Tables III-13, III-14, and III-15 present data on the percentage of plant product devoted to trade sales paints, industrial sales paints, and allied product productions. The "average" plant, based on the average mix of all plants, produces over 40 percent trade sales paints, just under 50 percent industrial sales paints, and about 9 percent of allied products. In total, 53 percent of the DCP respondents indicated that their monthly paint production varied by 25 percent or more.

Paint manufacturers also can be classified by the percentage of water-base paints and the percentage of solvent-base (or solvent thinned) paints produced. One-third of the paint plants responding to the DCP produce 90 percent or more solvent-base paints, but only 8 percent of the plants produce a like percentage of water-base paints. A breakdown of paint plants by the percent of water, solvent, or other base paint manufactured is presented in Tables III-16, III-17, and III-18. It should be noted that the values presented in these three tables are not necessarily consistent. For example, 55 plants indicated that they produced 100 percent water-base paint but 135 plants indicated that they produce zero percent water-base products and 1,056 plants indicated a zero production of other formulated products. However, contrary to the expected result, the sum of these three values is not equal to the total number of respondents. This is because the responses to three different DCP questions were not consistent. Similarly, discrepancies may be observed when comparing in Tables III-19, III-20, III-21, and III-22.

The "average" plant produces approximately 60 percent solvent-base paint and 35 percent water-base paints. However, there are some differences between plants which produce primarily (90 percent or more) solvent-base paints and those producing 90 percent or more water-base products. Plants making primarily solvent-base paint produce mostly industrial sales products, while the plants dedicated to water-base products manufacture primarily trade sales products, with a high proportion of white or tint-base paints. Although there are only 109 plants producing greater than 90 percent water-base paint, they form an important group of plants with respect to wastewater practices, which will be discussed in a subsequent section of the report.

The percentages of white or tint-base paints and color formulations produced by paint plants are shown on Tables III-19 and III-20. The number of plants in each decile of production is fairly uniform, but as noted, predominately water-base paint production plants produce a higher percentage of white or tint-base paints than mostly solvent-base or solvent thinned production plants. Approximately one-sixth of

TABLE III-13

PRODUCTION OF TRADE SALES PAINT

Percent of Individual Plant Production of Trade Sales Paint	Number of Plants	Percent Of Total Plants
0	464	33.8
1-10	125	9.1
11-20	39	2.8
21-30	44	3.2
31-40	39	2.8
41-50	58	4.2
51-60	34	2.5
61-70	47	3.4
71-80	43	3.1
81-90	77	5.6
91-99	160	11.6
100	182	13.2
No Response	62	4.5
TOTAL	1374	100.0
Average		42%

Source: DCP

TABLE III- 14

PRODUCTION OF INDUSTRIAL SALES PAINT

Percent of Individual Plant Production of Industrial Sales Paint	Number of Plants	Percent of Total Plants
0	295	21.5
1-10	190	13.8
11-20	62	4.5
21-30	56	4.1
31-40	38	2.8
41-50	66	4.8
51-60	26	1.9
61-70	33	2.4
71-80	44	3.2
81-90	44	3.2
91-99	111	8.1
100	340	24.7
No Response	69	5.0
TOTAL	1374	100
Average		48%

Source: DCP

TABLE III-15

PRODUCTION OF ALLIED PRODUCTS[1]

Percent of Individual Plant Production of Allied Products	Number of Plants	Percent of Total Plants
0	919	66.9
1-10	170	12.4
11-20	22	1.6
21-30	17	1.2
31-40	22	1.6
41-50	15	1.1
51-60	6	0.4
61-70	4	0.3
71-80	7	0.5
81-90	8	0.6
91-99	25	1.8
100	37	2.7
No Response	122	8.9
TOTAL	1374	100
Average		9%

(1) Including varnish, shellac, putty, removers,caulk, etc. Powder coatings are also included but are a dry product.

Source: DCP

TABLE III-16

PRODUCTION OF WATER BASE PAINT

Percent of Individual Plant Production of Water Base Paint	Number of Plants	Percent of Total Plants
0	345	25.1
1-10	274	19.9
11-20	86	6.3
21-30	53	3.9
31-40	52	3.8
41-50	63	4.6
51-60	83	6.0
61-70	99	7.2
71-80	79	5.7
81-90	61	4.4
91-99	54	3.9
100	55	4.0
No Response	70	5.1
TOTAL	1374	100
Average		35%

Source: DCP

TABLE III-17

PRODUCTION OF SOLVENT BASE PAINT

Percent of Individual Plant Production of Solvent Base Paint	Number of Plants	Percent of Total Plants
0	135	9.8
1-10	98	7.1
11-20	66	4.8
21-30	100	7.3
31-40	78	5.7
41-50	114	8.3
51-60	60	4.4
61-70	50	3.6
71-80	51	3.7
81-90	97	7.1
91-99	229	16.7
100	230	16.7
No Response	66	4.8
TOTAL	1374	100
Average		60%

Source: DCP

TABLE III-18

PRODUCTION OF OTHER FORMULATED PRODUCTS

Percent of Individual Plant Production of Products	Number of Plants	Percent of Total plants
0	1056	76.9
1-10	59	4.3
11-20	11	0.8
21-30	7	0.5
31-40	5	0.4
41-50	8	0.6
51-60	7	0.5
61-70	4	0.3
71-80	1	0.1
81-90	10	0.7
91-99	8	0.6
100	16	1.2
No Response	182	13.2
TOTAL	1374	100
Average		5%

Source: DCP

TABLE III-19

PRODUCTION OF WHITE OR TINT BASE PAINT

Percent of Individual Plant Production of White or Tint Base Paint	Number of Plants	Percent of Total Plants
0	122	8.9
1-10	159	11.6
11-20	106	7.7
21-30	87	6.3
31-40	102	7.4
41-50	122	8.9
51-60	95	6.9
61-70	106	7.7
71-80	113	8.2
81-90	109	7.9
91-99	115	8.4
100	49	3.6
No Response	89	6.5
TOTAL	1374	100

Source: DCP

TABLE III-20

PRODUCTION OF COLOR PAINT

Percent of Individual Plant Production of Color Paint	Number of Plants	Percent of Total Plants
0	125	9.1
1-10	200	14.6
11-20	121	8.8
21-30	127	9.2
31-40	91	6.6
41-50	145	10.6
51-60	105	7.6
61-70	71	5.2
71-80	88	6.4
81-90	87	6.3
91-99	68	4.9
100	40	2.9
No Response	106	7.7
TOTAL	1374	100

Source: DCP

TABLE III-21

USAGE OF INORGANIC PIGMENTS BY PAINT PLANTS
(excluding Titanium Dioxide)

Percent of Individual Plant's Production Using Inorganic Pigments	Number of Plants	Percent of Total Plants
0	92	6.7
1-10	113	8.2
11-20	49	3.6
21-30	39	2.8
31-40	25	1.8
41-50	86	6.3
51-60	44	3.2
61-70	52	3.8
71-80	104	7.6
81-90	156	11.4
91-99	344	25.0
100	99	7.2
No Response	171	12.4
TOTAL	1374	100

Source: DCP

TABLE III-22

USAGE OF ORGANIC PIGMENTS BY PAINT PLANTS

Percent of Individual Plant's Production Using Organic Pigments	Number of Plants	Percent of Total Plants
0	163	11.9
1-10	437	31.8
11-20	159	11.6
21-30	92	6.7
31-40	43	3.1
41-50	92	6.7
51-60	22	1.6
61-70	29	2.1
71-80	31	2.3
81-90	39	2.8
91-99	51	3.7
100	28	2.0
No Response	188	13.7
TOTAL	1374	100

Source: DCP

the plants in the industry have a nearly 50/50 breakdown between white or tint-base paint and color paint production.

Tables III-21 and III-22 summarize the usage of inorganic and organic pigments in paints, and can be used to ascertain whether there is a trend away from pigments containing heavy metals. This is important because many of these heavy metals are toxic pollutants. The DCP data show that the industry still relies on inorganic pigments, with half of the responding plants indicating that they use over 70 percent inorganic colorants.

As indicated previously, almost 10 percent of paint industry sales are from allied products. The DCP asked for plants to indicate which of the most common allied products were produced. This information is presented in Table III-23. Over half of the paint plants manufacture varnish on site, although only one-quarter of plants specializing in water-base products produce varnish (Table III-24). The other most common allied products are wood fillers or sealants, and paint removers. Some paint plant respondents produced the following additional materials: asphaltic coatings, lacquers, adhesives, plastisols, epoxy compounds, and stains. Thirty-three paint plants, or 2.4 percent of the industry, manufacture gravure ink, which actually is an activity classified under SIC 2893.

The type and characteristics of paint produced can influence the amount of wastewater generated and the degree of recycle practiced. These factors will be discussed in Section VII.

Raw Materials

Survey responses indicate that two production characteristics strongly affect the usage of toxic pollutants. These two characteristics are: industrial versus trade sales paint production; and solvent-base versus water-base paint production.

Table III-25 indicates that many raw materials are more prevalent in plants specializing in solvent-base paint than in plants producing primarily water-base paint, and more prevalent in industrial sales paint than in trade sales products. For example, toluene is used by 84 percent of the plants specializing in solvent-base paint, but only by 23 percent of the plants specializing in water-base paint. Toluene is also used by 84 percent of the plants that concentrate in industrial sales paint, and by 45 percent of the plants primarily engaged in trade sales paint production. Most of the toxic pollutants exhibit similar trends. Some raw materials such as chromium and zinc however, are used by approximately equal percentages throughout the industry. To quantify the dependency of toxic pollutant occurrence on production characteristics for the industry as a whole, the percentage of plants using particular raw materials or classes of raw materials

TABLE III-23

ALLIED PRODUCTS PRODUCED BY THE PAINT INDUSTRY

Product	Number of Plants Producing	Percent of All Plants
Resins	112	8.2
Allied Products		
Varnish	716	52.1
Shellac	32	2.3
Caulking Compounds	106	7.7
Putty Products	74	5.4
Gravure Ink	33	2.4
Powder Coatings	47	3.4
Paint Removers	124	9.0
Wood Filler/Sealer	206	15.0
Written In Responses (not necessarily SIC Code 2851)		
Lacquers	30	2.1
Asphaltics/Roof Coatings	28	2.0
Adhesives-unspecified	14	1.0
Epoxy Compounds/Adhesives	13	0.9
Plastisol	13	0.9
Stains	12	0.9
Color Concentrate	7	0.5
Enamel	5	0.4
Polyester compounds/gel	5	0.4
Polish/Wax	4	0.3
Leather Compounds	4	0.3

Source: DCP

TABLE III-24

COMPARISON OF PRIMARILY WATER-BASE AND
PRIMARILY SOLVENT-BASE PAINT PRODUCTION PLANTS

Comparison Parameter	Plants 90% or More Solvent-Base Paints (459 Plants)	Plants 90% or More Water-Base Paints (109 Plants)	All Plants (1374 Plants)
Percent of plants with over 100 employees	7.0%	6.5%	7.7%
Plant age less than 5 years old	10.1%	31.2%	12.5%
Average percent trade sales	16%	74%	42%
Average percent industrial sales	75%	23%	48%
Percent of plants producing over 50% white paint	25%	84%	46%
Percent of plants producing resins on site	8%	1%	8%
Varnish production	58%	25%	52%
Powder Coatings production	2%	9%	3%

Source: DCP

TABLE III- 25

TOXIC POLLUTANT USAGE TRENDS

Toxic Pollutant	90% + Trade Sales Plants (based on 342 Plants)	90% + Industrial Sales Plants (based on 451 Plants)	90% + Water-Base Plants (based on 109 Plants)	90% + Solvent-Base Plants (based on 459 Plants)	All Plants
	Percent of Plants				
Antimony	3	16	7	14	12
Cadmium	7	27	9	24	19
Copper	8	10	4	11	13
Chromium	70	78	69	72	76
Lead	46	65	23	64	61
Nickel	4	16	4	15	11
Selenium	1	4	0	4	3
Silver	12	23	6	20	18
Zinc	74	74	55	72	74
PCP	12	9	7	10	14
Asbestos	16	11	10	12	16
Cyanides	45	74	38	69	63
Phenol	34	57	27	53	48
Mercury	58	27	54	24	46
Vinyl/Vinylidene Chloride	14	62	17	54	41
Dichlorobenzidene	18	37	17	34	30
Naphthalene	50	57	33	61	62
Phthalates	21	57	16	51	40
Benzene	2	6	0	6	5
Toluene	45	84	23	84	70
Ethylbenzene	8	18	4	17	14
Isophorone	2	22	1	20	13
Methylene Chloride	11	26	6	29	22
Other Chlorinated Solvents	5	24	6	23	15

Source: DCP

was plotted against the percentage of industrial sales and the percentage of solvent-base paint production (see Appendix E). For each plot, a least squares fit was calculated. The results of these calculations (slopes and correlation coefficients) are presented in Table III-26. For all but one toxic pollutant, the slope of the best fit line is positive, indicating that the overall trend, however slight, is for greater toxic pollutant usage with increased industrial sales and/or solvent-base production. For some of the toxic pollutants, the statistical validity of the fit was better than others, as reflected in the higher R^2 or correlation coefficient values. As can be seen from Table III-26, comparatively good fits were obtained against at least one parameter for silver, cyanide, cadmium, chlorinated organic solvents, methylene chloride, phthalates, toluene, vinyl/vinylidene chloride, and phenol.

Several explanations for this trend are possible. For the inorganic toxic pollutants, the trend probably arises from the fact that both industrial sales and solvent-base paint production involve much more color production than water and trade sales operations. For solvents and resins containing toxic pollutants, the obvious fact that these materials are used primarily in solvent-thinned and industrial sales products accounts for the trend.

For one toxic pollutant, mercury, as indicated by the negative slope, the trend is reversed. Mercury is more common in the raw materials used in trade sales and water-base production by a factor of two to one. Clearly, mercury is in use as a preservative for those products which by their nature are more vulnerable to spoilage and simultaneously require longer shelf life.

Standard Manufacturing Processes

Paints can be either solvent-base or water-base but there is little difference between their production processes. The major production difference is in the carrying agent; solvent-base paints are dispersed in an oil mixture, while water-base paints are dispersed in water with a surfactant used as the dispersing agent. Another significant difference is in the clean up procedures used. Because the water-base paints contain surfactants, it is much easier to clean up the formulating tanks with water. The tanks for solvent-base paint are generally cleaned with an organic solvent, but cleaning with a strong caustic solution is also common (1, 15).

The principal raw materials in paint manufacture are oils, resins, pigments, and solvents. Drying oils, such as linseed oil, are used as film-forming binders in some solvent-base paints. Semi-drying oils are used in the manufacture of water-base (latex) paints. Some industrial water-base paints contain a third type of resin, the water soluble alkyd resins.

TABLE III- 26

SLOPES AND CORRELATION COEFFICIENTS
FOR PLOTS OF PERCENT TOXIC POLLUTANT USAGE
VERSUS
PERCENT INDUSTRIAL SALES OR PERCENT SOLVENT BASE PRODUCTION

Toxic Pollutant	% Industrial Sales Production		% Solvent-Base Production	
	Slope	R^2	Slope	R^2
PCP	0.047	0.4	0.006	0.002
Nickel	0.03	0.03	0.12	0.30
Silver	0.09	0.16	0.10	0.49
Dichlorobezidene	0.17	0.3	0.24	0.42
Cyanide	0.4	0.42	0.3	0.49
Zinc	0.02	0.0081	0.07	0.05
Cadmium	0.22	0.67	0.2	0.49
Chromium	0.06	0.09	0.03	0.006
Chlorinated Organic Solvents(1)	0.18	0.21	0.13	0.49
Lead	0.03	0.0016	0.3	0.3
Ethyl Benzene	0.02	0.067	0.09	0.16
Methylene Chloride	0.14	0.34	0.2	0.5
Phthalates	0.41	0.67	0.32	0.57
Mercury	-0.16	0.144	-0.22	0.2
Naphthanates	-0.09	0.044	0.2	0.24
Toluene	0.29	0.51	0.46	0.72
Vinyl Chloride and/or Vinylidene Chloride	0.39	0.67	0.43	0.63
Copper	0.02	0.005	0.09	0.13
Phenol	0.20	0.58	0.23	0.29
Antimony	0.1	0.28	0.09	0.26

(1) excluding Methylene Chloride

Source: DCP

Pigments impart opacity and color to the coatings. The four basic types of pigments are: (1) prime white pigments, such as titanium dioxide and zinc oxide; (2) colored inorganic and organic pigments; (3) filler and extender pigments; and (4) metallic powders. According to the Kline Guide, the paint industry is the largest consumer of titanium dioxide and inorganic pigments in the United States.

The paint industry also consumes large amounts of solvents, using them as the volatile vehicles in coatings and certain specialty products. The major solvents used are mineral spirits, toluene, xylene, naphtha, ketones, esters, alcohols, and glycols. In addition, the industry consumes a wide variety of other additives and chemical specialties such as dryers, bactericides and fungicides, defoamers, dispersants, and thickeners. Raw materials used by the paint industry and the possible presence of toxic pollutants were discussed previously.

Paints generally are made in batches. The major difference in the size of paint plants is in the batch sizes. Small paint plants make up batches of from 400 to 1,900 liters (100 to 500 gal); large ones manufacture batches of up to 38,000 liters (10,000 gal). There are generally too many color formulations to make a continuous process feasible.

Solvent-Base Paint Operations

There are three major steps in the solvent-base paint manufacturing process: (1) mixing and grinding of raw materials; (2) tinting and thinning; and (3) filling operations. Figure III-2 illustrates these steps.

Most plants mix and grind raw materials for solvent-base paints in one production step. For high gloss paints, the pigments and a portion of the binder and vehicle are mixed into a paste of a specified consistency. This paste is fed to a grinder, which disperses the pigments by breaking down particle aggregates rather than by reducing the particle size. Two types of grinders are ordinarily used for this purpose: pebble or steel ball mills, or roll-type mills. Other paints are mixed and dispersed in a mixer using a saw-toothed dispersing blade commonly referred to as a high speed disperser.

The next stage of production transfers the paint to tinting and thinning tanks, occasionally by means of portable transfer tanks but more commonly by gravity feed or pumping. Here, the remaining binder and liquid, as well as various additives and tinting colors, are incorporated. The paint is then analyzed and the composition adjusted as necessary to obtain the correct formulation for the type of paint being produced. The finished product is then transferred to a filling operation where it is filtered, packaged, and labeled (1, 15). Large

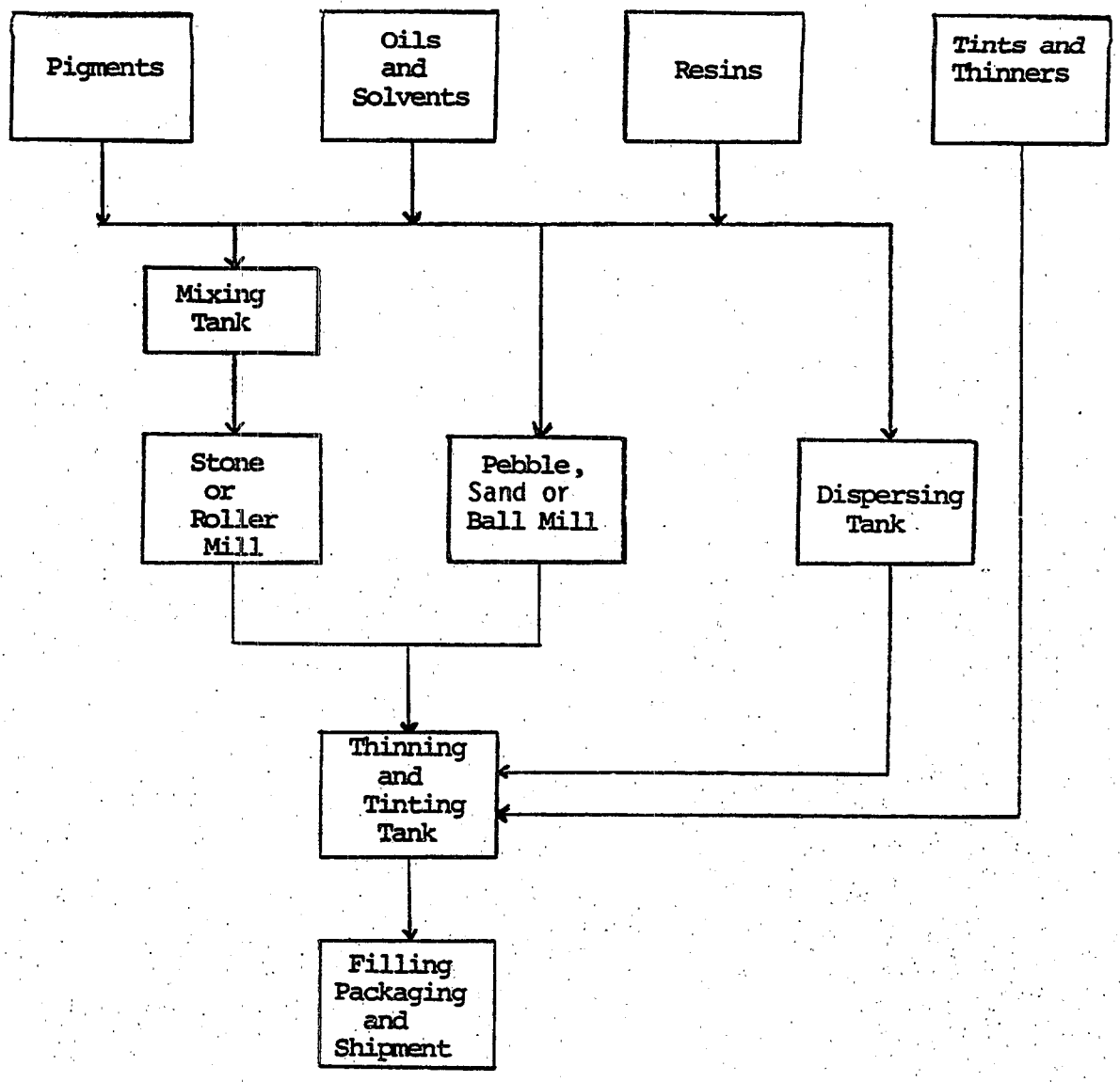


Figure III-2 - Flow Diagram of Manufacturing Process for Solvent-Base Paints

plants often mechanize these operations; small ones may do them manually.

Paint remaining on the sides of the tanks may be allowed to drain naturally, and the "clingage" remaining on the sides is cleaned with a squeegee during the filling operation until only a small quantity of paint remains. The final clean up of the tanks generally consists of flushing with a solvent until clean. The dirty solvent is treated in one of three ways: (1) it is used in the next paint batch as a part of the formulation; (2) it is collected in drums that are sold to a company where it is redistilled and resold; or (3) it is collected in drums for decanting with the cleaner solvent subsequent tank cleaning and returned to the drums until only sludge remains in the drum. The drum of sludge is then sent to a landfill for disposal (1, 15, 16).

Some plants clean solvent-base paint tanks and equipment with hot caustic, either on a regular or periodic basis. The caustic is generally recycled, and the caustic cleaning is followed by a water rinse. Part of this water is returned to the caustic tank as make-up, and any remaining water is disposed of by; (1) discharging to the sewer or receiving water; (2) holding, treating, and discharging to a sewer or receiving water; (3) drumming and landfilling; or (4) reusing as rinse water. In plants that manufacture both solvent-base and water-base paints, this rinse water often is combined with the wastewater from water-base paint operations.

Water-Base Paint Operations

Water-base paints are produced in a slightly different manner from solvent-base paints. The pigments and extending agents are usually purchased and viewed in proper particle size, and the pigment, surfactant, and binder are dispersed into the vehicle with a saw-toothed high speed disperser. Small plants, thin and tint the paint in the same tank; larger ones transfer paint to special tanks for final thinning and tinting. Once the formulation is correct, the paint is transferred to a filling operation where it is filtered, packaged, and labeled in the same manner as for solvent-base paints.

The production process for water-base paints is diagrammed in Figure III-3. The average composition of common water-base paints is shown in Table III-27. This table does not include small quantities of preservatives or dryers that may contain trace quantities of heavy metals nor does it include organic biocides.

As in the solvent-base paint operation, as much product as possible is removed from the sides of the tub or tank before final clean up. For the water-base paint tubs, clean up simply involves washing the sides with a garden hose or a more sophisticated washing device. The

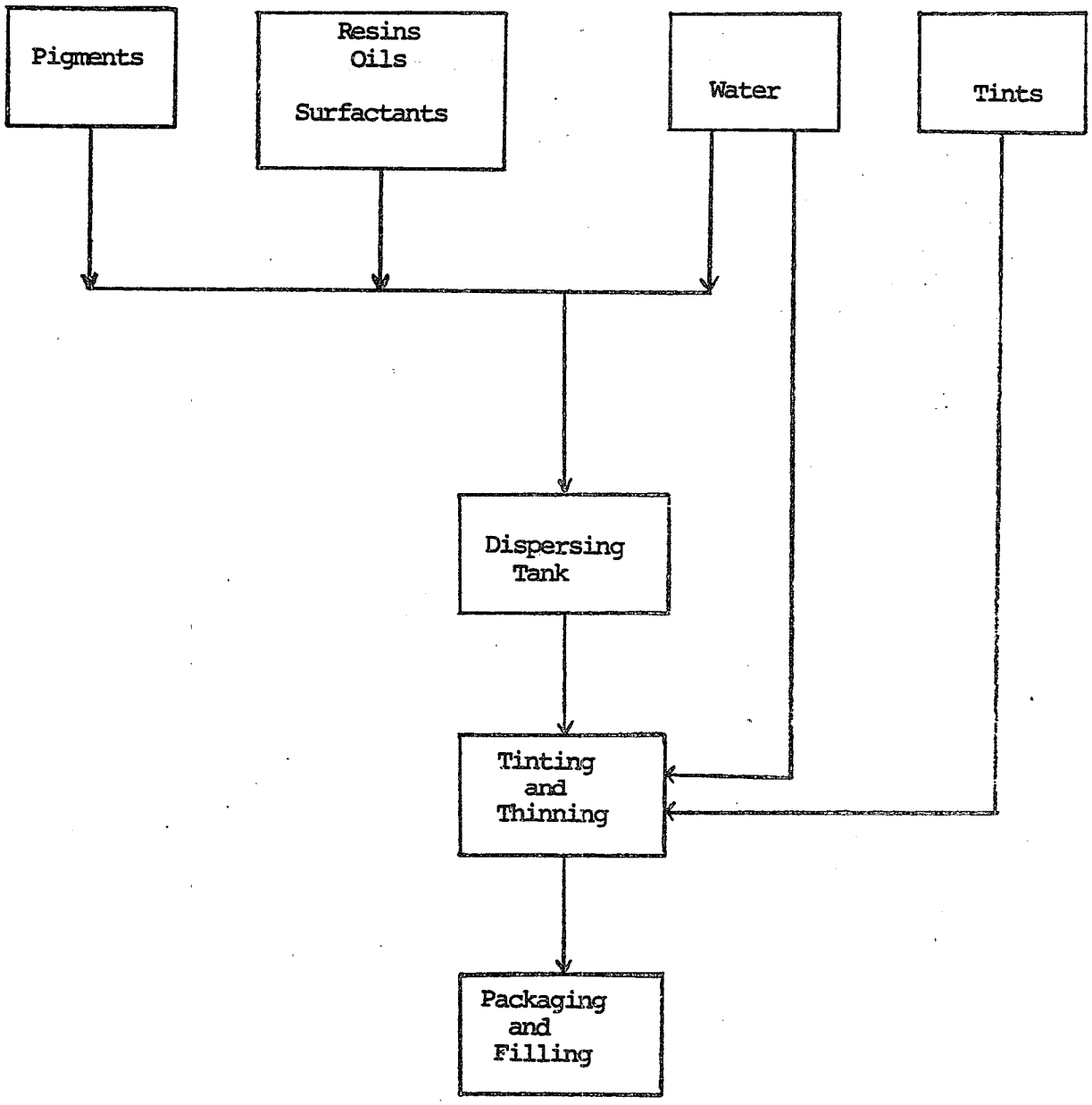


Figure III-3 - Flow Diagram of Manufacturing Process for Water-Base Paints

TABLE III-27

COMPOSITION OF COMMON WATER-BASE PAINTS (17)

Ingredient	Type of Paint: Polyvinyl Acetate Percent	Type of Paint: Acrylic Percent
Titanium dioxide	10.2	20.0
Calcium carbonate	3.4	-
Zinc oxide	-	4.1
Silicates	20.4	13.0
Synthetic latex solids	11.2	-
Acrylic resin	-	15.7
Plasticizer	2.6	-
Soy alkyd resin	-	2.5
Water	52.2	44.7
Total percent by weight	100.0	100.0

washwater may be: (1) collected in holding tanks and treated before discharge; (2) collected in drums and taken to a landfill; (3) discharged directly to a sewer or receiving stream; (4) reused in the next paint batch; or (5) reused in the washing operation.

Some paint plants regularly or occasionally rinse water-base paint tanks and equipment with hot caustic, in a similar manner to that described for solvent-base paints. Any rinse water generated is combined with the regular clean up water, and disposed of by one of the same methods.

Other Manufacturing Operations

Some of the larger paint plants also manufacture the synthetic resins sometimes used in paint: alkyd resin, water-soluble alkyd resin, or acrylic resin. These operations are not included in the scope of this study and therefore are not addressed in this document. The manufacture of either type of resin involves an esterification process in which polybasic acids and polyhydric alcohols react with various oils or fatty acids. The raw materials are fed into a large reactor (kettle) equipped with an agitator. Most alkyd resins are cooled, filtered, and stored for use in paint production or for sale (1).

Paint plants originally manufactured varnish by the slow cooking and polymerization of natural oils and resins. This process is being replaced rapidly by the manufacture of synthetic resins (often called varnishes) as described above. The only water pollution loads from these processes would come from air pollution equipment and from the caustic cleaning of the cook tanks. Lacquer is produced by dissolving certain resins in a solvent-base with the desired pigment. No water is used in these processes and no liquid wastes are discharged.

SECTION IV

INDUSTRY SUBCATEGORIZATION

INTRODUCTION

EPA considered the following factors in determining whether differences within the paint industry might require separate limitations:

1. Raw materials and products
2. Production methods
3. Size and age of production facilities
4. Wastewater characteristics
5. Tank cleaning techniques.

RATIONALE FOR SUBCATEGORIZATION

The Agency concluded that tank cleaning techniques offer an appropriate basis for subcategorizing the paint industry. The following two subcategories have been chosen.

1. Solvent-wash (solvent-base solvent-wash)
2. Caustic and/or water-wash

RAW MATERIALS AND PRODUCTS

Solvents, resins, extenders, pigments, and dispersing agents generally are used in all paint products, except for the use of solvent or water as the dispersing medium. Water-base and solvent-base paints are interchangeable in many applications except that in the past, industrial finishes were primarily solvent-base products. Their use has been declining in recent years, however because of air pollution problems resulting from industrial application of solvent-base products. Industrial sales products consequently, increasingly use water as well as solvent mediums. Raw materials or product uses are therefore not a basis for subcategorization, except as they influence tank cleaning techniques.

PRODUCTION METHODS

Both solvent-base and water-base paints can be made in the same factory, with many of the same raw materials and in much of the same equipment. Some solvent-base pigments may require dispersing in roll or ball mills before blending into the dispersed calcium carbonate, talcs and clays; these mills are not usually used for water-base paint pigments. Because the production methods for all paints are quite similar they are not a basis for subcategorization.

SIZE AND AGE OF PRODUCTION FACILITIES

This study showed that the size of production facilities affects only the volume of wastewater; the characteristics of the wastes are similar regardless of plant size. Because the paint manufacturing process equipment has not changed appreciably over the years, the age of the plant has little bearing on the waste characteristics. Therefore neither size nor age of plant production facilities appear to be a valid technical basis for subcategorization.

WASTEWATER CHARACTERISTICS

The untreated wastewaters generated by paint manufacturing operations contain a fairly diverse mixture of pollutants. These pollutants range from oxygen demand and solids to various toxic pollutants. Both water-base and solvent-base paint manufacturing wastewaters contain substantial quantities of these pollutants. With the exception of solvent-base solvent-wash operations which generate no wastewater, no specific segment of the industry has a significantly different quality or quantity of wastewater. Consequently, wastewater characteristics do not provide a good basis for subcategorization.

TANK CLEANING TECHNIQUES

The paint industry commonly uses three specific methods of paint tank cleaning. These cleaning methods include (1) solvent-wash; (2) caustic-wash; and (3) water-wash. Solvent-wash is used exclusively to clean tanks used for formulating solvent-based paint. When solvent-washing is used in solvent-based operations no wastewater is discharged. Caustic-wash techniques are used to clean both solvent-base and water-base paint manufacturing tanks. Water-washing techniques also are used in both the solvent-base and water-base segments of the paint industry. For solvent-base operations, water-washing usually only follows caustic-washing of solvent-base tanks. For water-base operations, water-washes often constitute the only tank cleaning operation. It should be noted however that periodic caustic cleaning of water-base paint tanks is also a common practice.

The treatability and disposal options for wastewater generated by water-wash and caustic-wash operations are essentially the same. Rinse waters generated following caustic-wash are sometimes less concentrated than exclusively water rinse generated wastewaters, although the pollutants contained in these two types of wastewater are similar. Consequently, the methods of treatment and disposal are alike. Section VII will show that there are no significant differences in the effluent concentrations attained by the various control technologies for caustic rinses versus water rinses. Furthermore, the quantity of wastewater generated by caustic-wash

operations is not greater than that generated by water-wash techniques.

On the other hand, solvent-wash operations create significantly different waste streams. As a result, tank cleaning techniques appear to be a workable basis for subcategorization.

SECTION V

WATER USE AND WASTE CHARACTERISTICS

WASTEWATER SOURCES

Tank and Equipment Cleaning

Wastewater from paint manufacturing plants results primarily from the rinsing of mixing tanks and filling equipment. Some additional wastewater may be contributed by floor and spill cleaning, laboratory and plant sinks, boiler and cooling water blowdown, air pollution control devices using water, and cleanout of raw material supply tank cars or trucks. Most paint plants segregate noncontact cooling water and sanitary wastewater for discharge to the sewer with no pretreatment.

Paint manufacture involves three basic steps: dispersing of raw materials, tinting and thinning, and filling and packaging. Some plants combine steps one and two by grinding the raw materials for dispersing in the same tanks where the paint is thinned. Where the steps take place in separate vessels, dispersion tanks or ball mills generally are cleaned up by rinsing with solvent or water (depending on the base of that paint batch). This solvent or water usually is drained into the thin down tank and serves as part of the caustic or solvent, or it is cleaned by dry methods, or by some combination of methods. Water rinses usually used on water-base paint batches, solvent rinses follow solvent-base paint batches, and caustic rinses follow either. Many plants routinely use an installed caustic-washing system for small portable tanks or tote bins, and clean fixed tanks with caustic only when heavy build-up of paint residue makes it necessary. The methods of tank rinsing practiced by paint plants are presented in Table V-1.

Solvent rinsing of solvent-base paint tanks ordinarily generates no wastewater. The used solvent generally is handled in one of three ways:

1. used in the next compatible batch of paint as part of the formulation;

2. collected and redistilled, either by the plant or by an outside company, for subsequent resale or reuse; and

3. reused with or without settling to clean tanks and equipment until spent, and then drummed off for disposal. If sludge is settled out, it is also drummed off for disposal by contract hauling.

TABLE V-1

METHODS OF TANK CLEANING USED BY PAINT PLANTS

Rinsing Method	Number of Plants	Percent of Plants
Water Rinse only*	143	10.4
Solvent Rinse only*	383	27.9
Caustic Rinse or Soak only*	14	1.0
Dry Cleaning only	24	1.7
Water and Caustic Rinse*	30	2.2
Water and Solvent Rinse*	491	35.7
Solvent and Caustic Rinse*	40	2.9
Water, Solvent and Caustic*	187	13.6
Not Answered	62	4.5
Total Using:		
Water	851	62
Solvent	1101	80
Caustic Rinse	163	12
Caustic Soak	164	12
Dry Clean Up	189	14

*With or without dry cleaning of tanks

Source: DCP

Spent tank and equipment rinse water is usually handled in one of four ways:

1. reused in the next compatible batch of paint as part of the formulation;

2. reused, either with or without treatment, to clean tanks and equipment until spent. If sludge is settled out, it is disposed of by contract hauling;

3. discharged with or without treatment as wastewater; and

4. disposed of by contract hauling.

Plants using caustic rinse systems usually rinse the caustic residue with water, although a few plants allow the caustic to evaporate from the tanks. Evaporation of caustic, however, can cause odor problems, and caustic residue can interfere with some types of paint formulas. There are several types of caustic systems commonly used by the paint industry. For periodic cleaning of fixed tanks two methods are popular:

1. maintaining the caustic in a holding tank (usually heated) and pumping it through fixed piping or flexible hose to the tank to be cleaned. Often a portable hood is placed over that tank, with nozzles to direct the spray. The caustic is returned to the holding tank; and

2. preparing the caustic solution in the tank to be cleaned, and the tank soaking until clean. The caustic solution is either transferred to the next tank to be cleaned, stored in drums or a tank for subsequent use, or is disposed of by contract hauling;

For cleaning small portable tanks, three common methods are in use by the paint industry:

1. pumping caustic from a holding tank (usually heated) to a fixed or portable hood which is placed over the tank to be cleaned. The caustic drains to a floor drain or sump and is pumped back to the tank, or is pumped back directly from the tank;

2. maintaining an open top caustic holding tank. Small tanks are put into "strainers" and dipped into these tanks until clean; and

3. placing the tanks in a "dishwasher-like" device which circulates hot caustic and a subsequent water rinse. These devices can handle tanks up to about 1900 liters (500 gal).

The water rinse following a caustic-wash is rarely reused in a subsequent batch of paint. The most common methods for disposal of this rinse are:

1. Recycling it back into the caustic as make-up water;

2. drumming it for contract hauling; and

3. discharging it as wastewater, with or without pretreatment. Combination with other plant wastewater prior to treatment or disposal is sometimes practiced. Discharge of this wastewater is currently prohibited by some states and municipalities, and may be prohibited in other areas in the future.

Most plants reuse the caustic solution until it loses some of its cleaning ability. The caustic then is disposed of either by contract hauling or as wastewater, with or without neutralization or other treatment. In the DCP, plants using caustic rinsing were asked to indicate whether their system was a closed loop system (all of the water rinse is used as caustic make-up), partial recycle, or open (no reuse of the water rinse). There was some confusion among responders regarding the definitions of the three terms. Seventy plants responded that they had a closed loop system; however, telephone and field follow-up with a 20 percent sample of these plants showed that while all of the plants recycled their caustic solution, none were able to recycle all of their water rinse. At least one company in the United States manufactures a true closed loop caustic system. It is not widely used by the paint industry, however, and several plants indicated experiencing operating problems with it, and have discontinued its use. Eighty plants responding to the survey recycled part of their caustic rinse water, and 101 plants recycled none of their rinse water.

The Agency asked plants responding to the DCP to indicate how many gallons of water were used to clean tanks of various sizes. The responses to these questions are presented in Table V-2, for that section of the industry indicating the use of water rinsing of tanks. For tank sizes up to 3800 liters (1000 gal), the majority of plants used less than 230 liters (60 gal) to clean the tank after a batch of paint. For tanks between 3800 and 5700 liters (1001-1500 gal), 37 percent of the plants required over 230 liters (60 gal) of water. The percentage of plants requiring over 230 liters (60 gal) to clean a mixing tank increases with the size of the tank. For tanks between 9500 and 23,000 liters (2500-6000 gal), EPA estimates that the average

TABLE V-2

AMOUNT OF WATER USED TO CLEAN A PAINT TANK

Tank Size	Water Used Per Tank Cleaning				
	0-60 gal.	61-100 gal.	101-200 gal.	Over 200 gal.	Total
	Percent of Plants Responding				
Under 250 gal.	97.9	1.6	0.4	0.1	100%
251-500 gal.	90.2	7.1	1.9	0.9	100
501-1000 gal.	79.6	13.5	3.1	3.8	100
1001-1500 gal.	62.9	22.5	9.6	5.1	100
1501-2500 gal.	54.7	22.0	11.3	11.9	100
2501-6000 gal.	38.6	26.7	18.8	15.8	100
Over 6000 gal.	59.4	15.6	12.5	12.5	100

Source: DCP

cleaning water usage for falls between 260 and 760 liters (70-200 gal) with the most likely average between 380 and 570 liters (100-150 gal).

As stated previously, the amount of water generated by tank cleaning is influenced by the water pressure used. A cross-tabulation of water pressure by volume of water for each range of tank size is presented in Appendix C. These tables indicate some correlation between the two variables; plants with high pressure rinses tend to generate less tank cleaning wastewater per batch of paint.

The amount of wastewater used to clean filling equipment is highly variable from plant to plant. Visits and phone contact with many paint plants indicate that the volume of rinse water for filling equipment ranges from 10 percent to ten times the volume of tank rinsing water. Factors that influence water usage include the pressure of the rinse water, and the existence or absence of floor drains. Without troughs or floor drains, equipment often is cleaned with rags, while there is a greater tendency to use hoses where there is an area for wastewater to drain. Of course, the latter circumstances generate a much larger volume of water. The one remaining source of wastewater that may have contact with paint solids is floor cleaning or spill handling. Again, where there are no floor drains, plants use dry clean up methods, mopping, or floor scrubbers, which generate little or no water. Some plants, however, clean production areas by hosing down the floor, and allowing the water to flow into floor drains. The variation in wastewater generation from plant to plant, and a review of potential wastewater controls is presented in Section VII of this report.

Other Pollutant Sources

Beyond process wastewater generated from tank and equipment cleaning, there are other sources of pollutants within the typical paint plant. These wastewater streams must be considered in any water management schemes developed for the paint industry. The following are the most common sources of potentially contaminated wastewater found at paint manufacturing facilities, other than those discussed in the preceding section:

1. resin and pigment plant wastewater from paint plants which produce some of their own raw materials at the same site. Some combined data have been collected during this study; however, this document presents information only on segregated paint plant wastewater;

2. bad or spoiled paint batches which are not reused in other products or discharged as a solid waste;

3. residue from spills, which is discharged to the sewer or combined with other wastewater;

4. contaminated storm water runoff;

5. wastewater from cleaning tank trucks delivering raw materials, such as latex;

6. wastewater from plant or laboratory sinks used for rinsing hand equipment coated with paint, or for disposal of small quantities of paint;

7. steam condensate from steam injection distillation of solvents used to clean paint tanks; and

8. contact water from air pollution control devices.

Other wastewater sources which do not contact the paint or raw materials, but which may contain conventional and nonconventional pollutants, such as BOD or TSS, include:

1. Sanitary wastewater,
2. Noncontact cooling water,
3. Boiler blowdown, and
4. Noncontact steam condensate.

In the DCP, plants were asked to indicate which of these wastewater sources were combined with tank cleaning wastewater before disposal. The three most common answers were sanitary wastewater, noncontact cooling water, and laboratory wastewater. As with water usage, sanitary wastewater and cooling water account for over half of the total wastewater stream at most paint plants, with tank cleaning wastes and boiler blowdown making the next largest contribution. Table V -3 presents the number of plants which generate each miscellaneous source of wastewater.

Wastewater Volume

The paint industry, in total, generates approximately 5.7 million liters (1.5 million gallons) of process wastewater daily, about half of which actually is discharged. The other half is reused by paint plants, evaporated or drummed off for disposal as a solid waste. This estimate is based on the responses to the DCP. Additional data, collected during the economic analysis indicates that the wastewater generation estimate from the DCP may be as low as 2.3 million liters (0.75 mgd). Consistent with the typical trend in the paint industry, a few large plants generate most of the waterwater, while the many small plants account for just a small percentage of the industry's total flow. Table V -4 presents the amount of process wastewater

TABLE V-3

OTHER POLLUTION SOURCES

Source	Number of Plants Responding	Percent of All Plants
Spray Booths	27	2
Wet Scrubbers	52	4
Boiler Blowdown	75	6
Laboratory	115	8
Steam Condensate	38	3
Solvent is Redistilled on site:	69	5
By Steam Injection Distillation	25	2
Spent Caustic is Discharged to Sanitary Sewer	91	7
Spent Solvent is Discharged to Sanitary Sewer	13	1

Source: DCP

TABLE V-4

WASTEWATER GENERATION

Wastewater Generated (gpd)	All Plants		Plants Using a Water Rinse	
	Number of Plants	Percent of Total	Number of Plants	Percent of Total
0	339	24.7	69	8.1
1 - 100	536	39.0	453	53.2
101 - 500	156	11.4	126	14.8
500 - 1,000	56	4.1	50	5.9
1,000 - 6,000	81	5.9	65	7.6
6,000 - 12,000	23	1.7	16	1.9
Over 12,000	63	4.6	45	5.3
Not Answered	120	8.7	27	3.2
Total	1,374	100.0	851	100.0

Source: DCP

generated by all paint plants responding to the DCP. Process wastewater for this study was defined as only that wastewater that has an opportunity to contact paint solids, such as tank wash water, caustic-wash rinse water, and floor wash water. Other wastewaters, such as sanitary or noncontact cooling water, were not considered part of the process wastewater stream.

The most important factor affecting the volume of process wastewater generated and discharged at paint plants is the percentage of solvent-base and water-base paints produced. Table V-5 compares wastewater volumes between plants producing primarily water-base paints and those producing primarily solvent-base paints. As the table shows, most of the plants that generate no wastewater produce primarily solvent-base paint, and consequently utilize no water rinse.

The volume of wastewater discharged by the paint industry as a whole is shown in Table V-6. Six hundred eight plants (44 percent plants of the industry) reported no discharge of wastewater. Of plants that utilize a water rinse for cleaning tanks, 230 plants (27 percent) practice "no discharge." Among all paint plants that discharge some wastewater, 412 plants (30 percent of the industry) discharge less than 380 liters per day (100 gal/d). Only 95 plants (7 percent of the industry) discharge more than 3800 liters per day (1000 gal/d), but these 95 plants account for at least 85 percent of the total wastewater discharge from all paint plants. Table V-7 presents a breakdown of wastewater discharge volumes from plants that produce 90 percent or more water-base paint and plants that produce 90 percent or more solvent-base paint. Sixty-six percent of plants specializing in solvent-base paint discharge no wastewater, and 25.7 percent of the plants specializing in water-base paint generate no wastewater. As expected, plants producing 90 percent or more water-base paint discharge more wastewater than plants producing 90 percent or more solvent-base paint.

The amount of wastewater generated and discharged from paint plants often depends on many interrelated factors and the best approach for comparing plants is to use a dimensionless parameter which eliminates extraneous factors, such as overall plant production volume. The comparison factor that was chosen was the unit volume of wastewater generated, or discharged per unit volume of water-base paint produced. Section VII will discuss the variability of this volume factor as compared to other general industry characteristics.

EPA used the data from the DCP responses on wastewater generation and disposal to calculate the overall industry average volume of wastewater generated, or discharged per unit volume of water-base paint manufactured. As confirmed by visits to various paint facilities, the survey information indicated a wide range of water usage and wastewater generation among plants. The calculated data for

TABLE V-5

VOLUME OF WASTEWATER GENERATED BY PAINT PLANTS
PRODUCING PRIMARILY WATER-BASE
OR SOLVENT-BASE PAINT

Wastewater Generated	Plants Producing Over 90% Water-Base Paint		Plants Producing Over 90% Solvent-Base Paint	
(gpd)	Number of Plants	Percent	Number of Plants	Percent
0	12	11.0	205	44.7
1 - 100	62	56.9	97	21.1
101 - 500	10	9.2	29	6.3
501 - 1000	3	2.8	12	2.6
1001 - 6000	13	11.9	20	4.4
6001 - 12,000	-	-	8	1.7
Over 12,000	5	4.6	25	5.4
Not Answered	4	3.7	63	13.7
Total	109	100.0	459	100.0

Source: DCP

TABLE V-6

WASTEWATER DISCHARGE BY THE PAINT INDUSTRY

Wastewater Discharged (gpd)	All Plants		Plants Using Waterwash	
	Number of Plants	Percent of Total	Number of Plants	Percent of Total
0	608	44.3	230	27.0
1 - 100	412	30.0	374	43.9
101 - 500	111	8.1	104	12.2
501 - 1000	26	1.9	23	2.7
1001 - 6000	50	3.6	47	5.5
6001 - 12,000	16	1.2	13	1.5
Over 12,000	29	2.1	22	2.6
Not Answered	122	8.9	38	4.5
Total	1374	100.0	851	100.0

Source: DCP

TABLE V-7

VOLUME OF WASTEWATER DISCHARGED BY PAINT PLANTS
PRODUCING PRIMARILY WATER-BASE
OR SOLVENT-BASE PAINTS

Wastewater Discharged	Plants Producing 90% or More Water-Base Paint		Plants Producing 90% or More Solvent-Base Paint	
(gpd)	Number of Plants	Percent	Number of Plants	Percent
0	28	25.7	305	66.4
1 - 100	50	45.9	58	12.6
101 - 500	10	9.2	12	2.6
501 - 1000	2	1.8	5	1.1
1001 - 6000	10	9.2	6	1.3
6001 - 12,000	2	1.8	3	0.7
Over 12,000	3	2.8	13	2.8
Not Answered	4	3.7	57	12.4
Total	109	100.0	459	100.0

Source: DCP

the volume factor are presented in Tables V-8 and V-9. For this calculation, the data base was reduced to only those plants that met the following criteria:

1. use water rinse for cleaning tanks and

2. produce some water-base paint.

Plant responses used in the DCP also had to be complete with regard to pertinent questions concerning wastewater volume and production. This selection reduced the data base to 50 percent of the plants responding to the survey. The median wastewater generation per volume of production is approximately 0.2 liters of wastewater per liter of water-base paint manufactured (0.2 gal/gal) and the median wastewater discharge is approximately 0.1 liters per liter (0.1 gal/gal). If these calculations had included solvent-base paint production as well as water-base, the median values would have been about 50 percent lower. For this reason, Tables V-8 and V-9 are based only on water-base products and are restricted to plants that have a water rinse. The significance of these figures, and a complete breakdown of their composition will be discussed in Section VII of this report.

WASTEWATER CHARACTERIZATION

Background

The Agency assembled historical analytical data on the occurrence of classical pollutants in wastewater from the paint manufacturing industry from the following sources:

1. Southern Research Institute (SRI) Report (1974);

2. National Field Investigation Center - Denver (NFIC-D) Report (1975) (2);

3. Draft Development Document for the Paint and Ink Industry 1976 (3);

4. Historical data attached to DCP responses; and

5. Municipalities and EPA regional offices.

Unfortunately, much of the historical data represents paint process wastewater combined with other wastewater sources, such as cooling water or sanitary wastewater, in undetermined ratios. Virtually all of the data obtained from municipalities and from the SRI report are in this form. These data are not directly comparable with sampling data from segregated paint process wastewater. The sources of historical analytical data are discussed in the following paragraphs.

TABLE V-8

WASTEWATER GENERATION PER UNIT VOLUME
OF WATER BASE PAINT PRODUCED*

Liter/Liter (Gal/Gal)	Number of Plants	Percent of Total
0	63	8.6
Over 0 but less than 0.05	110	15.0
0.05 - 0.10	49	6.7
0.10 - 0.20	122	16.6
0.20 - 0.50	139	18.9
0.50 - 1.0	111	15.1
Over 1.0	140	19.0

* Limited to plants using water rinse and manufacturing some water base paint.

Source: Calculations based on DCP responses

TABLE V-9

WASTEWATER DISCHARGE PER UNIT VOLUME
OF WATER BASE PAINT PRODUCTION*

Liter/Liter (Gal/Gal)	Number of Plants	Percent of Total
0	223	30.7
Over 0 but Less than 0.04	101	13.9
0.04 to 0.1	33	4.6
0.1 - 0.2	98	13.5
0.2 - 0.5	114	15.7
0.5 - 1.0	77	10.6
Over 1.0	79	10.9

Limited to plants using water rinse and manufacturing some water base paint.

Source: Calculations based on DCP responses.

The Southern Research Institute Report, Waterborne Wastes of the Paint and Inorganic Pigments Industries, published March 1974, studied wastewater management in these industries, and presented data concerning water usage, wastewater generation and treatment, and wastewater characteristics. The source for much of the data in this study was a survey sent to 153 plants, supplemented by four plant inspections. No paint process wastewater was sampled during this study. Nine paint plants supplied untreated wastewater data but all of the data were based on combined wastewater streams. Consequently, no analytical data from the SRI study are used in this report.

In February 1975, NFIC published a Draft Development Document for Proposed Effluent Guidelines and New Source Performance Standards for the Paint and Ink Formulation Industries. This report was based, in part, on data from the SRI report plus supplemental analytical data collected by the NFIC-Denver staff. This report served as the basis of the July 1975 Development Document recommending no discharge regulations for direct dischargers for the two subcategories, solvent-base/solvent-wash paint and solvent-base/solvent-wash ink. These regulations were subsequently promulgated. The NFIC researched the untreated wastewater discharge of paint manufacturing sites in the Oakland, California area using the files of the East Bay Municipal Utilities District (EBMUD). These results are presented in Table V-10. Some of the EBMUD samples, however, appear to be from paint wastewater combined with other plant wastewater streams, and, where reported, the high standard deviations indicate the large variations in wastewater characteristics from plant to plant. To supplement these data, NFIC collected three-day composite samples of untreated wastewater from three plants in the Oakland, California area. The summary of the data collected from these three plants is presented in Table V-11. For most parameters, the data from the field samples are significantly higher than the data from the EBMUD files.

Approximately 95 plants attached historical analytical data on wastewater discharged from their plants to their DCP responses. Of these 95 plants, only 17 submitted data on segregated paint process wastewater streams. Two of the 17 plants had data for both untreated and treated paint process wastewater, seven for untreated wastewater only, and eight for treated wastewater only. Table V-12 summarizes the data from the two plants that reported on both treated and untreated wastewater. Since one of the plants reported only their mercury analysis, the data from both plants were combined for this parameter. The plant that supplied data for a variety of conventional, nonconventional and metal toxic pollutants produced both water-thinned and solvent-thinned paints. Wastewater is treated by means of a physical-chemical treatment system.

Table V-13 summarizes the untreated paint process wastewater data supplied by seven plants. Table V-14 summarizes the data on treated

TABLE V-10

CONSTITUENTS OF PAINT MANUFACTURING PLANT WASTES IN EAST BAY MUNICIPAL UTILITIES DISTRICT[1] RESEARCHED BY NFIC-DENVER

Constituent	No. of Entries	Values (mg/l) Min.	Max.	Mean	Std. Dev.	Median
pH (units)	28	3.4	13.2	8.8	3.2	6.7
BOD	12	60	1,740	481	474	450
Total COD	31	53	99,999[2]	5,428	17,649	5,145
Dissolved COD	31	19	78,000	4,103	13,787	4,466
Total Solids	1	-	-	6,887	-	-
Settleable Solids	3	0[3]	2	1	-	-
Total Suspended Solids	32	38	8,180	1,039	1,759	612
Ammonia	3	0	1.7	0.5	-	1.7
Total Kjeldahl Nitrogen	3	0	189	64	-	-
Oil & Grease	26	4	999	103	232	7
Total Phosphorus	3	0.3	26.4	14	-	26
Aluminum	3	2.6	74.6	29.5	-	11.4
Antimony	1	1.1	1.1	1.1	-	-
Barium	3	0.77	5.7	2.8	-	5.7
Cobalt	2	0.05	0.23	0.14	-	-
Copper	3	0.11	0.22	0.17	-	0.11
Iron	3	3.8	37.3	15.2	-	4.6
Lead	3	1.14	9.99	4.99	-	1.1
Manganese	3	0.06	9.99	3.5	-	0.06
Nickel	3	0.02	0.07	0.03	-	0.02
Silver	2	0	0	0	-	-
Tin	3	0	0.07	0.02	-	-
Zinc	3	0.31	9.3	3.8	-	-
Phenols	3	0	0.1	0.0	-	-
Surfactants	3	0.2	7.5	2.8	-	7.5

(1) All data from East Bay Municipal Utilities District files.
(2) Series of 9's indicate number higher than allocated space in computer program.
(3) A zero indicates a value below detectable limits of analytical test.

Source: NFIC-D Report (2)

TABLE V-11

SUMMARY OF SAMPLING DATA
NFIC-D, 1973

	Plant 1	Plant 2	Plant 3	Average of Three Plants
pH (units)	11.5	8.2	7.7	8.2 (1)
COD	8100	14800	16200	13000
TOC	1200	1890	3100	2060
TSS	11300	31500	19800	20867
Barium	1.67	1	L 1.0	1.2
Total Chromium	0.93	59	0.77	20.2
Cadmium	L 0.01	L 0.01	L 0.001	L 0.01
Iron	41.7	139	523	235
Lead	0.62	1.02	2.5	1.4
Zinc	57.7	2.64	77.4	45.9
Copper	0.4	0.14	0.09	0.21
Titanium	223	743	248	405

(1) Median Value

All units mg/l unless otherwise noted.
L = Less than

Source: NFIC-D Report (2)

TABLE V-12

SUMMARY OF DATA FROM TWO PLANTS THAT SUBMITTED UNTREATED AND TREATED HISTORICAL ANALYTICAL DATA (1)

	Untreated				Treated				
	No. of Entries	Min	Max	Mean	No. of Entries	Min	Max	Mean	% Removal
pH (units)	1	8.5			1	5.4			
BOD	1			7850	1			4720	40
COD	1			12850	1			7160	44
TOC	1			7000	1			2500	64
O&G	1			1290	1			41	97
Total Solids	1			16040	1			3070	81
TSS	1			6450	1			2	G 99
TDS	1			1330	1			2990	-
TVS	1			5970	1			716	88
Phenol	1			0.17	1			0.16	6.4
Zinc	1			300	1			200	33
Lead	1			8.5	1			0.1	99
Nickel	1			1.0	1			2.2	-
Mercury (1)	3	0.25	0.9	0.58	3	0.07	0.3	0.15	75
Copper	1			0.5	1			0.24	52
Cadmium	1			0.15	1			0.07	53
Iron	1			540	1			0.24	G 99

(1) Combined data from two sites

All units mg/l unless otherwise noted.
G = greater than

Source: DCP

paint process wastewater supplied by eight plants. The variability of the data is probably due to differences in process operations, raw materials, amount of water used, type of treatment, if any, location of the sampling point, and analytical techniques.

The 1976 Draft Development Document prepared by Burns and Roe included a sampling program on treated and untreated paint process wastewater streams and sludge from nine paint manufacturing sites. Table V-15 summarizes the type of paint produced, the type of treatment used, and the number of samples taken at each of the nine plants. The average untreated and treated wastewater concentrations from the 1976 program are presented in Tables V-16 and V-17.

Sampling Data

Analytical data for conventional, nonconventional, and toxic pollutants from each of the 22 paint plants chosen for sampling during this study are presented in Appendix G. For most plants, samples were taken of intake water, untreated and treated wastewater, and sludge. Of the 22 plants, 17 treated their wastewater by means of a batch physical-chemical treatment system, using chemical addition, mixing, and settling. Three additional plants utilized a continuous system with the same unit operations as the batch physical-chemical plants. The two remaining plants utilized neutralization and gravity separation. Production characterization and statistics concerning wastewater generation and treatment from each of the 22 plants can be found in Tables V-18, V-19, and V-20. The information in these tables came from plant interviews during the sampling program, and was supplemented by data from the DCP's. The toxic pollutants that were potentially present in the raw materials from each paint plant are listed in Table V-21. This table was based on an analysis of the raw materials survey in the paint industry DCP.

A summary of the characteristics of untreated and treated wastewater, sludge, and tap water from the 22 sampled plants is presented in Tables V-22 to V-25 (Section VI discusses this information and its relationship to the raw materials survey). These tables summarize the number of times each conventional, nonconventional, and toxic pollutant was analyzed for, the number of times each organic toxic pollutant was detected, and the number of times each was detected above 10 ug/l (inorganic toxic pollutants and nonconventional pollutants had different detection limits, ranging from 0.5 ug/l to 2000 ug/l). The average (mean), median, minimum and maximum values also are indicated. For many parameters in paint wastewaters, the average value is significantly higher than the median value. This is caused partly by the batch nature of paint manufacture. The infrequent use of any particular pigment containing a high level of a toxic pollutant may result in a large number of wastewater batches with a relatively low concentration of that pollutant, and a few

TABLE V-13

AVERAGE UNTREATED WASTEWATER CONCENTRATIONS
FROM SEVEN PLANTS - DATA SUBMITTED WITH DCP'S

	# of Entries	Minimum	Maximum	Mean	Standard Deviation
pH (units)	36	4.3	12.9	10.6 (1)	
BOD	21	7.0	4000.0	1300	1030
COD	36	631	99999	23300	24200
Oil and Grease	9	12.5	394.0	150	110
Total Solids	22	918	56960	13900	17100
TSS	36	3.0	72980	9400	15700
TDS	11	2404	31494	16100	830
Phenol	5	0.11	6.6	1.8	2.7
Cyanide	1			0.1	
Zinc	38	0.05	280	40	65
Lead	11	0.2	11.6	4.3	3.8
Nickel	12	0.03	0.27	0.1	0.06
Mercury	17	0.01	13.0	2.5	4.1
Copper	31	0.05	2.2	0.4	0.5
Cadmium	16	0.01	0.19	0.1	0.05
Iron	30	1.0	550	70	110

(1) Median

All values in mg/l unless otherwise noted.

Source: DCP

TABLE V-14

AVERAGE TREATED WASTEWATER CONCENTRATIONS
FROM EIGHT PLANTS - DATA SUBMITTED WITH DCP'S

	# of Entries	Minimum	Maximum	Mean	Standard Deviation
pH (units)	17	5.4	11.2	7.1 (1)	
BOD	16	1.0	6725	870	1900
COD	13	20	49386	17900	19600
Oil and Grease	17	20.4	5314	660	1300
Total Solids	3	45.8	629	60	8.5
TSS	24	51	24959	3600	6700
Phenol	12	0.02	1.0	0.2	0.3
Cyanide	12	0.01	0.5	0.1	0.1
Zinc	24	0.04	98.0	4.5	20
Lead	20	0.02	21.9	1.3	4.9
Nickel	17	0.01	0.7	0.1	0.2
Mercury	21	0.001	4.8	0.51	1.0
Copper	17	0.05	67.2	4.9	16
Cadmium	14	0.01	55.0	3.9	15
Iron	16	0.1	1477	120	370

(1) Median

All values in mg/l unless otherwise noted.

Source: DCP

TABLE V-15

CHARACTERISTICS OF PAINT PLANTS SAMPLED DURING 1976

Plant Code	Type of Paint Produced		Type of Treatment	Number of Samples Taken	
	Water	Solvent		Untreated	Treated
76-A	x	x	S	1	1
76-B	x	x	PC	4	4
76-C	x		PC	3	3
76-D	x	x	PC	2	2
76-E	x		PC	4	4
76-F	x	x	PC	2	2
76-G	x		PC	1	1
76-H	x	x	PC	3	3
76-J	x	x	S	3	3

PC - Physical-Chemical
S - Sedimentation
Neut - Neutralization

Source: DCP

TABLE V-16

AVERAGE UNTREATED AND TREATED WASTEWATER CONCENTRATIONS
1976 PAINT SAMPLING PROGRAM

	pH (1)	BOD_5	COD	Dissolved COD	O&G	TS	TSS	Sett. Solids (2)	TDS	TVS	VSS	VDS	Phenols
76-A (1 Entry)													
Untreated	10.9	1300	3000	1800	300	4000	1600	180	2400	2100	900	1100	2.5
Treated	10.7	980	3500	1500	220	3000	550	140	2400	1600	240	1400	3.5
76-B (4 Entries)													
Untreated	8.2	16000	42300	16500	1700	23900	9600	40	12500	8400	3200	5200	0.4
Treated	6.0	11600	21000	16100	250	14700	850	13	13800	3000	620	3400	0.3
76-C (3 Entries)													
Untreated	7.8	4800	14900	4300	1400	20000	14100	110	5900	8300	5400	2800	0.1
Treated	7.1	1700	9000	3500	20	6000	130	1.7	5900	870	50	790	0.1
76-D (2 Entries)													
Untreated	7.6	4600	22600	7100	1400	20400	9900	90	10400	10300	3900	6400	0.7
Treated	7.2	2700	16500	5800	1100	8700	4200	40	4500	6800	3100	3700	0.4
76-E (4 Entries)													
Untreated	7.6	-	41100	7400	1700	29300	17400	78	11900	14900	6400	8500	0.2
Treated	7.1	3800	9500	4900	170	4900	1400	22	3500	3000	1100	1900	0.1
76-F (2 Entries)													
Untreated	12.4	3200	12800	7800	1200	102100	2900	45	99900	23300	1600	21600	0.1
Treated	9.4	6300	24600	10900	870	85000	2100	67	83000	19000	450	18600	0.4
76-G (1 Entry)													
Untreated	8.0	8500	28200	5900	1400	14500	3700	70	10800	12200	2600	9600	0.1
Treated	7.5	3800	6900	6600	37	3900	7.0	0.1	3900	570	70	60	0.1
76-H (3 Entries)													
Untreated	9.1	8500	63800	15200	2300	48600	39500	10900	9100	22100	16700	5500	2.6
Treated	6.4	3200	7800	4200	1300	10200	4500	4100	5700	3700	1700	2000	2.6
76-J (1 Entry)													
Untreated	8.8	3500	27900	4200	2400	36000	15600	14	17600	20600	4800	8300	1.1
Treated	5.7	1100	3300	2000	160	3200	1400	11	2300	2000	580	680	0.1

(1) Median, in units
(2) Ml/l

All Units mg/l Unless Otherwise Noted

TABLE V-17

AVERAGE UNTREATED AND TREATED WASTEWATER CONCENTRATIONS FOR METALS
1976 PAINT SAMPLING PROGRAM

	Al	Sb	Ba	B	Cd	Cr(1)	Co	Cu	Fe	Pb	Mn	Hg(2)	Mo	Ni	Sn	Ti	Zn
76-A (1 Entry)																	
Untreated	12	1.0	1.7	0.31	0.01	13	0.38	0.15	2.9	14	0.06	0.9	0.1	0.25	0.5	16	8
Treated	18	1.0	0.9	0.4	0.01	10	0.4	0.07	2.4	6.8	0.02	0.5	0.1	0.4	0.5	33	6.0
76-B (4 Entries)																	
Untreated	140	0.45	20	1.6	0.06	15	1.5	0.47	81	22	7.5	2.0	0.15	4.5	1.2	200	260
Treated	57	0.38	0.6	2.6	0.07	7.6	1.0	0.02	15	2.4	2.4	0.9	0.2	3.9	0.6	17	230
76-C (3 Entries)																	
Untreated	240	0.37	0.66	0.28	0.09	0.23	0.10	0.49	12	0.43	0.21	1.1	0.1	0.64	0.5	280	210
Treated	2.9	0.2	0.1	0.2	0.01	0.02	0.05	0.1	0.8	0.2	0.04	0.6	0.1	0.06	0.5	13	0.9
76-D (2 Entries)																	
Untreated	66	0.45	0.61	0.5	0.04	0.12	0.35	0.38	82	0.61	18	14	0.1	0.19	0.5	59	5.9
Treated	20	0.1	0.3	0.4	0.01	0.04	0.1	0.3	38	0.2	8.1	7.4	0.1	0.06	0.5	13	3.9
76-E (4 Entries)																	
Untreated	280	0.33	0.32	1.4	0.015	0.08	0.67	0.3	100	0.25	0.35	0.5	0.1	0.18	0.5	220	0.76
Treated	24.8	0.125	0.2	0.66	0.01	0.02	0.06	3.6	0.13	0.05	0.53	0.55	0.1	0.04	0.5	7.2	0.02
76-F (3 Entries)																	
Untreated	100	1.9	2.7	8.9	0.07	32	1.1	0.38	31	92	0.69	0.4	2.2	0.65	1.9	140	9.3
Treated	10	4.1	0.4	7.4	0.15	19	0.7	0.6	11	19	0.3	0.7	3.3	0.6	3.9	1.0	8.2
76-G (1 Entry)																	
Untreated	35.6	0.1	0.1	21	0.01	0.01	0.17	0.13	1.6	0.20	0.05	0.7	0.1	0.05	0.5	13	8.5
Treated	3.2	0.5	0.1	0.1	0.01	0.01	0.04	0.05	0.1	0.80	0.03	0.5	0.1	0.01	0.5	1	0.13
76-H (3 Entries)																	
Untreated	510	10	0.25	1.0	0.15		8.5	0.55	600	0.85	0.53	0.004	0.33	1.1	27	940	1300
Treated	530	13	0.3	1.0	0.2		8.2	0.3	270	0.7	1.0	0.004	0.33	0.8	23	440	1400
76-J (1 Entry)																	
Untreated	400	0.5	2.2	1.4	0.86	0.14	3.5	0.30	4.5	0.42	0.10	1.2	0.1	0.25	0.38	540	740
Treated	45	0.07	0.07	1.0	0.2	0.01	1.0	0.1	5.2	0.06	0.2	0.7	0.1	0.01	0.5	380	100

(1) Total chromium
(2) ug/l

All units mg/l unless otherwise noted

TABLE V-18

PRODUCTION CHARACTERISTICS OF PAINT PLANTS
PARTICIPATING IN 1977/1978 SAMPLING PROGRAM*

	Paint Production			Pigments			Wastewater Generation					
Plant Code	% Water Thinned	% Solvent Thinned	% White	% Organic	% In-Organic	Dedicated Tanks Yes/No	Liter H_2O/ Liter Paint	% of Flow To Treatment Process/Cleaning	Caustic Washer Yes/No	Water Pressure (lb/in^2)	% Reuse	Number of Employees(1)
1	75%	25%	55%	5%	95%	No	0.15(1)	100%	No	50(4)	0	150+
2	100	0	90	40	60		0.25	75	No	200	0	150+
3	90	10	75	75	25	No	0.27	45	No	150	50%	150+
4	100	0	65	5	95	No	0.3(1)	70(1)	No	50(4)	0	101 - 150
5	35	65	90(2)	15	85	Yes-Solvent	0.15(1)	65	Yes	50(4)	0	150+
6	100	0	65	15	85	No	0.1(1)	85	No	200	0	51 - 60
8	75	25	15	5	95		0.16(1)	99	Yes (3)	50(4)	0	101 - 150
9	75	25	60	35	65		0.17	100	Yes (3)	60(1)	0	51 - 60
11	15	85	75	25	75		0.3	100	Yes (3)	150	0	150+
12	10	90		20	80	Yes	0.3	100	Yes		0	101 - 150
13	65	35	55	45	55	No	0.15	100	No	75	0	10 - 20
14	65	35	60	15	85	No	0.08	100	No	100	0	81 - 90
15	25	75	65	10	90	No	0.04	100	No	50(4)	0	41 - 50
16	50	50	40	10	90	Yes-Ind.Ctgs.	0.13	100	No	50(4)	50	31 - 40
17	85	15	50			Yes-White	0.15	100	No	50(4)	0	101 - 150
18	65	35	75	10	90	No	0.25(1)	100	No	50(4)	75	51 - 60
20	65	35	25				0.03(1)	100	No	50(4)	25	41 - 50
24	100	0	55	15	85		0.7	100	Yes	125	0	101 - 150
25	40	60	55	5	95	Yes	0.23(1)	100	Yes	60(1)	0	150+
26	65	35	95	5	95		0.31(1)	100	No	60(1)	0	61 - 70
27	85	15	90	85	15		0.07		No	80	10	61 - 70
28	65	35	45	5	95		0.13(1)	100	Yes	50(1)	0	31 - 40

(1) Estimated from DCP
(2) Water-thinned only
(3) No discharge to treatment system
(4) Estimate of City water pressure

* As of Sampling Period

Source: Burns and Roe field Reports and DCP

TABLE V-19

WASTEWATER TREATMENT CHARACTERISTICS OF PAINT PLANTS
PARTICIPATING IN 1977/1978 SAMPLING PROGRAM

Plant Code	Type	Batch or Continuous	Size of Batch (gal)	Major Sources	Chemicals Used For Treatment	Jar Test(2) Yes/No	Sludge Held Batches	% Sludge Produced	Wastewater Volume (gal/day)(3)
1	PC	Batch	5000	Wt	Sodium Bisulfate, Anionic & Cationic Polymer	Yes	1	5%	1000 - 6000
2	PC	Batch	4000	Wt	Alum, Potassium Hydroxide	No	1-3		1000 - 6000
3	PC	Batch	6000	Wt	Deerborn Proprietary Aquafloc 409, Polymer	Yes	1	6	G 12,000
4	PC	Batch	5500	Wt	Aluminum Sulfate, Lime	Yes	1	9	1000 - 6000
5	PC	Batch	5700	Wt, CR	Sodium Aluminate Nalco 7722	Yes	1	20	1000 - 6000
6	PC	Batch	4000	Wt	Alum Ferric, Polymer Caustic	Yes	1	3	1000 - 6000
8	PC	Batch	4800	Wt	Ferric Chloride, Polymer Aqua Ammonia	Yes	1	17	1000 - 6000
9	PC	Batch	900	Wt	Nalco 7742A	Yes	1	22	500 - 1000
11	GS	Batch	6000	Wt		No	1	5	G 12,000
12	Neut	Batch	700	CR	Phosphoric Acid	No	1	22	1000 - 6000
13	PC	Batch	300	Wt	Nalco 3174	No	3	3	1 - 100
14	PC	Batch	750	Wt	Nalco 634	Yes	1	16	100 - 500
15	GS	Continuous		Wt, St	Mobil Floc Resin 9000	No			100 - 500
16	PC	Batch	1500	Wt	Cosan C-Floc 18	Yes	1	3	1 - 100
17	PC	Continuous		Wt	Alum, Lime, Soda Ash, Ferric Chloride	No		33	1000 - 6000
18	PC	Batch	1000	Wt	Caustic, Ferrous Sulfate, DuBois Floc 551	No	3	7	100 - 500
20	PC	Batch	800	Wt	Ferrous Sulfate	No	1	5	500 - 1000
24	PC	Batch	6000	Wt	Drew Amerfloc	No	3-4	17(1)	6000 - 12,000
25	PC	Continuous	200	Wt. CR	Ferric Floc, Sulfuric Acid, Caustic	No		7(1)	1000 - 6000
26	PC	Batch	25,000	Wt	Sulfuric Acid, Lime	Yes		5(1)	500 - 1000
27	PC	Batch	11,000	Wt	Amerfloc; Cationic Polymer	Yes	1	10(1)	100 - 500
28	PC	Batch	300	Wt	HCl, Cosan C-Floc		1	5(1)	6000 - 12,000

Type
PC: Physical Chemical
GS: Gravity Separation
Neut: Neutralization

Sources of Wastewater
Wt: Water-Thinned Operation
St: Solvent-Thinned Operation
CR: Caustic Rinse

(1) Estimated from DCP
(2) Indicates whether plant uses jar tests to optimize chemical dosage for each batch.
(3) Ranges are those indicated on DCP

Source: Burns and Roe Field Reports and DCP

G- Greater Than

TABLE V-20

WASTEWATER TREATMENT METHODS USED AT PAINT SAMPLING PLANTS

Plant Code	Neutralization	Settling and Clarification	Lagoon Evaporation	Gravity Separation	Flotation	Filtration	Chemical Treatment				
							Alum	Lime	Polymer	Other	Comments
1	X	X					X		X		
2							X				
3		X									
4				X			X	X			
5	X			X						X	Sodium Aluminate
6	X	X					X	X	X		
8							X		X		
9	X								X		
11	X	X		X				X			
12	X										
13				X						X	
14				X					X		
15				X			X		X		
16									X		
17	X					X		X			
18									X		
20		X					X	X		X	Ferric Chloride
24	X	X		X			X		X	X	Aluminum Sulfate
25	X	X		X	X					X	Ferric Sulfate and Sulphuric Acid; Sodium Hydroxide
26	X	X						X		X	Sulphuric Acid
27			X			X			X		
28	X	X							X		

Source: DCP

TABLE V-21

TOXIC POLLUTANTS REPORTED IN SAMPLING PLANT RAW MATERIALS

PLANT CODE

Toxic Pollutants	1	2	3	4	5	6	8	9	11	12	13	14	15	16	17	18	20	24	25	26	27	28
Antimony	X	X							X	X	X			X		X	X	X	X	X		
Cadmium				X	X		X				X		X	X	X			X	X	X		X
Copper	X	X	X	X	X	X	X	X		X	X	X	X	X	X	X		X	X	X	X	
Chromium	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X		X
Lead	X	X	X	X	X		X	X	X	X	X	X	X	X	X	X	X	X	X	X		X
Nickel	X	X	X	X	X		X	X	X	X	X	X	X	X	X	X	X	X	X	X		X
Selenium																				X		
Silver		X			X		X	X		X		X		X	X	X			X			
Zinc	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X		X	X	X	X
Asbestos							X	X	X		X				X					X		
Phenol	X	X			X		X	X	X	X	X		X	X	X	X	X		X	X	X	
Benzene															X							
Toluene	X	X	X		X		X	X	X	X	X		X	X		X		X	X	X		X
Ethylbenzene	X		X		X		X		X	X	X		X	X					X	X		X
Isophorone	X	X			X					X									X			
bis(2-Ethylhexyl) Phthalate									X	X	X	X										
di-N-Butyl Phthalate	X	X		X	X				X	X	X	X	X	X	X				X	X	X	
Mercury	X				X		X				X	X		X	X	X	X		X	X	X	
Dimethyl Phthalate										X			X									
Diethyl Phthalate	X																					
3-3 Dichloro Benzidine	X	X	X	X	X		X	X	X	X		X		X		X	X		X	X	X	X
Methyl Chloride	X				X				X	X	X		X									
Methylene Chloride		X			X						X		X									
Trichloroethylene	X									X	X	X										
Vinyl Chloride		X			X			X	X	X	X			X	X				X			
Vinylidine Chloride								X	X					X					X			
Pentachlorophenol									X		X					X					X	
1,2 Dichlorobenzene											X											
TOTAL	16	14	6	7	18	2	13	11	16	18	19	10	13	16	12	12	8	6	16	14	7	8

Source: DCP

TABLE V- 22
UNTREATED WASTEWATER DATA SUMMARY
1977/1978 SAMPLING PROGRAM

NO.	PARAMETER	NUMBER OF SAMPLES ANALYZED	NUMBER OF TIMES ABOVE DET. LIMIT	AVERAGE	MEDIAN	MINIMUM	MAXIMUM
	CONVENTIONAL POLLUTANTS						
	PH(UNITS)	56	56		8	5	13
	BOD(MG-L)	54	54	9892	4850	280	65500
	OIL & GREASE(MG-L)	52	52	1099	938	42	3400
	TOTAL SUSP. SOLIDS(MG-L)	50	50	20424	12800	280	148000
	NONCONVENTIONAL POLLUTANTS						
	COD(MG-L)	57	57	54956	39000	1201	350000
	TOC(MG-L)	51	51	10601	8500	1500	46000
	TOTAL SOLIDS(MG-L)	51	51	28945	22750	90	160000
	TOTAL DISS. SOLIDS(MG-L)	46	46	10619	4300	500	145000
	TOTAL VOLATILE SOLIDS(MG-L)	46	46	13017	11350	960	31700
	VOLATILE DISS. SOLIDS(MG-L)	27	27	5400	3600	270	21800
	TOTAL VOL. SUS. SOLIDS(MG-L)	29	29	7789	7600	160	25000
	ALUMINUM	55	55	196758	100000	8000	3000000
	BARIUM	54	53	8656	2000 L	50	100000
	BORON	52	39	4268	1000	131	40000
	CALCIUM(MG-L)	54	51	2277	281 L	20	38000
	COBALT	54	41	912	300 L	20	11600
	IRON	54	54	271307	40000	3000	6000000
	MAGNESIUM(MG-L)	54	54	107	36	4	2100
	MANGANESE	54	54	2901	886	40	40000
	MOLYBDENUM	53	42	674	200 L	5	11200
	SODIUM	54	45	397	205 L	60	2900
	TIN	54	53	1111	400 L	50	20000
	TITANIUM	54	54	16677	7000	80	210000
	VANADIUM	53	25	409 L	100	32	11400
	YTTRIUM	52	4	206 L	200 L	16 L	2000
	INORGANIC TOXIC POLLUTANTS						
114	ANTIMONY	57	11	209 L	25 L	10 L	2000
115	ARSENIC	48	25	286	69 L	20 L	2000
117	BERYLLIUM	60	14	126 L	10	2	3990
118	CADMIUM	60	29	524 L	20 L	8	15600
119	CHROMIUM	60	50	3120	260 L	50	40000
120	COPPER	60	58	2476	400	50	40000
121	CYANIDE	50	7	79	25 L	1	310
122	LEAD	60	45	6300	805	22	80000
123	MERCURY	55	44	5161 L	500 L	1	62000
124	NICKEL	60	18	1350 L	50 L	5	40000
125	SELENIUM	58	4	165 L	25	9 L	2000
126	SILVER	59	5	15 L	10 L	1 L	100
127	THALLIUM	59	11	151 L	10	6 L	2000
128	ZINC	60	57	74746	10000	600	900000

TABLE V- 22 (CON'T)
UNTREATED WASTEWATER DATA SUMMARY
1977/1978 SAMPLING PROGRAM

NO.	PARAMETER	NUMBER OF SAMPLES ANALYZED	NUMBER OF TIMES DETECTED	NUMBER OF TIMES ABOVE 10 UG/L	AVERAGE		MEDIAN		MINIMUM		MAXIMUM
	ORGANIC TOXIC POLLUTANTS										
2	ACROLEIN	31	1	0	10	L	10	L	10	L	10
4	BENZENE	31	18	18	1933		370		20		9900
6	CARBON TETRACHLORIDE	31	8	7	3770		14	L	10		30000
7	CHLOROBENZENE	31	4	3	1405		56	L	10		5500
9	HEXACHLOROBENZENE	31	1	1	92		92		92		92
10	1,2-DICHLOROETHANE	31	5	4	118		33	L	10		420
11	1,1,1-TRICHLOROETHANE	31	16	15	141		76		10		930
13	1,1-DICHLOROETHANE	31	2	1	11		11	L	10		13
14	1,1,2-TRICHLOROETHANE	31	5	2	568	L	10	L	10		2800
15	1,1,2,2-TETRACHLOROETHANE	31	2	1	20		20	L	10		30
20	2-CHLORONAPHTHALENE	31	1	0	10	L	10	L	10	L	10
21	2,4,6-TRICHLOROPHENOL	31	2	1	2455	L	2455	L	10		4900
23	CHLOROFORM	31	15	15	186		92		16		900
28	3,3'-DICHLOROBENZIDINE	31	1	0	10	L	10	L	10	L	10
29	1,1-DICHLOROETHYLENE	31	5	3	138		23	L	10		620
30	1,2-TRANS-DICHLOROETHYLENE	31	2	1	135		135	L	10		260
31	2,4-DICHLOROPHENOL	31	2	0	10	L	10	L	10	L	10
32	1,2-DICHLOROPROPANE	31	4	3	265		41	L	10		968
33	1,3-DICHLOROPROPYLENE	31	1	1	100		100		100		100
38	ETHYLBENZENE	31	25	25	7482		1300		80		112800
39	FLUORANTHENE	31	1	0	10	L	10	L	10	L	10
40	4-CHLOROPHENYL PHENYL ETHER	31	1	1	266		266		266		266
42	DI(2-CHLOROISOPROPYL) ETHER	31	1	1	3200		3200		3200		3200
43	DI(2-CHLOROETHYOXY) METHANE	31	1	0	10	L	10	L	10	L	10
44	METHYLENE CHLORIDE	31	18	17	31878		620	L	10		210000
48	DICHLOROBROMOMETHANE	31	1	1	27		27		27		27
55	NAPHTHALENE	31	9	8	2950		54	L	10		18000
56	NITROBENZENE	31	3	2	100		110	L	10		180
59	2,4-DINITROPHENOL	31	3	3	173		160		110		250
60	4,6-DINITRO-O-CRESOL	31	1	0	10	L	10	L	10	L	10
64	PENTACHLOROPHENOL	31	6	5	6017		750	L	10		27000
65	PHENOL	31	11	8	746		96	L	10		3800
	TOTAL PHENOLS	56		45	260		125	L	1		1900
66	DI(2-ETHYLHEXYL) PHTHALATE	31	11	9	418		140	L	10		2810
67	BUTYL BENZYL PHTHALATE	31	4	3	474		44	L	10		1800
68	DI-N-BUTYL PHTHALATE	31	19	13	5745		160	L	10		69000
70	DIETHYL PHTHALATE	31	3	1	233	L	10	L	10		680
73	BENZO (A)PYRENE	31	1	0	10	L	10	L	10	L	10
78	ANTHRACENE	31	1	0	10	L	10	L	10	L	10
85	TETRACHLOROETHYLENE	31	18	16	567		175	L	10		4900
86	TOLUENE	31	27	27	17966		2500		73		259700
87	TRICHLOROETHYLENE	31	17	12	81		23	L	10		250
89	ALDRIN	31	1	0	10	L	10	L	10	L	10
90	DIELDRIN	31	1	0	10	L	10	L	10	L	10
93	4,4'-DDE	31	1	0	10	L	10	L	10	L	10
94	4,4'-DDD	31	1	0	10	L	10	L	10	L	10
96	BETA-ENDOSULFAN	31	2	0	10	L	10	L	10	L	10
99	ENDRIN ALDEHYDE	31	1	0	10	L	10	L	10	L	10
102	ALPHA-BHC	31	2	0	10	L	10	L	10	L	10
103	BETA-BHC	31	1	0	10	L	10	L	10	L	10
104	GAMMA-BHC	31	1	0	10	L	10	L	10	L	10
105	DELTA-BHC	31	1	0	10	L	10	L	10	L	10

ALL UNITS UG/L UNLESS OTHERWISE NOTED; L=LESS THAN
AVERAGE, MEDIAN, AND MINIMUM VALUES BASED ONLY ON NUMBERS OF TIMES DETECTED FOR ORGANIC TOXIC POLLUTANTS

TABLE V- 23
TREATED WASTEWATER DATA SUMMARY
1977/1978 SAMPLING PROGRAM

NO.	PARAMETER	NUMBER OF SAMPLES ANALYZED	NUMBER OF TIMES ABOVE DET. LIMIT	AVERAGE	MEDIAN	MINIMUM	MAXIMUM
	CONVENTIONAL POLLUTANTS						
	PH(UNITS)	51	51		7	3	11
	BOD(MG-L)	50	48	5282	3750	6	32000
	OIL & GREASE(MG-L)	47	46	228	25	1	1700
	TOTAL SUSP. SOLIDS(MG-L)	49	49	1946	240	6	22000
	NONCONVENTIONAL POLLUTANTS						
	COD(MG-L)	52	52	19655	10050	1350	260000
	TOC(MG-L)	48	48	3867	2500	460	25000
	TOTAL SOLIDS(MG-L)	48	48	6249	5190	30	23000
	TOTAL DISS. SOLIDS(MG-L)	45	45	4451	3960	844	14966
	TOTAL VOLATILE SOLIDS(MG-L)	42	42	3146	1465	240	12000
	VOLATILE DISS. SOLIDS(MG-L)	42	42	1839	1120	184	9990
	TOTAL VOL. SUS. SOLIDS(MG-L)	42	42	1307	102	2	8200
	ALUMINUM	51	41	12219	3000 L	50	100000
	BARIUM	50	26	1572 L	50 L	5	30000
	BORON	48	33	2499	900	137	10000
	CALCIUM(MG-L)	50	38	309	160	8	1220
	COBALT	50	25	483 L	50 L	5	6000
	IRON	50	32	99461 L	2000 L	170	2000000
	MAGNESIUM(MG-L)	50	50	22	11	2	81
	MANGANESE	50	44	1814	200 L	5	30000
	MOLYBDENUM	49	22	196 L	50 L	5	6000
	SODIUM	50	42	697	230 L	60	15000
	TIN	50	27	175 L	50 L	5	2000
	TITANIUM	50	26	1785 L	200 L	15	30000
	VANADIUM	49	6	83 L	100 L	10	200
	YTTRIUM	47	1	152 L	200 L	16 L	200
	INORGANIC TOXIC POLLUTANTS						
114	ANTIMONY	52	6	182 L	25 L	10 L	2000
115	ARSENIC.	47	5	161 L	25	4 L	2000
117	BERYLLIUM	55	2	8 L	10 L	1 L	50
118	CADMIUM	55	15	30 L	20 L	2 L	200
119	CHROMIUM	55	29	1209 L	50 L	5	30000
120	COPPER	55	44	1636	100	13	60000
121	CYANIDE	47	5	53 L	20 L	1	530
122	LEAD	55	21	1362	200 L	20	40000
123	MERCURY	50	35	689	156 L	1	4400
124	NICKEL	55	13	2842 L	50 L	5	80000
125	SELENIUM	53	2	178 L	25 L	2 L	2000
126	SILVER	54	3	9 L	10 L	1 L	50
127	THALLIUM	54	3	160 L	10 L	10 L	2000
128	ZINC	55	39	7360	1000 L	60	100000

TABLE V- 23 (CON'T)
TREATED WASTEWATER DATA SUMMARY
1977/1978 SAMPLING PROGRAM

NO.	PARAMETER	NUMBER OF: SAMPLES ANALYZED	NUMBER OF: TIMES DETECTED	NUMBER OF: TIMES ABOVE 10 UG/L	AVERAGE		MEDIAN		MINIMUM		MAXIMUM
	ORGANIC TOXIC POLLUTANTS										
4	BENZENE	27	14	12	684		307	L	10		3800
6	CARBON TETRACHLORIDE	27	3	2	643		120	L	10		1800
7	CHLOROBENZENE	27	1	0	10	L	10	L	10	L	10
10	1,2-DICHLOROETHANE	27	4	3	71		53	L	10		170
11	1,1,1-TRICHLOROETHANE	27	14	10	81	L	16	L	10		560
13	1,1-DICHLOROETHANE	27	2	1	95	L	95	L	10		180
14	1,1,2-TRICHLOROETHANE	27	4	3	930		805	L	10		2100
16	CHLOROETHANE	27	1	0	10	L	10	L	10	L	10
21	2,4,6-TRICHLOROPHENOL	27	2	2	2400		2400		1100		3700
23	CHLOROFORM	27	16	14	370		30	L	10		4700
29	1,1-DICHLOROETHYLENE	27	4	2	19	L	11	L	10		44
30	1,2-TRANS-DICHLOROETHYLENE	27	6	4	51		27	L	10		188
32	1,2-DICHLOROPROPANE	27	2	2	212		212		24		400
33	1,3-DICHLOROPROPYLENE	27	1	1	44		44		44		44
37	1,2-DIPHENYLHYDRAZINE	27	1	0	10	L	10	L	10	L	10
38	ETHYLBENZENE	27	18	16	8117		520	L	10		73600
43	DI(2-CHLOROETHYOXY) METHANE	27	1	1	16		16		16		16
44	METHYLENE CHLORIDE	27	19	19	5600		1700	L	10		31000
54	ISOPHORONE	27	2	2	113		113		26		200
55	NAPHTHALENE	27	8	4	336	L	13	L	10		1830
56	NITROBENZENE	27	1	1	35		35		35		35
64	PENTACHLOROPHENOL	27	7	3	105	L	10	L	10		485
65	PHENOL	27	17	11	163		36	L	10		1240
	TOTAL PHENOLS	53		42	193		90		1		1900
66	DI(2-ETHYLHEXYL) PHTHALATE	27	10	3	36	L	10	L	10		160
67	BUTYL BENZYL PHTHALATE	27	5	4	695		67	L	10		2500
68	DI-N-BUTYL PHTHALATE	27	12	5	227	L	10	L	10		1300
70	DIETHYL PHTHALATE	27	4	2	464	L	14	L	10		1820
71	DIMETHYL PHTHALATE	27	3	1	79	L	10	L	10		219
77	ACENAPHTHYLENE	27	1	0	10	L	10	L	10	L	10
79	ANTHRACENE	27	1	0	10	L	10	L	10	L	10
81	PHENANTHRENE	27	1	0	10	L	10	L	10	L	10
85	TETRACHLOROETHYLENE	27	8	7	191		35	L	10		700
86	TOLUENE	27	21	21	2408		990		43		13200
87	TRICHLOROETHYLENE	27	11	8	72		14	L	10		300
93	4,4'-DDE	27	1	0	10	L	10	L	10	L	10
99	ENDRIN ALDEHYDE	27	1	0	10	L	10	L	10	L	10
103	BETA-BHC	27	1	0	10	L	10	L	10	L	10

ALL UNITS UG/L UNLESS OTHERWISE NOTED; L=LESS THAN
AVERAGE, MEDIAN, AND MINIMUM VALUES BASED ONLY ON NUMBER OF TIMES DETECTED FOR ORGANIC TOXIC POLLUTANTS.

TABLE V- 24
SLUDGE DATA SUMMARY
1977/1978 SAMPLING PROGRAM

NO.	PARAMETER	NUMBER OF SAMPLES ANALYZED	NUMBER OF TIMES ABOVE DET. LIMIT	AVERAGE		MEDIAN		MINIMUM		MAXIMUM
	CONVENTIONAL POLLUTANTS									
	PH(UNITS)	35	35			7		2		10
	BOD(MG-L)	34	34	24982		10200		1		150000
	OIL & GREASE(MG-L)	35	35	7578		2500		230		129000
	TOTAL SUSP. SOLIDS(MG-L)	33	33	101201		70000		100		466100
	NONCONVENTIONAL POLLUTANTS									
	COD(MG-L)	38	38	171641		130000		7		950000
	TOC(MG-L)	36	36	35126		29500		12000		108000
	TOTAL SOLIDS(MG-L)	32	32	107785		78000		8		470000
	TOTAL DISS. SOLIDS(MG-L)	30	27	13122		9800	L	1		100200
	TOTAL VOLATILE SOLIDS(MG-L)	31	31	39438		37000		3100		187000
	VOLATILE DISS. SOLIDS(MG-L)	16	14	7440		5250	L	1		40400
	TOTAL VOL. SUS. SOLIDS(MG-L)	20	20	23002		14133		880		89000
	ALUMINUM	37	37	867154		600000		50000		3000000
	BARIUM	36	36	9831		4345		72		50000
	BORON	34	29	2965		2000		175		14200
	CALCIUM(MG-L)	36	36	2870		914		250		30200
	COBALT	36	32	2131		600	L	50		15600
	IRON	36	36	886452		200000		22600		8000000
	MAGNESIUM(MG-L)	36	35	156		79	L	1		1500
	MANGANESE	36	36	7249		5000		300		50000
	MOLYBDENUM	35	34	1680		1000	L	50		15000
	SODIUM	36	32	583		260		100		3500
	TIN	36	36	2640		2000		200		14500
	TITANIUM	36	36	38345		20000		1000		230000
	VANADIUM	35	30	891		400		60		11500
	YTTRIUM	33	12	207	L	200		45	L	600
	INORGANIC TOXIC POLLUTANTS									
114	ANTIMONY	17	7	1579		150	L	10		13000
115	ARSENIC	12	5	879		495	L	25	L	2000
117	BERYLLIUM	39	25	192		20		2		3760
118	CADMIUM	39	28	840		200	L	8		14700
119	CHROMIUM	39	37	7050		700	L	50		90000
120	COPPER	39	39	7121		1000		216		80000
121	CYANIDE	34	3	1151	L	20	L	1		36500
122	LEAD	39	37	10770		3000		100		80000
123	MERCURY	36	31	15061		640		5		220000
124	NICKEL	39	27	10443	L	200	L	20		200000
125	SELENIUM	36	2	547	L	250		8	L	2000
126	SILVER	38	8	22	L	10	L	2	L	100
127	THALLIUM	9	1	967	L	400	L	10	L	2000
128	ZINC	39	36	230946		90000	L	600		2000000

TABLE V- 24 (CON'T)
SLUDGE DATA SUMMARY
1977/1978 SAMLING PROGRAM

NO.	PARAMETER	NUMBER OF SAMPLES ANALYZED	NUMBER OF TIMES DETECTED	NUMBER OF TIMES ABOVE 10 UG/L	AVERAGE		MEDIAN		MINIMUM		MAXIMUM
	ORGANIC TOXIC POLLUTANTS										
4	BENZENE	9	5	4	414		30	L	10		1900
6	CARBON TETRACHLORIDE	9	2	0	10	L	10	L	10	L	10
7	CHLOROBENZENE	9	2	2	176		176		12		340
10	1,2-DICHLOROETHANE	9	1	1	17		17		17		17
11	1,1,1-TRICHLOROETHANE	9	7	4	866		14	L	10		3200
15	1,1,2,2-TETRACHLOROETHANE	9	2	1	13		13	L	10		17
21	2,4,6-TRICHLOROPHENOL	9	1	0	10	L	10	L	10	L	10
23	CHLOROFORM	9	2	2	920		920		840		1000
34	2,4-DIMETHYLPHENOL	9	1	0	10	L	10	L	10	L	10
38	ETHYLBENZENE	9	8	8	14277		237		26		99000
44	METHYLENE CHLORIDE	9	8	8	120201		1735		300		900000
55	NAPHTHALENE	9	4	3	366		202	L	10		1050
59	2,4-DINITROPHENOL	9	2	1	18	L	18	L	10		27
64	PENTACHLOROPHENOL	9	4	4	346		125		35		1100
65	PHENOL	9	5	3	325		150	L	10		1120
	TOTAL PHENOLS	37		30	552		166	L	1		6000
66	DI(2-ETHYLHEXYL) PHTHALATE	9	8	6	455		215	L	10		1940
67	BUTYL BENZYL PHTHALATE	9	4	4	10410		1412		18		38800
68	DI-N-BUTYL PHTHALATE	9	5	4	3622		70	L	10		17750
70	DIETHYL PHTHALATE	9	3	3	370		100		50		960
71	DIMETHYL PHTHALATE	9	1	0	10	L	10	L	10	L	10
78	ANTHRACENE	9	2	1	210	L	210	L	10		410
84	PYRENE	9	1	0	10	L	10	L	10	L	10
85	TETRACHLOROETHYLENE	9	5	4	2142		170	L	10		8200
86	TOLUENE	9	8	8	44740		905		130		350000
87	TRICHLOROETHYLENE	9	6	2	39	L	10	L	10		130
89	ALDRIN	9	1	0	10	L	10	L	10	L	10
96	BETA-ENDOSULFAN	9	1	0	10	L	10	L	10	L	10
105	DELTA-BHC	9	1	0	10	L	10	L	10	L	10

ALL UNITS UG/L UNLESS OTHERWISE NOTED; L=LESS THAN
AVERAGE, MEDIAN, AND MINIMUM VALUES BASED ONLY ON NUMBER OF TIMES DETECTED FOR ORGANIC TOXIC POLLUTANTS.

TABLE V- 25
INTAKE (TAP) WATER DATA SUMMARY
1977/1978 SAMPLING PROGRAM

NO. PARAMETER	NUMBER OF SAMPLES ANALYZED	NUMBER OF TIMES ABOVE DET. LIMIT	AVERAGE	MEDIAN	MINIMUM	MAXIMUM
CONVENTIONAL POLLUTANTS						
PH(UNITS)	22	22		7	6	9
BOD(MG-L)	22	2	3 L	2 L	1 L	6
OIL & GREASE(MG-L)	18	4	1 L	1 L	1 L	5
TOTAL SUSP. SOLIDS(MG-L)	20	17	3	3	1	11
NONCONVENTIONAL POLLUTANTS						
COD(MG-L)	26	15	9 L	5	2	40
TOC(MG-L)	23	18	7	5 L	1	20
TOTAL SOLIDS(MG-L)	20	19	318	187 L	10	1500
TOTAL DISS. SOLIDS(MG-L)	18	18	338	187	29	1491
TOTAL VOLATILE SOLIDS(MG-L)	17	17	62	33	12	190
VOLATILE DISS. SOLIDS(MG-L)	17	17	56	28	4	188
TOTAL VOL. SUS. SOLIDS(MG-L)	18	12	1	1 L	1	8
ALUMINUM	24	12	1303 L	500 L	50	20000
BARIUM	23	17	64 L	50	5	600
BORON	21	9	382	500 L	50	1000
CALCIUM(MG-L)	23	13	53	40 L	10	210
COBALT	23	1	25 L	20 L	5 L	50
IRON	23	8	1029 L	700 L	17	3000
MAGNESIUM(MG-L)	23	20	20	10 L	1	81
MANGANESE	22	9	33	45	5	70
MOLYBDENUM	22	6	28 L	20 L	5	60
SODIUM	23	6	90 L	60 L	15	240
TIN	21	16	80 L	50 L	5	300
TITANIUM	22	3	101 L	60 L	15	200
VANADIUM	22	1	55 L	50 L	10 L	100
YTTRIUM	19	0	114 L	60 L	16 L	200
INORGANIC TOXIC POLLUTANTS						
114 ANTIMONY	25	3	10 L	10 L	2 L	25
115 ARSENIC	25	3	18 L	25 L	2 L	25
117 BERYLLIUM	27	2	6 L	4 L	1 L	20
118 CADMIUM	27	8	25 L	20 L	2	200
119 CHROMIUM	27	12	36 L	20 L	5	200
120 COPPER	27	17	174 L	60	6	959
121 CYANIDE	20	2	22 L	20 L	1	93
122 LEAD	26	7	105 L	80 L	10	400
123 MERCURY	24	3	1 L	1 L	1 L	5
124 NICKEL	26	4	32 L	20 L	5	200
125 SELENIUM	25	2	18 L	25 L	2 L	25
126 SILVER	27	2	8 L	10 L	1 L	20
127 THALLIUM	25	0	10 L	10 L	2 L	20
128 ZINC	26	19	974 L	600	40	8000

TABLE V- 25 (CON'T)
INTAKE (TAP) WATER DATA SUMMARY
1977/1978 SAMPLING PROGRAM

NO.	PARAMETER	NUMBER OF SAMPLES ANALYZED	NUMBER OF TIMES DETECTED	NUMBER OF TIMES ABOVE 10 UG/L	AVERAGE		MEDIAN		MINIMUM		MAXIMUM
	ORGANIC TOXIC POLLUTANTS										
4	BENZENE	29	11	9	90		16	L	10		572
6	CARBON TETRACHLORIDE	29	3	2	13		14	L	10		15
7	CHLOROBENZENE	29	1	0	10	L	10	L	10	L	10
11	1,1,1-TRICHLOROETHANE	29	11	6	36		18	L	10		110
14	1,1,2-TRICHLOROETHANE	29	2	1	14	L	14	L	10		18
15	1,1,2,2-TETRACHLOROETHANE	29	1	0	10	L	10	L	10	L	10
21	2,4,6-TRICHLOROPHENOL	29	2	0	10	L	10	L	10	L	10
23	CHLOROFORM	29	18	14	118		43	L	10		570
28	3,3'-DICHLOROBENZIDINE	29	1	0	10	L	10	L	10	L	10
29	1,1-DICHLOROETHYLENE	29	9	2	10	L	10	L	10		13
31	2,4-DICHLOROPHENOL	29	1	0	10	L	10	L	10	L	10
35	2,4-DINITROTOLUENE	29	1	0	10	L	10	L	10	L	10
38	ETHYLBENZENE	29	3	2	163		61	L	10		420
39	FLUORANTHENE	29	1	0	10	L	10	L	10	L	10
44	METHYLENE CHLORIDE	29	17	16	428		67	L	10		2200
47	BROMOFORM	29	2	1	12	L	12	L	10		14
48	DICHLOROBROMOMETHANE	29	15	10	25		15	L	10		86
51	CHLORODIBROMOMETHANE	29	12	5	19	L	10	L	10		113
56	NITROBENZENE	29	1	0	10	L	10	L	10	L	10
64	PENTACHLOROPHENOL	29	1	0	10	L	10	L	10	L	10
	TOTAL PHENOLS	21		6	17	L	20	L	1		40
66	DI(2-ETHYLHEXYL) PHTHALATE	29	4	0	10	L	10	L	10	L	10
67	BUTYL BENZYL PHTHALATE	29	1	0	10	L	10	L	10	L	10
68	DI-N-BUTYL PHTHALATE	29	7	2	28	L	10	L	10		100
69	DI-N-OCTYL PHTHALATE	29	1	0	10	L	10	L	10	L	10
70	DIETHYL PHTHALATE	29	2	0	10	L	10	L	10	L	10
74	3,4-BENZOFLUORANTHENE	29	1	0	10	L	10	L	10	L	10
75	11,12-BENZOFLUORANTHENE	29	1	0	10	L	10	L	10	L	10
78	ANTHRACENE	29	2	0	10	L	10	L	10	L	10
85	TETRACHLOROETHYLENE	29	2	0	10	L	10	L	10	L	10
86	TOLUENE	29	10	3	281	L	10	L	10		2700
87	TRICHLOROETHYLENE	29	5	0	10	L	10	L	10	L	10
99	ENDRIN ALDEHYDE	29	2	0	10	L	10	L	10	L	10
102	ALPHA-BHC	29	1	0	10	L	10	L	10	L	10
103	BETA-BHC	29	1	0	10	L	10	L	10	L	10
104	GAMMA-BHC	29	1	0	10	L	10	L	10	L	10

ALL UNITS UG/L UNLESS NOTED; L=LESS THAN
AVERAGE, MEDIAN, AND MINIMUM VALUES BASED ONLY ON NUMBER OF TIMES DETECTED FOR ORGANIC TOXIC POLLUTANTS.

wastewater batches with high levels. These high levels will proportionately influence the calculation of the average, and will have a small effect on the computation of the median. In the tables that follow, pollutants which were never detected are not listed.

Table V-22 indicates the average untreated wastewater characteristics from the paint industry. A total of 65 toxic pollutants were detected at any level in one or more samples although only 11 toxic pollutants occurred above 10 ug/l (or above their specific reported detection limit in the case of metals) in over 50 percent of the samples. They were:

Toxic Pollutant	Percent of time measured above 10 ug/l (or other detection limit for metals)
- Copper	97%
- Zinc	95%
- Toluene	87%
- Chromium	83%
- Ethylbenzene	81%
- Lead	75%
- Mercury	73%
- Benzene	58%
- Methylene Chloride	55%
- Arsenic	52%
- Tetrachloroethylene	52%

An additional nine toxic pollutants (1-1-1 trichloroethane, chloroform, naphthalene, phenol, di (2-ethylhexyl) phthalate, di-n-butyl phthalate, trichloroethylene, cadmium, and nickel) measured above 10 ug/l (or the specific detection limit) in 25 to 50 percent of all samples.

A summary of wastewater characteristics from paint plants after treatment (any type) is presented in Table V-23. Pollutant removal calculations will be presented in Section VII. A total of 51 toxic pollutants were reported in one or more treated paint effluent samples at any level. Only eight toxic pollutants measured above 10 ug/l (or above their specific reported detected limit in the case of metals) in over 50 percent of the samples. These were:

Toxic Pollutant	Percent of time measured above 10 ug/l (or other detection limit for metals)
- Copper	80%
- Toluene	78%
- Zinc	71%
- Methylene Chloride	70%
- Mercury	70%
- Ethylbenzene	59%
- Chromium	53%
- Chloroform	52%

An additional seven pollutants were detected above 10 ug/l (or their detection limit) in 25 to 50 percent of all samples.

A data summary of paint sludge (produced from physical-chemical treatment and/or settling) is presented in Table V-24. A total of 42 toxic pollutants were detected in one or more samples at any level and 12 toxic pollutants were detected at above 10 ug/l (or their specific reported detection limit in the case of metals) in over 50 percent of all samples. These were:

Toxic Pollutant	Percent of time measured above 10 ug/l (or other detection limit for metals)
- Copper	100%
- Chromium	95%
- Lead	95%
- Zinc	92%
- Ethylbenzene	89%
- Methylene Chloride	89%
- Toluene	89%
- Mercury	86%
- Cadmium	72%
- Nickel	69%
- Di (2-ethylhexyl) Phthalate	67%
- Beryllium	64%

Eleven other toxic pollutants measured over 10 ug/l (or their specific detection limit) in 25 to 50 percent of all samples.

To properly gauge the effect of intake water on toxic pollutant occurrence, tap water was sampled at each paint plant. These data are presented in Table V-25. A total of 49 toxic pollutants were detected at any level in one or more samples. However, 22 of these were organic toxic pollutants that never measured above 10 ug/l. Only nine

toxic pollutants measured over 10 ug/l (or their specific detection limit) in 25 percent or more of the samples. These were:

Toxic Pollutant	Percent of time measured above 10 ug/l (or other detection limit for metals)
- Zinc	73%
- Copper	63%
- Methylene Chloride	55%
- Chloroform	48%
- Chromium	44%
- Dichlorobromomethane	35%
- Benzene	31%
- Cadmium	30%
- Lead	27%

Mass Loadings

As discussed previously in this section, the paint industry generates approximately 5.7 million liters (1.5 million gallons) of process wastewater daily, of which 2.8 million liters (750,000 gallons) is discharged. Table V-26 indicates the mass loading from the paint industry for each conventional, nonconventional, and toxic pollutant, based on an industry flow of 2.8 million liters (750,000 gallons) daily, and the average untreated wastewater characteristics from Table V-22.

The paint industry discharges approximately 86,000 kg/day (189,000 lb/day) of conventional pollutants (BOD and TSS). The discharge of nonconventional pollutants is 227,200 kg/day (501,000 lb/day); that of inorganic toxic pollutnats is 268 kg/day (592 lb/day). The industry also discharges approximately 140 kg/day (308 lb/day) of organic toxic pollutants. It should be noted, however, that different pollutant classes may count the same materials more than once. For example, some organic or inorganic toxic pollutants may be detected and counted by the analysis for BOD, COD, and/or solids.

Data Comparisons

Table V-27 compares untreated wastewater concentrations from historical data sources with those from the 1976 and the 1977 sampling program. The 1976 and 1977 sampling data were obtained in a similar manner, and are assumed to be more comparable than historical data attached to the survey responses, which were often received without complete explanations of the wastewater source or the sampling and/or analytical methods used.

TABLE V-26

MASS LOADING FROM UNTREATED PAINT WASTEWATER

NO.	PARAMETER	AVERAGE CONC.	KG/DAY	(LB/DAY)
	CONVENTIONAL POLLUTANTS			
	BOD (MG-L)	9892	28032	(61800)
	TOTAL SUSP. SOLIDS(MG-L)	20424	57878	(127600)
	OIL & GREASE(MG-L)	1099	3114	(6866)
	TOTAL CONVENTIONAL POLLUTANTS	85910 KG/DAY(	189400 LBS/DAY)	
	NONCONVENTIONAL POLLUTANTS			
	COD (MG-L)	54956	155737	(343337)
	TOC(MG-L)	10601	30042	(66230)
	TOTAL DISS. SOLIDS(MG-L)	10619	30093	(66342)
	ALUMINUM	196758	558	(1229)
	BARIUM	8656	24.5	(54.1)
	BORON	4268	12.1	(26.7)
	CALCIUM(MG-L)	2277	6453	(14226)
	COBALT	912	2.6	(5.7)
	IRON	271307	768	(1695)
	MAGNESIUM(MG-L)	107	303	(668)
	MANGANESE	2901	8.2	(18.1)
	MOLYBDENUM	674	1.9	(4.2)
	SODIUM	397	1.1	(2.5)
	TIN	1111	3.1	(6.9)
	TITANIUM	16677	47.3	(104.2)
	VANADIUM	409	1.2	(2.6)
	YTTRIUM	206	0.58	(1.3)
	TOTAL NONCONVENTIONAL POLLUTANTS	227,200 KG/DAY(	501,000 LBS/DAY)	
	INORGANIC TOXIC POLLUTANTS			
114	ANTIMONY	209	0.59	(1.3)
115	ARSENIC	286	0.81	(1.8)
117	BERYLLIUM	126	0.36	(0.79)
118	CADMIUM	524	1.5	(3.3)
119	CHROMIUM	3120	8.8	(19.5)
120	COPPER	2476	7.0	(15.5)
121	CYANIDE	79	0.22	(0.49)
122	LEAD	6300	17.9	(39.4)
123	MERCURY	5161	14.6	(32.2)
124	NICKEL	1350	3.8	(8.4)
125	SELENIUM	165	0.47	(1.0)
126	SILVER	15	0.04	(0.09)
127	THALLIUM	151	0.43	(0.94)
128	ZINC	74746	211.8	(467.0)
	TOTAL INORGANIC TOXIC POLLUTANTS			

TABLE V-26 (CON'T)
MASS LOADING FROM UNTREATED PAINT WASTEWATER

NO.	PARAMETER	AVERAGE CONC.	PERCENT OCCURRENCE	KG/DAY	(LB/DAY)
	ORGANIC TOXIC POLLUTANTS				
2	ACROLEIN	10	3	0.001	(0.002)
4	BENZENE	1933	58	3.2	(7.0)
6	CARBON TETRACHLORIDE	3770	25	2.7	(5.9)
7	CHLOROBENZENE	1405	12	0.48	(1.1)
9	HEXACHLOROBENZENE	92	3	0.008	(0.02)
10	1,2-DICHLOROETHANE	118	16	0.05	(0.12)
11	1,1,1-TRICHLOROETHANE	141	51	0.20	(0.45)
13	1,1-DICHLOROETHANE	11	6	0.002	(0.004)
14	1,1,2-TRICHLOROETHANE	568	16	0.26	(0.57)
15	1,1,2,2-TETRACHLOROETHANE	20	6	0.003	(0.007)
20	2-CHLORONAPHTHALENE	10	3	0.001	(0.002)
21	2,4,6-TRICHLOROPHENOL	2455	6	0.42	(0.92)
23	CHLOROFORM	186	48	0.25	(0.56)
28	3,3'-DICHLOROBENZIDINE	10	3	0.001	(0.002)
29	1,1-DICHLOROETHYLENE	138	16	0.06	(0.14)
30	1,2-TRANS-DICHLOROETHYLENE	135	6	0.02	(0.05)
31	2,4-DICHLOROPHENOL	10	6	0.002	(0.004)
32	1,2-DICHLOROPROPANE	265	12	0.09	(0.20)
33	1,3-DICHLOROPROPYLENE	100	3	0.009	(0.02)
38	ETHYLBENZENE	7482	80	17.0	(37.4)
39	FLUORANTHENE	10	3	0.001	(0.002)
40	4-CHLOROPHENYL PHENYL ETHER	266	3	0.02	(0.05)
42	DI(2-CHLOROISOPROPYL) ETHER	3200	3	0.27	(0.60)
43	DI(2-CHLOROETHYOXY) METHANE	10	3	0.001	(0.002)
44	METHYLENE CHLORIDE	31878	58	52.4	(115.5)
48	DICHLOROBROMOMETHANE	27	3	0.002	(0.005)
55	NAPHTHALENE	2950	29	2.4	(5.3)
56	NITROBENZENE	100	9	0.03	(0.06)
59	2,4-DINITROPHENOL	173	9	0.04	(0.10)
60	4,6-DINITRO-O-CRESOL	10	3	0.001	(0.002)
64	PENTACHLOROPHENOL	6017	19	3.2	(7.1)
65	PHENOL	746	35	0.74	(1.6)
	TOTAL PHENOLS	260		0.74	(1.62)
66	DI(2-ETHYLHEXYL) PHTHALATE	418	35	0.42	(0.91)
67	BUTYL BENZYL PHTHALATE	474	12	0.16	(0.36)
68	DI-N-BUTYL PHTHALATE	5745	61	9.9	(21.9)
70	DIETHYL PHTHALATE	233	9	0.06	(0.13)
73	BENZO (A)PYRENE	10	3	0.001	(0.002)
78	ANTHRACENE	10	3	0.001	(0.002)
85	TETRACHLOROETHYLENE	567	58	0.93	(2.1)
86	TOLUENE	17966	87	44.3	(97.7)
87	TRICHLOROETHYLENE	81	54	0.12	(0.27)
89	ALDRIN	10	3	0.001	(0.002)
90	DIELDRIN	10	3	0.001	(0.002)
93	4,4'-DDE	10	3	0.001	(0.002)
94	4,4'-DDD	10	3	0.001	(0.002)
96	BETA-ENDOSULFAN	10	6	0.002	(0.004)
99	ENDRIN ALDEHYDE	10	3	0.001	(0.002)
102	ALPHA-BHC	10	6	0.002	(0.004)
103	BETA-BHC	10	3	0.001	(0.002)
104	GAMMA-BHC	10	3	0.001	(0.002)
105	DELTA-BHC	10	3	0.001	(0.002)

TOTAL ORGANIC TOXIC POLLUTANTS 140.5 KG/DAY(309.7 LB/DAY)

AVERAGE IS IN UG/L UNLESS OTHERWISE NOTED

TABLE V-27

AVERAGE UNTREATED WASTEWATER CONCENTRATIONS

DATA COMPARISON

	Historical Data from DCP's	1976 Sampling Program Data	1977/1978 Sampling Program Data
Conventional Pollutants			
ph (median), units	10.6	8.9	8
BOD	1,400	6,300	9,900
TSS	9,400	12,700	20,400
Oil and Grease	150	1,500	1,100
Nonconventional Pollutants			
COD	23,300	28,500	55,000
Total Phenols	1.8	0.9	0.3
Total Solids	13,900	32,200	28,900
Total Diss. Solids	16,100	16,100	10,600
Total Vol. Solids	-	13,600	13,000
Aluminum	-	190	197
Barium	-	3.3	8.7
Cobalt	-	1.7	0.9
Iron	70	103	271
Manganese	-	3.1	2.9
Molybdenum	-	0.5	0.7
Tin	-	3.7	1.1
Titanium	-	250	16.7
Inorganic Toxic Pollutants			
Cadmium	L 0.1	0.13	0.5
Chromium (total)		9.6	3.1
Copper	0.4	0.4	2.5
Cyanide	0.1	-	0.08
Lead	4.3	20	6.3
Mercury	2.5	2.9 ug/l	5.1
Nickel	0.1	0.9	1.4
Zinc	40	260	75

Organic Toxic Pollutants

Historical data and the 1976 sampling program had no information on organic toxic pollutants.

Notes

All units are in mg/l unless otherwise noted.
L - Less Than
Pollutants where comparative data was not available are not listed.

Most parameters show good general agreement between the 1976 and 1977 programs. One exception is mercury; the 1977 data show levels 100 times those of 1976. This discrepancy may have resulted from differences in the plants selected for sampling. Chromium, lead, and zinc each averaged about two-thirds lower in the 1977 sampling than the earlier sampling.

Resampling

Most of the paint industry sampling was conducted between September 1977 and January 1978. At that time, EPA contract laboratories were badly overloaded, and consequently some of the samples were not extracted promptly, and some of the classical and metals samples were not analyzed within the recommended time limits. To ascertain whether the subsequent analyses were accurate, the Agency chose six plants for resampling. During September, 1978, one sample each of untreated and treated wastewater, sludge, and tapwater was taken from each plant to compare with the old data. The untreated wastewater data for conventional and toxic pollutants is presented in Table V-28. Both samplings showed agreement for the presence or absence of most organic toxic pollutants, although there was often a large difference in the quantitative value indicated. This is caused partly by the batch nature of paint manufacture and wastewater treatment, and partly by the essentially random selection of batches approximately one year apart. The inorganic toxic pollutants showed tendencies similar to the organics.

TABLE V-28

RESULTS OF RESAMPLING AT SIX PLANTS (ONE YEAR INTERVAL)

Plant	2		3		4		5		6		12	
Batch	A	B	A	B	A	B	A	B	A	B	A	B
Conventional Pollutants												
BOD (mg/l)	2500	NR*	5800	NR	3300	NR	51000	15500	7100	NR	3100	3500
TSS (mg/l)	8800	NR	10400	NR	14000	NR	5600	31000	24000	NR	800	NR
Organic Toxic Pollutants*												
4 Benzene			1900	440	160	24			4000	40	73	ND
6 Carbon tetrachloride					12	ND			93	ND		
7 Chlorobenzene									L10	ND		
10 1,2-dichloroethane			33	L10			420	ND				
11 1,1,1-trichloroethane			17	150	ND	50			43	10	ND	L10
13 1,1-dichloroethane	ND	13					L10	ND				
23 Chloroform			310	87	16	ND			125	ND		
29 1,1-dichloroethylene							23	ND	128	ND	L10	ND
33 1,2-dichloropropylene					968							
38 Ethylbenzene	ND	110	15000	640	2000	460	4500	11000	730	80	8200	1300
44 Methylene chloride	85	220	ND	790	430	4200	900	ND	ND	275	ND	450
55 Naphthalene			7000	ND	ND	54	18000	1130	ND	30	260	40
56 Nitrobenzene	110	ND										
64 Pentachlorophenol							27000	ND			7500	1160
65 Phenol	96	L10			2600	36	ND	132	ND	30	ND	1270
66 Bis (2-ethylhexyl) phthalate	ND	L10					690	2810	ND	20	140	35
67 Butyl benzyl phthalate	ND	67	ND	18			ND	70				
68 Di-n-butyl phthalate	ND	L10	8000	L10	13000	57	69000	1310	2000	L10		
70 Diethyl phthalate							ND	680				
85 Tetrachloroethylene	ND	L10	74	18	ND	270			L10	ND		
86 Toluene	ND	210	5500	1280	3200	580	ND	8100	17000	400	ND	560
87 Trichloroethylene	210	23	L10	74	L10	ND	ND	L10			17	ND
Inorganic Toxic Pollutants												
114 Antimony	L15	L2000	L25	L2000	L25	NR	L30	L2000	L25	L2000	104	L25
115 Arsenic	NR	L2000	350	L2000	L25	NR	L25	L2000	140	L2000	L25	L25
117 Beryllium	L10	3990	L10	L50	L25	L10	L10	L10	L10	2810	L4	L10
118 Cadmium	100	15600	400	200	L70	L20	L50	40	400	11400	L8	L20
119 Chromium	1200	16300	60	350	L50	L50	25000	4780	L50	11800	4000	70
120 Copper	400	16600	250	L450	500	370	L500	220	430	11600	600	200
121 Cyanide	L20	L10	L20	L10	L200	L10	L160	L10	L100	L10	310	L10
122 Lead	L350	14500	L300	2150	L400	L200	18000	1320	800	10500	20000	25100
123 Mercury	L5	L5	L5	NR	L10	0.5	1400	NR	20	L0.5	L0.5	L.5
124 Nickel	L300	16500	L50	L250	L50	L50	L50	440	450	11600	L20	L50
125 Selenium	L25	L2000	L25	L2000	L25	NR	L25	L2000	L25	L2000	L25	L25
126 Silver	L10	NR	L10	L50	L10	L10	L10	70	L10	L10	L4	L10
127 Thallium	L10	L2000	L25	L2000	L10	NR	L10	L2000	L10	L2000	L10	L10
128 Zinc	60000	19300	L800	L2500	17000	73100	82000	63900	310000	28400	1000	5000

A: First Sample - Fall, 1977
B: Resampling - Fall, 1978

All results are for untreated wastewater and are in ug/l unless otherwise noted.

Notes: Blanks or ND indicate not detected; NR indicates not run; L = less than.
*Organic toxic pollutants not listed indicates not detected or less than 10 for all six plants.

SECTION VI

SELECTION OF POLLUTANT PARAMETERS

INTRODUCTION

The purpose of the BAT review of the paint industry is to evaluate the occurrence and impact of toxic pollutants in the untreated and treated wastewater and sludge streams generated within paint plants. The list of toxic pollutants, which represents the focus of the program, was developed as a result of the Settlement Agreement. Appendix A of the Settlement Agreement lists 65 classes of pollutants to be considered in the BAT revision for 21 industries, which EPA later expanded to 129 particular compounds. Appendix E presents the 129 pollutants which represent the toxic, or "priority", pollutants addressed in this study.

The BAT review also included the evaluation of conventional and selected nonconventional pollutant parameters. The conventional parameters included in the study were pH, BOD, oil and grease, and total suspended solids (TSS). Nonconventional parameters included COD, and TOC.

In addition, a number of other nonconventional parameters were evaluated on an incidental basis either because their analysis had been included in ICP (Inductively Coupled Argon Plasma) multiple metal analysis (see Appendix D for a detailed explanation of this method) or because the parameter is an important element in paint manufacture or physical-chemical treatment of paint wastewater. These additional pollutants included aluminum, barium, boron, calcium, cobalt, iron, magnesium, manganese, molybdenum, sodium, tin, titanium, vanadium, and yttrium.

This section presents the techniques used to identify toxic pollutants in the paint industry.

METHODOLOGY

Prior to the various EPA studies of the paint industry, relatively little historical data had been developed for toxic pollutants. Some limited analyses of inorganic toxic pollutants had been completed, but for the most part historical data focused on conventional and nonconventional pollutants. The Agency established a three-step methodology to develop toxic pollutant data:

1. raw materials evaluation;

2. industry-wide raw materials survey; and

3. screening sampling.

Raw Materials Evaluation

By studying the raw materials of the industry. EPA was able to establish the distribution of toxic pollutants in paint waste streams. This is a consequence of the way paint products are produced and paint wastewater is generated.

Paint typically is generally manufactured by blending raw materials; consequently, no thermodynamic changes occur (except for occasional heat of solution) and no by-products are formed. Instead, paint is made according to predetermined formulae or recipes without chemical reaction or change. Production of paint plant wastewater is similarly straightforward. When required, production tanks and other manufacturing vessels are washed clean of residue or clingage using water, caustic, or solvent. The spent cleaning material thus becomes laden with the material cleaned out of the tank, which, in turn, is composed of the raw materials making up the paint product. Determining the possible toxic pollutants in the waste stream is thus a matter of pinpointing the raw materials and toxic pollutants used in manufacturing paint.

There are three primary sources of paint industry raw materials information:

1. The NPCA Raw Materials Index (8,9,10);

2. Information supplied by raw materials vendors; and

3. The Colour Index (11).

The Agency identified 37 toxic pollutants as constituents of raw materials used in paint manufacture. Table VI-1 lists those toxic pollutants that were identified, and their occurrence in paint raw materials.

Raw Materials Survey

The next step in ascertaining the extent of toxic pollutants in the paint industry was a survey of the industry to determine the use of specific raw materials associated with specific toxic pollutants. Section G, Raw Materials, of the Data Collection Portfolio (DCP) was designed to obtain this information and was organized according to the four broad areas of raw materials used in paint manufacture:

TABLE VI-1

OCCURRENCE OF TOXIC POLLUTANTS
IN PAINT RAW MATERIALS

Toxic Pollutant	Occurrence in Raw Materials			
	Pigments & Dyes	Chemical Specialties	Resins	Solvents
Antimony	X			
Cadmium	X			
Copper	X			
Chromium	X			
Lead	X	X		
Nickel	X	X		
Mercury		X		
Selenium	X			
Silver	X			
Zinc	X	X		
Asbestos	X			
Phenols		X	X	
Benzene			X	X
Toluene			X	X
Ethylbenzene			X	X
Isophorone			X	X
Di(2-Ethylhexyl) Phthalate		X		
Di-N-Butyl Phthalate		X		
Dimethyl Phthalate		X		
Diethyl Phthalate		X		
3-3' Dichlorobenzidine	X			
Carbon Tetrachloride				X
Chloroform				X
Methyl Chloride			X	X
Methylene Chloride				X
Trichloroethylene			X	X
Vinyl Chloride			X	
Vinylidine Chloride			X	
1,2,4-Trichlorobenzene				X
1,2-Dichloroethane				X
1,1,1-Trichloroethane				X
1,1,2-Trichloroethane				X
Chlorobenzene				X
1,3-Dichloropropylene				X
Pentachlorophenol				X
1,2-Dichlorobenzene				X
Di(2-Chloroethyl) Ether				X

Sources: 8, 9, 10, 11

- Pigments and Dyes;
- Chemical Specialties;
- Resins; and
- Solvents.

Raw materials within these areas were grouped according to the occurrence of toxic pollutants. For example, all plasticizers containing diethyl phthalate, or all green aqueous dispersions containing chromium used in paint were grouped. Within each generic raw material designation, EPA listed the major manufacturers' trade names as an aid to respondents who might not be familiar with the chemical constituents of the raw materials in their products. Space also was provided so that respondents could indicate additional trade names for toxic pollutant-bearing raw materials used in their products.

The criteria for including raw materials in the DCP were:

1. The raw material itself is a toxic pollutant, i.e., solvents such as benzene, toluene, or chemical specialties such as di-n-butyl phthalate or asbestos.

2. The raw material is known to contain toxic pollutants, i.e., white lead, zinc oxide, chrome orange, etc.

3. The raw material is commonly thinned with, or contains, toxic pollutants that are solvents, i.e., polyamids soluble in, or containing, toluene.

4. The raw material is synthesized from other raw materials that are toxic pollutants, i.e., dichlorobenzidine- derived aqueous dispersions.

Although for the last item listed above (raw materials synthesized from toxic pollutants) there is no firm evidence that the toxic pollutant is present in the raw material, these raw materials were included because of the possible carry over of residues of the toxic pollutant.

Responses to the DCP indicated that all 37 toxic pollutants identified in the literature review (8,9,10,11) are used at one time or another in the paint industry. Since many of the raw materials included in the DCP can contain more than one toxic pollutant, the Agency was unable to obtain unambiguous counts for the occurrence of particular toxic pollutants. A conservative approach was taken because of this. When the DCP response did not indicate clearly which toxic pollutant was in use, the Agency made two counts - one including neither, one including both. This gave a maximum and minimum count for toxic pollutants. Twenty-eight plants did not check any boxes in the

survey. It is not clear whether these respondents use none of the listed raw materials or whether they did not fill out the questionnaire completely. Finally, within the group of responders to the raw materials survey, it was found that each raw materials question was answered positively at least once. This indicates that the raw materials questions represented appropriate paint raw materials. The range of plants using raw materials containing particular toxic pollutants appears in Table VI-2. The most common toxic pollutants found in paint raw materials are chromium, zinc, toluene, and lead. Eight of the raw materials containing toxic pollutants were used by more than 400 plants (based on minimum usage), and 23 raw materials were used by at least 140 plants.

Sampling Program

EPA designed the sampling program to generate information that could characterize the nature, distribution, and concentration of toxic pollutants in paint wastewater and sludges. Further, the sampling program aimed to gather information about the efficiency of common end-of-pipe treatment systems not only to remove toxic pollutants, but to reduce the concentration of classical pollutants. Detailed information on sampling and analytical procedures used and specific data on samples collected are included in Appendix F.

In selecting sites for sampling, the Agenct looked for paint manufacturing plants that were representative not only of industry production methods and product lines, but also of wastewater generation and treatment techniques. The following criteria were used in the selection process:

Plant Location

The logistics and costs of the anticipated sampling program required EPA to arrange multiple sampling visits within concentrated industrial zones. Table VI-3 summarizes the distribution of paint plants in major metropolitan areas. Paint plants located within these areas were given preference in the selection process.

Plant Size

Although very small plants outnumber others in the paint industry, the Agency decided not to sample at plants with less than ten production workers. The rationale for this decision rested on the fact that small paint plant operations do not differ significantly from the paint industry as a whole. Because paint manufacture is a batch process, using relatively small mixing vessels, small plants duplicate large plant operations precisely, differing only in scale. Plant inspection visits confirmed this.

TABLE VI-2

RAW MATERIALS CONTAINING TOXIC POLLUTANTS
USED BY THE PAINT INDUSTRY

Toxic Pollutant	Responders Indicating Usage of Raw Materials Containing Specific Toxic Pollutants			
	Minimum		Maximum	
	No. of Plants	Percent	No. of Plants	Percent
Antimony	166	12.1	243	17.7
Cadmium	260	18.9	312	22.7
Copper	173	12.6	894	65.1
Chromium	1042	75.8	1083	78.8
Lead	833	60.6	1016	73.9
Nickel	156	11.4	395	28.7
Selenium	37	2.7	37	2.7
Silver	250	18.2	440	32.0
Zinc	1020	74.2	1046	76.1
Asbestos	218	15.9	218	15.9
Phenol	665	48.4	765	55.7
Mercury	627	45.6	627	45.6
Pentachlorophenol	190	13.8	190	13.8
Vinyl Chloride	550	40.0	563	41.0
Vinylidene Chloride	*	*	44	3.2
3,3- Dichlorobenzidene	409	29.8	412	30.0
Di-2 Ethylhexyl Phthalate	338	24.6	338	24.6
Di-N-butyl Phthalate	354	25.8	354	25.8
Dimethyl Phthalate	51	3.7	51	3.7
Diethyl Phthalate	22	1.6	22	1.6
Benzene	66	4.8	66	4.8
Toluene	961	69.9	998	72.6
Ethylbenzene	189	13.8	506	36.8
Isophorone	175	12.5	175	12.5
Carbon Tetrachloride	8	0.6	8	0.6
Chlorobenzene	9	0.7	9	0.7
1,2,4 Trichlorobenzene	3	0.2	3	0.2
1,2 Dichloroethane	5	0.4	5	0.4
1,1,1 Trichloroethane	140	10.2	140	10.2
1,1,2 Trichloroethane	10	0.7	10	0.7
Di-2 Chloroethyl ether	1	0.1	1	0.1
Chloroform	3	0.2	3	0.2
1,2 Dichlorobenzene	8	0.6	8	0.6
1,3 Dichloropropylene	6	0.4	6	0.4
Methylene Chloride	305	22.2	305	22.2
Trichloroethylene	77	5.6	77	5.6
Methyl Chloride	*	*	316	23.0

*Minimum usage of vinylidene chloride and methyl chloride could not be determined.

Source: DCP

TABLE VI-3

DISTRIBUTION OF PAINT PLANTS
IN MAJOR METROPOLITAN AREAS

Metropolitan Area	Number of Paint Plants
Los Angeles	127
New York/New Jersey	101
Chicago	88
Cleveland	61
Miami	49
San Francisco	48
Detroit	34
St. Louis	28
Atlanta	27
Dallas	20
Louisville	20
Houston	18

Source: DCP

Wastewater Treatment

Candidate plants that operated end-of-pipe wastewater treatment systems were given preference in the selection process. The selection effort was aimed at choosing plants that encompassed all existing wastewater treatment types. Raw wastewater loads at these plants were comparable to untreated wastewater loads at similar plants without treatment.

Wastewater Generation

A significant proportion (40 percent) of the DCP respondents indicated that they did not discharge any wastewater. These plants fit into several categories, including plants using only solvent-wash, complete wastewater reuse, and contract hauling of all wastewater or spent caustic. Other plants indicated that they produced or discharged very little wastewater. As a result, minimum wastewater flow was a sampling plant selection criterion. Rather than picking a specific minimum wastewater volume, it was decided to limit the candidate sampling plant list to plants that generated enough wastewater within a one-week period to permit treatment of at least one batch. This criterion for selecting sampling plants assured collection of a minimum of one sample during a visit of several days duration.

Historical Data

Some plants indicated that they had taken wastwater samples over a period of time. The data developed therefore could supply some background or history of wastewater quality. Because this historical data could supply important substantiation, an effort was made to sample at plants that reported that they had previously sampled and analyzed their wastewaters.

Toxic Pollutants

As previously stated, a goal of the raw materials survey was to provide information about the distribution of toxic pollutants in paint wastewaters. The survey established that 37 of the 129 toxic pollutants could be expected to occur at one time or another in paint wastewater. Consequently, in choosing sampling plants the Agency tried to select operations that utilized raw materials containing a maximum number of toxic pollutants.

Direct Dischargers

EPA knew from the outset that practically no paint plants discharged process wastewaters to navigable waters; nevertheless, the Agency hoped to sample at least a few direct dischargers. Unfortunately, only a handful of plants, discharging a combined wastewater containing

only a very small fraction of paint process wastewater were located. These combined dischargers were judged to be inappropriate for sampling.

SELECTION OF SAMPLING PLANTS

The sampled plants were chosen in a step fashion. Initially, plants were selected if they had indicated on their questionnaires that they treat or condition their wastewater in some way before disposal. This selection yielded a preliminary list containing 153 paint plants. A supplementary selection of plants treating their wastewater before reuse yielded an additional 88 preliminary sampling site candidates. Successive selections on the basis of location, size, wastewater volume and treatment, historical data, and toxic pollutants resulted in the final selection of 22 paint plants located in eight major metropolitan areas. See Section V for detailed information on the plants selected for the sampling program.

TOXIC POLLUTANTS

The toxic pollutants covered in this study may be divided into groups to facilitate discussion:

- Pesticides
- Polychlorinated Biphenyls (PCB's)
- Phenolic Compounds
- Volatile Organic Compounds
- Semi-volatile Organic Compounds
- Inorganic Compounds

The basis for this breakdown is chemical similarities and methods of analysis within each group. Each group's impact on paint wastewater is discussed in the following sections.

Pesticides and Metabolites

aldrin
dieldrin
chlorodane (technical mixture and metabolites)
4,4' - DDT
4,4' - DDE (p,p' DDX)
4,4' - DDD (p,p' TDE)
a-endosulfan
b-endosulfan
endosulfan sulfate
endrin
endrin aldehyde
heptachlor
heptachlor epoxide

alpha-BHC (hexachlorocylohexane)
beta-BHC (hexachlorocylohexane)
gamma-BHC (hexachlorocylohexane)
delta-BHC (hexachlorocylohexane)
toxaphene

Pesticides are not part of any raw materials used in paint manufacture. Occasional use of these materials in some paint plants for fumigation purposes has been reported. All occurrences of pesticides in paint wastewater samples were at less than 10 μg/l. Out of 31 untreated paint wastewater samples analyzed, the following pesticides occurred once at less than 10 μg/l: aldrin, dieldrin, 4,4'-DDE, 4,4'-DDD, endrin aldehyde, beta-BHC, gamma-BHC, delta-BHC. Two pesticides, beta-endosulfan and alpha-BHC occurred twice each at less than 10 μg/l in untreated paint wastewater samples. Of 27 effluent analyses for these 18 pesticides, only three individual occurrences at less than 10 μg/l were detected. These three pesticides were 4,4'-DDE, endrin aldehyde and beta-BHC In sludge samples, aldrin, beta-endosulfan and delta-BHC each occurred in one of nine samples at less than 10 μg/l. Similarly, in tap water samples, alpha-BHC, beta-BHC and delta-BHC occurred in only one of 29 samples, all at less than 10 μg/l. Endrin aldehyde was found in two of 29 tap water samples, but both times at less than 10 μg/l.

PCB's

None of the PCB mixtures included in the toxic pollutant listings were detected in any sample analyzed during this study. The raw materials evaluation similarly did not uncover any use of these materials in paint manufacture. However, it should be noted that specific PCB compounds may nevertheless be present in paint wastewaters.

The PCB's on the toxic pollutant list are actually mixtures of various PCB compounds ranging from monochlorobiphenyl to octochlorobiphenyl. As such, a positive identification of a PCB would require observation of a predetermined set of gas chromatogram peaks with appropriate relative intensities. However, various PCB's are formed during the synthesis of two types of pigments commonly used in paint manufacture: diarylide and phthalocyanine pigments. In Appendix E of the Dry Color Manufacturers Association comments regarding proposed rules for their industry (46), the following evaluation of PCB compounds in diarylide and phthalocyanine pigments was presented:

"For diarylide pigments, the source of the PCB's is 3,3'-dichlorobenzidine, or its reaction product, which may undergo cleavage at the (biphenyl) carbon-to-nitrogen linkage to yield 3,3' dichlorobiphenyl. Indeed, this has been identified as the PCB present in diarylide pigments. In the case of phthalocyanine the source of PCB is the trichlorobenzene (TCB) which has for many years been used

as the solvent in the synthesis of the crude. TCB is not the only solvent which may be used, but it is the solvent which has been most widely used historically. It is believed that PCB's form by the elimination of hydrogen chloride, in the presence of copper, between two molecules of TCB. In the case of phthalocyanine blue, many different PCB's are present, since TCB is not a chemically pure material, and contains some amounts of dichloro and tetrachloro as well as trichlorobenzenes, and isomers of each in addition."

Phenolic Compounds

phenol	2-nitrophenol
2-chlorophenol	4-nitrophenol
2,4-dichlorophenol	2,4-dinitrophenol
p-chlorometacresol	4,6-dinitro-o-cresol
2,4-dimethylphenol	pentachlorophenol (PCP)
2,4,6-trichlorophenol	total phenols

Only one phenolic toxic pollutant is used directly as a raw material in paint manufacture. That compound is pentachlorophenol (PCP) which is used as a preservative in some paint formulations. Nearly 14 percent of the respondents to the Data Collection Portfolio indicated that they used PCP. Other phenolic toxic pollutant compounds are not directly used in paint manufacture, but some occurrence of these materials was expected by virtue of the approximately 50 percent of the industry using phenolic resins.

PCP occurred in about 20 percent of all paint untreated and treated wastewaters analyzed for phenolic compounds. In influent samples PCP ranged from less than 10 μg/l to 27,000 μg/l with a median value of 750 μg/l. In treated wastewater samples, PCP concentrations ranged from less than 10 μg/l to 485 μg/l. Four of nine sludge samples were found to contain PCP. The median PCP concentration for the sludge samples was 125 μg/l. One of 29 tap water samples contained PCP at less than 10 μg/l.

Phenol also occurred in 11 of 31 paint wastewater samples. Untreated wastewater levels ranged from less than 10 μg/l to 3800 μg/l with a median of 96 μg/l. Treated effluent phenol ranged from 10 μg/l to 1240 μg/l, with a median of 36 μg/l. The median value in sludge was 150 μg/l.

2,4-dinitrophenol was found to occur in about 10 percent of the untreated paint wastewaters collected during the sampling program. Concentrations of 2,4-dinitrophenol in untreated wastewater ranged between 110 and 250 μg/l. This toxic pollutant was not found in any effluent sample, but it did occur in two of nine sludge samples.

4,6-dinitro-o-cresol occurred in one untreated wastewater sample at less than 10 μg/l, but in no other samples.

2,4,6-trichlorophenol was found in two of 31 untreated wastewater samples (less than 10 and 4900 μg/l), in two of 27 effluent samples (1100 and 3700 μg/l) and in one of nine sludge samples (less than 10 μg/l). It was also found in two of 29 tap water samples both times at less than 10 μg/l.

2,4-dichlorophenol was found in two of 31 untreated wastewater samples, also both times at less than 10 μg/l. No effluent or sludge sample contained 2,4-dichlorophenol, but one of 29 tap water samples contained it at less than 10 μg/l.

Finally, 2,4-dimethylphenol occurred in one of nine sludge samples at less than 10 μg/l, but not in any other sample.

Total phenols occurred frequently in all waste samples analyzed during the screening program. Untreated wastewater total phenol ranged from less than 1 μg/l to 1,900 μg/l with an average of 260 μg/l. Treated effluent total phenol ran from 1 μg/l to 1,900 μg/l with an average of 193 μg/l. The average sludge level for total phenol was 552 μg/l.

Volatile Organic Toxic Pollutants

Halomethanes

bromoform (tribromomethane)
carbon tetrachloride (tetrachloromethane)
chloroform (trichloromethane)
chlorodibromomethane
dichlorodifluoromethane
dichlorobromomethane
methyl bromide (bromomethane)
methyl chloride (chloromethane)
methylene chloride (dichloromethane)
trichlorofluoromethane

Halomethanes, consisting of methane molecules with one or more carbon replaced by a halogen (chlorine, bromine, etc.) are used as solvents, aerosol propellants or for medicinal purposes. In the paint industry only three of these pollutants, carbon tetrachloride, chloroform and methylene chloride were found to be raw materials (used as solvents) or present in wastewater at any significant concentration or frequency of occurrence. Bromoform and chlorodibromomethane were detected in the tap water at several plants but not in the untreated or treated wastewaters. Dichlorobromomethane was found in about half of the tap water samples, but occurred in only one of 27 untreated wastewater samples (27 μg/l) and in no other sample.

Less than one percent of the respondents to the Data Collection Portfolio indicated that carbon tetrachloride was used in their paint manufacturing operation. However in nearly one-third of the untreated wastewater samples analyzed for volatile organic pollutants carbon tetrachloride was found to be present at concentrations ranging from less than 10 μg/l to a high of 30,000 μg/l with a median value of 14 μg/l. About 10 percent of the treated wastewater samples contained carbon tetrachloride in concentrations ranging from less than 10 to 1800 μg/l.

Similarly for chloroform, whereas only 0.2 percent of the DCP respondents indicated usage of the solvent, about half of the volatile organic analyses indicated chloroform in untreated and treated paint wastewaters. For chloroform, untreated wastewater values ranged between 16 and 900 μg/l, with a median value of 92 μg/l.

Treated wastewater chloroform values were sometimes higher than corresponding untreated wastewater values. The median value was 30 μg/l. Chloroform occurred at least as frequently in the tap water supplied to the sampled plants as in the wastewater, but not on a consistent enough basis to be subtracted as a background value. The median chloroform level in tap water was 43 μg/l.

Data Collection Portfolio results indicated that over 22 percent of the respondents use methylene chloride in their operations. About two-thirds of all untreated wastewater volatile organic analyses revealed the presence of methylene chloride with a median value of 620 μg/l. Contamination of samples with methylene chloride has been reported as being a common problem, and in the paint wastewater data, contamination appears to have occurred. For example, the median value for methylene chloride in treated effluent was 1700 μg/l, considerably higher than untreated wastewater levels. Average values were similarly inconsistent. A median of 67 μg/l methylene chloride in tap water was also detected.

<u>Chlorinated Ethanes</u>

1,1-dichloroethane
1,2-dichloroethane
1,1,1-trichloroethane
1,1,2-trichloroethane
1,1,2,2-tetrachloroethane
chloroethane

Three of the six chlorinated ethanes which are primarily used as solvents were identified as being used in paint manufacture. The responses to the Data Collection Portfolio indicated that 1,1,1 trichloroethane, 1,2 dichloroethane and 1,1,2 trichloroethane are used at 10.2 percent, 0.4 percent and 0.7 percent of all paint

manufacturing sites, respectively. Occurrence of chlorinated ethanes in analyzed samples roughly followed this trend. 1,1,1 trichloroethane was detected in more than half of all untreated and treated waste samples. Untreated waste levels ranged from less than 10 μg/l to 930 μg/l with a median value of 76 μg/l. Similarly, treated effluent levels ran from less than 10 μg/l to 560 μg/l, with 16 μg/l for the median. Seven of nine sludge samples also contained 1,1,1 trichloroethane at concentrations ranging from less than 10 to 3200 μg/l, as did eleven of 29 tap water samples (median 17 μg/l).

1,2-dichloroethane was detected in five of the 31 untreated wastewater samples analyzed for volatile organics. Concentrations ranged from less than 10 μg/l to 420 μg/l. The median untreated waste value was 33 μg/l. Treated wastewater was found to contain this solvent in four of 27 samples analyzed. The treated wastewater levels ranged between less than 10 μg/l to 170 μg/l. This solvent was also detected in one sludge sample out of nine analyzed at 17 μg/l.

Analyses for 1,1,2-trichloroethane were also positive in five of 31 untreated wastewater samples analyzed for volatile organic toxic pollutants. Only two of these analyses yielded values above 10 μg/l with the maximum at 2,800 μg/l. Four of 27 treated effluent samples were found to contain 1,1,2-trichloroethane at levels ranging from less than 10 μg/l to 2100 μg/l. This solvent was not detected in any of the nine sludge samples that were analyzed for it, but it was found in two of 29 tap water samples.

1,1-dichloroethane was found in two of 31 untreated paint wastewaters (median 11 μg/l) and in two of 27 effluent samples, but in no other analyzed samples.

1,1,2,2-tetrachloroethane also occurred at low levels in two of 31 untreated wastewater samples and two of nine sludge samples but not in any effluent samples. It did occur in one of 29 tap water samples at less than 10 μg/l.

Chloroethane was found once in an effluent sample at less than 10 μg/l.

<u>Aromatic Solvents</u>

benzene
toluene (methylbenzene)
ethylbenzene

The three aromatic solvents designated as toxic pollutants are common raw materials used throughout the paint industry, although some are used more extensively than others. These materials are not only used

in paint formulations and as cutting solvents for resins used in paint, but also as solvents for clean up.

Roughly 70 percent of all Data Collection Portfolio respondents indicated on the raw materials survey that they use toluene or toluene containing raw materials in their plants. The median toluene concentration in untreated wastes analyzed for aromatic solvents was 2500 μg/l. Twenty-seven out of 31 untreated wastewater samples were found to contain toluene. Similarly, 21 out of 27 treated effluent samples were found to contain toluene with a median value of 990 μg/l and eight out of nine sludge samples contained the solvent. Ten of 29 tap water samples contained toluene at low levels (median less than 10 μg/l).

Ethylbenzene, although less common as a raw material, was found almost as frequently as toluene in paint wastewaters. Ethylbenzene was detected in 25 of 31 untreated wastewater samples analyzed. The maximum concentration in these samples was 112,800 μg/l with a median of 1300 μg/l. The median concentration in 18 of 27 treated effluent samples was 520 μg/l and eight out of nine sludge samples were found to contain the solvent. Ethylbenzene was also measured in about ten percent of the tap water samples.

Benzene is the least frequently utilized aromatic solvent with only 4.8 percent of the DCP respondents indicating it on the raw materials survey. Nevertheless, 18 of 31 untreated wastewater samples were found to contain the solvent. The median untreated wastewater level was 370 μg/l. Half of the treated effluents contained benzene with a median of 307 μg/l. Five of nine sludges contained the solvent, as did about one-third of the analyzed tap water samples.

Chloroalkyl Ethers

di (chloromethyl) ether
2-chloroethyl vinyl ether

These two materials which are used in pharmaceutical manufacture are not used in the paint industry, nor were they detected in any analyzed sample.

Dichloropropane and Dichloropropylene

1,2-dichloropropane
1,3-dichloropropylene

Neither of these two solvents which are used as dry cleaning agents or soil fumigants were identified as raw materials used in the paint industry. However, 1,2-dichloropropane was found in about 10 percent of the untreated and treated wastewaters analyzed for volatile

organics. 1,3-dichloropropylene was found in one untreated and one treated waste sample at 100 and 44 μg/l, respectively.

Chlorinated Ethylenes

vinyl chloride
1,1-dichloroethylene
1,2-trans-dichloroethylene
trichloroethylene
tetrachloroethylene

Tetrachloroethylene is a common solvent used as a degreaser or dry cleaning fluid. Although not identified as a raw material used in paint manufacture, 18 of 31 untreated wastewater samples were found to contain tetrachloroethylene. The range of concentrations in untreated wastewater was from less than 10 μg/l to 4900 μg/l with a median value of 175 μg/l. Tetrachloroethylene was found in about one-third of the treated effluent samples (maximum: 700 μg/l;, median: 35 μg/l), five of nine sludge samples, and five of 29 tap water samples.

More than five percent of the Data Collection Portfolio respondents indicated that trichloroethylene is used in their operations, and more than half of the untreated wastewater samples analyzed for volatile organics were found to contain this solvent (range: less than 10 μg/l to 250 μg/l; median: 23 μg/l). Eight of 27 treated samples contain the solvent (median: 14 μg/l), as did six of nine sludge samples and five of 29 tap water samples.

Two other chlorinated ethylenes, 1,1-dichloroethylene and 1,2-trans-dichloroethylene were found in paint wastewater although not identified in the raw materials desktop evaluation. Median values for 1,1-dichloroethylene in untreated and treated paint wastewaters were 23 and 11 μg/l, respectively. About 15 percent of the samples contained this material. Median values for 1,2-trans-dichloroethylene in untreated and treated paint wastewaters were 135 and 27 μg/l, respectively. This material was found in less than 10 percent of the untreated wastewater samples and in about 20 percent of the treated wastewater samples. Neither of these materials occurred in any sludge samples analyzed for volatiles, but 1,1-dichloroethylene did occur at low concentrations in about one-third of the tap water samples.

Vinyl chloride was expected to occur in paint wastewater by virtue of the fact that about 40 percent of the DCP respondents indicated that they use polyvinylchloride (PVC) resins. Although vinyl chloride is the monomer used in polymerization of PVC, no paint wastewater samples were found to contain this toxic pollutant.

Miscellaneous Volatile Organics

acrolein
acrylonitrile
chlorobenzene

Acrolein was not identified as a raw material used in paint manufacture. A single untreated waste sample was found to contain less than 10 μg/l of this toxic pollutant.

Chlorobenzene is a chemical intermediate used in production of phenol, aniline and DDT. It is also a solvent indicated by 0.7 percent of the respondents to the Data Collection Portfolio as being used in their paint plants. Four out of 31 untreated wastewater samples were found to contain chlorobenzene (median 56 μg/l). Two of nine sludge samples were found to contain chlorobenzene (12 and 340 μg/l), but it was only detected once in either effluent or tap water samples, both times at less than 10 μg/l.

No incidence of the use of acrylonitrile in paint manufacture or in paint wastewater was uncovered.

Semi-Volatile Organic Toxic Pollutants

Polynuclear Aromatics (PNA's)

acenaphthene
acenaphthylene
anthracene
1,2-benzanthracene
3,4-benzofluoranthene
11,12-benzofluoranthene
benzo (a) pyrene
1,12-benzoperylene
crysene
1,2,5,6-dibenzanthracene
fluorene
fluoranthene
indeno-(1,2,3-cd) pyrene
naphthalene
phenanthrene
pyrene

With the exception of naphthalene, little significant incidence of polynuclear aromatics was found in paint wastewater, nor are any of these materials used as raw materials in the industry.

Naphthalene was detected in nine of 31 untreated wastewater samples (range: less than 10 μg/l to 18,000 μg/l, median: 54 μg/l.)

Similarly, eight of 27 treated effluent samples contained naphthalene. (Range: less than 10 μg/l to 1830 μg/l; median 13 μg/l). Four of nine sludge samples also contained naphthalene (median: 202 μg/l).

Fluoranthene, benzo (a) pyrene and anthracene were found once each in untreated paint wastewaters at less than 10 μg/l. Similarly, acenaphthene, anthracene and phenanthrene occurred once each in treated effluent samples at less than 10 μg/l. Anthracene was found twice in sludge samples (less than 10 and 410 μg/l) and low levels of 3,4-benzofluoranthene, 11,12-benzofluoranthene, anthracene and fluoranthene were detected in several tap water samples.

Chlorobenzenes

1,2-dichlorobenzene
1,3-dichlorobenzene
1,4-dichlorobenzene
1,2,4-trichlorobenzene
hexachlorobenzene

With the exception of a single occurrence of hexachlorobenzene in one of 31 untreated wastewater samples (92 μg/l) no chlorobenzene was detected in any sample obtained during the screening sampling program. As a result of the raw materials survey, two of these compounds were found to be used as solvents in the paint industry. These toxic pollutants are 1,2-dichlorobenzene which 0.6 percent of the DCP respondents said they use and 1,2,4-trichloroebenzene which 0.2 percent of the respondents indicated as in use at their plants.

Phthalate Esters

di (2-ethylhexyl) phthalate
butyl benzyl phthalate
di-n-butyl phthalate
di-n-octyl phthalate
diethyl phthalate
dimethyl phthalate

Phthalate esters are synthetic compounds used primarily as plasticizers. In the paint industry, several phthalate esters were indicated as in use by varying percentages of DCP respondents: di (2-ethylhexyl) phthalate, 24.6 percent; di-n-butyl phthalate, 25.8 percent; dimethyl phthalate, 3.7 percent; diethyl phthalate, 1.6 percent. All of the phthalate ester toxic pollutants were detected at least once during the screening sampling program. As indicated by the DCP responses, di (2-ethylhexyl) phthalate, and di-n-butyl phthalate occurred most frequently in paint wastewater. The first of these, di (2-ethylhexyl) phthalate was found in eleven of 31 untreated waste samples (range: less than 10 μg/l to 2810 μg/l; median: 140 μg/l).

In ten of 27 treated wastewater samples the range was less than 10 μg/l to 160 μg/l with a median of 10 μg/l. Eight of nine sludge samples contained di (2-ethylhexyl) phthalate (range: less than 10 μg/l to 1,940 μg/l; median: 215 μg/l).

Di-n-butyl phthalate was found in 19 of 31 untreated wastewater samples. The concentration range in these samples was between less than 10 μg/l to 69,000 μg/l with a median of 259 μg/l. Twelve of 27 treated wastewater samples contained di-n-butyl phthalate. The range was less than 10 μg/l to 1,300 μg/l with a median of less than 10 μg/l. Similarly, five of nine sludge samples contained di-n-butyl phthalate (range: less than 10 μg/l to 17,750 μg/l; median: 70 μg/l).

Butyl benzyl phthalate also occurred fairly often in paint wastewater samples. This pollutant was found in about 10 percent of all untreated wastewater samples (range: less than 10 to 1800 μg/l; median: 44 μg/l), in about one fifth of the treated effluent samples and in nearly half of the sludge samples (median: 1412 μg/l).

Diethyl phthalate also occurred in about one-tenth of the untreated wastewater (range: less than 10 to 680 μg/l) and treated effluent samples. One-third of the analyzed sludge samples contained diethyl phthalate.

Since all but two of the plants covered by the screen sampling program were samples using grab sampling techniques, the impact of phthalate ester contamination due to contact with sampler tubing was minimized.

Haloethers

di (2-chloroethyl) ether
di (2-chloroisopropyl) ether
di (2-chloroethyoxy) methane
4-bromophenyl phenyl ether
4-chlorophenyl phenyl ether

The haloethers are synthetically produced chemical intermediates that are sometimes used as solvents. Only one of the haloethers was identified as being used in the paint industry, di (2-chloroethyl) ether. However, only 0.1 percent of the DCP respondents indicated that they used this material.

Of the 31 untreated paint wastewaters analyzed there were only three single occurrences of haloethers: 4-chlorophenyl phenyl ether (266 μg/l), di (2-chloroisopropyl) ether (3200 μg/l) and di (2-chloroethyoxy) methane (less than 10 μg/l). A single occurrence of di (2-chloroethyoxy) methane in an effluent sample (16 μg/l) was also found.

Nitrosamines

N-nitrosodimethylamine
N-nitrosodiphenylamine
N-nitrosodi-n-propylamine

No incidence of nitrosamine toxic pollutants in paint raw materials has been found in the literature. Additionally, the screening sampling program did not detect any of these materials.

Nitro-Substituted Aromatics Other than Phenols

nitrobenzene
2,4-dinitrotoluene
2,6-dinitrotoluene

Dinitrotoluenes are chemical intermediates used in the production of TNT. No evidence of the use of these compounds in paint manufacture was found during the raw materials evaluations.

Although not identified as a paint raw material, nitrobenzene was measured in three of 31 untreated wastewater samples. Concentrations ranged from less than 10 μg/l to 180 μg/l with a median of 110 μg/l. A single treated wastewater sample was found to contain 35 μg/l of nitrobenzene.

Benzidine Compounds

benzidine
3,3'-dichlorobenzidine

Benzidine compounds are used primarily in the manufacture of dyes. Benzidine itself was not identified as a paint raw material, nor was it detected in any samples. However, 3,3'-dichlorobenzidine was identified as a raw material used in the manufacture of many pigments and dyes used in paint. Additionally, about 30 percent of the DCP respondents said they use dichlorobenzidine derived dyes or pigments. Although it was suspected that this material might carry over as a contaminant in pigments or dyes used in paint, it was found in only one of 31 untreated paint wastewaters at less than 10 μg/l.

Miscellaneous Semi-Volatile Organic Toxic Pollutants

1,2 diphenylhydrazine
hexachloroethane
hexachlorobutadiene
hexachlorocyclopentadiene
2-chloronaphthalene
isophorone

2,3,7,8-tetrachlorodibenzo-p-dioxin (TCDD)

These materials are used primarily as solvents or chemical intermediates. TCDD is a by-product produced during the synthesis of the pesticide 2,4,5-T. Of the miscellaneous semi-volatile organics, only one, isophorone, was identified as in use in paint manufacturing operations. Used as a solvent, 12.5 percent of the DCP respondents indicated isophorone on the raw materials survey. Although not found in any untreated wastewater sample, isophorone was found in two treated wastewater samples (median: 113 μg/l). Additionally, 2-chloronaphthalene was found in one untreated wastewater sample at less than 10 μg/l, as did 1,2 diphenylhydrazine occur once in a treated effluent at less than 10 μg/l.

Inorganic Toxic Pollutants

antimony	lead
arsenic	mercury
asbestos	nickel
beryllium	selenium
cadmium	silver
chromium	thallium
copper	zinc
cyanide	

Although 15.9 percent of the DCP respondents indicated that they use asbestos or asbestos-containing raw materials, no analyses for this toxic pollutant were run. It is probable that asbestos would be found in paint wastewater but, because of the absence of an appropriate analytical method at the time of the sampling program, no samples were collected for asbestos analysis.

Six inorganic toxic pollutants, chromium, copper, mercury, nickel, lead and zinc were both found to be contained in commonly used raw materials and to occur at relatively high concentrations in paint wastewater. For each of these toxic pollutants, average untreated wastewater concentrations were above 1,000 μg/l. Average treated effluent values were above 600 μg/l.

Some of the remaining inorganic toxic pollutants are contained in common paint raw materials, but none of the untreated wastewater samples were found to contain average concentrations greater than 525 μg/l for any of these pollutants. No treated effluent sample concentrations were above 200 μg/l.

Average concentrations of cyanide in paint untreated and treated wastewaters and sludges were 73, 51, and 1,261 μg/l, respectively.

Conventional Pollutant Parameters

Four conventional pollutant parameters (BOD, TSS, oil and grease, and pH) were measured in paint wastewaters and sludges collected during the sampling program. BOD concentrations averaged 9,900 mg/l in untreated paint wastewaters, 5,300 mg/l in treated wastewaters and 25,000 mg/l in sludge samples. For TSS, average untreated wastewaters, treated wastewater and sludge sample concentrations were 20,000, 2,000 and 101,000, respectively. For oil and grease the average raw wastewater level was 1,200 mg/l with the treated effluent averaging 230 mg/l and the resulting sludge averaging 7,600 mg/l. The median pH value in untreated paint wastewater samples was 8.

Nonconventional Pollutant Parameters

Among the nonconventional pollutant parameters analyzed during the screening program, a number of materials and reagents used in paint manufacture and paint wastewater treatment were measured. Elements found in paint wastewater treatment that were measured included aluminum, calcium, iron and sodium. Average untreated wastewater concentrations for these elements ranged between 397 and 271,000 µg/l. Concentrations of these materials often increased across physical-chemical treatment systems. Other inorganic nonconventional toxic pollutant average influent concentrations ranged between 107 µg/l to a high of nearly 17 mg/l for titanium. The most significant nonconventional pollutant parameter observed was COD. COD was measured in influent, effluent, and sludge samples at average level of 56,000 mg/l, 21,000 mg/l and 187,000 mg/l respectively.

SECTION VII

CONTROL AND TREATMENT TECHNOLOGY

The vast majority of paint plants that discharge wastewater discharge to municipal sewage systems. Consequently, the degree of sophistication of wastewater control and treatment often depends on the restrictions applied by the municipal system. Paint plants thus vary widely in the amount, characteristics, handling, and treatment of their process wastewater. The following paragraphs discuss some of these factors, as well as the practice of various wastewater management and treatment alternatives.

IN-PLANT WASTEWATER CONTROL STRATEGIES

There are two widely used general strategies for reducing the amount of wastewater that all paint plants discharge to the environment. The first is to reduce the amount of wastewater, and the second is to reuse as much wastewater as possible within plant processes. The amount of wastewater generated is influenced by the water pressure used for tank and equipment cleaning, the degree of cleaning required, the use of dry cleaning techniques, etc. Some of these factors have been discussed in Section V (see Table V-2).

Wastewater Reduction

Some paint plants already utilize methods to reduce overall water usage. The amount of water required to clean a paint tank can be reduced by cleaning the tank walls with a squeegee or rag, prior to rinsing with water. The quantity of wastewater from tank cleaning also can be reduced by the use of high-pressure water. There are several commercial systems available which consist of booster pumps, flow regulators, and nozzles; these supply low volume, high-pressure water sprays which clean tanks as well or better than hand-held hoses using city water pressure, in a shorter time, with less water.

A typical tank cleaning method may consist of using a garden hose with 40 to 60 psi water for a ten minute rinse of a 15,000 liter (4,000 gallon) mixing tank. This procedure can generate up to 1,100 liters (300 gallons) of wastewater. The use of a high-pressure (1200 to 1500 psi), low volume (19 liters per minute) spray system on the same tank after it has been scraped clean of excess paints, will generate only 110 to 190 liters (30 to 50 gallons) of water. The lower volume of wastewater also will have a higher solids content, which can facilitate its recycle into subsequent batches of paint. The basic equipment for a high-pressure, low volume wash system includes: a 19 liter per minute (5 gal/m) pump, high-pressure hoses, nozzles, one inch piping, and the necessary fittings and connectors. The cost of

such a system for various size paint plants is detailed in Section VIII. A spray pressure of 1200 to 1500 psi achieves the maximum cleaning efficiency while still maintaining a margin of safety for plant personnel. Hand-held wand nozzles, as well as large fixed whirling nozzles, are both available for tank cleaning. The wand nozzles also can be adapted for other cleaning operations within a paint plant, such as filling equipment clean up. A permanent high-pressure wash system with enough outlets to service the whole production area can be installed at larger paint plants. Smaller plants can use portable high-pressure pumps with flexible hoses that can be moved from spot to spot.

As discussed in Section V, the DCP responses indicate some correlation between water pressure and the amount of water required for tank cleaning. This cross tabulation is shown in Appendix C.

Another in-plant control measure used by paint plants to reduce wastewater is the sealing or elimination of floor drains and trenches. Plants that have no drains must collect all tank and filling area rinse water (unless it is piped to the treatment system or disposal point) which may encourage them to reduce the volume of water used for each purpose. Spills must be picked up with shovels or squeegees; floors usually are mopped, vacuumed, or cleaned by machine. Where floor trenches exist, there is a greater tendency to hose down equipment and floors, leading to greater water consumption and wastewater generation.

Good housekeeping procedures can significantly affect total wastewater volume. According to the SRI report, about one-third of the plants surveyed in 1972 reduced wastewater either by recycling or by conservation through the use of high-pressure nozzles, self-contained tank washers, or other methods. In several small plants (less than 50 employees), clean up wastewater ranged from 0.02 to 0.23 liters/liter (gal/gal) of paint. These plants, production equipment and cleaning facilities were nearly identical. The ten-fold difference in wastewater volume shows the effect of water conservation practices. A comparison of two large plants of nearly equal capacity showed that one discharged 0.86 liters of waste per liter (gal/gal) of product and the second discharged 0.08 liters of waste per liter (gal/gal) of product.

Data presented in Table V-8 confirms the still wide range of wastewater generation from plant to plant. These data were confirmed by recent paint plant inspections, as evidenced in Table V-18. Many plants clean tanks by allowing a worker to hold a free-running hose for an indeterminate length of time, while other plants ration clean up water by either volume or time. It was also observed that several paint plants have negated the need for occasional caustic rinsing of

their water-base paint tanks by the use of very high-pressure (1000 to 2000 psi) water or steam cleaning on a periodic basis.

Wastewater Recycle

Although most paint plants produce a wide variety of paint colors and finishes, many plants' production consists of predominantly white and off-white batches. Good practice, already in use at some plants, is to segregate white paint production as much as possible, and to reuse the wastes from each batch in the subsequent batch. Use of the same tank for the subsequent batch makes the wash-down operation unnecessary and precludes the production of wastewater. Plants with a high ratio of white to color paint production, and with sufficient production equipment can segregate white paint production; and reuse the residue in the subsequent batch. This also is possible in isolated cases where a plant makes a large amount of any given paint color in a short period of time.

Even where plants cannot dedicate tanks to a single product, the same recycle opportunities arise from scheduling batches of the same or similar products back to back in the same tank. The rinse water from the first batch remains in the tank and is used in the next batch as part of the formulation, reducing raw material requirements and avoiding disposal costs.

When paint plants cannot immediately reuse paint rinse water, several recycling methods are available. Some plants collect all paint wastewater in drums or tanks, label it by color and base, and reuse it in the next compatible batch (similar or darker color). This wastewater may need treatment with a biocide, and is usually used as soon as possible. Paint companies have had different experiences with spoilage. Some plants will not use wastewater more than a few days old, while others claim to have used biocide-treated wastewater with satisfactory results several months or more after collection. Several paint companies are reluctant to reuse wastewater at all, pointing out that the economic losses from a spoiled 6,000 or 10,000 gallon paint batch are very large, compared with the disposal costs of a few hundred gallons of wastewater. A recall of spoiled paint from retailers could make economic losses even more severe.

A flow diagram of one simple wastewater recycle system is presented in Figure VII-1. This system consists of three holding tanks for three types of paint. Wastewater from a mix tank is pumped through a manifold to the appropriate holding tank. Each time a batch of paint is manufactured, as much wastewater as possible from the appropriate holding tank is pumped back. The costs for such a system will be discussed in Section VIII. Plants with large product lines will have difficulty recycling some of their infrequently manufactured products that are not compatible with other paints. Experience has shown that

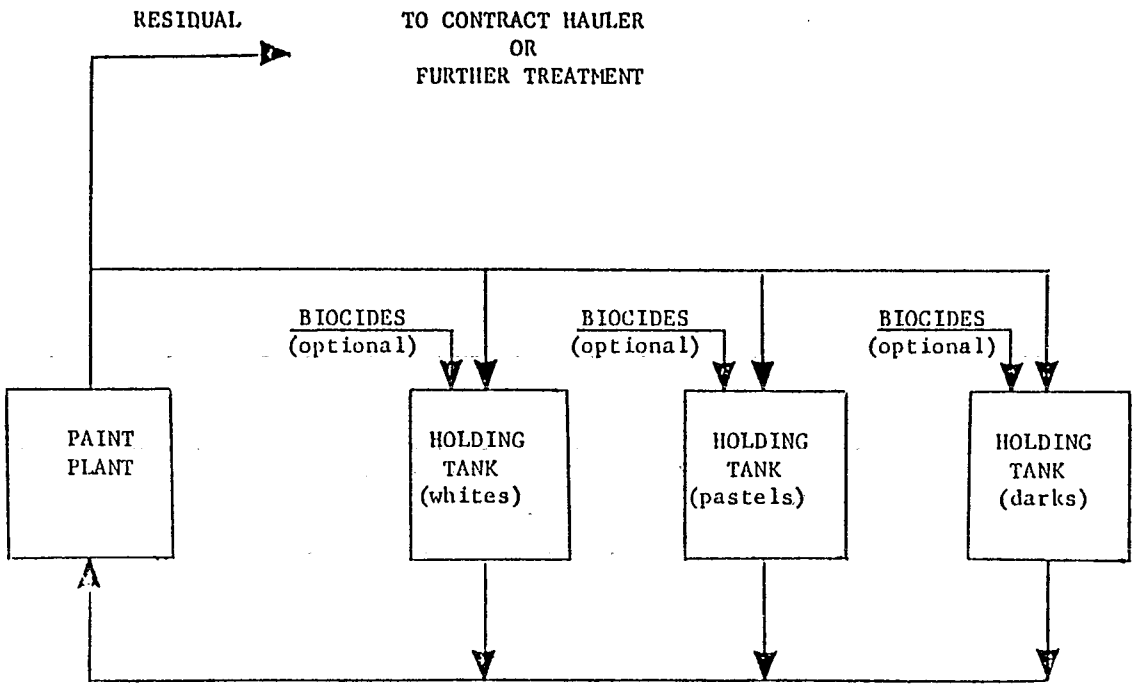


FIGURE VII-1
FLOW DIAGRAM FOR A WASTEWATER RECYCLE SYSTEM*
(mixers and pumps not shown)

* one of many potential systems

even plants with "complete" recycle may at times contract haul 10 to 50 percent of their wastewater once it spoils or is otherwise unsuitable for reuse.

Paint plants that practice caustic rinsing of tanks also can recycle some of their rinse water. As discussed in Section V, most caustic rinse systems recycle the caustic cleaning solution. The subsequent water rinse should be reused to the greatest extent possible to make up caustic solution lost by evaporation. Package caustic cleaning systems that incorporate complete or potential recycle of rinse water are available from various venders. High-pressure rinses following caustic cleaning reduce wastewater generation.

Another technique for reusing paint wastewater is to treat the wastewater by physical-chemical precipitation or some other method and reuse the rinse water for subsequent paint batches or as rinse water. The effluent from good physical-chemical treatment systems usually is colorless and low in suspended solids and oil and grease. Treating rinse waters prior to reuse does, however, remove economically valuable solids.

The DCP data representative of 1977 operations show an increase in the incidence of reuse or recycle. Eight hundred fifty-one respondents indicated that they used a water rinse, and an analysis of the tank cleaning and wastewater recycle procedures used by these plants is presented in Table VII-1. Of this group, 76 percent of the plants usually clean their tanks between batches, and 13 percent of the plants always reuse their wastewater in subsequent batches of paints. Over 57 percent of the plants reuse wastewater in subsequent batches at least occasionally. The number of plants always reusing their wastewater is greatest among plants whose production is concentrated in few products. Twenty-two percent of the plants which produce 90 percent or more of white or tint-base paint always recycle rinse water into product, while 25 percent of plants producing 90 percent or more water-base paints always recycle. Of the small group (76 plants) which concentrate both in white or tint-base paint and water-base paints (90 percent or more of both) 29 percent always recycle their rinse water. In contrast, of plants producing 90 percent or more of color paint, who may be expected to have a broader product mix, only 8 percent always recycle their rinse water into subsequent paint batches.

Small paint plants are far more likely than large plants to reuse their wastewater as part of product formulation. Of the plants with under 20 employees, 38 percent reuse the rinse water in product always or most of the time, whereas only 17 percent of plants with over 100 employees use spent wash water in subsequent paint batches. Only 1.1 percent of the large plants indicated reusing wastewater in product

TABLE VII-1

FREQUENCY OF TANK CLEANING AND REUSE OF PAINT WASTEWATER

	All Plants Using Water Rinse	Plants Producing: 90%+ Water-Base	Plants Producing: 90%+ White or Tint-Base Using Water Wash	Plants Producing: 90%+ Color Paint Using Water Wash	Plants Producing: 90%+ White & 90%+ Water-Base	Plants with Under 20 emp. Using Water Wash	Plants with Over 100 emp. Using Water Wash
	Percent of Plants						
Frequency of Tank Cleaning Between Batches							
Always	33.7	43.1	37.4	20.3	42.1	33.8	27.2
Most of time	42.0	26.6	30.6	38.4	18	36.9	52.2
Occasionally	21.3	24.8	23.1	24.7	23.7	23.2	18.5
Never	1.9	3.7	6.8	11.0	13.2	3.9	1.1
Not Answered	1.2	1.8	2.0	5.5	2.6	2.1	1.1
Reuse in Product							
Always	13.0	24.8	22.4	8.2	28.9	16.4	1.1
Most of time	24.3	17.4	26.5	9.6	13.2	21.7	16.3
Occasionally	20.6	21.1	8.8	6.8	7.9	14.8	25.0
Never	35.8	26.6	29.9	49.3	28.9	29.1	51.5
Not Answered	6.2	10.1	12.2	26.0	21.1	18.1	6.5
Reuse as Rinse-water							
Always	6.8	11.9	6.8	4.1	10.5	8.2	2.2
Most of time	16.6	11.0	12.9	6.8	7.9	16.3	10.9
Occasionally	24.9	16.5	16.3	6.8	7.9	18.4	27.2
Never	39.7	44.0	42.2	52.1	46.1	32.5	52.2
Not Answered	12.0	16.5	21.8	30.1	27.6	24.6	7.6

Source: DCP

all of the time versus 16 percent of small plants and 13 percent of all plants that use a water rinse.

Plants that reuse wastewater to rinse tanks and equipment follow the same general trends as those that reuse it in the product. Small plants are more likely to practice recycle than large plants, and plants producing water-base paints recycle more often than the industry-wide average. Plants which produce 90 percent or more white paint, as expected, reuse their wastewater for rinsing more than plants producing various pigmented products. These data also are presented in Table VII-1.

There is a trend in the paint industry, in part prompted by air pollution regulations, to replace some solvent-base paint applications with water-base products. This will lead to an overall increase in wastewater from the paint industry, and may complicate recycle programs, since industrial water-base coatings may not be fully compatible with trade sales products. However, the paint industry has demonstrated that management attention to water use within the plant can reduce wastewater volume and find potential uses for this wastewater.

WASTEWATER DISPOSAL

Almost all paint plants that discharge process wastewater are indirect dischargers. The disposal methods utilized by paint plants were indicated on the DCP responses, and are presented in Table VII-2. The most common methods are discharge to a sewer, contract hauling, evaporation, and landfill or impoundment. Only 13 plants indicated discharging paint process wastewater directly to a receiving stream. Follow-up with these plants, however, showed that most actually were not direct dischargers. Several respondents had misinterpreted the question, others discharged only noncontact cooling water, and several were part of a multi-industry plant complex that discharged directly. In the last case, paint process waste was always less than 10 percent of the total plant wastewater volume, and was less than 1 percent at several plants.

Sixty-eight plants indicated the discharge of wastewater to a storm sewer, which can be considered a form of direct discharge. However, of the 68 plants, 26 discharge to both sanitary and storm sewers, making it probable that process wastewater is restricted to the sanitary sewer. Ten plants utilize contract hauling of process wastewater along with discharge to the storm sewer, and it is likely that only cooling water is discharged to the storm sewer. About half of the plants that indicated their only disposal method was discharge to the storm sewer were surveyed by telephone. Among this group, several plants discharge only noncontact cooling water or stormwater runoff to the storm sewer, and only two plants dispose of process

TABLE VII-2

WASTEWATER DISPOSAL METHODS

Disposal Method	All Plants		Plants Using Waterwash	
	Number of Plants*	Percent of Total	Number of Plants	Percent of Total
Complete Reuse	88	6.4	82	9.6
Partial Reuse	262	19.1	242	28.4
Evaporation	125	9.1	105	12.3
Discharge to City Sewer	475	34.6	363	42.7
Discharge to Storm Sewer	68	4.9	51	6.0
Discharge to Receiving Stream	13	0.9	13	1.5
Impoundment on Plant Property	87	6.3	82	9.6
Incineration	5	0.4	2	0.2
Contract Hauling	271	19.7	239	28.1
Landfilled	107	7.8	97	11.4
Well or Septic Tank	13	0.9	10	1.2
Spray Irrigation	8	0.6	7	0.8

* Some plants indicated multiple disposal methods.

Source: DCP

wastewater in this manner. The majority of plants misinterpreted the question and actually discharge to the sanitary sewer. In summary, there are six known manufacturing sites that can be considered as exclusively or primarily engaged in paint manufacture that discharge process waste on a regular basis directly to a receiving stream.

Plants with wastewater treatment often generate a sludge which requires disposal by contract hauling. Other plants dispose of some or all of their untreated process wastewater by contract hauling. Other common disposal methods included trucking to landfill by the plant, and storage on plant property. Incineration, reclamation, and other disposal methods were mentioned by just a few plants.

Most contract haulers used by paint plants dispose of the sludge in a landfill, although a small number incinerate or reclaim it. Nineteen percent of all paint plants did not know what the contract hauler does with their waste.

Another potential source of waste from the paint industry is off-specification paint batches, or other nonsuitable or returned product. Most plants attempt to rework this paint into other products to save as much of the raw materials as possible. Other plants sell or give the material to scavengers for reclaiming, or sell the paint as a lower quality material at reduced prices. The methods used by paint plants for handling off-spec batches of paint are presented in Table VII-3. This waste source usually is not discharged as a wastewater.

WASTEWATER TREATMENT

The methods used by paint plants for treating or pretreating wastewater prior to disposal are shown in Table VII-4. Some type of wastewater treatment is used by 355 plants. The most common treatment methods are settling and clarification, gravity separation (with or without chemical addition), and neutralization. Few plants employ biological treatment for paint wastes, and those that do usually have a combined treatment plant for wastes from other plant operations. No paint plants use advanced wastewater treatment methods such as activated carbon or ultrafiltration. Of the plants that discharge their wastewater to a municipal sewer, approximately 40 percent pretreat their waste prior to disposal. Only 208 plants indicated that the local municipality or sewage authority limited their discharges by an industrial waste ordinance, but 413 plants said that the municipality required sewer use charges or surcharges. Two-hundred six plants indicated that the municipality sampled their wastewater and 105 plants were required to sample their own wastewater. To discharge to the city sewer, 137 plants need a permit. Although most municipalities prohibit the discharge of solvents to the sewers, 13 paint plants indicated that they discharge their spent solvents to the sewer. Ninety-one plants discharge spent caustic

TABLE VII-3

HANDLING OF OFF-SPECIFICATION PAINT

Method	Number of Plants*	Percent of Industry
Reworked into Other Products	1074	78.2
Sold to Scavenger	192	14.0
Given to Scavenger	182	13.2
Pay Scavenger to Remove	34	2.5
Sold at Reduced Price	29	2.1
Landfilled	26	1.9
Discharged with Wastewater	17	1.2
Reclaimed by Plant for Solvent	8	0.6
Incinerated	5	0.4

* Some Plants Indicated Multiple Answers.

Source: DCP

TABLE VII-4

WASTEWATER TREATMENT METHODS

Treatment Method	Number of Plants*	Percent of Total
Neutralization	53	3.9
Filtration	28	2.0
Evaporation	87	6.3
Flotation	23	1.7
Activated Sludge	5	0.4
Trickling Filtration	3	0.2
Lagoon	24	1.7
Gravity Separation	132	9.6
Carbon Adsorption	0	0
Equalization	10	0.7
Settling or Clarification	158	11.5
Chemical Treatment		
Alum	28	2.0
Lime	19	1.4
Polymer	42	3.1
Other	24	1.7
Plants indicating at least one type of treatment	355	25.8%

* Many plants use multiple treatment methods

Source: DCP

solutions to the sewer, either with or without neutralization. Two-thirds of the plants discharging to the sewer indicate that their discharge is batch, while the remaining plants discharge continuously.

Preliminary Treatment Systems

Many paint plants use physical treatment systems such as equalization or settling. Gravity settling of paint wastewater removes many of the suspended solids, but still leaves a supernatant layer high in solids and other pollutants. The 1977/1978 sampling program did not collect effluent samples from plants which treated only by settling. Therefore, no discussion of this type of treatment is included. The use of flocculating chemicals with gravity settling enhances treatment of paint wastewater.

Physical-Chemical Treatment

Physical-chemical (P-C) treatment systems in the paint industry are basically enhancements of gravity settling systems. Most plants utilizing P-C systems operate them on a batch basis. The plant's caustic or water-wash wastewater flow collects in a holding tank until a sufficient quantity warrants treatment. If necessary, the pH is adjusted to an optimum level, a coagulant (often lime, alum, ferric chloride, or iron salts) and/or a coagulant aid (polymer) is added and mixed, and the batch is allowed to settle (from 1 to 48 hours). The supernatant is discharged, and the sludge is generally disposed of as a solid waste. Often the sludge remains in the treatment tank for one or more subsequent batches, to reduce the overall sludge volume. Solvents, oils, and skins may float to the surface where they are removed manually. A flow diagram of a typical batch P-C treatment system is presented in Figure VII-2.

Some plants operate continuous P-C treatment systems which operate on the same principal. Other plants operate semi-continuous P-C treatment systems, where the wastewater is collected, batch treated, and released into a continuous flow settling tank. Most P-C systems in the paint industry are batch, however, which seems best suited to the batch nature of wastewater generation by the industry.

The 1977-1978 sampling program sampled many plants with batch P-C treatment systems. Forty-eight batches from 16 plants were analyzed for conventional pollutants and metals, and 23 batches were analyzed for toxic pollutants. The influent and effluent characteristics, and average percentage of removals for selected conventional, nonconventional, and toxic pollutants are presented in Table VII-5. The Agency adjusted the data base used in Table VII-5 for purposes of median percent removal computations. Batches where both the influent and effluent were reported as less than 10 ug/l (or other detection limit in the case of inorganic and nonconventional pollutants) were

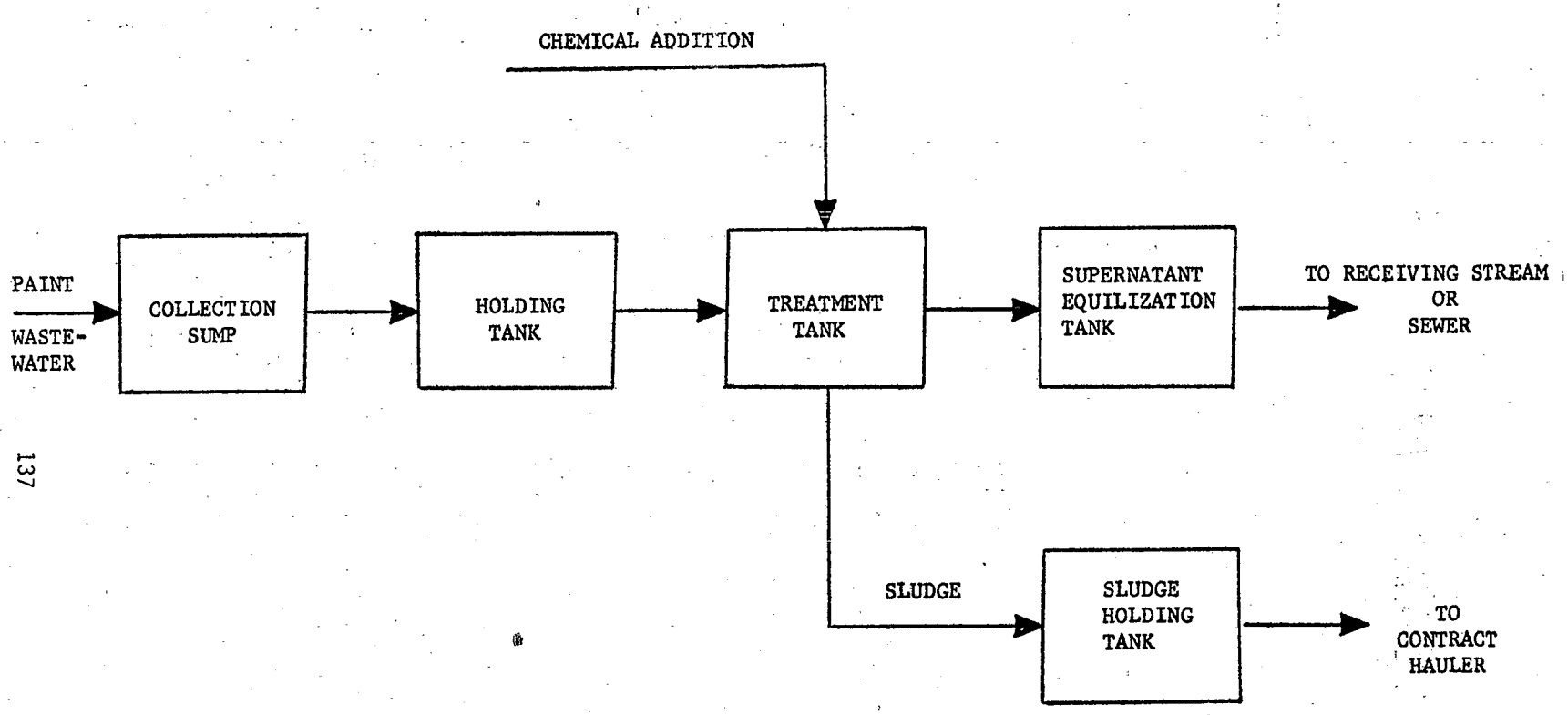


FIGURE VII-2
FLOW DIAGRAM FOR A BATCH PHYSICAL-CHEMICAL TREATMENT SYSTEM
(mixers and pumps not shown)

TABLE VII-5

POLLUTANT REMOVAL EFFICIENCY OF BATCH PHYSICAL-CHEMICAL TREATMENT SYSTEMS

NO.	PARAMETER	---AVERAGE(1)---- INFLUENT	EFFLUENT	PCNT REDUCTION	NO. OF BATCHES (2)	MEDIAN PERCENT REMOVAL(2)
	CONVENTIONAL POLLUTANTS					
	BOD(MG-L)	10778	5585	48	41	20
	TOTAL SUSP. SOLIDS(MG-L)	23831	1310	94	38	99
	OIL & GREASE(MG-L)	1158	118	89	38	97
	NONCONVENTIONAL POLLUTANTS					
	COD(MG-L)	55833	18749	66	45	74
	TOC(MG-L)	10856	3498	67	40	75
	TOTAL SOLIDS(MG-L)	31967	5905	81	40	80
	TOTAL DISS. SOLIDS(MG-L)	11330	4911	56	35	35
	TOTAL VOLATILE SOLIDS(MG-L)	13324	2499	81	35	88
	VOLATILE DISS. SOLIDS(MG-L)	5155	1650	67	23	72
	TOTAL VOL. SUS. SOLIDS(MG-L)	8709	956	89	25	98
	ALUMINUM	227760	6921	96	43	99
	BARIUM	6770	842	87	42	94
	BORON	2206	1874	15	31	16
	CALCIUM(MG-L)	2799	304	89	41	51
	COBALT	1018	533	47	35	75
	IRON	334466	110795	66	42	90
	MAGNESIUM(MG-L)	129	21	83	42	60
	MANGANESE	3508	2102	40	42	53
	MOLYBDENUM	820	213	74	33	83
	SODIUM	397	803	0	39	0
	TIN	858	163	81	41	86
	TITANIUM	19300	738	96	42	97
	VANADIUM	495	79	84	19	72
	INORGANIC TOXIC POLLUTANTS					
114	ANTIMONY	281	226	19	10	60
115	ARSENIC	344	194	43	22	80
117	BERYLLIUM	162	8	95	13	50
118	CADMIUM	674	31	95	25	80
119	CHROMIUM	3399	1403	58	38	54
120	COPPER	3083	1894	38	44	69
121	CYANIDE	75	57	24	4	54
122	LEAD	6033	1062	82	36	90
123	MERCURY	4022	322	91	32	88
124	NICKEL	1729	3386	0	19	77
125	SELENIUM	210	211	0	5	79
126	SILVER	17	9	47	6	73
127	THALLIUM	194	190	2	11	33
128	ZINC	94634	6821	92	45	90

TABLE VII-5 (CON'T)

POLLUTANT REMOVAL EFFICIENCY OF BATCH PHYSICAL-CHEMICAL TREATMENT SYSTEMS

NO.	PARAMETER	---AVERAGE(1)---- INFLUENT	EFFLUENT	PCNT REDUCTION	NO. OF BATCHES (2)	MEDIAN PERCENT REMOVAL(2)
	ORGANIC TOXIC POLLUTANTS					
4	BENZENE	1190	563	52	17	65
6	CARBON TETRACHLORIDE	19	16	15	5	100
10	1,2-DICHLOROETHANE	81	20	75	5	69
11	1,1,1-TRICHLOROETHANE	104	70	32	15	30
14	1,1,2-TRICHLOROETHANE	355	203	42	4	50
23	CHLOROFORM	144	283	0	18	68
29	1,1-DICHLOROETHYLENE	9	13	0	4	50
38	ETHYLBENZENE	2387	4342	0	21	80
44	METHYLENE CHLORIDE	19874	4480	77	21	62
55	NAPHTHALENE	3278	335	89	5	70
65	PHENOL	448	80	82	11	0
	TOTAL PHENOLS	274	210	23	37	28
66	DI(2-ETHYLHEXYL) PHTHALATE	340	26	92	7	97
67	BUTYL BENZYL PHTHALATE	380	695	0	4	0
68	DI-N-BUTYL PHTHALATE	6474	90	98	12	99
85	TETRACHLOROETHYLENE	545	90	83	14	98
86	TOLUENE	6165	1438	76	22	74
87	TRICHLOROETHYLENE	59	50	15	11	9

NOTES

(1) AVERAGE ONLY OF PLANTS WITH BATCH PHYSICAL-CHEMICAL TREATMENT SYSTEMS. BATCHES WHERE BOTH INFLUENT AND EFFLUENT WERE NOT DETECTED ARE NOT INCLUDED IN CALCULATION OF AVERAGE CONCENTRATIONS.

(2) INDIVIDUAL PERCENT REMOVALS WERE CALCULATED ONLY WHERE BOTH INFLUENT AND EFFLUENT VALUES WERE DETERMINED AND WHERE ONE OR BOTH VALUES WERE ABOVE 10 UG/L (OR OTHER DETECTION LIMIT IN THE CASE OF METALS OR NONCONVENTIONAL POLLUTANTS).

TOXIC POLLUTANTS WITH LESS THAN FOUR CALCULATED REMOVALS ARE NOT LISTED

INFLUENT AND EFFLUENT AVERAGES ARE IN UG/L UNLESS OTHERWISE NOTED

not included in the calculations. This adjustment is explained in the notes below Table VII-5.

Overall, P-C treatment removed many conventional, nonconventional and toxic pollutants, although the level of many in the effluent remained high. Six toxic pollutants (lead, zinc, carbon tetrachloride, di (2-ethylhexyl) phthalate, di-n-butyl phthalate and tetrachloroethylene) had median removals of 90 percent or greater. Twenty other toxic pollutants had median removals between 50 and 90 percent. The conventional and nonconventional pollutant parameters best removed by P-C treatment were oil and grease (97 percent median), total suspended solids (99 percent), total volatile suspended solids (98 percent), aluminum (99 percent), and titanium (97 percent).

The Agency searched the data base utilized in preparing Table VII-5 for surrogate pollutants; that is, easily measured conventional or nonconventional pollutants whose removal or effluent levels would predict the removal or effluent level of toxic pollutants. Unfortunately, no statistically meaningful correlations could be found. This is due in part to some of the problems with the analytical data explained in Sections V and VI. There were many instances where toxic pollutants were measured in the treated effluent from one batch but not in the influent from that batch.

In the case of analyses which are at or near the detection limit for the pollutant, the sensitivity of the analytical tests may be so poor that apparent discrepancies appear. The data for several of the frequently occurring toxic pollutants were screened and questionable data points rejected. These reduced data were correlated against several conventional pollutants. The correlation values were much improved, but statistically insignificant. It is likely that the data base is too small and heterogeneous for statistical analysis, but several broad conclusions can be supported by the data. These are:

1. Removals of total solids, suspended solids, oil and grease, COD and TOC by P-C treatment are all good (over 70 percent median removal for each). The BOD5 removals were lower, possibly because of difficulty in measuring the BOD of untreated paint wastewater and effluent.

2. Removals of most of the frequently occurring inorganic toxic pollutants also were good. Arsenic, cadmium, copper, mercury, lead, nickel, and zinc had median removals of 69 percent or greater. Removals of chromium were lower. Where they occurred, chromium, copper, lead, nickel, and zinc averaged over 1 mg/l in the effluent. Zinc averaged almost 7 mg/l. The remaining toxic pollutant metals were not present frequently enough to draw any firm conclusions.

3. Removal of most commonly used solvents was very good. Benzene, carbon tetrachloride, ethylbenzene, tetrachloroethylene, methylene chloride, and toluene all had median removals above 60 percent. However, all except carbon tetrachloride and tetrachloroethylene were present in effluents at an average concentration of over 500 ug/l. Trichloroethylene was poorly removed, although it only occurred in low average concentrations.

4. Di (2-ethylhexyl) phthalate and di-n-butyl phthalate removals were excellent, with median removals of 97 percent and 99 percent, respectively. Butyl benzyl phthalate, however, was poorly removed (based on only four batches).

Various paint plants have adopted several operating procedures to improve the performance of their P-C treatment systems. Some of these are:

1. Selection of proper pH and flocculating chemicals. Plants that have experimented with different inorganic salts and/or polymers have often upgraded their treatment efficiency.

2. Jar testing for optimum dosage. Each batch of paint wastewater has different characteristics and requires varying chemical dosages. Testing each batch in several jars with different pH's and/or chemical doses requires little time and can lead to enhanced performance. Too much polymer, in addition to wasting money, results in worse treatment than the proper dose.

3. Selection of proper mixers and/or flocculators. Some plants have improved performance by using higher speed mixers and/or optimizing mixing time and blade shape.

Biological Treatment

Biological treatment has been mentioned in the literature (40, 41) as being applicable to latex-containing wastewaters. Several paint plants that are part of large chemical production complexes treat their wastewater in this manner. These plants generally pretreat the paint wastewater and combine it with other, more dilute plant wastewater. Because of the exceptionally high solids and metals concentrations in paint wastewater, biological treatment must almost always follow some kind of preliminary treatment (such as physical-chemical). The most common types of biological treatment systems include activated sludge, aerated lagoons, and trickling filters. In the paint industry, aerated lagoons predominate. The shorter detention times of activated sludge and trickling filter plants may make these units more prone to failure from interferences and shock loading.

One plant sampled during 1978 has an aerated lagoon that treats primarily paint effluent (after batch P-C treatment). Data from this plant are presented in Table VII-6. Toxic pollutant parameters which were not detected in any of the three sample points are not listed. The data indicate that the aerated lagoon successfully reduces conventional, inorganic, and organic pollutants to low levels. Of the toxic pollutants, only methylene chloride was present in the lagoon effluent at over 200 ug/l, and this was probably due in part to contamination from bottle preparation techniques.

In general, aerated lagoons with very long detention periods can reduce organic loadings by 90 percent or more, and can reduce volatile compounds through the process of air stripping. Aerated lagoons may be practical for paint plants in rural areas that wish to further treat effluent from P-C treatment, for both conventional and toxic pollutants.

A flow diagram of a typical aerated lagoon system, preceded by P-C treatment, is shown in Figure VII-3. Depending upon the composition of the wastewater to be treated, nitrogen and phosphorus supplement may be necessary to maintain the biomass. pH control also may be required.

Aerated lagoons may not be feasible in very cold climates or in urban areas where land is not available. Because there is very limited operating experience of biological treatment of paint wastewater, performance characteristics and effluent quality cannot be specified.

Other Wastewater Treatment Systems

Other wastewater treatment processes such as ultrafiltration and activated carbon are used commonly on industrial wastewaters and have been mentioned for potential application to the paint industry. No paint plants according to DCP responses, currently use these systems.

Ultrafiltration (UF) is a membrane process that reduces the solids content of a feed stream by pressurizing the feed while it is in contact with a semi-permeable membrane. Water molecules pass through the membrane while solids are left behind. The automotive industry commonly uses UF for purification of electrolytic paint solutions by removing some water and impurities while "rejecting" valuable paint solids. Two companies contacted during this study had conducted tests of UF for paint wastewater treatment. Both tests were unsuccessful. The problems encountered included rapid fouling of the membranes, lack of sufficient throughput, and insufficient membrane life. Ultrafiltration also produces a concentrate stream consisting of rejected solids and some water, which requires disposal by contract hauling. No data is available on the effluent quality that can be expected from UF treatment of paint wastewater.

TABLE VII-6

BIOLOGICAL TREATMENT AERATED LAGOON, AT ONE PAINT PLANT[1]

Parameter		Untreated Wastewater		P-C Effluent		Lagoon		Tap Water
Conventional Pollutants								
pH (units)		7.4		7.0		8.3		7.6
BOD (mg/l)	G	25,000		23,400		17	L	1
Total Suspended Solids (mg/l)		46,000		400		42	L	5
Non Conventional Pollutants								
COD (mg/l)		70,000		260,000		675		10
TOC (mg/l)		7,500		25,000		200		4
Total Phenols (mg/l)		1.2		1.1		0.003	L	0.002
Inorganic Toxic Pollutants								
114 Antimony	L	1,000		170		30	L	2
115 Arsenic		440	L	100	L	20		2.8
117 Beryllium		7		2	L	1		2
118 Cadmium		130		58	L	2	L	2
119 Chromium		1,450		105		9		7
120 Copper		264		115		7		16
122 Lead		12,000		98	L	20	L	20
123 Mercury		1,010		142		0.1		0.1
124 Nickel		450	L	5	L	5	L	5
125 Selenium	L	200		400	L	200		20
126 Silver	L	10	L	10	L	10	L	10
127 Thallium	L	200		100	L	20	L	2
128 Zinc		60,000		4,200	L	60	L	60

TABLE VII-6 (Continued)

BIOLOGICAL TREATMENT BY AERATED LAGOON, AT ONE PAINT PLANT[1]

Parameter	Untreated Wastewater	P-C Effluent	Lagoon	Tap Water
Organic Toxic Pollutants				
4 Benzene	280	200	L 10	N-D
11 1,1,1 Trichloroethylene	120	560	22	L 10
23 Chloroform	N-D	23	N-D	37
38 Ethylbenzene	730	N-D	N-D	N-D
44 Methylene Chloride	6,300	31,000	1,000	740
48 Dichlorobromomethane	N-D	N-D	N-D	L 10
51 Chlorodibromomethane	N-D	N-D	N-D	L 10
64 Pentachlorophenol	L 10	L 10	N-D	N-D
65 Phenol	L 10	L 10	N-D	N-D
66 Di(2 ethyl-hexyl) phthalate	N-D	N-D	L 10	L 10
68 Di-N-butyl phthalate	L 10	L 10	N-D	N-D
85 Tetrachloroethylene	110	25	N-D	N-D
86 Toluene	290	200	N-D	N-D

(1) Sampling was by EPA regional Surveillance and Analysis personnel without technical contractor or Effluent Guidelines representation.

L = Less than G = Greater than N-D = Not detected

All units ug/l unless otherwise noted.

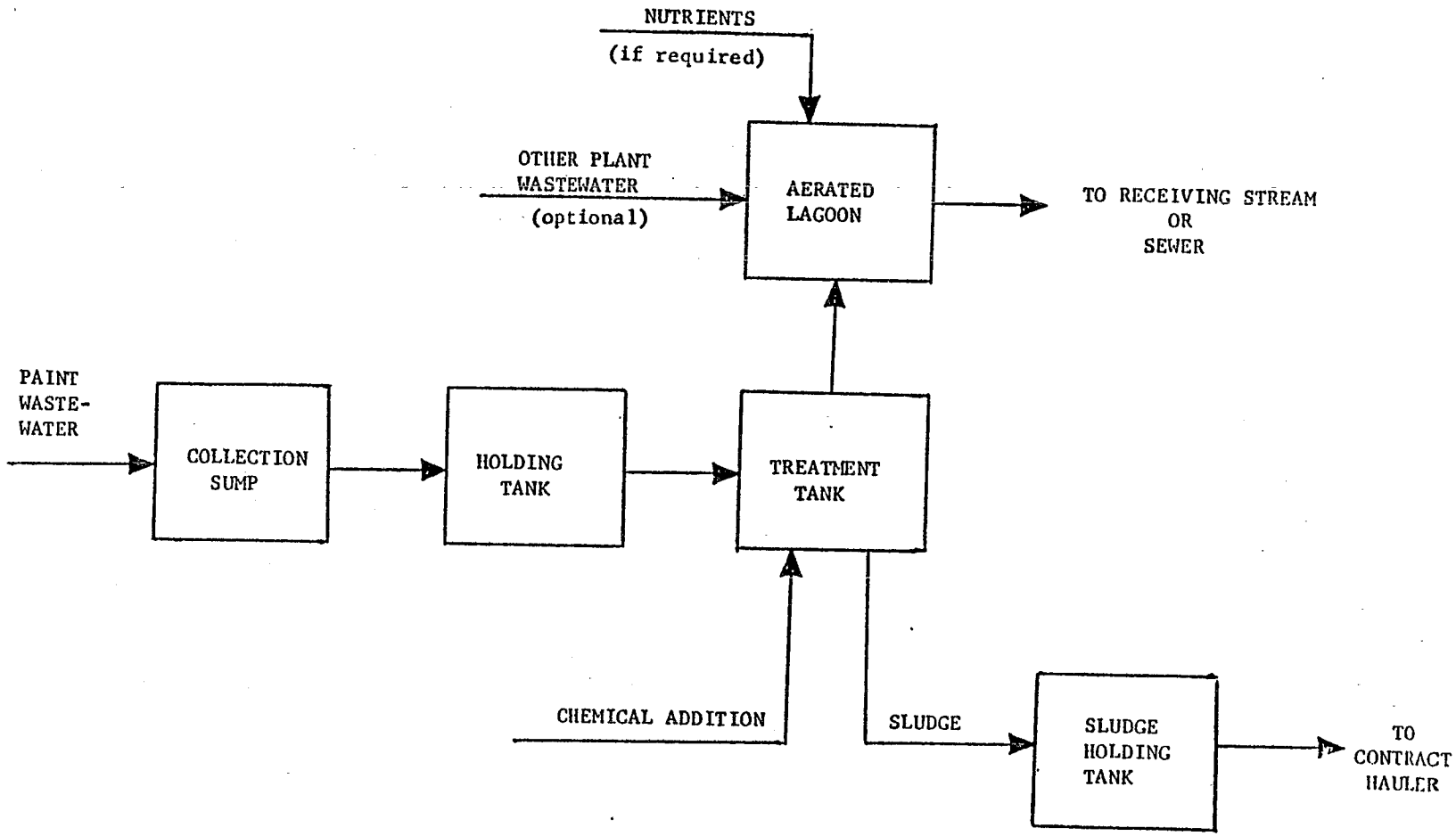


FIGURE VII-3

FLOW DIAGRAM FOR A BATCH PHYSICAL-CHEMICAL PRETREATMENT SYSTEM
FOLLOWED BY BIOLOGICAL TREATMENT
(mixers and pumps not shown)

Activated carbon is a tertiary treatment process capable of removing some organic toxic pollutants by adsorption. It generally is applied after biological treatment has reduced a wastewater's strength to low BOD and TSS levels. Carbon is rapidly plugged by high solids loadings, and does not appear applicable to untreated paint wastewater or to effluent from batch physical-chemical treatment systems (based on data from Tables V-22 and VII-5). For carbon to treat paint wastewater effectively, extensive pretreatment is required.

EFFECT OF PRODUCTION CHARACTERISTICS ON EFFLUENT QUALITY

In Section IV it was indicated that tank cleaning procedures form a rational basis for paint industry subcategorization. Data presented in the 1976 Burns and Roe draft document indicated some differences in wastewater characteristics (for conventionals, nonconventionals and metals only) between plants that manufacture only water-base paint and plants that manufacture both water and solvent-base paint. Analytical data collected from this study were grouped by production characteristics of paint plants. The three groupings chosen included: plants producing exclusively water-base paint (4 plants), plants producing 51 percent to 99 percent water-base paints (13 plants), and plants producing under 50 percent water-base paint (5 plants). Untreated wastewater characteristics for selected conventional and toxic pollutants are indicated in Table VII-7. While individual pollutants show large variations between groups, the trend is not always in the same direction. Overall, it appears that the variability in incidence and loading of toxic pollutants from the various groups of plants cannot be directly associated with the manufacture of water-versus solvent-base paint. Both types of paint manufacture result in the generation of wastewater with high concentrations of both organic and inorganic toxic compounds.

MASS BALANCE FOR THE PAINT INDUSTRY

This section presents mass loadings for conventional, nonconventional, and toxic pollutants in untreated and treated wastewater and sludges. The average concentration of each stream was multiplied by the estimated total industry flow, assuming that all plants treated their wastewater by batch physical-chemical treatment. In an effort to make the data base as consistent as possible, EPA made the following adjustments to the data:

1. Plants without batch physical-chemical treatment were excluded. This reduced the data base from 22 plants to 17 plants.

2. If a particular pollutant parameter was not analyzed for one batch, the influent and effluent values from that batch were both

TABLE VII-7

UNTREATED WASTEWATER CHARACTERISTICS
FROM PLANTS WITH DIFFERENT PRODUCTION CHARACTERISTICS

	100% Water Base	50-99% Water Base	Less Than 50% Water Base
Conventional Pollutants			
	(Average Concentration in mg/l)		
BOD	6970	6288	21,800
TSS	15,000	26,340	9,700
Selected Metal Priority Pollutants			
	(Average Concentration in ug/l)		
Cadmium	1750	95	37
Chromium	2370	1090	9544
Copper	2090	3380	573
Lead	1930	6510	11,560
Mercury	46	5720	10,154
Nickel	1900	1560	65
Zinc	111,300	70,900	36,240
Selected Organic Priority Pollutants			
	(Percent Occurrence at 10 ug/l or Greater)		
Benzene	44	73	43
Carbon tetrachloride	22	20	14
1,1,1 Trichloroethane	56	47	43
1-1 Dichloroethylene	11	0	29
Ethylbenzene	89	80	71
Methylene Chloride	89	40	43
Naphthalene	22	13	57
Pentachlorophenol	0	13	43
Bis(2-ethylhexyl) phthalate	11	27	57
Di-N-butyl phthalate	44	40	43
Tetrachloroethylene	44	67	29
Toluene	89	100	57
Trichloroethylene	22	40	43

excluded. This exclusion primarily affected metals analyzed by flameless atomic absorption and some nonconventional pollutants.

The untreated paint wastewater mass loadings were based on an assumed industry flow of 2.8 million liters per day (750,000 gpd). The Agency estimated treated wastewater at 85 percent of that flow (2.4 million liters per day) and sludge at 15 percent of that flow (0.4 million liters/day). The total quantity of conventional, nonconventional, and toxic pollutants is indicated in Table VII-8. Organic toxic pollutants balanced well, but conventional, nonconventional, and inorganic toxic pollutants were all computed at higher levels in the influent than in the effluent and sludge combined. Part of this problem may have been caused by the difficulty experienced by analytical laboratories analyzing paint sludges.

EPA derived the following conclusions:

1. Several volatile organic toxic pollutants (benzene, 1-1-2 trichloroethane, and naphthalene) that were removed from the influent appeared in the sludge at relatively low concentrations. Methylene chloride and toluene did not exhibit this tendency.

2. Di-n-butyl phthalate and pentachlorophenol both appeared in the influent at more than ten times their combined sludge and effluent quantity.

3. All metals except beryllium and cadmium balanced within a factor of 2.5. Zinc accounted for over 80 percent of the influent and sludge inorganic toxic pollutant loading.

4. Over 98 percent of the inorganic toxic pollutant loading from untreated wastewater is from chromium, copper, lead, mercury, nickel, and zinc. These six metals account for 94 percent of the treated wastewater toxic pollutant loading and over 98 percent of the sludge toxic pollutant loading (from data in Table VII-8).

TABLE VII-8

MASS BALANCE FOR THE PAINT INDUSTRY THROUGH BATCH PHYSICAL-CHEMICAL TREATMENT

NO.	PARAMETER	---WASTEWATER SOURCE--- UNTREATED	TREATED	SLUDGE
		----------KG/DAY----------		
	CONVENTIONAL POLLUTANTS			
	BOD(MG-L)	30540	13347	10833
	TOTAL SUSP. SOLIDS(MG-L)	67533	3131	40072
	OIL & GREASE(MG-L)	3282	282	3463
	TOTAL CONVENTIONAL POLLUTANTS	98073	16478	50905
	NONCONVENTIONAL POLLUTANTS			
	COD(MG-L)	158200	44810	74910
	TOC(MG-L)	30764	8360	14810
	TOTAL DISS. SOLIDS(MG-L)	32110	11740	5961
	ALUMINUM	645	16.5	350
	BARIUM	19.2	2.01	4.15
	BORON	6.25	4.48	1.29
	CALCIUM(MG-L)	7929	727	1269
	COBALT	2.88	1.27	0.855
	IRON	948	265	359
	MAGNESIUM(MG-L)	363	50.2	68.4
	MANGANESE	9.94	5.02	3.09
	MOLYBDENUM	2.32	0.507	0.699
	SODIUM	1.13	1.92	0.250
	TIN	2.43	0.387	1.13
	TITANIUM	54.7	1.76	16.5
	VANADIUM	1.40	0.186	0.386
	YTTRIUM	0.601	0.366	0.090
	TOTAL NONCONVENTIONAL POLLUTANTS	234300	66300	101200
	INORGANIC TOXIC POLLUTANTS			
114	ANTIMONY	0.796	0.540	0.713
115	ARSENIC	0.975	0.461	0.374
117	BERYLLIUM	0.459	0.019	0.083
118	CADMIUM	1.91	0.072	0.364
119	CHROMIUM	9.63	3.35	3.07
120	COPPER	8.73	4.52	3.08
121	CYANIDE	0.210	0.134	0.035
122	LEAD	17.1	2.54	4.26
123	MERCURY	11.4	0.767	6.75
124	NICKEL	4.90	8.09	4.53
125	SELENIUM	0.595	0.502	0.236
126	SILVER	0.048	0.022	0.009
127	THALLIUM	0.550	0.452	0.411
128	ZINC	268	16.3	100.
	TOTAL INORGANIC TOXIC POLLUTANTS	325	37.8	124

MASS BALANCE FOR THE PAINT INDUSTRY THROUGH BATCH
PHYSICAL-CHEMICAL TREATMENT

NO.	PARAMETER	WASTEWATER SOURCE UNTREATED	TREATED	SLUDGE
		KG/DAY		
	ORGANIC TOXIC POLLUTANTS			
4	BENZENE	2.49	1.002	0.110
6	CARBON TETRACHLORIDE	0.017	0.012	0.001
7	CHLOROBENZENE	0.014	N-D	0.019
9	HEXACHLOROBENZENE	0.011	N-D	N-D
10	1,2-DICHLOROETHANE	0.060	0.012	0.001
11	1,1,1-TRICHLOROETHANE	0.204	0.116	0.321
13	1,1-DICHLOROETHANE	0.003	N-D	N-D
14	1,1,2-TRICHLOROETHANE	0.349	0.169	N-D
15	1,1,2,2-TETRACHLOROETHANE	0.003	N-D	0.001
23	CHLOROFORM	0.320	0.532	0.098
29	1,1-DICHLOROETHYLENE	0.006	0.007	N-D
30	1,2-TRANS-DICHLOROETHYLENE	N-D	0.007	N-D
32	1,2-DICHLOROPROPANE	0.128	0.043	N-D
33	1,3-DICHLOROPROPYLENE	0.011	0.002	N-D
38	ETHYLBENZENE	6.175	9.548	6.058
40	4-CHLOROPHENYL PHENYL ETHER	0.031	N-D	N-D
42	DI(2-CHLOROISOPROPYL) ETHER	0.394	N-D	N-D
44	METHYLENE CHLORIDE	51.420	9.852	51.057
54	ISOPHORONE	N-D	0.022	N-D
55	NAPHTHALENE	3.23	0.279	0.071
56	NITROBENZENE	0.034	0.002	N-D
59	2,4-DINITROPHENOL	0.062	N-D	0.002
64	PENTACHLOROPHENOL	3.38	0.026	0.015
65	PHENOL	0.825	0.123	0.027
	TOTAL PHENOLS	0.776	0.502	0.238
66	DI(2-ETHYLHEXYL) PHTHALATE	0.544	0.034	0.159
67	BUTYL BENZYL PHTHALATE	0.232	0.364	2.21
68	DI-N-BUTYL PHTHALATE	12.8	0.149	0.962
70	DIETHYL PHTHALATE	0.085	0.193	0.059
71	DIMETHYL PHTHALATE	N-D	0.024	0.000
78	ANTHRACENE	N-D	N-D	0.022
85	TETRACHLOROETHYLENE	1.142	0.159	0.560
86	TOLUENE	16.7	3.31	19.0
87	TRICHLOROETHYLENE	0.113	0.082	0.012
	TOTAL ORGANIC TOXIC POLLUTANTS	101	26.1	80.8

NOTES

UNTREATED MASS LOADING BASED ON AVERAGE INFLUENT CONENTRATION FROM PLANTS WITH BATCH P-C TREATMENT AND INDUSTRY FLOW OF 2.8 MILLION LITERS PER DAY.

TREATED MASS LOADINGS BASED ON EFFLUENT AVERAGE CONCENTRATIONS FROM PLANTS WITH BATCH P-C TREATMENT AND INDUSTRY FLOW OF 2.4 MILLION LITERS PER DAY.

SLUDGE MASS LOADING BASED ON AVERAGE SLUDGE CONCENTRATION FROM BATCH P-C TREATMENT SYSTEMS, AND AN INDUSTRY FLOW OF 0.4 MILLION LITERS PER DAY.

INDIVIDUAL VALUES WERE INCLUDED ONLY IF A PARAMETER WAS ANALYZED FOR IN BOTH THE INFLUENT AND EFFLUENT OF THAT BATCH.

N-D: NOT DETECTED

SECTION VIII

COST, ENERGY, AND OTHER NONWATER ASPECTS

COSTS

Historical Cost Information

The DCP asked plants with installed wastewater treatment systems to report on their capital and operating costs and the year of installation. Most wastewater treatment systems have been installed since 1970, although 80 systems were installed prior to that year. This information is presented in Table VIII-1. Table VIII-2 presents the capital costs of the various treatment systems. The majority of the plants spent less than $7,000 in 1977 dollars. However, many of these lower costs represent only gravity settling equipment. There was not enough capital cost data from plants with batch physical-chemical treatment systems (the second most common system) to help predict what these costs would be for new installations.

Operating cost data provided from DCP responses are indicated in Table VIII-3. The median operating cost was between $1,000 and $2,000 in 1977, compared to a median capital cost of $5,000 to $10,000 (1977 dollars). Of plants that utilize contract hauling of either their wastewater or sludges, 511 reported unit cost information for hauling and disposal. These costs are presented in Table VIII-4. The cost per unit volume is affected by such factors as transportation distance, disposal method used by the contractor, variation in landfill policy from state to state, etc. The reported median cost of contract hauling (transportation and disposal combined) was 3.7¢ per liter (14¢ per gallon), and the average cost was 5.3¢ per liter (20¢ per gallon). EPA expects these costs to rise as the states and federal government adopt more stringent solid and hazardous waste disposal requirements.

Cost Development

The following discussion presents the capital and operating costs for various wastewater treatment unit operations currently practiced by the paint industry. All costs have a 1978 basis unless otherwise noted. Costs have been developed for six model plant sizes ranging from 190 liters per day (50 gpd) to 38,000 liters per day (10,000 gpd). Because the size range for all paint plants is very narrow, and flows are relatively small compared to the entire wastewater treatment industry, little error will result from linear interpolation to determine intermediate costs between adjacent model treatment plant

TABLE VIII-1

PAINT INDUSTRY
DATES OF WASTEWATER TREATMENT SYSTEM
INSTALLATIONS

Year	Number of Installations
1900 - 1950	6
1951 - 1955	5
1956 - 1960	9
1961 - 1965	21
1966 - 1968	20
1969 - 1970	19
1971	8
1972	29
1973	20
1974	30
1975	26
1976	19
1977 (through Midyear)	13

Source: DCP

TABLE VIII-2

PAINT INDUSTRY
CAPITAL COSTS OF INSTALLED
WASTEWATER TREATMENT SYSTEMS
IN 1977 DOLLARS

Cost ($)		Number of Plants
$50	1,000	18
1,001	2,000	17
2,001	3,000	17
3,001	5,000	22
5,001	10,000	36
10,001	20,000	19
20,001	50,000	20
50,001	100,000	16
100,001	500,000	19
Over 500,000		6

Source: DCP responses adjusted by ENR Cost Index

TABLE VIII-3

PAINT INDUSTRY
ANNUAL OPERATING COSTS (1977) OF
WASTEWATER TREATMENT SYSTEMS

Cost ($)			Number of Plants
$50	-	500	50
501	-	1,000	29
1,001	-	2,000	21
2,001	-	3,000	14
3,001	-	5,000	16
5,001	-	10,000	16
10,001	-	20,000	12
20,001	-	50,000	11
Over 50,000			8

Source: DCP

TABLE VIII-4

COST (1977) OF SLUDGE OR WASTEWATER REMOVAL BY CONTRACT HAULER

Cost (¢/gallon)	Cost (¢/liter)	Number of Plants
1 - 5	Less than 1.3	84
6 - 10	1.6 - 3	133
11 - 15	3 - 4	82
16 - 20	4 - 5	56
21 - 30	5 - 8	63
31 - 40	8 - 11	35
41 - 50	11 - 13	29
Over 50	Over 13	29

Source: DCP

sizes. Below 190 liters/day, costs will decrease only slightly as flow decreases, since most equipment is already at a minimum size.

The Agency expects the minimal costs presented to vary widely between plants, depending on geographical location, possible use of existing equipment, "off-the-shelf" components versus designed units, and other factors. An effort was made to cost all processes conservatively. Therefore, most plants should be able to purchase and operate the treatment systems covered at near or below the cost estimates presented.

EPA made the following assumptions throughout its cost evaluation:

- Plant Operations. Plants were assumed to operate 250 days annually, one shift per day. Treatment equipment is sized to treat all wastewater in one shift. Treatment of wastewater over two or three shifts can significantly reduce capital costs.

- Depreciation. Annual depreciation was assumed at 17.7 percent of capital costs, which equals a capital recovery over ten years at 12 percent interest.

- Contingency. A contingency of 15 percent was assumed.

- Labor. A rate of $16,000 per man year, including labor taxes and fringe benefits, for a plant operator was assumed. Indirect labor was taken at 20 percent of operator costs, to account for occasional laboratory, management, and accounting involvement in wastewater treatment.

- Power, Heat, and Light. Electricity costs were assumed to be $0.04 per kWh. The Agency calculated the annual power costs for mixing and pumping as follows:

(Total horsepower) x (hours per year of operation) x (0.746 kWh/hp) x $0.04/kWh.

Based on engineering visits, the Agency also assumed that most wastewater treatment or modification systems will be installed in existing buildings. Consequently, no increase in heating and lighting costs were assumed.

- Piping and Valving. Where required, piping and valves were assumed to cost 50 percent of basic equipment costs.

- Buildings, Yard, and Service Facilities. The Agency anticipates that most plants will construct required facilities in existing buildings. However, the installed cost of an outdoor steel

utility building of appropriate size has been developed for plants without available space.

- Land. Land costs were not included in cost calculations, but the total area required for each system is shown.

- Electrical and Instrumentation. Where required, these items were assumed to be 10 percent of total equipment costs.

- Engineering, Freight, and Installation. These costs were assumed to be 50 percent of total equipment costs. Package units from a single manufacturer may significantly reduce these costs.

- Operation and Maintenance. These were assumed at 3 percent of capital costs per year.

- Contract Hauling Costs. Most plants contract their wastewater or sludge hauling to outside firms, and pay a single cost for transportation and disposal. These costs range from less than 1.3 cents per liter (5¢/gal) to over 13 cents per liter (50¢/gal). The higher costs prevail in states which have restricted industrial wastes to designated landfills only. Therefore, an "average" or median cost has little meaning to plants that are forced to pay the higher fees. To be conservative, the Agency assumed a contract hauling cost of 7.0 cents per liter (30¢/gal) including transportation to be characteristic of 1978 prices for the majority of all plants. As previously discussed, the cost of contract hauling may rise in the future because of more stringent state and federal regulations.

- POTW Charges. POTW user charges are also highly variable, and often are computed as a percentage of the plant's water bill, or according to wastewater strength and volume, or by some combination of these and other factors. A use charge of $5 per 3750 liters (1000 gallons) of wastewater was assumed, which allows for significant surcharges for high BOD and TSS loadings.

- Monitoring Costs. The cost of monitoring effluent to meet any new regulations was assumed to be $1,200 per year per plant regardless of size. This assumes that each plant will sample its wastewater once monthly, and pay a commercial laboratory to analyze chromium, copper, mercury, nickel, lead, zinc, BOD, and TSS. The exact monitoring cost will depend on the regulations adopted.

Physical-Chemical Precipitation

Physical-chemical (P-C) wastewater treatment was discussed in Section VII. The treatment design is based on a batch system, and design information is presented in Table VIII-5. P-C capital costs are presented in Table VIII-6, and include four tanks, a collection sump,

TABLE VIII-5

PHYSICAL-CHEMICAL TREATMENT SYSTEM
DESIGN DATA

Wastewater Generated liters/day (gallons/day)	190 (50)	950 (250)	1900 (500)	5700 (1500)	19000 (5000)	38000 (10000)
Square meters (square feet) required	9(100)	23(250)	28(300)	37(400)	65(700)	73(1000)
Height required, meters (feet)	3(10)	3(10)	3(10)	4(12)	5(16)	6(18)
Collection sump volume (liters)	1900	1900	1900	5700	7600	11400
Polymer mix tanks volume (liters)	380	760	760	760	760	760
Holding tank volume (liters)	190	950	1900	5700	19000	38000
Treatment tank volume (liters)	190	950	1900	5700	19000	38000
Supernatant holding tank volume (liters)	400	2000	4000	11000	30000	60000
Sludge holding tank volume (liters)	400	2000	4000	12000	23000	45000
Total continuous horsepower	1/2	3/4	1-1/2	1-1/2	2-1/2	3-1/2
Total intermittent horsepower (2 hours/day)	2	3	4-1/2	5	8	12
Labor, direct required (manhours/day)	1	2	2	3	4	8
Energy required to operate system (kWh/yr)	4000	6000	11500	11700	19000	27500

Alum ($0.22/kg) dosage (kg/l)	.004 (all sizes)
Polymer ($11/kg) dosage (mg/l)	10 (all sizes)
Sulfuric acid ($.26/liter) dosage (l/l)	.002 (all sizes)

TABLE VIII-6

PHYSICAL-CHEMICAL PRETREATMENT SYSTEMS
CAPITAL COSTS

Wastewater Generated liters/day (gallons/day)	190 (50)	950 (250)	1900 (500)	5700 (1500)	19000 (5000)	38000 (10000)
Collection Sump	$1,000	$1,000	$1,000	$1,500	$2,000	$3,000
Tanks	2,200	6,000	10,000	18,000	29,000	55,000
Mixers	2,000	2,500	3,000	3,500	4,500	7,000
Pumps	1,500	2,000	3,000	4,000	6,000	8,000
Polymer Feed System	1,300	1,600	1,600	1,600	1,600	1,600
Piping and Valving	4,000	6,500	9,300	14,300	21,600	37,300
Subtotal	12,000	19,600	27,900	42,900	64,700	111,900
Electrical and Instrumentation	1,200	2,000	2,800	4,300	6,500	11,200
Engineering and Installation	6,600	10,800	15,400	23,600	35,600	61,500
Contingency	3,000	4,900	6,900	10,600	16,000	27,700
Total	$22,800	$37,300	$53,000	$81,400	$122,800	$212,300
Additional Utility Building, if required	$ 2,500	$ 5,000	$ 6,000	$ 8,000	$ 10,000	$ 15,000

mixers, and pumps. The polymer feed system consists of two plastic tanks, two portable mixers, and two small feed pumps.

P-C operating costs are presented in Table VIII-7. For design and cost purposes, the Agency assumed the use of alum, polymer, and sulfuric acid as flocculating and neutralizing agents. Historical data indicate that sludge volume will average 15 percent of original wastewater volume. Sludge was assumed to be contract hauled.

Physical-Chemical Pretreatment with Biological Treatment (aerated lagoon)

Biological treatment of paint wastewater following physical-chemcial treatment was described in Section VII. For design purposes, the Agency chose an aerated lagoon of 30 days detention and 8 feet in depth. The main unit costs include excavation, grading, seeding of slopes, and floating aerators. Table VIII-8 lists the capital costs for a P-C pretreatment/biological treatment system. Operating costs (including assumed nutrient addition) are presented in Table VIII-9. Land costs for this system are not included, and sludge clean-out costs (expected only once every several years) also are excluded.

Wastewater Recycle System

As discussed in Section VII, there are many potential methods and management practices to reduce or recycle wastewater. The recycle system selected for the design and cost model is one used by several plants, and is not intended to imply that it applies best to any other plant. This system includes three holding tanks for different categories of paint (e.g., whites, pastels, and dark colors) with associated pumping, piping, and mixing to prevent settling. Wastewater is pumped to the appropriate tank and withdrawn as required into batches of compatible paint. Pertinent design data is in Table VIII-10.

The Agency assumes that plants practicing recycle will generate a "residual" wastewater equal to 20 percent of the total wastewater volume that cannot be recycled or further reduced. (See Section VII.) Disposal options for this wastewater are contract hauling or P-C treatment (with or without subsequent biological treatment) with discharge of the supernatant and contract hauling of the sludge. The capital costs for these three options are presented in Tables VIII-11, VIII-12 and VIII-13. Operating costs are presented in Tables VIII-14, VIII-15, and VIII-16.

TABLE VIII-7

PHYSICAL-CHEMICAL PRETREATMENT SYSTEM
OPERATING COSTS

Wastewater Generated liters/day (gallons/day)	190 (50)	950 (250)	1900 (500)	5700 (1500)	19000 (5000)	38000 (10000)
Depreciation	$ 4,040	$ 6,600	$ 9,400	$14,400	$ 21,700	$37,600
Labor - direct	2,000	4,000	4,000	6,000	8,000	16,000
Labor - indirect	400	800	800	1,200	1,600	3,200
Chemicals						
Polymers	5	25	50	150	500	1,000
Acid	25	125	250	750	2,500	5,000
Inorganic salt	40	190	375	1,125	3,750	7,500
Power	160	240	460	470	760	1,100
Maintenance	680	1,100	1,600	2,400	3,700	6,400
Sludge Disposal (including transportation)	560	2,810	5,600	16,900	56,250	112,500
POTW user charge	55	270	540	1,600	5,400	10,800
Monitoring	1,200	1,200	1,200	1,200	1,200	1,200
Total	$9,165	$17,360	$24,275	$46,200	$105,360	$202,300

TABLE VIII-8

PHYSICAL-CHEMICAL PRETREATMENT WITH BIOLOGICAL TREATMENT (AERATED LAGOON)
CAPITAL COSTS

Wastewater Generated liters/day (gallons/day)	190 (50)	950 (250)	1,900 (500)	5,700 (1,500)	19,000 (5,000)	38,000 (10,000)
Aerated Lagoon[1]						
Main Unit	$60,000[2]	$60,000[2]	$60,000[2]	$60,000[2]	$60,000[2]	$88,000
Inlet and Outlet Piping	10,000	10,000	10,000	10,000	10,000	13,500
Impervious Liner	3,000	3,000	3,000	3,000	3,000	4,400
Chemical and/or nutrient feedsystem	10,000	10,000	10,000	10,000	10,000	13,500
Subtotal	$83,000	$83,000	$83,000	$83,000	$83,000	$119,400
Electrical and Instrumentation	8,300	8,300	8,300	8,300	8,300	11,940
Engineering, Freight, and Installation	45,650	45,650	45,650	45,650	45,650	65,690
Contingency	20,550	20,550	20,550	20,550	20,550	29,570
Subtotal	$157,500	$157,500	$157,500	$157,500	$157,500	$226,600
Physical-chemical Pretreatment[3]	22,800	37,300	53,000	81,400	122,800	212,300
TOTAL	$180,300	$194,800	$210,500	$238,900	$280,300	$438,900

(1) Biological treatment costs for treating physical-chemical system supernatant, assumed to be 85% of generated wastewater volume.

(2) Aerated lagoon costs for plants operating in these size ranges is assumed equal to the 19,000 liter/day flow system. Land required is 0.02 hectares (.04 hectares for largest plant)

(3) Total physical-chemical treatment system costs from Table VIII-6.

TABLE VIII-9

PHYSICAL-CHEMICAL PRETREATMENT WITH BIOLOGICAL TREATMENT (AERATED LAGOON)
OPERATING COSTS

Wastewater Generated liters/day (gallons/day)	190 (50)	950 (250)	1,900 (500)	5,700 (1,500)	19,000 (5,000)	38,000 (10,000)
Depreciation-Total	$31,915	$34,480	$37,260	$42,285	$49,615	$77,680
Biological treatment Costs (1)						
Labor-direct, additional	4,000	4,000	4,000	4,000	4,000	8,000
Labor-indirect	800	800	800	800	800	1,600
Chemicals	1,000	1,000	1,000	1,000	1,000	1,350
Power	2,600	2,600	2,600	2,600	2,600	3,500
Maintenance	4,725	4,725	4,725	4,725	4,725	6,800
Subtotal	45,040	47,605	50,385	55,410	62,740	98,930
Physical-chemical treatment (2)	5,125	10,760	14,875	31,800	83,660	164,700
TOTAL	$50,200	$58,400	$65,300	$87,200	$146,400	$263,700

(1) Biological treatment costs for treating physical-chemical system supernatant, assumed to be 85% of generated wastewater volume.

(2) Costs determined from Table VIII-7 with costs for depreciation excluded.

TABLE VIII-10

WASTEWATER RECYCLE SYSTEM DESIGN DATA

Wastewater Generated liters/day (gallons/day)	190 (50)	950 (250)	1,900 (500)	5,700 (1,500)	19,000 (5,000)	38,000 (10,000)
Base System						
Square meters (square feet) required	9(100)	19(200)	23(250)	37(400)	93(400)	186(2000)
Height, meters (feet) required	3(8)	3(10)	3(10)	4(12)	5(15)	5(15)
Tanks required	3	3	3	3	3	3
Tank size, each (liters)	570	2,850	5,700	17,100	57,000	114,000
Mixers required (one-speed)	3	3	3	3	3	3
Pumps required	3	3	3	3	3	3
Option A - Contract Hauling of unused wastewater						
Total continuous hp	1	1-1/2	2	3	9	18
Total intermittent hp (2 h/d)	2	2	3	3	6	12
Energy required to operate system (kWh/yr)	7,300	10,500	14,200	20,700	61,000	122,000
Total direct labor required (manhours/d)	3	3	5	5	9	10

TABLE VIII-10 (Cont.)

Wastewater Generated liters/day (gallons/day)	190 (50)	950 (250)	1,900 (500)	5,700 (1,500)	19,000 (5,000)	38,000 (10,000)
Option B - Physical-Chemical treatment of unreused wastewater						
Total continuous hp	1-1/2	2	2-1/2	4	10	20
Total intermittent hp	4	4	6	8	10	16
Energy required to operate system with Option B (kWh/yr)	11,300	14,600	18,600	29,100	69,100	137,000
Total direct labor required (manhours/d) (total)	3	3	6	6	10	11
Option C - Option B with biological treatment						
Additional continuous hp	10	10	10	10	10	10
Total energy required (kWh/yr)	77,000	80,000	84,000	94,000	134,000	202,000
Additional direct labor required (manhours/d)	2	2	2	2	2	2

TABLE VIII-11

WASTEWATER RECYCLE SYSTEM WITH CONTRACT HAULING OF UNREUSED WASTEWATER
CAPITAL COSTS

Wastewater Generated liters/day (gallons/day)	190 (50)	950 (250)	1900 (500)	5700 (1500)	19,000 (5000)	38,000 (10,000)
Recycle System						
Tanks	$ 3,500	$ 9,000	$14,000	$24,000	$ 50,000	$ 75,000
Mixers	1,500	2,250	2,500	3,000	7,500	12,000
Pumps	1,500	1,500	2,500	3,000	4,500	6,000
Piping and Valving	3,250	6,375	9,500	15,000	31,000	46,500
Subtotal	9,750	19,125	28,500	45,000	93,000	139,500
Electrical and Instrumentation	975	1,900	2,850	4,500	9,300	14,000
Engineering, Freight and Installation	5,360	10,500	15,675	24,750	51,150	76,750
Contingency	2,400	4,730	7,050	11,100	23,000	34,500
Subtotal	18,500	36,300	54,100	85,400	176,000	265,000
Contract Hauling Collection System (1)	4,600 (2)	4,600	7,000	14,000	27,000	47,000
TOTAL	$23,100	$40,900	$61,100	$99,400	$203,000	$312,000

(1) Costs determined by interpolation from Table VIII-17

(2) Minimum (190 liters/day) size was assumed.

TABLE VIII-12

WASTEWATER RECYCLE SYSTEM WITH PHYSICAL-CHEMICAL TREATMENT
OF UNREUSED WASTEWATER
CAPITAL COSTS

Wastewater Generated liters/day (gallons/day)	190 (50)	950 (250)	1900 (500)	5700 (1500)	19,000 (5000)	38,000 (10,000)
Recycle System						
Tanks	$3,500	$9,000	$14,000	$24,000	$50,000	$75,000
Mixers	1,500	2,250	2,500	3,000	7,500	12,000
Pumps	1,500	1,500	2,500	3,000	4,500	6,000
Piping and Valving	3,250	6,375	9,500	15,000	31,000	46,500
Subtotal	9,750	19,125	28,500	45,000	93,000	139,500
Electrical and Instrumentation	975	1,900	2,850	4,500	9,300	14,000
Engineering, Freight and Installation	5,360	10,500	15,675	24,750	51,150	76,750
Contingency	2,400	4,730	7,050	11,100	23,000	34,500
Subtotal	18,500	36,300	54,100	85,400	176,000	265,000
P-C System (1)	22,800 (2)	22,800 (2)	24,500	40,000	67,000	129,000
Total Cost	$41,300	$59,100	$78,600	$125,400	$243,000	$394,000
Additional Utility Building (if required)	$ 3,000	$ 4,500	$ 5,000	$ 6,000	$ 15,000	$ 20,000

(1) Costs determined by interpolation from Table VIII-6, for treatment of 20% of indicated flow.
(2) Minimum size system of 190 liters/day assumed.

TABLE VIII-13

WASTEWATER RECYCLE SYSTEM WITH PHYSICAL-CHEMICAL PRETREATMENT AND BIOLOGICAL TREATMENT OF UNREUSED WASTEWATER

CAPITAL COSTS

Wastewater Generated liters/day (gallons/day)	190 (50)	950 (250)	1,900 (500)	5,700 (1,500)	19,000 (5,000)	38,000 (10,000)
Recycle System[1]	$ 18,500	$ 36,300	$ 54,100	$ 85,400	$176,000	$265,000
Physical - Chemical treatment[2]	22,800	22,800	24,500	40,000	67,000	129,000
Biological System[3]	157,500	157,500	157,500	157,500	157,500	157,500
Total	$198,800	$216,600	$236,100	$282,900	$400,500	$551,500

(1) Costs determined from Table VIII-11.
(2) Costs determined by interpolation from Table VIII-6, applied to 20 percent of indicated flow.
(3) Costs determined from Table VIII-8. Aerated lagoon costs for plants in this size range assumed equal to 19,000 liter/day flow.

TABLE VIII-14

WASTEWATER RECYCLE SYSTEM WITH CONTRACT HAULING OF UNREUSED WASTEWATER

OPERATING COSTS

Wastewater Generated liters/day (gallon/day)	190 (50)	950 (250)	1,900 (500)	5,700 (1,500)	19,000 (5,000)	38,000 (10,000)
Depreciation	$ 4,100	$ 7,200	$10,800	$17,600	$ 36,000	$ 55,200
Labor-direct	6,000	6,000	10,000	10,000	18,000	20,000
Labor-indirect	1,200	1,200	2,000	2,000	3,600	4,000
Power	290	420	570	830	2,440	4,900
Maintenance	690	1,230	1,830	3,000	6,100	9,400
Sludge Disposal (including transportation)	750	3,750	7,500	15,000	75,000	150,000
TOTAL	$13,000	$19,800	$32,700	$48,400	$141,100	$243,500

TABLE VIII-15

WASTEWATER RECYCLE SYSTEM WITH PHYSICAL-CHEMICAL TREATMENT OF UNREUSED WASTEWATER

OPERATING COSTS

Wastewater Generated liters/day (gallon/day)	190 (50)	950 (250)	1,900 (500)	5,700 (1,500)	19,000 (5,000)	38,000 (10,000)
Depreciation	$ 7,300	$10,500	$13,900	$22,200	$43,000	$69,700
Labor-direct	6,000	6,000	12,000	12,000	20,000	22,000
Labor-indirect	1,200	1,200	2,400	2,400	4,000	4,400
Power	450	580	740	1,160	2,760	5,480
Chemicals	70	70	140	420	1,350	2,700
Sludge Disposal (including transportation)	110	560	1,120	3,400	11,300	22,500
POTW User Charge	10	50	110	320	1,100	2,100
Maintenance	1,200	1,800	2,400	3,800	7,300	12,000
Monitoring	1,200	1,200	1,200	1,200	1,200	1,200
TOTAL	$17,500	$22,000	$34,000	$46,900	$92,000	$142,000

TABLE VIII-16

WASTEWATER RECYCLE SYSTEM WITH PHYSICAL-CHEMICAL AND BIOLOGICAL TREATMENT OF UNREUSED WASTEWATER

OPERATING COSTS

Wastewater Generated liters/day (gallons/day)	190 (50)	950 (250)	1,900 (500)	5,700 (1,500)	19,000 (5,000)	38,000 (10,000)
Depreciation	$35,190	$38,340	$41,790	$50,075	$ 70,890	$ 97,615
Recycle with Physical - Chemical Treatment[1]	10,200	11,500	20,100	24,700	49,000	72,300
Biological System[2]	13,125	13,125	13,125	13,125	13,125	13,175
Total	$58,500	$63,000	$75,000	$87,900	$133,000	$183,100

(1) Costs determined from Table VIII-15 with individual depreciation excluded.
(2) Costs determined from Table VIII with depreciation and physical-chemical system costs excluded. Aerated lagoon design flow of 19,000 liter/day assumed for all sizes.

Wastewater Disposal by Contract Hauling

This alternative holds the total wastewater flow for periodic removal by a contract hauler. The capital costs for this option are presented in Table VIII-17.

Costs include a holding tank equal to either ten days flow or 91,000 liters (24,000 gallons), whichever is smaller, with associated piping and installation. Small plants may prefer to hold wastewater in drums to avoid capital expenditures. Plants with excess tankage can convert a spare tank to a wastewater holding tank at minimum expense.

Operating costs are indicated in Table VIII-18. The four smallest model plants are assumed to require one hour of labor daily to service the collection system. The two larger model plants will require two hours of labor daily. No costs for routine monitoring have been included because the wastewater will not be discharged to a waterway or sewer.

Manual Physical-Chemical Treatment System

A simpler P-C system than that presented in Table VIII-5 is available to small plants which wish to avoid large capital expenditures. Such an alternative system can consist of plastic treatment tanks (or drums) and portable mixers and pumps. The system manually carries wastewater to the treatment tanks (via pails) and manually adds the chemicals. The capital costs for such a system are presented in Table VIII-19 for 190 liter per day (50 gpd) and 380 liter per day (100 gpd) wastewater flows. Operating costs are indicated in Table VIII-20. Labor costs are assumed to be slightly higher than standard P-C systems and were given as two hours per day for the small system and three hours per day for the larger system. The other design assumptions are the same as those in Table VIII-5.

Wastewater Reduction System

As discussed in Section VII, one option for reducing wastewater volume is to replace standard tank rinsing operations with a high-pressure low volume rinse system. The approximate capital costs for such a system are presented in Table VIII-21. The model system consists of 2 pumps to pressurize water to 1200-1500 psi, one-inch piping to selected points in the process area, and flexible hoses with connectors to reach individual tanks and filling equipment. Operating costs are not presented, but are expected to compare to standard cleaning procedures.

TABLE VIII-17

WASTEWATER DISPOSAL BY CONTRACT HAULING

CAPITAL COSTS

Wastewater Generated liters/day (gallon/day)	190 (50)	950 (250)	1,900 (500)	5,700 (1,500)	19,000 (5,000)	38,000 (10,000)
Holding Tank	$1,600	$ 4,600	$ 6,350	$14,000	$20,000	$20,000
Piping & Valving	800	2,300	3,175	7,000	10,000	10,000
Subtotal	2,400	6,900	9,525	21,000	30,000	30,000
Electrical and Instrumentation	240	690	950	2,100	3,000	3,000
Engineering, Freight and Installation	1,320	3,800	5,240	11,550	16,500	16,000
Contingency	640	1,710	2,360	5,200	7,400	7,400
TOTAL	$4,600	$13,100	$18,100	$39,800	$56,900	$56,900
Square Meters (Feet Required	5 (50)	12 (125)	14 (150)	23 (250)	28 (300)	28 (300)
Additional Utility Building (if required)	$2,000	$ 4,000	$ 4,000	$ 5,000	$ 6,000	$ 6,000

TABLE VIII-18

WASTEWATER DISPOSAL BY CONTRACT HAULING

OPERATING COSTS

Wastewater Generated liters/day (gallon/day)	190 (50)	950 (250)	1,900 (500)	5,700 (1,500)	19,000 (5,000)	38,000 (10,000)
Depreciation	$ 815	$ 2,350	$ 3,200	$ 7,040	$ 10,000	$ 10,000
Labor-direct	2,000	2,000	2,000	2,000	4,000	4,000
Labor-indirect	400	400	400	400	800	800
Maintenance	135	400	600	1,200	1,700	1,700
Sludge Transportation & Disposal	3,750	18,750	37,500	112,500	375,000	750,000
TOTAL	$7,100	$23,900	$43,700	$123,000	$392,000	$767,000

TABLE VIII-19

MANUALLY OPERATED PHYSICAL-CHEMICAL PRETREATMENT SYSTEMS
CAPITAL COSTS

Wastewater Generated liters/day (gallons/day)	190 (50)	380 (100)
Tanks (plastic)	$ 110	$ 455
Mixers (portable)	700	700
Pumps	600	600
Piping, Valving	700	900
Material Handling Equipment	300	300
Subtotal	2,410	2,955
Electrical	240	300
Freight & Installation	1,325	1,625
Contingency	600	730
Total	$4,575	$5,610

TABLE VIII-20

MANUALLY OPERATED PHYSICAL-CHEMICAL PRETREATMENT SYSTEMS
OPERATING COSTS

Wastewater Generated liters/day (gallons/day)	190 (50)	380 (100)
Depreciation	$ 810	$ 1,000
Labor-direct	4,000	6,000
Labor-indirect	800	1,200
Chemicals		
Polymers	5	10
Acid	25	50
Inorganic Salt	40	80
Power	150	150
Maintenance	140	170
Sludge Disposal (including transportation)	560	1,120
POTW User Charge	55	110
Monitoring	1,200	1,200
Total	$7,800	$11,100

TABLE VIII-21

WASTEWATER REDUCTION THROUGH HIGH PRESSURE TANK RINSING

CAPITAL COSTS

Wastewater Generated liter/day (gallons/day)	190 (50)	950 (250)	1,900 (500)	5,700 (1,500)	19,000 (5,000)	38,000 (10,000)
Pump System (with motors, pressure regulators, and nozzles)	$ 7,000	$ 7,000	$ 7,000	$ 7,000	$10,000	$14,000
Piping & Flexible Hoses	3,500	3,500	3,500	3,500	5,000	7,000
Subtotal	10,500	10,500	10,500	10,500	15,000	21,000
Electrical	1,050	1,050	1,050	1,050	1,500	2,100
Freight, Engineering and Installation	5,775	5,775	5,775	5,775	8,250	11,550
Contingency	2,600	2,600	2,600	2,600	3,700	5,200
TOTAL	$19,925	$19,925	$19,925	$19,925	$28,450	$39,850

Cost Summary

Table VIII-22 summarizes the capital and operating costs for each treatment alternative presented in this section. From the viewpoint of economics alone, different options are most economical for different model plant sizes. Changes or variations in the assumed depreciation rate, labor compensation rate, contract hauling costs, or other of the listed assumptions could change the relative costs of various options.

NONWATER QUALITY ASPECTS

Energy

The energy usage for the preceding wastewater management and treatment schemes on an industry-wide basis is presented in Table VIII-23. These figures convey the various orders of magnitude, and the differences between treatment alternatives. The assumptions used in this calculation were as follows:

- Plants that currently discharge no wastewater will continue to do so, and will not implement any treatment alternative.

- All remaining plants will implement the selected treatment scheme, and no credit was allowed for systems already in place.

The industry-wide approximations were computed by calculating the energy use of each model plant size with an estimate of the number of plants in that size range.

Physical-chemical treatment and recycle require the lowest inputs of energy when applied to all plants. Systems that include aerated lagoons require the highest.

Sludge Quantity and Characterististics

A study by EPA's Office of Solid Waste Management (1976) estimated that the paint manufacturing industry generated 436,000 metric tons of solid waste (wet basis) in 1974, of which 105,000 tons were potentially hazardous. Almost all of the potentially hazardous wastes were from process cleaning operations, spoiled batches, and spills. Most of the nonhazardous wastes were composed of raw materials packaging. The EPA study also found that most of these wastes were disposed in off-site landfills by private contractors.

If the entire volume of wastewater currently discharged by the paint industry (approximately 2,800,000 liters/day) were treated by P-C precipitation and settling, it would produce a sludge volume of 420,000 liters per day (110,000 gpd), industry wide. This is based on

TABLE VIII-22

SUMMARY OF COSTS FOR VARIOUS WASTEWATER TREATMENT SYSTEMS

Capital Cost
(Operating Cost)

	WASTEWATER GENERATED (liters/day)					
	190	950	1,900	5,700	19,000	38,000
Physical-Chemical Pretreatment	$23,000 ($ 9,200)	$ 37,000 ($ 17,000)	$ 53,000 ($ 24,000)	$ 81,000 ($ 46,000)	$123,000 ($105,000)	$212,000 ($202,000)
Physical-Chemical Pretreatment with biological treatment	180,000 (50,000)	195,000 (58,000)	211,000 (65,000)	239,000 (87,000)	280,000 (146,000)	439,000 (264,000)
Wastewater recycle system with contract hauling of unreused wastewater	23,000 (13,000)	41,000 (20,000)	61,000 (33,000)	99,000 (48,000)	203,000 (141,000)	312,000 (244,000)
Wastewater recycle system with Physical-Chemical Pretreatment of unreused wastewater	41,000 (18,000)	59,000 (22,000)	79,000 (34,000)	125,000 (47,000)	243,000 (92,000)	394,000 (142,000)
Wastewater recycle system with Physical-Chemical Pretreatment and biological treatment of unreused wastewater (1)	199,000 (59,000)	217,000 (63,000)	236,000 (75,000)	283,000 (88,000)	401,000 (133,000)	552,000 (183,000)
Wastewater disposal by contract hauling	4,600 (7,100)	13,000 (24,000)	18,000 (44,000)	40,000 (123,000)	57,000 (392,000)	57,000 (767,000)
Manually operated Physical-Chemical Pretreatment	4,600 (7,800)	5,600 (11,100)	N/A	N/A	N/A	N/A

(1) Biological unit (aerated lagoon) assumed equal to design flow of 19,000 liters/day for all sizes. Wastewater volumes are reduced 83 percent by recycle and Physical-Chemical Pretreatment with the remaining wastewater receiving biological treatment.

TABLE VIII-23

APPROXIMATE ENERGY USAGE FOR VARIOUS WASTEWATER TREATMENT ALTERNATIVES

Treatment Alternative	Approximate Annual Energy Use When Applied to all Paint Plants (millions of kwh/yr)
Physical - Chemical	5
Physical - Chemical with biological	50
Recycle system with contract hauling of unreused wastewater	12
Recycle system with Physical - Chemical	15
Recycle system with Physical - Chemical and biological	60

an average of 15% of the total wastewater per batch ending in the sludge fraction. Based on the average sludge characteristics (see Table V-24), the Agency expects that 72 kg/day (159 lb/day) of organic toxic pollutants and 122 kg/day (270 lb/day) of inorganic toxic pollutants would be included in this total industry sludge flow. The major constituents of the organic toxic pollutant loading are methylene chloride (63%), toluene (23%), and ethylbenzene (7%). Zinc accounts for approximately 80% of the inorganic toxic pollutant loading.

Use of the in-plant controls recommended in Section VII will reduce sludge generation proportionately. Therefore, reduction of wastewater discharges by 80% also would reduce sludge generation being reduced to 3% of the wastewater volume generated. Plants which implement these controls may then elect to contract haul the nonrecyclable fraction of the waste without any further treatment. The hazardous waste hauled would amount to up to 20% of the wastewater generated. Based on the data collected from the DCP and economic analysis, the total hazardous waste generation would be between 150,000 and 300,000 metric tons annually.

If the entire wastewater volume of the paint industry were contract hauled, the toxic pollutant loading would equal that presented in Table V-26 (140 kg/day of organic toxic pollutants and 268 kg/day of inorganic toxic pollutants). The recycle option (back into product) would reduce wastewater and sludge volumes (and corresponding mass loadings) by the same percentage that was reused. Reduction of wastewater volume by high pressure rinse alone, without any other dry cleanup procedures, will not affect the amount of pollutants discharged from the paint industry, but it can significantly reduce the wastewater volume and disposal costs for plants that contract haul any of their wastewater.

Solvent-Wash Subcategory

Existing source solvent-wash subcategory indirect dischargers are the only unregulated segment of the paint industry. A key point in favor of the no discharge regulation for the remaining segment of this subcategory was the proven economic benefits of solvent reclamation versus the outside purchase of reclaimed solvent.

The July 1975 Development Document stated that the in-house cost of reclaiming solvents was 1.0 to 3.8¢/l (3.6 to 14.2¢/gal), while the selling price of reclaimed solvents was 10 to 30¢/l ($.40 to $1/gal). These costs compared favorably with the cost of purchasing new solvent.

The Agency updated these data with a telephone survey of paint plants using recovered solvent for tank cleaning.

Considering the rising costs of labor, energy and sludge disposal, in 1979 solvents can be reclaimed for 5.4 to 8.1¢/l ($.20 to .30/gal) while reclaimed solvents are selling for $.11/l ($.45/gal) to well over $.30/l ($1/gal). New solvents generally cost over $.30/l ($1/gal).

SECTION IX

EFFLUENT REDUCTION ATTAINABLE THROUGH THE APPLICATION OF THE BEST AVAILABLE TECHNOLOGY ECONOMICALLY ACHIEVABLE EFFLUENT LIMITATIONS GUIDELINES

INTRODUCTION

EPA determines the effluent limitations that must be achieved by July 1, 1984, by identifying the very best control and treatment technology employed by a specific point source within the industrial category or subcategory or by one industry where it is readily transferable to another. The Agency must specifically determine the availability of control measures and practices to eliminate the discharge of pollutants, taking into account the cost of such elimination.

Consideration also was given to:

- The age of the equipment and facilities;
- The processes employed;
- The engineering aspects of the application of various types of control techniques;
- Process changes; and
- Nonwater quality environmental impact (including energy requirements).

The Best Available Technology Economically Achievable (BAT) emphasizes in-process controls as well as control or additional treatment techniques employed at the end of the production process. It considers those plant processes and control technologies which, at the pilot plant, semi-works, and other levels, have demonstrated sufficient technological performances and economic viability to justify investing in such facilities. BAT represents the highest degree of demonstrated control technology for plant-scale operation up to and including "no discharge" of pollutants. The costs of this level of control are defined by the top-of-the-line current technology, subject to limitations imposed by economic and engineering feasibility. There may be some technical risk, however, with respect to performance and certainty of costs. Therefore, some process development and adaptation may be necessary for application at a specific plant site.

The statutory assessment of BAT "considers" costs, but does not require a balancing of costs against effluent reduction benefits (see Weyerhaeuser v. Costle, supra). In developing the proposed BAT, however, EPA has given substantial weight to the reasonableness of costs. The Agency has considered the volume and nature of discharges, the volume and nature of discharges expected after application of BAT, the general environmental effects of the pollutants, and the costs and economic impacts of the required pollution control levels.

Despite this expanded consideration of costs, the primary determinant of BAT is effluent reduction capability. As a result of the Clean Water Act of 1977, the achievement of BAT has become the principal national means of controlling toxic water pollution. EPA has selected BAT technology which will significantly reduce this toxic pollution.

IDENTIFICATION OF BAT TECHNOLOGY

Both in-plant and end-of-pipe modification are necessary for most plants to achieve BAT. Control technologies are discussed in detail in Section VII while costs and operating parameters for model plants are given in Section VIII.

The Agency considered the following technologies:

In-Plant Controls

- wastewater reduction through high-pressure water-washing of equipment, dry floor clean up and sealing of floor drains, and use of squeegees prior to tank cleaning.

- wastewater reuse through recycle of caustic rinses back into caustic tank as make-up and water rinses back into the product or rinse water.

End-of-Pipe Controls

- Physical-chemical treatment including coagulation/precipitation and sedimentation
- Biological treatment by aerated lagoons
- Contract hauling
- Evaporation
- Ultrafiltration
- Reverse osmosis
- Activated carbon adsorption

Technology Options Available

Option One - Physical-chemical treatment (coagulation/precipitation and sedimentation)

Option Two - Physical-chemical treatment plus biological treatment with aerated lagoons

Option Three - Reduction of wastewater volume generated to 0.04 liter per liter of caustic or water-washed paint through the use of in-plant controls such as recycle or water conservation followed by Option Two treatment of the remaining wastewater prior to discharge

Option Four - No discharge of pollutants through the use of Option Three technologies and contract hauling of nonrecyclable wastes

Other evaluated technologies were unacceptable due to a lack of demonstrated effectiveness on paint wastewater or severe economic or nonwater quality impacts.

RATIONALE USED TO DEVELOP BAT EFFLUENT GUIDELINES

Based on analysis of available control options, the Agency selected Option Four for the Caustic and/or Water-Wash Subcategory. Strict control of water use through in-plant controls such as high-pressure rinses and recycle of water and caustic-washes can reduce wastewater discharges from paint plants to at least 0.04 liter of wastewater per liter of caustic or water-washed paint produced.

The remaining wastewater should be sufficiently small in volume to make contract hauling practical and eliminate any need for discharge.

The Agency rejected options One, Two, and Three because they fail to provide consistent removal of toxic pollutants to the level attained by Option Four. High concentrations of toxic pollutants have been measured in the effluents from plants using the best end-of-pipe technologies. Due to the toxic nature of paint manufacturing wastewater, the Agency has determined that disposal of these wastes to properly designed hazardous waste disposal sites is preferable to discharge to surface waters.

SIZE, AGE, PRODUCTION METHODS, RAW MATERIALS AND PRODUCTS, TANK CLEANING TECHNIQUES

Paint production uses process equipment which has not changed appreciably for many years. This equipment produces paint in batches of varying sizes. Therefore the age of a plant has little bearing on its waste characteristics. Size of a plant affects only the volume of wastewater produced. Raw materials used and products produced affect wastewater characteristics only to the extent that they affect equipment cleaning techniques. These techniques are the basis of subcategorization of the industry.

In summary, the factors of size, age, production methods, raw materials, and products are not significant to effective application of the control technology. Detailed discussion of the wastewater characteristics for the paint industry is available in Section V.

ENGINEERING ASPECTS OF BEST AVAILABLE TECHNOLOGY ECONOMICALLY ACHIEVABLE

The effectiveness of in-plant controls has been described in detail in Section VII. Use of in-plant controls has enabled an estimated 101 plants to reduce the amount of wastewater generated to less than 0.04 liters per liter of water-rinsed paint manufactured. This group includes 63 plants which have attained no discharge. Of the plants using a water-rinse, 13% report 100% recycle of the rinse back to product; an additional 24.3% report that reuse in the product is accomplished most of the time.

High-pressure washing generally can reduce wastewater generation by 90%. Elimination of floor drains and subsequent dry clean up of spills, and use of squeegees or rags for precleaning of equipment can further reduce wastewater generation.

Simple volume reduction does not also reduce pollutant mass. It does concentrate pollutants in manageable volumes of water which then can be recycled back into product or contract hauled to hazardous waste disposal facilities. If wastewater can be recycled, valuable raw materials are reclaimed.

The most significant conventional pollutants and pollutant parameters controlled are BOD, TSS, oil and grease, and pH. The most significant nonconventional pollutants and pollutant parameter controlled is COD.

NONWATER QUALITY ENVIRONMENTAL IMPACT

EPA anticipates that the implementation of BAT at a plant will generate of up to 0.04 liters of hazardous waste per liter of water or caustic-washed (water-rinsed) paint produced. Paint plants currently, are classified as major sources of hazardous wastes, the principal components being off-specification batches, sludges from physical-chemical treatment, and untreated wastewater. BAT will increase the wastewater component of the generation of hazardous wastes and may reduce the sludge component as facilities adopt in-plant control alternatives to physical-chemical treatment. No significant change in consumptive water use or atmospheric quality in terms of air emissions, noise, or radiation will result from implementation of BAT.

Negligible amounts of energy will be used for pumping, mixing, and contract hauling of these wastes.

TOTAL COST OF APPLICATION IN RELATION TO EFFLUENT REDUCTION BENEFITS

Based on the cost information in Section VIII, EPA estimates all six direct dischargers will have to incur additional costs to comply with BAT. EPA estimates that total capital investment will be $0.18 million and that annual costs will be $0.12 million including interest and depreciation. The Agency expects no unemployment, plant closures, or changes in industry production capacity as a result of BAT.

BAT EFFLUENT GUIDELINES

There shall be no discharge of pollutants in process wastewaters from the Caustic and/or Water-Wash Subcategory of the Paint Formulating Point Source Category. The prohibition of discharge of pollutants from the Solvent-Wash Subcategory promulgated in 40 CFR 446 on July 28, 1975, remains unchanged.

REGULATED POLLUTANTS

Issuance of this regulation will prevent discharges of all pollutants from affected paint plants. The significant toxic pollutants controlled are:

Chromium (Total)	Carbon Tetrachloride
Copper (Total)	Ethylbenzene
Lead (Total)	Napthalene
Mercury (Total)	Di (2-ethylhexyl) Phthalate
Nickel (Total)	Di-n-butyl Phthalate
Zinc (Total)	Tetrachlorethylene
Benzene	Toluene

SECTION X

NEW SOURCE PERFORMANCE STANDARDS

INTRODUCTION

The basis for New Source Performance Standards (NSPS) under Section 306 of the Act is the best available demonstrated technology. New plants have the opportunity to design the best and most efficient paint manufacturing processes and wastewater treatment technologies, and Congress therefore directed EPA to consider the best demonstrated processes and operating methods, in-plant control measures, end-of-pipe treatment technologies, and other alternatives that reduce pollution to the maximum extent feasible, including, where practicable, a standard permitting no discharge of pollutants.

IDENTIFICATION OF NEW SOURCE PERFORMANCE STANDARDS

New Source Performance Standards rest on the technology options considered for BAT in Section IX. Since BAT represents the current state-of-the-art technology, no further improvement for new sources is possible. Based on analyses of the technology options EPA selected BAT Option Four for NSPS for the Caustic and/or Water Wash Subcategory. This option completely removes all pollutants from paint plant discharges. Selection of BAT Options One, Two, or Three would provide less stringent requirements for NSPS than BAT. This would be inconsistent with the basis for NSPS.

RATIONALE USED TO DEVELOP NSPS EFFLUENT LIMITATIONS

The rationale used to select NSPS was identical to that used to select BAT in Section IX. No justification could be found for selecting a technology option for NSPS less stringent than BAT.

SIZE, PRODUCTION METHODS, RAW MATERIALS, AND PRODUCTS, TANK CLEANING TECHNIQUES

The aspects of size, production methods, raw materials, and products, and tank cleaning techniques for the paint industry discussed for BAT in Section IX also apply to NSPS.

ENGINEERING ASPECTS OF NEW SOURCE PERFORMANCE STANDARDS

In addition to the engineering aspects discussed in Section IX for BAT, it should be noted that the design of new plants offers the opportunity to optimize performance of in-plant controls. This optimization should enable new plants to attain NSPS with reduced hazardous waste generation in comparison with many existing plants meeting BAT.

NONWATER QUALITY ENVIRONMENTAL IMPACTS

The nonwater quality environmental impacts associated with NSPS effluent limitations are the same as those associated with BAT effluent limitations, as discussed in Section IX. The energy requirements to meet this standard should represent a small fraction of the plants' consumption.

TOTAL COST OF APPLICATION IN RELATION TO EFFLUENT REDUCTION BENEFITS

At the present time there are only six paint plants throughout the country that practice direct discharge. The majority of new firms that enter the industry are expected to be indirect dischargers. NSPS is not expected to have significant impact on the paint industry.

NSPS EFFLUENT LIMITATIONS

There shall be no discharge of pollutants in process wastewaters from the Caustic and/or Water-Wash Subcategory of the Paint Formulating Point Source Category.

The prohibition of discharge of pollutants from the Solvent-Wash Subcategory promulgated in 40 CFR 446 on July 28, 1975, remains unchanged.

REGULATED POLLUTANTS

The pollutants controlled are identical to those controlled by BAT and discussed in Section IX.

SECTION XI

PRETREATMENT STANDARDS FOR EXISTING SOURCES

INTRODUCTION

The effluent limitations that must be achieved by existing sources in the paint industry that discharge into a publicly owned treatment works (POTW) are termed pretreatment standards. Section 307(b) of the Act requires EPA to promulgate pretreatment standards for existing sources (PSES) to prevent the discharge of pollutants that pass through, interfere with, or are otherwise incompatible with the operation of POTW. The Clean Water Act of 1977 adds a new dimension by requiring pretreatment for pollutants, such as heavy metals, that limit POTW sludge management alternatives, including the beneficial use of sludges on agricultural lands. The legislative history of the 1977 Act indicates that pretreatment standards are to be technology-based, analagous to the best available technology for removal of toxic pollutants. The general pretreatment regulations (40 CFR Part 403), which served as the framework for these proposed pretreatment regulations for the paint industry, can be found at 43 FR 27736-27773 (June 26, 1978).

Consideration was also given to the following in establishing the pretreatment standards:

- Plant size, age of equipment and facilities, production methods, raw materials and products, tank cleaning techniques;
- The engineering aspects of the application of pretreatment technology and its relationship to POTW;
- Nonwater quality environmental impact (including energy requirements); and
- The total cost of application of technology in relation to the effluent reduction and other benefits to be achieved from such application.

Pretreatment standards must reflect effluent reduction achievable by the application of the best available pretreatment technology. This may include primary treatment technology as used in the industry and in-plant control measures when such are considered to be normal practice within the industry.

A final consideration is the determination of economic and engineering reliability in the application of the pretreatment technology. This

must be determined from the results of demonstration projects, pilot plant experiments, and most preferably, general use within the industry.

IDENTIFICATION OF PRETREATMENT STANDARDS

Paint plants discharge almost exclusively to POTW. Forty percent of these plants report using some pretreatment technologies. Many also practice in-plant controls to reduce wastewater generation. The technologies considered for pretreatment are identical to those considered for BAT in Section IX, with the exception of solvent reclamation which was considered for solvent-wash paints. Analysis of the technologies resulted in the development of three options for pretreatment standards for existing sources.

Technology Options Available:

Option One - Physical-chemical treatment by coagulation/flocculation and sedimentation (BAT Option One)

Option Two - Reduction in wastewater volume generated to 0.04 liter per liter of water-rinsed (water or caustic-washed) paint manufactured through the use of in-plant controls such as recycle and/or water conservation followed by Option One treatment of nonrecyclable wastes

Option Three - No discharge of pollutants through the use of Option Two technologies, solvent reclamation, or contract hauling of nonrecyclable wastes (BAT Option Four)

Other evaluated technologies were unacceptable due to a lack of demonstrated effectiveness on paint wastewater, or severe economic or nonwater quality impacts.

RATIONALE USED TO DEVELOP PRETREATMENT STANDARDS FOR EXISTING SOURCES

The elimination of pollutant discharge for solvent-wash paint is based on the hazardous and toxic nature of these wastes and the economic advantage in reclaiming the solvents. Since no water is used in the cleaning solvent-wash equipment, the solvents and off-specification batches comprise the entire discharge of this subcategory. Most plants in the subcategory currently do not discharge wastes. The Agency is requiring that the remainder of the industry meet this level of good practice.

Caustic and/or water-wash subcategory standards are based on strict control of water use. This control is achieved through in-plant controls such as high-pressure rinses, recycle of water and caustic-washes, and contract hauling of nonrecyclable wastes. The Agency

rejected Options One and Two because they fail to provide consistent removal of toxic pollutants to the level attained by Option Three. Due to the toxic nature of paint wastewater, EPA has determined that the disposal of these wastes to properly designed hazardous waste disposal sites is preferable to discharge to POTW.

SIZE, AGE, PRODUCTION METHODS, RAW MATERIALS AND PRODUCTS, TANK CLEANING TECHNIQUES

As previously noted in Section IX for BAT, paint is produced with methods and equipment which are relatively uniform from plant to plant. As a result, the factors of size, age, production methods, raw materials, and products do not affect wastewater characteristics significantly. Tank cleaning techniques are the fundamental factors which control these characteristics. Therefore, the subcategorization of the paint industry is based on use of solvent, caustic, or water for tank cleaning.

ENGINEERING ASPECTS OF PRETREATMENT FOR EXISTING SOURCES

Waste solvents produced by tank and equipment cleaning can be regenerated easily through distillation. Not surprisingly, many plants recover their solvents and distill them on site. Other plants sell waste solvents to scavengers who regenerate and market them. Few plants therefore, have any reason to discharge waste solvents to the POTW.

As noted in Section IX for BAT, the use of in-plant controls significantly reduces the wastewater from caustic and/or water-washed paint formulation which must be eliminated.

Recycle, high-pressure rinses, dry clean up of floors, and precleaning of tanks with squeegees or rags are all techniques to reduce wastewater for disposal to 0.04 liter/liter or less. The removal of the nonrecyclable wastes by contract hauler to a hazardous waste disposal site should provide an acceptably safe method of disposal for these toxic materials. Recycle of wastewater to the product also conserves raw materials in addition to saving water.

NONWATER QUALITY ENVIRONMENTAL IMPACTS

EPA estimates that the implementation of PSES will generate an additional 150,000 to 300,000 metric tons (wet) of hazardous wastes. It should be noted that PSES also will commensurately reduce concentrations and quantities of toxic pollutants in POTW sludges. These sludges will become more amenable to a wider range of disposal alternatives, possibly including beneficial use on agricultural lands. Moreover, disposal of adulterated POTW sludges is significantly more

difficult and costly than disposal of smaller quantities of wastes from individual plant sites.

No significant change in consumptive water use or atmospheric quality in terms of air emissions, noise, or radiation will result from implementation of PSES.

TOTAL COST OF APPLICATION IN RELATION TO EFFLUENT REDUCTION BENEFITS

Based on the cost information presented in Section VIII, elimination of pollutant discharges by paint plants to POTW is possible with a total capital investment of 10.8 million dollars. The annualized cost for the industry will be 11 million dollars.

PRETREATMENT STANDARDS FOR EXISTING SOURCES

There shall be no discharge of pollutants in process wastewaters from the Solvent-Wash Subcategory and the Caustic and/or Water-Wash Subcategory of the Paint Formulating Point Source Category.

REGULATED POLLUTANTS

Issuance of this regulation will prevent the discharges of all pollutants from affected indirect dischargers. The significant toxic pollutants controlled are:

Chromium (Total)	Carbon Tetrachloride
Copper (Total)	Ethylbenzene
Lead (Total)	Naphthalene
Mercury (Total)	Di(2-ethylhexyl) Phthalate
Nickel (Total)	Di-n-butyl Phthalate
Zinc (Total)	Tetrachloroethylene
Benzene	Toluene

If the Agency had selected Pretreatment Option Two for the Caustic and/or Water-Wash Subcategory, numerical mass limitations would be used. Concentration values are not appropriate due to the ease with which dilution can occur by indiscriminate water use in equipment cleaning.

The mass limitations are based on the median percent removal calculated in Table VII-6, average observed pollutant concentration in untreated wastewater reported in Table V-22, and wastewater discharge of 0.04 liter per liter of water-rinsed paint produced.

The resulting concentration and mass limitations would be:

Pollutant	mg/1000 liters water-rinsed paint	lb/1000 gallons water-rinsed paint
Chromium (Total)	57.4	0.0005
Copper (Total)	30.7	0.0003
Lead (Total)	25.2	0.0002
Mercury (Total)	24.7	0.0002
Nickel (Total)	12.4	0.0001
Zinc (Total)	299.0	0.0025
Benzene	27.0	0.0002
Carbon Tetrachloride	No Discharge	No Discharge
Ethylbenzene	59.8	0.0005
Naphthalene	35.4	0.0003
Di(2-ethylhexyl) Phthalate	0.5	0.0001
Di-n-butyl Phthalate	2.2	0.0001
Tetrachloroethylene	0.4	0.0001
Toluene	186.9	0.0016

SECTION XII

PRETREATMENT STANDARDS FOR NEW SOURCES

INTRODUCTION

Section 307(c) of the Act requires the EPA to promulgate Pretreatment Standards for New Sources (PSNS) at the same time that it promulgates NSPS. New indirect dischargers, like new direct dischargers, have the opportunity to incorporate the best available demonstrated technologies including process changes, in-plant controls, and end-of-pipe treatment technologies, and to use plant site selection to insure adequate treatment system installation.

IDENTIFICATION OF NEW SOURCE PRETREATMENT STANDARDS

New Source Pretreatment Standards were based on the options considered for PSES in Section XI. Since PSES represents the current state-of-the-art technology, no further improvement for new sources is possible.

Based on analyses of the technology options, EPA chose PSES Option Three for PSNS for the caustic and/or water-wash subcategory. This option completely eliminates pollutant discharges from paint plants to POTW. Selection of PSES Options One or Two would provide less stringent requirements for PSNS than PSES and would be inconsistent with the basis for PSNS limitations.

RATIONALE USED TO DEVELOP PSNS EFFLUENT LIMITATIONS

The rationale used to select PSNS was identical to that used to select PSES in Section XI. No justification could be found for selecting a technology option for PSNS less stringent than PSES.

SIZE, PRODUCTION METHODS, RAW MATERIALS AND PRODUCTS, TANK CLEANING TECHNIQUES

The aspects of size, production methods and products, and tank cleaning techniques for the paint industry discussed for PSES in Section XI also apply to PSNS.

ENGINEERING ASPECTS OF NEW SOURCE PERFORMANCE STANDARDS

In addition to the engineering aspects discussed in Section XI for PSES, it should be noted that the design of new plants offers the opportunity to optimize performance of in-plant controls. This optimization should enable new plants to attain PSNS with reduced

hazardous waste generation in comparison to many existing plants meeting BAT.

NONWATER QUALITY ENVIRONMENTAL IMPACTS

The nonwater quality environmental impacts associated with NSPS effluent limitations are the same as those associated with PSES, as discussed in Section IX. Energy consumption in order to attain new source performance should represent a negligible fraction of total plant consumption.

TOTAL COST OF APPLICATION IN RELATION TO EFFLUENT REDUCTION BENEFITS

EPA estimates that production costs for new source indirect dischargers may increase by 3.1 cents per gallon.

PRETREATMENT STANDARDS FOR NEW SOURCES

There shall be no discharge of pollutants in process wastewaters from the Caustic and/or Water-Wash Subcategory of the Paint Formulating Point Source Category.

The prohibition of discharge of pollutants from the Solvent-Wash Subcategory promulgated in 40 CFR 446 on July 28, 1975 remains unchanged.

REGULATED POLLUTANTS

The pollutants controlled are identical to those controlled by PSES and discussed in Section XI. If the Agency had selected pretreatment Option Two for the Caustic and/or Water-Wash Subcategory, numerical mass limitations equal to those calculated for this option in Section XI would have been used.

SECTION XIII

ACKNOWLEDGMENTS

Acknowledgment is made to all Environmental Protection Agency personnel contributing to the overall project effort. Specifically, the development of this report was under the direction of the following EPA personnel:

Robert B. Schaffer	Director, Effluent Guidelines Division
John E. Riley	Chief, Wood Products and Fibers Branch
James R. Berlow	Project Officer, Paint and Ink Industries
Lisa Friedman	Office of the General Counsel
Barry Malter	Office of the General Counsel
Louis DuPuis	Office of Analysis and Evaluation
John Kukulka	Office of Analysis and Evaluation
Chris Ehret	Monitoring and Data Support Division

Acknowledgment is also made for the helpful cooperation of the following paint and ink industry Working Group Members:

Michael Flaherty
Samuel Napolitano
Richard Raines
Fanny Knox
Roman Kuchkuda
Benjamin Lim
Matthew Straus
Ronald Turner

Special thanks go to David Alexander, the EPA Project Officer for the first two years of the project, and to the Document Preparation Staff of Kaye Starr, Pearl Smith, Carol Swann, Vicky Wilson, and Nancy Zrubek. Micki Treacy is especially noted for her valuable secretarial assistance.

Appreciation is extended to the National Paint and Coatings Association, especially Executive Director Robert Nelson, and the Water Quality Task Force for their assistance and cooperation throughout this project.

Appreciation is also extended to the following companies for their participation in the study:

Ameritone Paint Div. Grow Chemical
Benjamin Moore and Co.
Binney and Smith, Inc.
Cook Paint and Varnish Inc.

DeSoto Inc.
DeVoe and Raynolds Co.
E.I. DuPont de Nemours Inc.
Enterprise Paint Corporation
Farwest Paint Co.
F. O. Pierce, Inc.
General Paint Co.
Glidden Division of SCM Inc.
McCloskey Varnish Corp.
Major Paints Div. Standard Brands Paint
Mobil Chemical Corp.
Mobile Paint Manufacturing Co.
National Paint and Varnish Co.
Norris Paint Co.
Norton and Son Inc.
O'Brien Corporation
PPG Industries Inc.
Parker Paint Co.
Patterson Sargent Inc.
PurAll Paint Inc.
Reliance Universal, Inc.
Sherwin Williams Inc.
Standard T. Chemical Co.
Whiteline Paint Co.

The following members of the Burns and Roe Technical Staff made significant contributions to the project and the development of the report:

Arnold S. Vernick, P.E.	Manager, Environmental Engineering
Howard D. Feiler, P.E.	Project Manager
Paul J. Storch, P.E.	Project Engineer
Mark V. Sadowski	Assistant Project Engineer
Richard Hergenroeder	Civil Engineer
Roy E. Ehlenberg	Systems Engineer

The assistance of Mrs. S. Frances Thompson and Miss Emilie Carl of Burns and Roe in the typing of this report is specifically noted.

The efforts of Edward H. Richardson Associates, Inc. in regard to sampling and analysis is greatly appreciated. Specifically, the efforts of Mr. Albert Merena are acknowledged.

SECTION XIV

REFERENCES

1. Barrett, W.J., G.A. Mooneau, and J.J. Rodig, Waterborne Wastes of the Paint and Inorganic Pigments Industries, Southern Research Institute, Birmingham, Alabama, July, 1973, EPA 670/2-74-030.

2. Environmental Protection Agency, Development Document for Effluent Limitations Guidelines and New Source Performance Standards for the Oil Base Solvent Wash Subcategories of the Paint and the Ink Formulating Point Source Category, Washington, DC, July 1975.

3. Burns and Roe Industrial Services Corporation, Draft Development Document for Effluent Limitations Guidelines, Pretreatment Standards and New Source Performance Standards for the Paint and Ink Formulating Point Source Categories - Water-Base, Water-Wash, and Caustic-Wash Subcategories, Paramus, NJ, September, 1976.

4. Environmental Protection Agency, Assessment of Industrial Waste Practices: Paint and Allied Products Industry, Contract Solvent Reclaiming Operations, and Factory Application of Coatings, Washington, DC, 1976.

5. Marketing Guide to the Paint Industry, 4th Edition, Charles H. Kline and Company, Fairfield, NJ, 1975.

6. Paint Red Book, 8th edition, Palmerton Publishing Company, Inc., New York, NY, 1976.

7. "Census of Manufactures", Bureau of the Census, U.S. Department of Commerce, 1972.

8. Raw Materials Index - Pigments and Solvents, National Paint and Coatings Association, Washington, DC, 1975.

9. Raw Materials Index - Resins, National Paint and Coatings Association, Washington, DC, 1972.

10. Raw Materials Index - Drying Oils, National Paint and Coatings Association, Washington, DC, 1973.

11. Colour Index, 3rd Edition, Society of Dyers and Colourists with acknowledgement to the American Association of Textile Chemists and Colorists, 1971.

12. Arthur D. Little, Inc. "Economic Analysis of Proposed Effluent Guidelines: Paint and Allied Products and Printing Ink Industries",

Draft Document for the Environmental Protection Agency, Washington, DC, August, 1974.

13. Nie, N., C. Hull, J. Jenkins, K. Steinbrenner, and D. Bent, Statistical Package for the Social Sciences$5, 2nd Edition, McGraw-Hill Book Company, 1975.

14. Shreeve, R., "Surface-Coating Industries", Chemical Process Industries, 3rd Edition, McGraw-Hill Book Company, New York, NY, 1967.

15. Environmental Protection Agency, "Field Notes and Chemical Analyses - Survey of Paint and Ink Manufacturers in Oakland, California," collected by National Field Investigations Center, Denver, Colorado, October, 1973.

16. Hine, W.R., "Disposal of Waste Solvents," Journal of Paint Technology, 43 (588):75-78, July, 1971.

17. Williams, Rodney, "Latex Wastes and Treatment," Paper presented at the meeting of the Golden Gate Section, National Paint and Coatings Association, San Francisco, California, June, 1972.

18. Environmental Protection Agency, Development Document for Proposed Effluent Limitations Guidelines and New Source Performance Standards for the Synthetic Resins Segment of the Plastics and Synthetic Materials Manufacturing Paint Source Category, Washington, DC, August, 1973.

19. Bruhns, F., "The paint industry vs. Water Pollution," Paint and Varnish Production, May, 1971, pp. 35-39.

20. Lederer, S.J. and M. Goll, "The Mercury Problem," Paint and Varnish Production, March, 1971, pp. 26-35.

21. Mann, A., "Mercury Biocides: Paint's Problem Material," Paint and Varnish Production, March, 1971, pp. 26-35.

22. Yazujian, D., "Chemicals in Coatings," Chemical Week, October, 1971, pp. 35-51.

23. Mann, A., "1972 Review-1973 Forecast," Paint and Varnish Production, July, 1973, pp. 23-36.

24. Larsen, D., K. Kunel, "COD Solids Removal Exceeds 90% in Effluent from Coatings Plant," Chemical Processing, January, 1971, pp. 16-17.

25. Maas, W., "Solid Waste Disposal and Organic Finishing," Metal Finishing, March, 1972, pp. 44, 45, 49.

26. Desoto Corporation, Desoto Waste Treatment System for Latex Paint Wastes, Chicago, Illinois.

27. Reid, L.C., "Memorandum to Record," (Specifying Plants Attaining No Discharge of Process Wastewater to Surface Waters), National Field Investigations Center, Environmental Protection Agency, Denver, Colorado, December, 1973-January, 1974.

28. Reid, L.C., and A. Masse, "Trip Reports," (Paint and Ink Plants in Chicago, Illinois and Oakland, California Areas), National Field Investigations Center, Environmental Protection Agency, Denver, Colorado, December, 1973-January, 1974.

29. "Water Quality Criteria, 1972," National Academy of Sciences and National Academy of Engineering for the Environmental Protection Agency, Washington, DC, 1973 (U.S. Government Printing Office Stock No. 5501-00520).

30. Pashman, Howard, Paper presented to the Water Quality Task Force of the National Paint and Coatings Association, December 9, 1976.

31. Environmental Protection Agency, Handbook for Monitoring Industrial Wastewater, Washington, DC, August, 1973.

32. Environmental Protection Agency, Methods for Chemical Analysis of Water and Wastes, Cincinnati, OH, 1974.

33. Environmental Protection Agency, Federal Guidelines: State and Local Pretreatment Programs, Washington, DC, January, 1977.

34. Environmental Protection Agency, Rationale for the Development of BAT Priority Pollutant Parameters, Washington, DC, June, 1977.

35. Environmental Protection Agency, Sampling and Analysis Procedures for Screening of Industrial Effluents for Priority Pollutants, Cincinnati, OH, April, 1977.

36. Environmental Protection Agency, General Reference Materials Relating to the Measurement of Priority Pollutants, Washington, DC, June, 1977.

37. Coppa-Zuccari, I.G., "Wastewater Treatment in Paint Works," Polymers, Paint, and Colour Journal, May 11, 1976, pp 114 - 115.

38. Tackett, Raymond, "State-of-the-Art of Waste Disposal in the Coatings Industry (as of June 1973)" Journal of Paint Technology, 46 (590) 63-68, March 1974.

39. Chin-Pao, H, M. Ghadirian, "Physical-Chemical Treatment of paint industry Wastewater," Journal Water Pollution Control Federation 46 (10) 2340-2346, October 1974.

40. Williams, Rodney, "Regulating Latex Paint Wastes, Part I," Industrial Wastes, July/August 1974, pp 15-17.

41. Williams, Rodney, "Regulating Latex Paint Waste, Part II," Industrial Wastes, September/October 1974.

42. Hine, Willard, "Disposal of Waste Solvents," Journal of Paint Technology$5, 43 (558), July 1971.

43. Broadbent, David, "Energy Conservation and Pollution Control in the Paint Finishing Industry," Product Finishing, July 1974, pp 8-11.

44. Sethuraman, V.V., and B.C. Raymahashay, "Color Removal by Clays-Kinetic Study of Adsorption of Cationic and Anionic Dyes," Environmental Science and Technology, 9 (13) pp 11391140, December 1975.

45. Spring, Samuel, "Disposal of Paint Overspray," Metal Finishing, July 1965, pp 63-66.

46. Dry Color Manufacturers Association, Appendix E of the comments made to the proposed rules on the "Manufacturing, Processing, Distribution in Commerce, and Use Bans of Polychlorinated Biphenyls" as appeared in the Federal Register on June 7, 1978.

SECTION XV

GLOSSARY

Acrylic Resin. A synthetic resin made from derivatives of acrylic acid.

Activated Carbon. A highly absorbent form of carbon, used to remove dissolved organic matter from wastewater.

Additive. One of a number of materials added to coatings in small amounts to alter one or more of its properties. They include anti-skinning agents, anti-settling agents, anti-sagging agents, leveling agents, etc. Almost always the total concentration of these additives will be less than one percent. Driers are not generally defined as additives.

Aerated Lagoon. A pond or lagoon of wastewater artificially supplied or impregnated with air. The aeration is used to foster biological and chemical purification.

Alkyd Resin. A synthetic resin made from polyhydric alcohols and polybasic acids.

Allied Products. Products other than paint which are included in SIC 2851 such as putty, caulking compounds, stains, shellacs, varnish, paint remover, wood sealers, etc.

Background Level. The amounts of toxic pollutants present in process intake waters (tap water).

Ball Mill. A horizontally mounted cylindrical tank containing steel or ceramic balls that reduce particle size of materials when the tank is rotated.

Batch. Any manufacturing or treatment process which accumulates a fixed volume of material (i.e. wastewater) for processing, treatment or discharge. Compare to Continuous.

BATEA. Limitations for point sources which are based on the application of the Best Available Technology Economically Achievable. These limitations must be achieved by July 1, 1985.

Binder. The film forming ingredient in paint that binds the pigment particles together.

Biochemical Oxygen Demand (BOD5). The amount of oxygen required by microorganisms while stabilizing decomposable organic matter under

aerobic conditions. The level of BOD5 is usually measured as the demand for oxygen over a standard five-day period. Generally expressed as mg/l.

Biocide. Chemical used to inhibit biological life.

Biological Treatment. The use of aerobic and/or anaerobic organisms to treat wastewaters.

Blowdown. Water intentionally discharged from a cooling or heating system to maintain the dissolved solids concentration of the circulating water below a specific critical level. The removal of a portion of any process flow to maintain the constituents of the flow within desired levels. Process may be intermittent or continuous.

BOD. Biochemical Oxygen Demand.

Capital Costs. Expenditures which result in the acquisition of, or the addition to, capital or fixed assets. Costs associated with the installation of such assets are included in capital costs.

Captive Manufacturing Site. A plant which only manufactures paint for internal use or use by other divisions of a parent organization.

Caulking Compound. A soft plastic material, consisting of pigment and vehicle, used for sealing joints in buildings and other structures where normal structural movement may occur.

Caustic Rinse. The cleaning of residue from paint tanks with a caustic solution. See closed loop caustic system, open caustic system and partial recycle caustic system.

Caustic Soda. In its hydrated form it is called sodium hydroxide.

Chemical Oxygen Demand (COD). A measure of the amount of organic matter which can be oxidized to carbon dioxide and water by a strong oxidizing agent under acidic conditions. Generally expressed as mg/l.

Chemical Treatment. A process involving the addition of chemicals to wastewater to induce the settling of solid matter and remove dissolved materials. Materials commonly used in chemical treatment include polyelectrolytes, lime and alum. (See also Physical-Chemical Treatment.)

Clarification. Any process or combination of processes, the primary purpose of which is to reduce the concentration of suspended matter in a liquid.

Clean Water Act. The Federal Water Pollution Control Amendments 1977. PL 92-500.

Closed Loop Caustic System. A tank cleaning system which recyles a primary caustic rinse and uses all of a secondary water rinse as make-up water for the caustic. Compare to Open Caustic System and Partial Recycle Caustic System.

Coating. A paint, varnish, lacquer, or other finish used to create a protective and/or decorative layer.

COD. Chemical Oxygen Demand

Colorant. A concentrated coloring agent which is added to a base paint to produce the desired final color. Colorants are usually added to the paint by the retailer for the customer.

Continuous. Any manufacturing process which produces a continuous flow of product or wastewater and treats or discharges wastewater at the same rate at which it is generated. Compare to Batch.

Contract Hauling. The collection of wastewater or sludge by a private disposal service, scavenger, or purveyor in tank trucks or by other means for transportation from the site.

Cost Center. A business whose objective it is to accomplish its mission within cost or expense parameters. A cost center realizes no income.

Discharge of Wastewater. Th release of treated or untreated wastewater to a receiving water, POTW, or any other location that is off-site. Examples of instances where wastewater is generated but not discharged are total recycling, total on-site containment, contract hauling of wastewater, and total evaporation.

Disperser. Mixing machine that acts to distribute the components of paint or ink.

Dispersing Agent. A reagent that is compatible with the solvent and holds finely divided matter dispersed in the solvent.

Drier. A composition which accelerates the drying of oil, paint, printing ink, or varnish. Driers are available in both solid and liquid forms.

Drying Oil. An oil which readily takes oxygen from the air and changes it to a relatively hard, tough, elastic substance when exposed to form a thin, dry film. Drying oils also act as binders for pigments used in coatings.

Enamel. A pigmented coating which is characterized by an ability to form an especially smooth film which is free from brush or other tool marks. Although most enamels are glossy, flat enamels are also available. They are usually considered to be relatively hard coatings.

Equalization. Any process for averaging variations in flow and/or composition of wastewater so as to effect a more uniform discharge.

Evaporation of Wastewater. A disposal method in which natural or induced heat causes evaporation of wastewater.

Extender. A pigment which is usually inexpensive and inert in nature, used to give opacity and extend or increase the bulk of a paint, thus reducing its unit cost, and modifying its consistency.

Exterior Paint. A coating for the outside surfaces of a structure.

Film. Layer or coat of paint or other material applied to a surface.

Flocculants. Those water-soluble organic polyelectrolytes that are used alone or in conjunction with inorganic coagulants such as lime, alum or ferric chloride or coagulant aids to agglomerate solids suspended in aqueous systems or both. The large dense flocs resulting from this process permit more rapid and more efficient solids-liquids separations.

Flotation. Dissolved Air Flotation (DAF) or dispersed air flotation, are processes that inject air into wastewater causing dissolved and suspended material to float to the surface for removal.

Fungicide. An agent that helps prevent mold or mildew growth on a painted surface.

Generation of Wastewater. The process whereby wastewater results from the manufacturing process. Wastewater may be generated but not discharged. See Discharge of Wastewater.

Gravity Separation. Any process in which oil, grease, skins or other floating solids are allowed to rise to the surface, where they are skimmed off, while heavier solids are allowed to settle out.

Industrial Sales Paint. Paint which is primarily sold to other manufacturers for factory application to such porducts as aircraft, appliances, furniture, machinery, etc.

Interior Paint. A coating for the inside surfaces of a structure.

Lacquer. A solution in an organic solvent of a natural or synthetic resin, a cellulose ester or a cellulose ester together with modifying agents, such as plasticizers, resins, waxes, and pigments. Lacquers may be clear or pigmented, and dry by solvent evaporation only. Other types of coatings by comparison, dry by a combination of evaporation, oxidation, and polymerization of portions of their constituents.

Lagoon. A shallow body of water, such as a pond or lake, which can be used for impoundment for purposes of storage, treatment or disposal.

Landfill. A solid waste land disposal technique in which waste is placed in an excavation and covered with earth. Wastewaters and sludges may occasionally be disposed of in landfills.

Latex. Aqueous colloidal dispersion of rubber or rubber-like substances.

Latex Paint. A paint containing a stable aqueous dispersion of synthetic resin, produced by emulsion polymerization, as the principal constituent of the binder. Modifying resins may also be used.

Marine Paint. A varnish specially designed to withstand immersion in water and exposure to marine atmosphere.

Mildewcide. See Fungicide.

Mineral Spirits. A petroleum derivative used as a thinner for paints and varnishes. It usually boils in the range of 149 to 204°C (300 to 400°F) and has a flash point just about 27°C (100°F).

Mixing. The incorporation of ingredients into a coating with the use of little or no shearing energy.

NPDES (National Pollutant Discharge Elimination System) Permit A permit issued by EPA or an approved state program to point sources which discharge to public waters allowing the discharge of wastewater under certain stated conditions.

Neutralization. Addition of acid or alkali until the pH is approximately neutral (i.e., pH = 7).

Noncontact Cooling Water. Water which is used for cooling purposes but which has no direct contact with and is in no way contaminated by either the manufacturing process or contaminated wastewaters. In the cooling process, however, it may experience a change in temperature.

OSHA. The Occupational Safety and Health Act.

Oil-Base Paint. A paint that contains drying oil and oil varnish as the basic vehicle ingredient.

Open Caustic System. Any tank or tub cleaning system that does not reuse any part of a secondary water rinse following caustic washing.

Operating Costs. Expenses necessary for the maintenance and operation of capital assets, including depreciation, interest, labor, materials, etc.

pH. The reciprocal logarithm of the hydrogen ion concentration in wastewater expressed as a standard unit.

POTW (Publicly Owned Treatment Works). Wastewater collection and treatment facilities owned and operated by a public authority such as a municipality or county.

Paint. A combination of a pigment, extender and vehicle, and frequently other additives, in a liquid composition, which is converted to an opaque solid film after application.

Partial Recycle Caustic System. A tank or tub cleaning operation which recycles a primary caustic rinse and uses only a portion of secondary water rinse as make-up water for the caustic. Compare to Closed Loop Caustic System and Open Caustic System.

Physical-Chemical. The method of treating wastewaters using combinations of the processes of coagulation, flocculation, sedimentation, carbon adsorption, electrodialysis or reverse osmosis. As used in this study, a physical-chemical treatment system involves the addition of chemicals to wastewater to induce the settling of solids and removal of dissolved materials, followed by mixing and sedimentation.

Pigment. A general term used to describe any of a wide variety of organic, inorganic, natural, or synthetic insoluble material which are added to coatings to produce a desired color, viscosity, solids level or gloss.

Plasticizer. A substance added to paint, varnish, or lacquer to impart flexibility.

Powder Coating. A coating prepared as a dry powder, which is placed on a surface and fused into a cohesive film.

Preservative. Material added to water-thinned paints to prevent the growth of bacteria or yeast in the can during paint storage.

Primer. The first of two or more coats of paint, varnish, or lacquer system.

Process Wastewater. Any used water which results from or has had contact with the manufacturing process, including any water for which there is a reasonable possibility of contamination from the paint manufacturing process or from raw material-intermediate product-final product storage, transportation, handling processing or cleaning. Examples of process wastewater include wastewater generated by tank washing, filling machine washing equipment, or floor cleaning, etc. Cooling water, sanitary wastewater, storm water and boiler blowdown are not considered process wastewater if they have no contact with the process.

Profit Center. A business or portion of a business whose objective it is to contribute income over and above its expenditures and allocated charges.

Public Waters. All navigable waters of the United States and the tributaries thereof; all interstate waters and tributaries thereof; and all intrastate lakes, rivers, streams and tributaries thereof not privately owned.

Purveyor. See Contract Hauling.

Putty. A dough-like material consisting of pigment and vehicle, used for sealing glass in frames, and for filling imperfections in wood or metal surfaces.

Reclaimed. Water, or solvent which has been treated and restored for use.

Recycle of Wastewater. The piping of wastewater, whether treated or not, from its points of final collection to a prior process step.

Resin. A natural or synthetic material that is the main ingredient of paint which binds the various other ingredients together. It also aids adhesion to the surface.

Reuse of Wastewater. The collection of either treated or untreated wastewater for the purpose of utilization in a prior step of the manufacturing process.

Scavenger. See Contract Hauling

Screening. Samples taken of untreated wastewater only to determine the absence or presence of toxic pollutants (see also Verification).

Settlement Agreement. A court approved agreement between the National Resources Defense Council (NRDC) and EPA covering 21 industrial categories, one of which is paint and ink manufacturing and printing, for review of BATEA, including a study of toxic pollutant levels.

Settling. The process of disposition of suspended matter carried by a liquid by gravity. It is usually accomplished by reducing the velocity of the liquid below the point at which it can transport the suspended material, as opposed to gravity separation in which floatables are also removed.

Shellac. A type of varnish made by dissolving shellac resin in alcohol. Shellac is the form of lac resin obtained in thin curled sheets (shells).

Sludge Conditioning. Treatment of liquid sludge by chemical addition, dewatering, filtration, drying or other methods.

Spray Irrigation. Transport of sludge or wastewater to a distribution system from which it is sprayed over an area of land. The liquid percolates into the soil and/or evaporates. None of the sludge or wastewater runs off the irrigated area.

Solvent. The volatile part of a paint composition that evaporates during drying.

Solvent-Base Paint. Paints in which the resin or film former is soluble or dispersed in an organic solvent.

Stain. A solution or suspension of coloring matter in a vehicle designed primarily to be applied to create color effects rather than to form a protective coating. A transparent or semi-opaque coating that colors without completely obscuring the grain of the surface.

Thinner. The portion of a paint, varnish, lacquer, or related product that volatilizes during the drying process. The solvents and dilutents which act as thinners are used to reduce coating viscosity, and prevent oxidation, polymerization, and drying prior to coating application.

Tint. A color produced by the mixture of white pigment or paint in predominating amounts with a colored pigment or paint which is not white.

Tint-Base Paint. A noncolored paint shipped to the retailer where colorants are added to customer specifications.

TOC. Total Organic Carbon

Total Organic Carbon (TOC). A measure of the amount of carbon in a sample originating from organic matter only. The test is run by burning the sample and measuring the carbon dioxide produced.

Total Suspended Solids (TSS). Solids that either float on the surface of, or are in suspension in, water and which are largely removable by filtering or sedimentation.

Tote-Bin. A shipping container that may be used to make paints.

Toxic Pollutant. One of the elements or compounds on a list of 129 derived from the Settlement Agreement (See Appendix E of this document).

Trade Sales Paint. Paints which are sold to the do-it-yourself market, i.e., the over-the-counter retail segment of the coatings market. Trade sales paint does not include paint which is sold to painting contractors or similar professionals.

Treatment. Any process of conditioning water, wastewater or sludge prior to use, reuse, or discharge.

Ultrafiltration. A process similar to reverse osmosis that reduces the solids content of a feed stream by pressurizing the feed while it is in contact with a semi-permeable membrane. Water molecules pass through the membrane while the solids are left behind.

Varnish. The volatile and nonvolatile liquid portion of a paint or coating which disperses and suspends the pigment whenever the latter is used.

Vehicle. The volatile and nonvolatile liquid portion of a paint or coating which disperses and suspends the pigment whenever the latter is used.

Verification. A sampling program including samples of untreated and treated wastewater and sludge to determine the levels of classical pollutant and toxic pollutants known to be present, as well as removal efficiencies by various wastewater treatment processes. (See also Screening.)

Volatile Fraction. That portion of a coating which evaporates from the film during the drying process.

Water-Base Paint. Paints which use water as the primary vehicle for all other raw materials. Water-base paints may contain some semi-drying oils, such as soybean oil for desired drying characteristics.

APPENDIX A

DATA COLLECTION PORTFOLIOS

PAINT MANUFACTURING INDUSTRY SURVEY

A. General Information (Note: For Multiple Plant Companies, complete one questionnaire for each manufacturing site.)

1. Name of Firm _____

2. Plant Location and Mailing Address _____
(including zip code)

_____

3. Telephone Number _____

4. Name and Title of Respondent _____

5. Address and Telephone Number of Respondent (if different) _____

_____

6. Indicate your type of business organization: (Multiplant Companies indicate status of parent company).

Incorporated, Publicly Held ☐ Incorporated, Privately Held ☐ Partnership ☐

Proprietorship ☐ Cooperative ☐

7. Indicate the status of this site:

a. The Company's only manufacturing location ☐ b. A branch of a multiple plant company ☐

c. A division (or subsidiary) of a parent or affiliated company ☐ d. A captive manufacturing site ☐

e. Other _____

8. If b, c or d is checked for Question 7, this facility is a: Cost Center ☐ Profit Center ☐ (See definitions)

B. General Plant Operations (Paint Manufacturing only)

1. Indicate number of employees at this site:

	Less Than 10	10-20	21-30	31-40	41-50	51-60	61-70	71-80	81-90	91-100	101-150	More Than 150
Average (1976)	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
Maximum (1976)	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐

2. Does your monthly production ever vary by more than 25% (excluding shutdown for maintenance or vacation)

Yes ☐ No ☐

3. Age of Paint Manufacturing operation (years):

Less than 3 ☐ 3-5 ☐ 6-10 ☐ 11-20 ☐ 21-30 ☐ More than 30 ☐

4. Total 1976 annual production volume (gallons): Less than 50,000 ☐ 50,001-200,000 ☐

200,001-1 million ☐ 1 million-5 million ☐ Greater than 5 million ☐

5. Indicate the percent of maximum production capacity your plant achieved in 1976:

0-10 ☐ 11-20 ☐ 21-30 ☐ 31-40 ☐ 41-50 ☐ 51-60 ☐ 61-70 ☐ 71-80 ☐ 81-90 ☐ 91-100 ☐

6. Average annual production over the last 5 years (gallons): Less than 50,000 ☐ 50,001-200,000 ☐

200,001-1 million ☐ 1 million-5 million ☐ Greater than 5 million ☐

7. Approximate market value of products manufactured at this plant ($): Less than 250,000 ☐ 250,001-500,000 ☐

500,001-1.5 million ☐ 1.5 to 3 million ☐ 3-5 million ☐ 5-10 million ☐ Over 10 million ☐

8. Indicate the number of the various size fixed and portable paint manufacturing tanks (tubs) at your plant that require cleaning (use closest tank size shown). Do not include any dedicated storage tanks (i.e., solvent, resin, etc.) that are rarely or never cleaned.

Number of Tanks

Tank Size (Gallons)	0	1-5	6-10	11-20	21-50	More than 50
Less than 250	☐	☐	☐	☐	☐	☐
251 - 500	☐	☐	☐	☐	☐	☐
501 - 1000	☐	☐	☐	☐	☐	☐
1001 - 1500	☐	☐	☐	☐	☐	☐
1501 - 2500	☐	☐	☐	☐	☐	☐
2501 - 6000	☐	☐	☐	☐	☐	☐
More than 6000	☐	☐	☐	☐	☐	☐

9. Average number of production shifts per day: 1 ☐ 2 ☐ 3 ☐

10. Length of shifts (Hours): 7 ☐ 8 ☐ 10 ☐ 12 ☐ Other_____

11. Number of days of production per week under average production:

Less than 4 ☐ 4 ☐ 5 ☐ 6 ☐ 7 ☐

12. Indicate the number of days per year the paint plant operates:

150-200 ☐ 201-250 ☐ 251-300 ☐ 301-365 ☐ Exact, (if known)_____

13. Indicate the average daily water consumption for all uses (see question 14) within the paint manufacturing facility (gallons per day). 0-10,000 ☐ 10,000-25,000 ☐ 25,000-50,000 ☐

50,000-100,000 ☐ 100,000-500,000 ☐ over 500,000 ☐ actual (if known)_____gpd.

14. Indicate the percent of water used for each of the following:

Percent of Total Water Usage

	0	1-10	11-20	21-30	31-40	41-50	51-60	61-70	71-80	81-90	91-99	100
Used in Product	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
Cooling Water	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
Boiler Feed	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
Tub & Equipment Cleaning	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
Sanitary	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
Air Pollution Control	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
Other_____	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐

C. Production Breakdown

Indicate the appropriate percent of production for the four categories listed below:

Percent of Total Gallonage of Paints and Coatings Produced

	0	1-10	11-20	21-30	31-40	41-50	51-60	61-70	71-80	81-90	91-100	100
General Production												
1. Trade Sales	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
2. Industrial Sales	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
3. Other Formulated Products	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
Vehicles												
4. Water Thinned	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
5. Solvent Thinned	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
6. Other	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
Color Formulations												
7. White and Tint Base	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
8. Colors	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
Pigments Used (excluding titanium)												
9. Organic	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
10. Inorganic	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐

11. Do you manufacture resins at this site? Yes ☐ No ☐

12. Indicate which allied products you manufacture at this plant site: Varnish, clear or unpigmented coatings ☐

Shellac ☐ Caulking Compound ☐ Putty ☐ Gravure Inks ☐ Powder Coatings ☐

Paint and Varnish Removers ☐ Wood fillers or sealants ☐ Other _____

D. Tank (Tub) and Equipment Cleaning Operations and Housekeeping

1. Indicate the method(s) used to clean tanks, tubs, filling machines, etc. (check as many as applicable):

Water Rinse ☐ Caustic Wash ☐ Solvent Wash ☐ Dry Clean Up Techniques ☐ Periodic Caustic Soak ☐

2. If you use a caustic system, indicate which type:

Closed Loop (Complete Recycle) ☐ Open (No Recycle) ☐ Partial Recycle ☐

3. If you use a water rinse, indicate the water pressure used:

Less than 50 psi ☐ 51-100 psi ☐ 101-150 psi ☐ Greater than 150 psi ☐

4. Do you pick up spills using dry clean-up methods? Yes ☐ No ☐

5. Indicate the appropriate frequency for each of the following equipment cleaning or housekeeping operations:

	All The Time	Most of the Time	Occasionally	Never
Clean tanks between each batch	☐	☐	☐	☐
Reuse spent rinse water in subsequent batches	☐	☐	☐	☐
Reuse spent rinse water to wash tanks, equipment, etc.	☐	☐	☐	☐

6. Are any floor drains or sumps connected to the storm sewer? Yes ☐ No ☐

7. Are any floor drains or sumps connected to the sanitary sewer? Yes ☐ No ☐

8. Indicate approximately how much water is used to clean the tank sizes listed (if water rinse is used at this site):

Tank Size (Gallons)	Volume of Water Used to Clean a Tank (Gallons) 0-60	61-100	101-200	More than 200
Less than 250	☐	☐	☐	☐
250 - 500	☐	☐	☐	☐
501 - 1000	☐	☐	☐	☐
1001 - 1500	☐	☐	☐	☐
1501 - 2500	☐	☐	☐	☐
2501 - 6000	☐	☐	☐	☐
More than 6000	☐	☐	☐	☐

9. If you use solvent washing is your spent solvent redistilled? Yes ☐ No ☐

10. Do you redistill solvent at this site? Yes ☐ No ☐

If yes, do you use steam injection distillation? Yes ☐ No ☐

If steam injection distillation is used, what is the disposition of the contact steam condensate

Discharged to storm sewer ☐ Discharged to sanitary sewer ☐ Mixed with cooling water ☐

Mixed with other process wastewater ☐ Other ☐

11. If caustic is used for tank cleaning, is spent caustic discharged to the sanitary sewer? Yes ☐ No ☐

12. If solvent is used for tank cleaning, are spent solvents discharged to the sanitary sewer? Yes ☐ No ☐

E. Other Wastewater Sources

1. Do you operate spray booths (water curtain type) in the paint plant? Yes ☐ No ☐

2. Do you use wet scrubbers in the paint plant for air pollution control? Yes ☐ No ☐

3. Which of the following other air pollution control devices do you utilize? (paint manufacturing operations only)

Afterburners ☐ Electrostatic Precipitators ☐ Baghouse Collectors ☐ Cyclones ☐ Filters ☐

Other _____

4. Indicate which of the following wastewaters are combined with tank cleaning wastewater before disposal:

Wet Scrubber ☐ Spray Booth ☐ Boiler Blowdown ☐ Boiler Cleaning ☐ Sanitary ☐

Non-Contact Cooling ☐ Laboratory ☐ Steam Condensate ☐ Other (indicate) _____

F. Wastewater Handling and Disposal

1. Total volume of raw wastewater generated daily (gallons):

	0	1-100	101-500	501-1000	1001-6000	6001-12,000	Over 12,000
Average	☐	☐	☐	☐	☐	☐	☐
Peak	☐	☐	☐	☐	☐	☐	☐

2. Of this wastewater, indicate the method(s) of disposal practiced: Complete Reuse or Recycle ☐

Evaporation ☐ Partial Reuse or Recycle ☐ Discharge to City Sewer ☐ Discharge to Storm Sewer ☐

Discharge to Receiving Water ☐ Impoundment and Storage ☐ Incineration ☐ Ocean Dumping ☐

Scavenger, Outside Contractor or Purveyor ☐ Landfill ☐ Deep Well Injection ☐ Spray Irrigation ☐

3. Total Volume of paint wastewater discharged from plant daily:

	0	1-100	101-500	501-1000	1001-6000	6001-12,000	Over 12,000
Average	☐	☐	☐	☐	☐	☐	☐
Peak	☐	☐	☐	☐	☐	☐	☐

4. If process wastewater is discharged to public waters, do you have an NPDES permit? Yes ☐ No ☐

5. Have you made an application for an NPDES permit for process wastewater? Yes ☐ No ☐

6. Have you applied for and/or received an NPDES permit for cooling water or stormwater runoff? Yes ☐ No ☐

7. If yes to 4, 5 or 6, indicate the name of stream or water body receiving your wastewater _____

8. If process wastewater is discharged to city sewer, indicate the name and address of the sewer authority or municipality: _____

9. Indicate if the municipality or sewage authority utilizes any of the following:

Industrial Waste Ordinance ☐ Sewer Use Charges or Surcharges ☐ Wastewater sampling at your plant ☐

Local permit system to discharge to the sewer ☐ Requires you to sample and analyze your own wastewater ☐

10. Is the plant wastewater treated or conditioned in any way before disposal? Yes ☐ No ☐

11. If process wastewater is treated by the plant prior to discharge, indicate which wastewater streams are combined with the process wastes prior to treatment, and the extent of their contribution to the wastewater stream:

Wastewater Source	Percent of Total Wastewater Stream Undergoing Treatment						
	0%	1-20	21-40	41-60	61-80	81-99	100
Process Wastewater	☐	☐	☐	☐	☐	☐	☐
Resin Manufacturing Wastewaters	☐	☐	☐	☐	☐	☐	☐
Boiler Blowdown	☐	☐	☐	☐	☐	☐	☐
Air Pollution Control	☐	☐	☐	☐	☐	☐	☐
Sanitary	☐	☐	☐	☐	☐	☐	☐
Cooling Water	☐	☐	☐	☐	☐	☐	☐
Other_____	☐	☐	☐	☐	☐	☐	☐

12. Indicate method(s) of wastewater treatment or conditioning used at your site: Neutralization ☐ Filtration ☐

Evaporation ☐ Flotation ☐ Activated Sludge ☐ Trickling Filter ☐ Lagoon ☐ Gravity Separation ☐

Carbon Adsorption ☐ Equalization ☐ Settling or Clarification ☐ Chemical Treatment (alum) ☐

Chemical Treatment (lime) ☐ Chemical Treatment (polymer) ☐ Chemical Treatment (other) ☐

Other Treatment _____

13. Is your wastewater treatment system batch ☐ or continuous ☐

14. Is your wastewater discharge batch ☐ or continuous ☐

15. Provide the following information for your in-plant wastewater treatment facility: Year Installed 19__

Installed capital cost ($)_____ Approximate annual operating costs ($)_____

Design Volume (gpd)_____

16. If you are required to pay a sewer bill, sewer use charge or surcharge for the paint formulating plant's wastewater discharge, indicate the annual amount: $_____

17. If wastewater is treated at your site, what is the disposition of sludge produced:

Stored on plant property ☐ Incinerated ☐ Sold ☐ Contract Disposal ☐ Reclaimed ☐

Trucked to appropriate landfill by plant ☐ Other_____

18. Is sludge conditioned in any way before disposal? Yes ☐ No ☐

19. If wastewater, spent solvent or sludge is hauled away by outside contractors, indicate their name(s), address and phone number: _____

20. Indicate how the outside contractors or scavenger disposes of the wastewater of sludge:

City Landfill or Dump ☐ Private Landfill or Dump ☐ Incineration ☐ Reclaim or Reuse ☐

Don't know ☐ Other (indicate) _____

21. What is the approximate cost per gallon of transportation and contract disposal: Cents Per Gallon _____ ¢

22. If you have in-plant wastewater treatment, what percent of the wastewater flow ends up as sludge:

0-5% ☐ 6-10% ☐ 11-15% ☐ 16-20% ☐ 21-25% ☐ Over 25% ☐

23. Indicate how you handle off-spec or other spoiled batches: Discharge with Wastewater ☐

Sell to Scavengers ☐ Give to Scavengers ☐ Blend into or utilize in another product ☐

Other (indicate) _____

24. Indicate which of the following analyses have been done on your wastewater or sludge:

pH ☐ Suspended Solids ☐ Oil and Grease ☐ BOD ☐ Total Solids ☐ Turbidity ☐

COD ☐ Heavy Metals ☐ Trace Organics ☐ Other (indicate) _____

25. If you responded positively for any of the analyses listed above, please attach data sheets summarizing the analytical information you have collected for the last four years. Indicate whether the analyses are for untreated or treated wastewater, and whether the process wastewater stream was combined with other waste streams at the point of sampling.

26. Estimate the combined new investment and total operating costs that will be required during the next four years to meet existing water pollution control regulations on the local, state and Federal levels.

Total New Investment required $ _____ Annual Operating Costs $ _____

27. Indicate which of the following miscellaneous regulatory areas you expect will require significant investment over the next four (4) years:

Odor ☐ Thermal ☐ Solid Waste ☐ OSHA ☐ Air Pollution Control ☐

Toxic Substances Act ☐ Safe Drinking Water ☐

28. Estimate the anticipated new investment and annual operating costs to meet the current requirements of these other regulatory considerations over the next four (4) years:

Total New Investment Required $ _____ Annual Operating Costs $ _____

G. RAW MATERIALS

Please check the appropriate box for each class of raw material which is used at this site (regardless of quantity used). If you are not positive about the heading used, check the list of tradenames and numbers and check the box if you use one of the materials listed. If you use an unlisted material which is described exactly by the heading, check the box; listing the other material is optional. If there is no "other" listed for any category, check the box only if one of the specific listed materials is used. Abbreviation used for company names are listed at the end of this section.

☐ WHITE LEAD

Cyastab® Series
Hammond: "Halcarb" Series
Eagle Picher: "E-P-202", "E-P-303","E-P 41"
Oncor® 45x
Other:

☐ ANTIMONY OXIDE

Chemtron: WT 6200 Series
Harshaw: KR, KR-TS
NL Ind.: Regular (TMS); Red Star; Grade 10; FM-1; Oncor®-23A; 75RA; 75RAZ
Other:

☐ ZINC SULFIDE PIGMENTS

Perm-O-Lith® Series
Other:

☐ ZINC OXIDE-AMERICAN

ASARCO: "AZO"-11,22,33,55,55LO,55TT
ASARCO: "AZODOX" Series
Eagle-Picher: "E-P" AAA Series
N.J. Zinc - "XX" Series
Ozide® 30-P
St. Joe Minerals: "ST JOE" - 17,20,40
Other:

PIGMENTS AND DYES

☐ ZINC OXIDE FRENCH

ASARCO - AZO 66, 77, 77S
N.J. Zinc: Florence Green Seal - 8; "KADOX" 25,515
St. Joe Minerals: "St. Joe" - 911
Other:

☐ ZINC YELLOW

F.B. Davis: 505W, 505WJ, J1345, 533W, 533WJ, J1310
Dupont: Y-539-D
Other:

☐ ZINC DUST AND FLAKES

N.J. Zinc: "Standard Zinc Dust" - 22, 44, 422, 444, 64; "High Purify Zinc Dust" - 122,222
U.S. Bronze: 751, 752
Other:

☐ OTHER METALLIC POWDERS AND FLAKES CONTAINING NICKEL, SILVER, COPPER AND/OR LEAD

Alcan: "MD" 756, 750, 183, 201
U.S. Bronze "Cupro-Nickel"
Other:

☐ CADMIUM RED

Ferro Corp.: V-8860, V-8560, V-8840, V-8830, V-8530, V-8820, V-8521, V-8835, V-8825, V-8845, V-8540
General Color: 800, 805, 813, 824, 827, 1000, 1010, 1020, 1024, 1027, 2000, 2012, 2020, 2024, 2027, 3015, 3020, 3022, 3027, 1005
Glidden: "Cadmolith" 200 Series; 2000 Series
Harshaw: "Lithopone Red" Series; CP 1400 Series; CP 1500 Series
Hercules: X-2327, X-3327, X-2328, X-3328, X-2329, X-3329, X-2330, X-2947, X-2948, X-2949, X-2950X
Other Cadmium Reds:

☐ CADMIUM-MERCURY RED, MAROON, ORANGE

Cadmerc[R] Series
Harshaw: 18060, 18120, 18210, 18290, 18370, 18410 CP Cadmium Series
Mercadium[R] Red Series
Other:

☐ CADMIUM YELLOW AND ORANGE

Ferro: V-9820, V-9520, V-9810, V-9510, V-8810, V-8815
General Color: 920, 950, 970, 620, 640, 660
Cadmolith[R] Series
Glidden: 3050, 3150, 3250, 3350, 3450, 3550
Harshaw Chem.: 1400 Series; 1500 Series; Primrose - 20, 206, 23, 1400 Series,; Lemon 30, 306, 32, 33, Yellow 40, 406, 42, 43, 45, 456, Light Orange 50
Hercules: X-2272, X-2273, X-2283, X-2315, X-2821, X-2825, X-2823, X-2824, X-2825, X-2826, X-3201, X-3203, X-3205, X-2320, X-2326, X-2945, X-2946
Other Cadmium Yellow and Orange:

☐ CHROME GREEN

Am. Cyanamid: "Norwood Green" 10-8000 Series
Hercules: A-4400 C.P. Series
Other:

☐ HYDRATED CHROMIUM OXIDE

Hercules: X-1010, X-1483, X-2944
Pfizer: GH-9869
Other:

☐ CHROMIUM OXIDE

F.B. Davis: 3020, J 5310, J 5351
Hercules: X-1134 C.P., X-1861 C.P.
Pfizer: G 4099, G 5099, G 6099, G 6199, G 7099
Other

☐ CHROME YELLOW

Am. Cyanamid - Yellow 40 Series, Primrose 40 1450, 1460
F.B. Davis - J1200 Series
Dupont - Y-758-D; Y-433-D; 434 D, 469 D, Krolor[R] KY Series
Harshaw: "Yellow 2000" Series; "Grellow" 3950, 3951, "Primrose" Series, Softex Series
Hercules: X-1937, X-3148, X-1945, X-2558, X-1899, X-2548, X-3355, X-1809, X-2541, X-3356, X-2891, X-2774, X-3215, X-2777, X-2778, X-3218, X-3480, X-1810 X-2035, X-3431, X-3459 Rampart[R] HR Med.
Oncor[R] Y47-A
Nichem: 1561E, 1590, 1610E, 1610, 3105E, 3105, 8777E, 1678PD, 1677PD, 1605PD, 1640, 1670
Reichhold: Yellow 45-100 Series, 45-200 Series
Other Chrome Yellows:

☐ CHROME ORANGE

Harshaw: 2201, 2204, 2213, 2205, 2209, 2203
Hercules: X-819 CP Light
Other:

☐ MOLYBDATE ORANGE CONTAINING CHROMIUM AND/OR LEAD

Am. Cyanamid: Orange 400-8000 Series
Dupont: Moly. Orange YE Series; Krolor[R] Or.Y. KO-789-D; Krolor[R] Or.Y. KO-786-D; Krolor[R] Red, Kr-980-D
Harshaw: "Ming Orange" Series
Hercules: Rex[TM] Orange Series, "Chili Red" X-3170, Rampart[R] Or - X-3386, X-3390; Rampart[R] HR Or X-3047
Nichem: Moly. Or. 1720, 1730, 1740
Reichhold: Orange 45-365, 45-366, 45-370, 45-382
Other Molybdate Oranges:

☐ RED LEAD, LITHARGE, BLUE LEAD, ETC.

Eagle-Picher: Eagle 97 Red Lead; Eagle 29 Litharge; Eagle 33 Litharge; Eagle Sublimed Blue Lead
Hammond: "Litharge" 100Y; Red Lead - 85%, 95%, 97% 98%, Orange Mineral
NL Ind: Red Lead 95%, 97%, 98%; "Fume" Litharge; "Color Makers" Litharge
Other:

☐ LUMINESCENT PIGMENTS CONTAINING LEAD

Hostasol[R] 13-3397, 3398, 3399, 11-5100
Other:

☐ ULTRAMARINE BLUE CONTAINING SILVER

Davis Co.: 410B, 448, 449, 458B, 4156N, 4532B
Kohnstamm: A4575, A9829
Landers-Segal: 5301F, 5303F, 5183F, 5400F
Wittaker, Clark, Daniels: 500 Series
Other:

☐ IRON BLUE CONTAINING CYANIDES

Am. Cyanamid: 50-0000 Series, "Alkaloric", "Milori", "Blackstone"
F.B. Davis: "Milori" Blue 4049, 4215
Harshaw: "Milori" Blue AR 4028, 4050
Hercules: X-640 C.P., X-2274 C.P., X-3163 C.P., X-2285-C.P., X-1835-C.P., X-712 C.P. A-984 C.P., X-3434, X-3340
Other:

☐ BROWN AND GRAY PIGMENTS CONTAINING ZINC AND/OR CHROMIUM

Ferro: V-9117, V-9119, V-9121, V-5101, V-5102, F-6109, F-6111, F-6112, F-6113, V-9128
Harshaw: 7733, 7739, 7751, 7760, 7776,
Hercules: 10393, 10352, 10369, 10392, 10327, 10391, 10378, 10328, 10363, 10394
Other Browns and Grays Containing Zinc And/Or Chromium

☐ PHTHALOCYANINE BLUE

Am. Cyanamid: "Cyan" 55-3000 Series
Hostaperm[R] 15-1000 Series
BASF: "Paliofast" Blue - 6000 Series, 7000 Series
Chemtron: BT-4510, BL-4521, BT-4559, BT-4561, BT-4564, BT-4614, BT-4651
Irgazin[R] Blue 3GT
Irgalite[R] Blue LGLD
Dupont: Monstral[R] Blue BT Series, BL Series, "Ramapo" Blue - BP Series
Harmon Colors: B-4714, B-4769, B-4773, B-4804
Harshaw: "Zulu" Blue 4800 Series
Hercules: X-2925, X-3374, X-3048, X-2303, X-3414, X-3228, X-2371, X-2810, X-3367, X-3453, X-2658, X-2372, X-3241, A-4434, X-3485, X-3527, X-9120, X-9220, Monarch[TM] Blue, Series
Hilton-Davis: 30-0286, 30-0291, 30-0344; SUP-R-CONC[R] 6-68-C-301
Kohnstamm: A5712 "Monafast" Blue
Nichem: "Phthalo" Blue 5000 Series, 1140;
Sandoz: "Graphthal" Blue BNK
Sun Chem: Sunfast[R] Blue and Peach Blue Series
Other Phthalocyanine Blue:

☐ PHTHALOCYANINE GREEN

Am. Cyanamid: Cyan Green Y15-3040; B15-3100
Hostaperm[R] 16-2000 Series
BASF: Paliofast Green 8600, 8680, 8720, 9140, 9360
Chemtron: GT 4800 Series
Dupont: Monstral[R] Green GT Series "Ramapo" Green B, GT-501-D
Harmon Colors: G-5000 Series
Harshaw: "Zulu" Green - 3800 Series
Hercules: X-3166, X-3167, A-4433, A-4436
Hilton-Davis: 30-0315, 30-325; SUP-R-CONC[R] 6-68-C-401 B.S.
Kohnstamm: B 1581, A 5776
Nichem: Phthalo Green 4000 Series
Sandoz: "Sandorin" Green 3GLS
Sun Chem: Sunfast[R] Green 264-0000 Series; Sunfast[R] 464 Series; "Emerald Vista" Green 264-444
Other Phthalocyanine Greens:

☐ CORROSION INHIBITING PIGMENTS CONTAINING CHROMIUM

F.B. Davis: Strontium Chromate J-1365
Calcium Chromate J-1376
Hercules: X-2865, X-2974 Strontium Chromate
Other:

☐ CORROSION INHIBITING PIGMENTS CONTAINING ZINC

FB. Davis: Zinc Molybdate 0830, Zinc Phosphate 0852
"HALOX" ZK-111
NL Ind.: Nalzin[R] SC-1, "Moly-White" 101, 212
Other:

☐ CORROSION INHIBITING PIGMENTS CONTAINING LEAD

Eagle Picher: "Permox" 1-4-3, "Permox" EC
Hammond: P-7, C-9
NL Ind.: "Dyphos", Oncor[R] F-31, Oncor[R] M-50
Other:

☐ DIARYLIDE YELLOW TONER (DICHLOROBENZIDENE-DERIVED)

Am. Cyanamid: 45-2555, 45-2650
Am. Hoechst: 11-1101, 1103, 1006, 1003, 1200, 1300, 1216, 1300, 1216, 1012, 1013, 1305, 1125
1012, 1013, 1305, 1125
Chemtron: YT-8073, YT-8047, YT-8093
Irgalite[R] Yellow LBAW
Harmon Colors: YB-5700 Series
Harshaw: Yellow 1200 Series
Hercules: X-2485, X-1940, X-2476, X-2600, X-2882, X-3385, X-2838, X-2864, X-3446, X-3535, X-9340
Hilton-Davis: Diarylide Yel 30-0535; Sup-R-Conc[R] Series
Kohnstamm: A9145, A9744, B3503, B3577, B3615
Nichem: "Benezidine Yel" 3000 Series
Sandoz: 4233-0, 4335-0, 4534-0; "Graphtol Yellow" RCL
Sun Chem: "Rangoon Yel" 273-0000 Series; "Radiant Yel" 274-0000 Series; "Lemon Metallic" - 275-0003, 275-5129; "Diarylide Yel" 275-0049; "TransPerm YHR" 275-2233
Other Diarylide Yellow Toners (Dichlorobenzidene Derived):

☐ DIARYLIDE ORANGE TONER (DICHLOROBENZIDENE-DERIVED)

Am. Cyanamid: "Diarylide Or. "45-2850, 45-2880 Series
Am. Hoechst: "Perm. Or." 12-1000 Series
Chemtron: OT-5661
Harmon: OP-5833
Hercules: X-2065, X-3082
Sandoz: 3272-0
Sun Chem: 276-2384
Other Diarylide Orange Toners (Dichlorobenzidene Derived):

☐ PYRAZOLONE REDS AND MAROONS (DICHLOROBENZIDENE DERIVED)

Am. Hoechst: 13-1000 "Perm Red" VB
Harmon Colors: R-6200 Series
Harshaw: "Pyrazolone Red" 1153
Sun Chem: "Anisco Red" 236-5025
Other:

☐ MISCELLANEOUS REDS, MAROONS TONERS AND LAKES CONTAINING ZINC, CHROMIUM, AND/OR LEAD

Am. Hoechst: 13-4305 "Perm Pink" R-D
Chemtron: RT-5310; RT-5340; RT-5390
Other:

☐ MISCELLANEOUS YELLOW AND ORANGE TONERS AND LAKES CONTAINING ANTIMONY AND/OR CHROMIUM

BASF: "Paliotol Yellow" -1690, 1770, 2330;
Harshaw: "Meteor Buff" 7370, 7376
"Meteor Orange" 7383
"Meteor Tan" 7729
Other:

☐ MISCELLANEOUS YELLOW AND ORANGE TONERS AND LAKES CONTAINING COPPER AND/OR DICHLOROBENZIDENE (DERIVED)

BASF: "Paliotol Yellow" 1070
Harshaw: "Pyrazalone Orange" 2912
Other:

☐ MISCELLANEOUS YELLOW AND ORANGE TONERS AND LAKES CONTAINING NICKEL

BASF: "Paliotol Yellow" 0830
DuPont: "Green Gold" YT-714-D, YT-562-D
Harshaw: "Sun-Yellow-S", N8310, C8320, "Sun-Buff" 8380
Hercules: X-3247 "Empress Green Yellow", 10401
Other:

☐ MISCELLANEOUS BLUE, PURPLE AND VIOLET PIGMENTS CONTAINING CHROMIUM

Ferro: V-5200 Blue; V-5272 Blue-Green, V-5274 Med. Blue
Harshaw: "Meteor Cobalt" - BLR-7536
"Meteor Cobalt" - BL 7550, 7556
"Meteor Turquoise-Cobalt" 7579
Other:

☐ MISCELLANEOUS BLUE, PURPLE AND VIOLET PIGMENTS CONTAINING CADMIUM

Hercules: 10312 "Cerulean Blue"
Other:

☐ MISCELLANEOUS BLACK PIGMENTS CONTAINING COPPER

Ferro: V-302, V-717, F-2302, F-6331,
Harshaw: 7890 "Meteor Bk"
Other:

☐ MISCELLANEOUS BLACK PIGMENTS CONTAINING CHROMIUM

Ferro: V-6730
Hercules: 10335 Black
Other:

☐ MISCELLANEOUS YELLOW PIGMENTS CONTAINING ANTIMONY, LEAD, AND/OR ZINC

Hercules: 10315 Lemon Yellow, 10324 Amber, 10401 Yellow
Other:

☐ AQUEOUS DISPERSIONS - WHITE CONTAINING ANTIMONY

Aurasperse[R] Antimony Oxide W-320 KR LTS
Other:

☐ AQUEOUS DISPERSIONS - RED (DICHLOROBENZIODENE DERIVED)

Podell: W-5031 "Pyrazolone Red"
Other:

☐ AQUEOUS DISPERSIONS - YELLOW (DICHLOROBENZIDENE DERIVED)

Colanyl[R] Yellow OT 11-1109
Aurasperse[R] W-1041
Hercules: X-2413, X-2453, X-3611
Sandoz: "Graphtol Yellow" 4534-2
Podell: W-3827
Other:

☐ MISCELLANEOUS GREEN PIGMENTS CONTAINING COPPER OR CHROMIUM

Ferro: F 5686, 5687, 7687, 7610, 11633, 11649, 11655, 11656
Harshaw: Sun Green L 8420, Meteor 7416, 7459
Hercules: 10342, 10329, 10307, 10402
Other:

☐ AQUEOUS DISPERSIONS - YELLOW CONTAINING LEAD AND/OR CHROMIUM

Hydrotint[R] D 512, D536
Aurasperse[R] W-1031
Harshaw B-1133
Inmont: 991 B022 Chrome Lemon Yellow, 991 038 Chrome Medium Yellow
Podell: W3013, W3507, IW3499, W3903, W3904
Aquasperse[R] 877-000-2065
Colortrend[R] GP8865 G
Other Aqueous Dispersions - Yellow Containing Lead and/or Chromium:

☐ AQUEOUS DISPERSIONS - YELLOW CONTAINING NICKEL AND/OR CADMIUM

Aurasperse® W1061, W1068
Hercules: X-3291
Podell: W3941, W3946
Other:

☐ AQUEOUS DISPERSIONS - ORANGE CONTAINING LEAD

Daniel: UL 20-69 Molybdate Or.
Hydrotint® D-5022
Aurasperse® W-2013
Inmont: 991-B-018 Moly Orange
Podell: W-4017, IW4596
Aquasperse® 877-000-0941
Other:

☐ AQUEOUS DISPERSIONS - ORANGE (DICHLOROBENZIDENE DERIVED)

Aurasperse® W-2090
Imperse® X-2457, X-3346
Kodis® N-54, AD-54
Podell: W-4124
Sandoz: "Graphtol" OR, 3272-2, 3333-2
Other:

☐ AQUEOUS DISPERSIONS - GREEN CONTAINING COPPER AND/OR CYANIDES

Colanyl® Green 16-2005, 16-2001, 16-2010
Chemetron: WDG-55,
Daniel: WD2744, UL20-77, UCS 10-70D, AC 66-78, UL 20-79
Hydrotint® D-3658
Aurasperse® W-6013
"Aquis" Monastral® Green - B,GW-749-P
Harshaw: "Thalo" Green MC-D
IMPerse® Green - X-2346, X-2454, X-2689, X-3244, X-3288,
Hilton-Davis: 6-11-B-462; 6-11-B-432; 6-33-T-410
Inmont: 991-B-041 "Phthalo" Green B/S; 991-006 "Green Phthalo" Y/A
Landers-Segal: 3336D "Phthalo" Green W.D.
Podell: W-2603A, IW-2829
Sandoz: Graphtal Green 5869-2
Aquasperse® 877-000-5511
Cal-Tint® UC-3022, 3046, 3011
Colortrend® GP-8811D
Tenneco: "Thalo" Green 897-000-5501
Other Aqueous Dispersions - Green containing Copper and/or Cyanides:

☐ AQUEOUS DISPERSIONS - GREEN CONTAINING CHROMIUM

Daniel: UCS 10-72K.
Hydrotint® D-310
Aurasperse® W 6017
Harshaw: Chromium Oxide MC-K
IMPerse® Green X2722, X3289
Podell: W-2035, W2607A, W2817
AquaSperse® 877-000-4205
Cal-Tint® UC-3005
Colortrend® GP-8805K
Other Aqueous Dispersions - Green Containing Chromium:

☐ AQUEOUS DISPERSIONS - BLUE CONTAINING COPPER AND/OR CYANIDES

Colanyl® Blue 15-1006
Chemetron WDB56
Microsol® Brilliant Blue 4G Paste
Daniel: AC 66-27, WD 2228, UL 20-26, UCS 10-20E
Hydrotint® D4546
"Aquis" Monastral® BW-372-P, BW-431-P
Aurasperse® W4123
Harshaw: "Phthalo" Blue MC-E, B-4011
IMPerse® Blue X-2345, X-2446, X-2687, X-2688, X-2663, X-3221 X-3496
Hilton-Davis: 6-11-B-325 "Phthalo" Blue; 6-33-T-315 "Phthalo" Blue (G.S.)
Inmont: 991 037, 9918-040;
Kodis® Blue N-21
Podell: W-6402, W-6307R, IW-62934, IW-6942
Sandoz: "Graphtol" Blue 6812-2, 6825-2
Tenneco: 895-000-7202 "Thalo" Blue
Aqua-Sperse® "Thalo" Blue - 877-000-7026, 877-000-7214
Cal-Tint® Blue UC-3014; Colortrend® Blue - GP 8814E
Other Aqueous Dispersions -Blue Containing Copper And/or Cyanides:

☐ AQUEOUS DISPERSIONS - BLUE CONTAINING SILVER

Hydrotint® D4051
Kodis® Blue AD-23
Landers-Segal: 5494-D Ultramarine Blue, WD
Podell: W-6032, IW-6940
Aquasperse® 817-000-7504 Ultra Blue
Cal-Tint® Blue - UC-3074
Other:

☐ NON-AQUEOUS DISPERSIONS - BLUE CONTAINING SILVER

Alkytint® 5448
Daniel: AL 221
Inmont: 6297
Tenneco: 7504
Other:

☐ NON-AQUEOUS DISPERSIONS - RED CONTAINING LEAD

Daniel: AL625 "Quinacridone" Red
Alkytint® S-5022 Lt. Molybdate Orange
Hilton-Davis: 5-42-A-123 Toluidine Red, Dark
other:

☐ NON-AQUEOUS DISPERSIONS - RED CONTAINING CADMIUM AND SELENIUM

Inmont: Cadmium Red - 5419, 5420
Chroma-Cal® Cadmium Red 850-000-0601, 850-000-0801
Other:

☐ NON-AQUEOUS DISPERSIONS - YELLOW CONTAINING LEAD AND/OR CHROMIUM

Daniel: Chrome Yellow - AL 405, AL 409
Alkytint® Chrome Yellow - S-536, S-5507
Hilton-Davis: Chrome Yellow - 5-24-A-200; 5-24-A-203; 5-24-A-206; 5-42-A-201; 5-42-A-206; 5-83-P-353; 5-21-P-212
Auracote® Chrome Yellow 5-50-F-365
Inmont: Chrome Yellow 3,6; Medium Chrome Yellow 2347, 2612, 4904, 5413, 5414, 6258
Uni-Cal® 66 - 6604M, 6665X
Chroma-Cal® - 850-000-2006
Tenneco: Chrome Yellow - GPD 2006: GPD 2510
Other:

☐ NON-AQUEOUS DISPERSIONS - YELLOW (DICHLOROBENZIDENE DERIVED)

Inmont: Diarylide Yellow 1178, Transparent Yellow 1198
Other:

☐ NON-AQUEOUS DISPERSIONS - ORANGE CONTAINING LEAD AND/OR CHROMIUM

Daniel: Molybdate Orange: AL 615, UL 2069
Hilton-Davis: Chrome Orange 5-24-A-600; Orange Blend 5-24-A-609; Molybdate Orange 5-24-A-616, 5-42-A-612; 5-83-P-635, 5-42-A-615, 5-21-P-603
Auracote® Molybdate Orange 5-50-H-639
Inmont: Molybdate Orange 840, 2377, 4905, 5415, 6264
Tenneco: Moly Orange GPD 0940
Chroma-Cal® 850-000-0903
Other:

☐ NON-AQUEOUS DISPERSIONS - GREEN CONTAINING LEAD AND/OR CHROMIUM

Alkytint® Green S-310
Daniel UCS 10-72K
Tenneco: GPD-4202CP, GPD-4509 CP, GPD-4208, GPD-5103
Uni-Cal® 66-6605
Other:

☐ NON-AQUEOUS DISPERSIONS - BLUE CONTAINING LEAD AND/OR CHROMIUM

Chemtron: "NCNF" FS-895; "NCNF" RS-957; "NCNF" RS-1197; "NCNF" RS-1795
Other:

☐ NON-AQUEOUS DISPERSIONS - GREEN CONTAINING COPPER AND/OR CYANIDES

Hostaprint® Green 16-2008
Chemetron: "Phthalo" Green FS-784; FS-958; FS-1192, FS 1794
Microlith® Green G-A, G-T, G-K
Alkytint® Green S-317
Daniel: "Phthalo" Green - AL 703, UL 20-77, UCS 10-70D, AC 66-78, UF 75-74, EP 30-71, PF 4750, AL 745, UL 20-79,
Hilton-Davis: "Phthalo" Green - 5-24-A-400, 5-24-A-405, 5-42-A-407, 5-42-A-411, 5-24-A-435 5-83-P-401, 5-42-A-400, 5-83-P-401, 5-21-P-441, 5-21-P-444, Chroma Gr. 5-24-A-406
Auracote® Phthalo 5-65-A-427
Inmont: Chrome Green 1, 809; "Phthalo" Green 1083, 1168, 1199, 1245, 2330, 2610, 3035, 5412, 5447, 5412
Podell: 2000 Series prefix AL, AM, AME, AV, C, CS, CU, DU, LA, LC, S, VT, Y
Tenneco: GPD-5503, GPD-4508-LF, AD-5503
Uni-Cal® 66 - 6611R
Chroma-Cal® Green 850-000-5001
Other Non-Aqueous Dispersions - Green Containing Copper and/or Cyanides:

☐ ASBESTOS

☐ NON-AQUEOUS DISPERSION - BLUE CONTAINING COPPER AND/OR CYANIDES

Microlith® Blue 4G-K, 4G-T, A3R-K
Alkytint® 54215, 54557, S-182
Daniel: AL 201A, AL 281A, AL 296B, AC 66-27, UF 75-28, EP 30-23, PF 4260, AL 297R, AL 298, UL 20-26, UCS 10-20E
Hilton-Davis: "Chinese Blue" 5-24-A-304, 302; "Phthalo Blue - 5-24-A-306, 304, 308, 309, 311, 5-21-P-335, 337, 5-42-A-312, 305, 5-83-P-300,301
Auracote® Blue 5-65-A-395
Inmont: 1190, 1202, 1211, 2609, 5444, 5475, 3034, 4914, 1077, 4916, 9024, 2327, 5498, 6150,
Podell: 6000 Series prefix AL, AM, AME, AV, C, CS, DU, LC, S, SR, SK, VT, Y
Tenneco: GPD-7308, 7209,
Uni-Cal® 66 - 6608P, 6614U
Chroma-Cal® - 850-000-7202
Other Non-Aqueous Dispersions - Blue Containing Copper and/or Cyanides:

☐ NON-AQUEOUS DISPERSIONS - BLUE CONTAINING SILVER

Alkytint® 5448
Daniel: AL 221
Inmont: 6297
Tenneco: GPD 7504
Other:

CHEMICAL SPECIALTIES

☐ DRIERS CONTAINING LEAD

Shepherd - Lead Tallates, Lead Linoleates, "Hexogen", "Advasol", "Catalox", "Octasol", "Octoate", Troychem®, Troymax®, Troykyd®, Witco®, Witcon®, "Hex-Cem", "Ten-Cem", "Tallate", "Nuolate", "Linoresinate", "Lin-All", "Cem-All", "Intercar", "Cyclodex", "Noury-Dry", "HED", "Neo-Nap", "NuXtra"
Other Driers Containing Lead:

☐ DRIERS CONTAINING ZINC

Shepherd - Zinc Acetate, Zinc Tallates, "Hexogen", "Catalox", "Octasol", "Octoate", Troymax® Witco®, Witcon®, "Hex-Cem", "Linoresinate", "Lin-All" "Cem-All", "Noury-Dry", "HED", "Neo-Nap", "NuXtra",
Other Zinc Containing Driers:

☐ MISCELLANEOUS DRIERS

Shepherd - Copper Linoleates: "Hexogen" - Copper Octoate; "Advasol" - Copper; "Drytain-24"; "Neodecanoate"; "Hex-Cem" - Nickel; "Linoresinate" - Copper; "Nuact"

☐ DRIERS - NAPHTHENATE TYPE

Interstab Series, Ferro Series, "Nap-All" Series, "Uversol" Series, "Nuodex" Series, Shepherd Series, Troykyd® Series, Troysan® Series, Witco® Series
Other:

☐ METALLIC SOAPS AND FLATTING AGENTS CONTAINING ZINC

Aero No. 4S U.S.P.; Diamond "Zinc St. H", "Zinc St. USP", "Zinc St. USP 603", "Zinc St. 639C"; Nuodex USP, DLG-10, DLG-20, Technical; Plymouth XXX-H, SI-36, SI-50, No. 21; Witco Regular, Lacquer Grade No. 3, NB-60; NB-70; "Zinc Palmitate"
Other:

☐ METALLIC SOAPS AND FLATTING AGENTS CONTAINING LEAD

Diamond - Lead Stearate
Nuodex V-1 Precipitated, V2 Fused
Witco 30
Other:

☐ PLASTICIZERS CONTAINING DI-N-BUTYL PHTHALATE

Allied "Dibutyl Phthalate"
Amsco Dibutyl Phthalate
CSC - Dibutyl Phthalate
Kodaflex® DBP
Santicizer® 213
Nuoplaz® DBP
Sherwin Williams CP-907
Phthalic Acid; Dibutyl Ester; Ortho-Benzene-Carboxylic Acid; Dibutyl Ester; Benzene-O-Dicarboxylic Acid DI-N-Butyl Ester; DI-N-Butyl Phthalate, "Celluflex DBP"; "DBP", "Elaol", "Hexaplas M/B; "Palatinolc"; "Polycizer DBP"; "PX-104"; "Staflex DBP"; "Witcizer 300"
Other Plasticizers containing DI-N-Butyl Phthalate:

☐ PLASTICIZERS CONTAINING DIMETHYL PHTHALATE

Kodaflex® DMP
Others:

☐ PLASTICIZERS CONTAINING DIETHYL PHTHALATE

Amsco Diethyl Phthalate
Kodaflex® DEP
Santicizer® 885; Monsanto DEP
Formic Acid; Ethyl Ester; 1,2-Benzene Dicarboxylic Acid; Diethyl Ester; Ethyl Formic Ester; Phthalic Acid; Diethyl Ester; Ethyl Methanoate; Ethyl Phthalate; Formic Ether; "Anozol", "Areginal", "Neantine"; "Palatinol A"; "Phthalol"; "Placidole"; "Solvanol"
Other:

☐ PLASTICIZERS CONTAINING DI-2-ETHYLHEXYL PHTHALATE

Jayflex® DOP
Monsanto DOP
Kodaflex® DOP
Santicizer 215
Other:

☐ STABILIZERS CONTAINING LEAD

All Halstab Lead
All NL Lead
"Lead Stearate"
Other:

☐ STABILIZERS CONTAINING ZINC AND/OR CADMIUM

Interstab - BC-100S, BC-103, BC-103A, BC-103L, BC-109, BC-110, BC-202, 761-28, 943-38, R-4023, R-4025, 778-45, CZ-11, CZ-11D, CZ-19A, CZ-10, ABC-1 ABC-7,
Ferro - 651; 1238, 703; 1241, 707X; 1701, 763, 1720, 760X, 1212A; 1776, 1237; 1777, 1827,, 5019, 1840, 5373, 2020; 5444, 2035; 5473, IV4; 5918, 2V4; 5919, 6V2; 5930, 6V6A, 19V1, 5002, 59V11
"Nuostabe" - V1; V1218, V2; V1250, V12; V1255, V133; V1277, V134; V1298, V152; V1399, V1026; V1420, V1048; V1503, V1204; V1555, V1216; V1572
Other Stabilizers Containing Zinc and/or Cadmium:

☐ STABILIZERS CONTAINING LEAD OR PHENOL

Interstab LO-24
Troykyd[R] Anti-Skin Special Mod.
Anti-Skin Odorless
Other:

☐ WETTING AGENTS CONTAINING PHENOL

Diamond: "Hyonic" Series
Witco 936, 960, 980
Other:

☐ MISCELLANEOUS WETTING AGENTS

Aerosol[R] OS
Troysan[R] Zinc 8

☐ VISCOSITY SUSPENSION & FLOW CONTROL AGENTS CONTAINING TOLUENE

Pliolite[R] AC-3
Other:

☐ ANTI-SKINNING AGENTS CONTAINING PHENOLS

"Guaiacol Special C"; Troykyd[R] Antiskin Special Modified, Troykyd[R] Antiskin Odorless Liquid, Troykyn[R] Antiskin S; Nevillac[R] 10, TS
Other:

☐ PRESERVATIVES CONTAINING COPPER

Interstab "Copper Naphthenate" 6%, 8%
"Intercide" Copper 10%
Insotral[R] CQ-A, CQ-WR, CN8
"Nap-All" Copper Naphthenate
"Uversol" Copper Naphthenate
Troysan[R] Copper 8
Witco[R] Copper Naphthenate
Nuodex Copper Naphthenate
"Quindex"
Other Preservatives Containing Copper:

☐ PRESERVATIVES CONTAINING MERCURY

"Intercide" PMO 11%, PMA 18%, 60
Nuodex PMA-18, PMO-10
"Troysan" CMP Acetate, PMA10 SEP, CMP 10 SEP, PMO 30, PMB, Mercuric Oxide, PMA 30, PMA 100
"Super AD-It"
Other Preservatives Containing Mercury

☐ PRESERVATIVES CONTAINING PENTACHLOROPHENOL (PCP)

Dowicide[R] G, EC-7
"Santobrite"
"Penta"
"Santophen-20"
"PCP"
Other PCP Preservatives

☐ PRESERVATIVES CONTAINING ZINC

"Interstab" Zinc Naphthenate 8%
"Troysan" Zinc 8
"Vancide" 51Z
"Nap-All" Zinc Naphthenate
"Uversol" Zinc Naphthenate
Witco Zinc Naphthenate
Other Zinc Preservatives:

☐ OTHER PRESERVATIVES

Dowacide[R] A

RESINS

☐ DRYING OIL MODIFIED ALKYD SOLUBLE IN OR CONTAINING NAPHTHALENE

Aroplaz[R] 310-V-50; "Coroc" L-26-H4, S-47-H4, S-4700-H4; Reliance AL-4313-HA-50, AL-3617-HA-50, AL-4409-HA-60, AL-4313-HA-50,
Other:

☐ DRYING OIL MODIFIED ALKYD SOLUBLE IN OR CONTAINING TOLUENE OR ETHYLBENZENE

Koppers: 1530-27, 7365-ES-70
Reliance: AL 4310-T-50, AL 4323-T-60
"Synresate" D-30360-T, W-7170-T
Other:

☐ NON-DRYING & SEMI OXIDIZING OIL MODIFIED ALKYD SOLUBLE IN OR CONTAINING ETHYLBENZENE OR TOLUENE

Conchemco 323-010
Koppers 99-4, 99-ES-70; "Mirasol" 123-6-T, 131, 902, RCI-12-010, 12-021; Reliance AL-2107-TX-60, AL-2313-TIB-60, AL-4106-TX-75, AL-4129-T-60; "Synresate" W-7170-T
Other:

☐ RESIN MODIFIED ALKYDS SOLUBLE IN OR CONTAINING TOLUENE OR NAPHTHALENE

Aroplaz[R] 1031-T-70; "Mirasol" 214, 202-A; RCI 10-010; Reliance AL-3321-HA-50 Varkyd[R] 310-50HS
Other:

☐ COPOLYMER ALKYDS SOLUBLE IN OR CONTAINING TOLUENE OR NAPHTHALENE

"Chempol" 13-2444; "Synresate" D-9850-S, TP-134-DA; Reliance SY-2003-VT-50; "Kelpol" D718-60E
Other:

☐ POLYESTER ALKYDS SOLUBLE IN OR CONTAINING TOLUENE OR NAPHTHALENE

Aroplaz[R] 6022-S-65, 6025-S-70, 6029-S-60; Cargill 6619/6619-70, 6620/6620-60; "Synresate" W83270EX03, W8760S
Other:

☐ EPOXY SOLUTIONS SOLUBLE IN OR CONTAINING TOLUENE

"EPI-REZ" - 2047; Araldite[R] 571-T-75, 597-ET-55, 597-EX-55, 597-KT-55; Dow D.E.R. 671-T75, GenEpoxy[R] 526T-75; Epotuf[R] 38-508, 38-507, 38-519
Epon[R] Resin 1001 BT 70, 1001 CX-75, 1001 FT-75, 1001 T-75 1007-CT-55, 1007-KT-55; Vanoxy[R] 201-T-75, 201-BT-70, 201-FT-75, 207-KT-55, 207-CT-55
Other Epoxy Solutions Soluble in or Containing Toluene:

☐ POLYAMIDES SOLUBLE IN OR CONTAINING TOLUENE

"CIBA Polyamide" 800IT60, 815T-70; "Cropolamid" L-100 IT; Emery "Emerez" 1500; Versamid[R] 400; Epotuf[R] 37-621, 37-648; VanAmid[R] 300 ET-60
Other:

RESINS (Cont.)

☐ UREA RESINS SOLUBLE IN OR CONTAINING TOLUENE

Reliance AM-1008-IT-55, AM-1012-IT-55
Other:

☐ MELAMINE RESINS SOLUBLE IN OR CONTAINING NAPHTHALENE

Melmac[R] 243-3
Other:

☐ VINYL SOLIDS, PVD (SYNTHESIZED FROM VINYL CHLORIDE)

APCI "PVC" Series; Goodspar "Pliovic" Series;
UCC - VYHH; VYNC, VYHD; QYNV, VYLF; QYKV, VYNS; VLFV, VYNW; QYJV, VAGH; QYOH, VAGD; QYNL, VMCH; QYNJ, VMCC; E-2000; VMCA; VYDS, VROH; VYDS-66, VERR;
"Saran Resin" F310
Other Vinyl Solids, PVC:

☐ POLYVINYL ACETATE (SYNTHESIZED FROM VINYL CHLORIDE)

Vinac[R] B7, B15, B25, B100, B600, ASB516
Other:

☐ POLYVINYL ALCOHOL, FORMAL & BUTYRAL SOLUBLE IN OR CONTAINING PHENOL OR TOLUENE

Formvar[R] Series; UCC XYHL, XYSG, EDBC, EDBM
Other:

☐ VINYL CHLORIDE & VINYLIDENE CHLORIDE

"Polyco" Series; "Saran Latex" 143; Polidene[R] Series
Other:

☐ ACRYLIC SOLIDS SOLUBLE IN OR CONTAINING TOLUENE

Acryloid[R] B48N, B50, B66, B67, B72, B82
Other:

☐ ACRYLIC SOLUTIONS SOLUBLE IN OR CONTAINING TOLUENE

Conchemco 311-405, 311-120; Elvacite[R] 6011, 6012, 6013, 6014, 6016, 6024; G Cure[R] 867 RNF 60, 868 RWF 60, 869 RWF 50; Acryloid[R] A-21, A-21LV, B-44, B-48N, B-50, B-66, B-72, B-82, B-84, B-99, C-10LV
Other:

☐ STYRENE & VINYL TOLUENE SOLUBLE IN TOLUENE

Picolastic[R] FT, Bronze Vehicle
Other:

☐ OLEORESINOUS VARNISHES SOLUBLE IN OR CONTAINING PHENOL OR ETHYLBENZENE

Conchemco 385-003; Tenneco 2-12B; McCloskey 12825-54 END, 10424-55E, 11233-55END, 11325-60 END, 735-41E, 10917-54END, 1633-58E, 1625-60N; Syncon GS-2-60, 3024-65END, 1335-56E, 11150-51ND, 10731-46E, 10931-28E, 2211-46E, 820-50END; Kelvar[R] G-638-40E, G-681-50M Chempol[R] 15-2509, 15-2518; Maxvar[R] 2516, 2598; Syncon" Series, F-247, F-12L, Flora, RLC
Other Oleoresinous Varnishes Soluble in or Containing Phenol or Ethylbenzene

☐ SILICONES SOLUBLE IN OR CONTAINING TOLUENE OR NAPHTHALENE

UCC-R-12; Cargill 6106-60
Other:

☐ MALEIC SOLUTIONS SOLUBLE IN OR CONTAINING TOLUENE

Arochem[R] 520T; Syncon MA560T
Other:

☐ PHENOLIC RESINS

Arofene[R] Series; Amberol[R] ST-137, Super Beckacite[R] Series; Reichold (V) 29-000, 100, 400 Series:
UCC CK-1282, CK-1634;
BKR-2620, BKS-2315, BKSC-2455, BKS-2600, BLS-2700, BKS-2750; Amerol[R] ST-149; UCC "CK" Series, CKSB-2001; Pentalyn[R] Series; Nevillac[R] Series; "Synresol" Series; "Shanco" Series
Other Phenolic Resins:

☐ CELLULOSE RESINS SOLUBLE IN OR CONTAINING METHYL CHLORIDE OR TOLUENE

Eastman "CA" Series, CAB 381-0.1, CAB 381-0.5, CAB 381-20, CAB 451-1, CAP 482-0.5
Other:

☐ URETHANE RESINS SOLUBLE IN OR CONTAINING TOLUENE

"Spenkel" F78-50T, Spencer XP 1857; "Synresate" W83270 EX03; Spenlite[R] L61-301; Spencer DV "2000" Series
Other:

☐ MISCELLANEOUS SOLUBLE IN OR CONTAINING TOLUENE, METHYL CHLORIDE, OR TRICHLOROETHYLENE

Elvax[R] 40; "Vitez" PE207, PE207F, PE222, PE222F, PE307, PE307F, VPE5545A, VPE 5571A,; RCI 10-714
Other:

SOLVENTS

☐ BENZENE

Espesol[R] Benzene; Benzene (Nitration Grade)
"Benzol", "Cyclohexatriene"
Other:

☐ BENZENE AND TOLUENE MIXTURES:

Amsco "Solv'A, "Solv' A-80, "Solv' A-81, "Solv' A-100; Cyclosol[R] 27, 28; Espesol[R] 7200-A; Skelly SK-69
Other:

☐ TOLUENE

Espesol[R] 1° Toluene, 7200
Toluol; Methyl-Benzene; Methacide Phenylmethane; Toluonol
Other:

☐ TOLUENE & ETHYLBENZENE MIXTURES

Amsco Solv B; Cyclosol[R] 37
Other:

☐ ETHYLBENZENE

Espesol[R] Ethylbenzene; Amsco "Super Hi-Flash Naphtha"; Shell TS-288
Phenylethane
Other:

☐ ISOPHORONE

3-5-5-Trimethyl-2-Cyclohexen-1-One

☐ CARBON TETRACHLORIDE

Dow "Dowclene" EC; Methane Tetrachloride; Tetrachloromethane; Perchloromethane; Mecatorina; Benzinoform; "Necatorina"; "Benzinoform"

☐ CHLOROBENZENE

Monochloro-Benzene; Benzene-Chloride; Phenyl Chloride
Ashland Monochloro Benzene; Dow Monochloro Benzene
Other:

☐ 1,2,4 - TRICHLOROBENZENE

☐ 1,2 - DICHLOROETHANE

Ashland Ethylene Dichloride; Dow Ethylene Dichloride; Olin Ethylene Dichloride
Other:

☐ 1,1,1 - TRICHLOROETHANE

Methylchloroform; 1-1-1-TCE; Chlorothene; Vinyl Trichloride; 1-1-1-Trichloroethane; 1-1-2 Trichloroethane
Dow "Chlorothene" NCL
"Triethone"; "Genklene"

☐ 1,1,2 - TRICHLOROETHANE

SOLVENTS (Cont.)

☐ bis (2-CHLOROETHYL) ETHER

Dichloroethyl Ether

☐ CHLOROFORM

Trichloromethane

☐ 1,2 - DICHLOROBENZENE

O-Dichlorobenzene; P-Dichlorobenzene
Dow Orthodichloro Benzene

☐ 1,3 DICHLOROPROPYLENE

Propylene Dichloride

☐ METHYLENE CHLORIDE

Methane Dichloride; Dichloromethane; Methylene Bichloride; Methylene Dichloride
Ashland Perchloroethylene; Dow Perchloroethylene "Solaesthin"

☐ TRICHLOROETHYLENE

Trichloroethene; Ethinyl-Trichloride; Tri-Clene; Trielene; Trilene; Trichloran; Trichloren; Algylen; Trimar; Triline, Tri; Trethylen; Trethylene; Westrosol; Chlorylen; Gemalgene; Germalgen

Company Abbreviations Used

Alcan	- Aluminum Co. of Canada
Amsco	- Amsco Div. - Union Oil of California
APCI	- Air Products and Chemicals, Inc.
CSC	- Commercial Solvents Corp.
RCI	- Reichhold Chemicals Inc.
Reichhold (V)	- Varcum Chemical Division of Reichhold Chemicals
UCC	- Union Carbide Corp.

APPENDIX B

CROSS TABULATION

AGE OF PAINT MANUFACTURING FACILITIES

By

NUMBER OF EMPLOYEES

FREQUENCY FOR ALL QUESTIONS

FILE Paint (CREATION DATE = 12/24/77)

* CROSSTABULATION OF AVRGEMP BY PLANTAGE *

Number of Employees AVRGEMP	COUNT / ROW PCT / COL PCT / TOT PCT	PLANTAGE: AGE OF MANUFACTURING FACILITIES (Years) Over 30 F	20-30 E	10-20 D	5-10 C	3-5 B	Under 3 A	ROW TOTAL
Over 150		34	7	7	2	2	1	53
		64.2	13.2	13.2	3.8	3.8	1.9	4.0
		8.1	2.6	2.2	1.2	2.0	1.5	
		2.5	0.5	0.5	0.1	0.1	0.1	
101 to 150		20	12	10	4	2	3	51
		39.2	23.5	19.6	7.8	3.9	5.9	3.8
		4.8	4.5	3.2	2.4	2.0	4.5	
		1.5	0.9	0.7	0.3	0.1	0.2	
90 to 100		7	4	4	2	0	2	19
		36.8	21.1	21.1	10.5	0.0	10.5	1.4
		1.7	1.5	1.3	1.2	0.0	3.0	
		0.5	0.3	0.3	0.1	0.0	0.1	
81 to 90		9	6	1	3	0	0	19
		47.4	31.6	5.3	15.8	0.0	0.0	1.4
		2.1	2.2	0.3	1.8	0.0	0.0	
		0.7	0.4	0.1	0.2	0.0	0.0	
71 to 80		5	5	4	1	0	0	15
		33.3	33.3	26.7	6.7	0.0	0.0	1.1
		1.2	1.9	1.3	0.6	0.0	0.0	
		0.4	0.4	0.3	0.1	0.0	0.0	
61 to 70		12	5	5	4	4	0	30
		40.0	16.7	16.7	13.3	13.3	0.0	2.2
		2.9	1.9	1.6	2.4	3.9	0.0	
		0.9	0.4	0.4	0.3	0.3	0.0	
51 to 60		19	12	13	3	0	2	49
		38.8	24.5	26.5	6.1	0.0	4.1	3.7
		4.5	4.5	4.1	1.8	0.0	3.0	
		1.4	0.9	1.0	0.2	0.0	0.1	
	COLUMN TOTAL	420	267	317	167	102	66	1339
		31.4	19.9	23.7	12.5	7.6	4.9	100.0

(CONTINUED)

FREQUENCY FOR ALL QUESTIONS

FILE Paint (CREATION DATE = 12/28/77)

* * * * * * * * * * * * * * * * * * CROSSTABULATION OF AVRGEMP BY PLANTAGE * * *

PLANTAGE AGE OF MANUFACTURING FACILITIES (Years)

Number of Employees AVRGEMP	COUNT / ROW PCT / COL PCT / TOT PCT	Over 30 F	20 to 30 E	10 to 20 D	5 to 10 C	3 to 5 B	Under 3 A	ROW TOTAL
E		23	17	10	8	3	4	65
		35.4	26.2	15.4	12.3	4.6	6.2	4.9
41 to 50		5.5	6.4	3.2	4.8	2.9	6.1	
		1.7	1.3	0.7	0.6	0.2	0.3	
D		26	17	11	6	2	2	64
		40.6	26.6	17.2	9.4	3.1	3.1	4.8
31 to 40		6.2	6.4	3.5	3.6	2.0	3.0	
		1.9	1.3	0.8	0.4	0.1	0.1	
C		51	19	36	16	8	3	133
		38.3	14.3	27.1	12.0	6.0	2.3	9.9
21 to 30		12.1	7.1	11.4	9.6	7.8	4.5	
		3.8	1.4	2.7	1.2	0.6	0.2	
B		84	47	79	36	28	11	285
		29.5	16.5	27.7	12.6	9.8	3.9	21.3
		20.0	17.6	24.9	21.6	27.5	16.7	
10 to 20		6.3	3.5	5.9	2.7	2.1	0.8	
A		130	116	137	82	53	38	556
		23.4	20.9	24.6	14.7	9.5	6.8	41.5
		31.0	43.4	43.2	49.1	52.0	57.6	
Less than 10		9.7	8.7	10.2	6.1	4.0	2.8	
	COLUMN TOTAL	420	267	317	167	102	66	1339
		31.4	19.9	23.7	12.5	7.6	4.9	100.0

NUMBER OF MISSING OBSERVATIONS = 35

APPENDIX C

CROSS TABULATION

AMOUNT OF WATER USED TO

RINSE A PAINT TANK

BY

WATER PRESSURE OF RINSE WATER

BREAKDOWN

* * * * * * * * * * * * * * * * * * * C R O S S T A B U L A T I O N O F
WATRPRES WATER PRESSURE USED FOR TANK RINSING
* *

TNKSIZE1 TANKS UNDER 250 GALLONS

WATER USED PER TANK RINSING

WATRPRES (COUNT / ROW PCT / COL PCT / TOT PCT)	OVER 200 GALS D	101 TO 200 GALS C	61 TO 100 GAL B	0 TO 60 GALS A	ROW TOTAL
D OVER 150 PSI	0 0.0 0.0 0.0	0 0.0 0.0 0.0	0 0.0 0.0 0.0	22 100.0 3.1 3.1	22 3.1
C 101 TO 150 PSI	0 0.0 0.0 0.0	0 0.0 0.0 0.0	2 11.1 16.7 0.3	16 88.9 2.3 2.2	18 2.5
B 50 TO 100 PSI	0 0.0 0.0 0.0	0 0.0 0.0 0.0	5 2.8 41.7 0.7	175 97.2 24.9 24.3	180 25.0
A LESS THAN 50 P	1 0.2 100.0 0.1	3 0.6 100.0 0.4	5 1.0 41.7 0.7	491 98.2 69.7 68.2	500 69.4
COLUMN TOTAL	1 0.1	3 0.4	12 1.7	704 97.8	720 100.0

TNKSIZE2 TANKS 251 - 500 GALLONS

WATER USED PER TANK RINSING

WATRPRES (COUNT / ROW PCT / COL PCT / TOT PCT)	OVER 200 GALS D	101 TO 200 GALS C	61 TO 100 GAL B	0 TO 60 GALS A	ROW TOTAL
D OVER 150 PSI	0 0.0 0.0 0.0	0 0.0 0.0 0.0	0 0.0 0.0 0.0	17 100.0 4.2 3.7	17 3.7
C 101 TO 150 PSI	0 0.0 0.0 0.0	0 0.0 0.0 0.0	3 20.0 9.4 0.7	12 80.0 2.9 2.6	15 3.3
B 50 TO 100 PSI	2 1.3 50.0 0.4	4 2.6 44.4 0.9	12 7.9 37.5 2.6	134 88.2 32.8 29.5	152 33.5
A LESS THAN 50 P	2 0.7 50.0 0.4	5 1.9 55.6 1.1	17 6.3 53.1 3.7	246 91.1 60.1 54.2	270 59.5
COLUMN TOTAL	4 0.9	9 2.0	32 7.0	409 90.1	454 100.0

BREAKDOWN

* C R O S S T A B U L A T I O N O F

WATRPRES WATER PRESSURE USED FOR TANK RINSING

* *

TNKSIZE3 TANKS 501 - 1000 GALLONS

WATER USED PER TANK RINSING

WATRPRES	COUNT / ROW PCT / COL PCT / TOT PCT	OVER 200 GALS D	101 TO 200 GALS C	61 TO 100 GAL B	0 TO 60 GALS A	ROW TOTAL
D OVER 150 PSI	COUNT	4	0	4	7	15
	ROW PCT	26.7	0.0	26.7	46.7	4.8
	COL PCT	33.3	0.0	9.3	2.8	
	TOT PCT	1.3	0.0	1.3	2.3	
C 101 TO 150 PSI	COUNT	0	0	5	8	13
	ROW PCT	0.0	0.0	38.5	61.5	4.2
	COL PCT	0.0	0.0	11.6	3.2	
	TOT PCT	0.0	0.0	1.6	2.6	
B 50 TO 100 PSI	COUNT	5	2	17	98	122
	ROW PCT	4.1	1.6	13.9	80.3	39.2
	COL PCT	41.7	22.2	39.5	39.7	
	TOT PCT	1.6	0.6	5.5	31.5	
A LESS THAN 50 P	COUNT	3	7	17	134	161
	ROW PCT	1.9	4.3	10.6	83.2	51.8
	COL PCT	25.0	77.8	39.5	54.3	
	TOT PCT	1.0	2.3	5.5	43.1	
COLUMN TOTAL		12	9	43	247	311
		3.9	2.9	13.8	79.4	100.0

TNKSIZE4 TANKS 1000 - 1500 GALLONS

WATER USED PER TANK RINSING

WATRPRES	COUNT / ROW PCT / COL PCT / TOT PCT	OVER 200 GALS D	101 TO 200 GALS C	61 TO 100 GAL B	0 TO 60 GALS A	ROW TOTAL
D OVER 150 PSI	COUNT	2	0	2	4	8
	ROW PCT	25.0	0.0	25.0	50.0	4.7
	COL PCT	25.0	0.0	5.1	3.7	
	TOT PCT	1.2	0.0	1.2	2.3	
C 101 TO 150 PSI	COUNT	1	2	1	3	7
	ROW PCT	14.3	28.6	14.3	42.9	4.1
	COL PCT	12.5	11.8	2.6	2.8	
	TOT PCT	0.6	1.2	0.6	1.7	
B 50 TO 100 PSI	COUNT	4	7	19	56	86
	ROW PCT	4.7	8.1	22.1	65.1	50.0
	COL PCT	50.0	41.2	48.7	51.9	
	TOT PCT	2.3	4.1	11.0	32.6	
A LESS THAN 50 P	COUNT	1	8	17	45	71
	ROW PCT	1.4	11.3	23.9	63.4	41.3
	COL PCT	12.5	47.1	43.6	41.7	
	TOT PCT	0.6	4.7	9.9	26.2	
COLUMN TOTAL		8	17	39	108	172
		4.7	9.9	22.7	62.8	100.0

BREAKDOWN

C R O S S T A B U L A T I O N O F

WATRPRES WATER PRESSURE USED FOR TANK RINSING

TNKSIZE6 TANKS 2501 - 6000 GALLONS

WATER USED PER TANK RINSING

WATRPRES	COUNT / ROW PCT / COL PCT / TOT PCT	OVER 200 GALS D	101 TO 200 GALS C	61 TO 100 GAL B	0 TO 60 GALS A	ROW TOTAL
D OVER 150 PSI	COUNT	1	2	3	2	8
	ROW PCT	12.5	25.0	37.5	25.0	8.0
	COL PCT	6.3	10.5	11.1	5.3	
	TOT PCT	1.0	2.0	3.0	2.0	
C 101 TO 150 PSI	COUNT	1	1	4	0	6
	ROW PCT	16.7	16.7	66.7	0.0	6.0
	COL PCT	6.3	5.3	14.8	0.0	
	TOT PCT	1.0	1.0	4.0	0.0	
B 50 TO 100 PSI	COUNT	10	12	11	25	58
	ROW PCT	17.2	20.7	19.0	43.1	58.0
	COL PCT	62.5	63.2	40.7	65.8	
	TOT PCT	10.0	12.0	11.0	25.0	
A LESS THAN 50 P	COUNT	4	4	9	11	28
	ROW PCT	14.3	14.3	32.1	39.3	28.0
	COL PCT	25.0	21.1	33.3	28.9	
	TOT PCT	4.0	4.0	9.0	11.0	
COLUMN TOTAL		16	19	27	38	100
		16.0	19.0	27.0	38.0	100.0

TNKSIZE5 TANKS 1501 - 2500 GALLONS

WATER USED PER TANK RINSING

WATRPRES	COUNT / ROW PCT / COL PCT / TOT PCT	OVER 200 GALS D	101 TO 200 GALS C	61 TO 100 GAL B	0 TO 60 GALS A	ROW TOTAL
D OVER 150 PSI	COUNT	3	1	3	4	11
	ROW PCT	27.3	9.1	27.3	36.4	7.1
	COL PCT	16.7	5.9	8.6	4.7	
	TOT PCT	1.9	0.6	1.9	2.6	
C 101 TO 150 PSI	COUNT	1	0	6	1	8
	ROW PCT	12.5	0.0	75.0	12.5	5.2
	COL PCT	5.6	0.0	17.1	1.2	
	TOT PCT	0.6	0.0	3.9	0.6	
B 50 TO 100 PSI	COUNT	6	9	15	45	75
	ROW PCT	8.0	12.0	20.0	60.0	48.4
	COL PCT	33.3	52.9	42.9	52.9	
	TOT PCT	3.9	5.8	9.7	29.0	
A LESS THAN 50 P	COUNT	8	7	11	35	61
	ROW PCT	13.1	11.5	18.0	57.4	39.4
	COL PCT	44.4	41.2	31.4	41.2	
	TOT PCT	5.2	4.5	7.1	22.6	
COLUMN TOTAL		18	17	35	85	155
		11.6	11.0	22.6	54.8	100.0

CROSSTABULATION OF

WATRPRES WATER PRESSURE USED FOR TANK RINSING

TNKSIZE7 TANKS OVER 6000 GALLONS

WATER USED PER TANK RINSING

WATRPRES	COUNT / ROW PCT / COL PCT / TOT PCT	OVER 200 GALS D	101 TO 200 GALS C	61 TO 100 GAL B	0 TO 60 GALS A	ROW TOTAL
D OVER 150 PSI		2	0	0	2	4
		50.0	0.0	0.0	50.0	12.5
		50.0	0.0	0.0	10.5	
		6.3	0.0	0.0	6.3	
C 101 TO 150 PSI		0	1	0	1	2
		0.0	50.0	0.0	50.0	6.3
		0.0	25.0	0.0	5.3	
		0.0	3.1	0.0	3.1	
B 50 TO 100 PSI		2	3	2	8	15
		13.3	20.0	13.3	53.3	46.9
		50.0	75.0	40.0	42.1	
		6.3	9.4	6.3	25.0	
A LESS THAN 50 P		0	0	3	8	11
		0.0	0.0	27.3	72.7	34.4
		0.0	0.0	60.0	42.1	
		0.0	0.0	9.4	25.0	
	COLUMN TOTAL	4	4	5	19	32
		12.5	12.5	15.6	59.4	100.0

APPENDIX D

PROCEDURES FOR METALS ANALYSIS BY INDUCTIVELY COUPLED ARGON PLASMA

Determination of Total Metals in Water
and Wastewaters by Plasma Spectrometry
CRL Method Nos. 504-570

Scope and Application

This procedure is applicable to the determination of calcium, magnesium, sodium, potassium, aluminum, barium, berylium, boron, cadmium, chromium, cobalt , copper, lead, manganese, molybdenum, nickel, silver, thallium, tin, titanium, vanadium, ytrium and zinc in water and industrial municipal wastewaters.

Summary of Method

The sample is digested with 8 N nitric acid to near dryness followed by additional heating with HCl to solubilize transition and noble metals. The sample is cooled, diluted to 50 ml and analyzed using Inductively Coupled Argon Plasma Atomic Emission Spectrometry (ICAP). The alkali metals concentrations are expressed in milligrams per liter, whereas concentrations for other metals are expressed in micrograms per liter. Twenty-two metals are routinely analyzed.

Equipment

Jarrell Ash Atomcomp 750. Inductively coupled argon plasma emission spectrometer consisting of:

a. RF generator

b. Plasma housing

   1. Water-cooled induction coil
   2. Quartz torch
   3. Cross-flow nebulizer
   4. Spray chamber

c. Direct reading spectrometer

   1. Entrance slit
   2. Refractor plate at entrance slit
   3. Grating
   4. Exit slits
   5. Phototubes.

d. Computer for instrument control

e. Data output device.

300 ml tall form beakers
Mettler PR 700 Balance
Corning Hot Plates

Reagents, Water, Glassware and Standards

Redistilled Nitric Acid (1:1-8 Normal).
Hydrochloric Acid (1:1), Reagent Grade.

Glassware: Beakers for digestion, after being run through diswasher, are rinsed with distilled water and placed in an aqua regia bath for at least two hours. They are then rinsed thoroughly and allowed to air dry. The chemist performing the digestion will select his or her beakers and give each a hot acid wash by following then with 1:1 HCl and placing on the hot plate for at least one half hour.

The laboratory distilled water is passed through an ultrapure mixed-bed resin column before use. All water used unless otherwise stated, has been passed through the mixed-bed resin (Super Q Water).
Standards: All standards are diluted from Fisher 1000 ppm Atomic Absorption standards with the exception of silver and beryllium (varian) and Yytrium (made from ytrium nitrate (Y(N03)3).
Standards used for the ICAP Calibration Procedure

- S000: Mixed-bed resin water (super Q water)
- S001: One ppm in all elements except silver and calcium
- AGCA: 1 ppm silver and 10 ppm calcium, made fresh daily.
- 1000: 1000 ppm calcium (Fisher)
- XXXX: 1000 ppm iron (Fisher), FFFA matrix only.

Procedure

1. A designated aliquot (usually 50 ml) of well-shaken and preserved sample (pH<2) is poured off into a 300 ml tall-form beaker. Normal procedure is to place the beaker on an automatic-tare balance and deliver 50 g - drawing off excess with a disposable pipet. (This procedure assumes the sample is of sufficiently low concentration that the specific gravity is not appreciably greater than one. The purpose of a mass determination rather than a volume one is to eliminate cross-contamination). After the addition of 6 ml of 8N redistilled HNO3, to the sample a ribbed beaker cover is placed on the beaker and the sample is heated to near dryness. (The sample is not taken to complete dryness to avoid the loss of boron). If the residue is dark colored after cooling, an additional 6 ml of 8N HN03 is added and the sample is reheated. This process is continued until no color change is detected.

2. Following the digestion, 5 ml of 1:1 HCl is added and the residue is dissolved and/or placed in suspension by warming on a hot plate. After cooling, the sample is transferred to a pre-tared 2 ounce polyethylene bottle and diluted up to 50 g. If some solids remain undissolved, the sample is filtered into a 50 ml volumetric and then transferred to a polyethylene bottle for subsequent analysis.

3. Operating Conditions

a.	Incident RF power	1.1 kw
b.	Reflected RF power	mimimized (<10 w)
c.	Plasma observation height	15 mm above load coil
d.	Horizontal observation position...center	
e.	Aspiration Argon flow rate	0.6 L/min
f.	Plasma Argon flow rate	22 L/min

4. ICAP Standardization Procedure and Sample Analysis.

Following startup, the instrument is profiled with the mercury monitor. The micrometer reading is recorded on the sheet with the interelement correction values for the day.

The matrix is brought onto core and time and date established. The available matrices are:

CCAS: correction for calcium
FEAS: correction for calcium and iron
KIAS: correction for calcium and iron and outputs potassium.

The Q-string QEGGGAB is set for standization. This string of commands will erase the burn buffers, execute three burns, average them, and print the average on the teletype.

(It has been found that examining the standards in background mode allows a better judgement of the noise in a given channel).

5. The standards cited above are run. Once it has been verified that the standards check, the values for interelement correction for iron and calcium are recorded and entered via the data base manager. In actual operation it is possible that these may vary only slightly (5%) from day to day, in which case they need not be entered.

Upon return to the operating system, the matrix is recalled and the blank and 1 ppm standard are checked. If these remain with in standardzation, an instrument AQC solution is measured. This AQC solution is simply the waste from the drain of the nebulizer, collected and held until it is deemed stable. The values for this solution are recorded in a log book and compared with previous values. This is a check for gross operator error during standardzation.

6. Once these criteria have been satisfied, the instrument is ready to run samples. The blank and 1 ppm standard should be checked every 30-45 min to establish that the instrument has not drifted. The blank should also be checked if values above detection limits are found for the field blanks or digested laboratory blanks.

7. Samples are aspirated for 45 seconds before executing the Q string QEGC which perform a single burn followed by output in concentration mode which includes interelement corrections. Longer flush times, may be desired for samples which follow high (>500 ppm) iron samples or high (>1000 ppm) sodium samples. No other elements have been encountered in sufficient quantities in real samples to result in noticeable memory effects.

8. Duplicates and spikes should be checked against the corresponding samples before continuing. This is to establish whether deviations occur in the digestion or measurement of samples on the ICAP. If it is found that the digestion is not at fault, restandardization on the ICAP is recommended.

9. Samples at high levels are routinely diluted 10-fold to determine if results for all elements are valid or the result of intererence not accounted for by the matrix IECC's.

The paper tape from the teletype is read into the DG NOVA and the report plus QC check is performed by programs written in BASIC.

Quality Control

Four types of quality control samples are put through the digestion process at the same time as the samples. In a typical run of forty samples there are in addition, four blanks, 4 AQC solutions, 2 duplicates, 2 spikes.

1. Blanks: These are simply the laboratory super Q water carried through the same digestion process as the samples. The blank data is summarized periodically and is used to determine detection limits for the method (average and 2 standard deviations).

2. AQC Solutions: A series of solutions were made to cover the ranges measured for each parameter. These were arranged in Youden pairs approximately as follows: 10 ppm - 8 ppm; 1 ppm - 800 ppb; 100 ppb - 80 ppb. Two pairs of these solutions are digested as part of the run. This is separate from the instrument AQC and calibration procedure mentioned earlier.

3. Duplicates: Two samples are chosen to be analyzed as duplicates are carried through the digestion process. The results for these are expected to be within 10% of each other for each element, for concentrations in the working range (blank one + 10 standard deviations).

4. Spikes: Two samples are chosen to be analyzed as spikes. A table of spike concentrations in terms of final concentrations is formulated Spike recoveries are determined if the sample is less than 200% of the added spike.

Routine Maintainance

Following four days of operation the torch and nebulization spray chamber should be acid washed. Before the torch is removed and after it is replaced, statistical programs are run to determine the standard deviation of all the lines when aspirating blank water. Dark currents are also examined in this manner. A reading of the profile meter is taken for each element both before and after cleaning while aspirating both blank water and the 1 ppm standard. When the torch is replaced, coarse alignment is made using a 1000 ppm yttrium standard to center the image on the slit. Fine adjustment of the mirror is made by maximizing the signal to noise ratio on the lead line.

Once a month, statistical programs are run to maintain an historical record of intensities obtained on each line for the series of standards.

Calculations

These are done by the computer program (written in basic) including insertion of dilution factors to give results in mg/l for calcium, magnesium and sodium and ug/l for the other metals.

Reference

1. Manual of "Methods for Chemical Analysis of Water and Wastes", U.S. Environmental Protection Agency, Office of Technology Transfer, 1974, Washington, DC, pp 78-155.

2. "Simultaneous Multielement Analysis of Liquid Samples by Inductively Coupled Argon Plasma Atomic - Emission spectroscopy", U.S. Environmental Protection Agency. Region V, Central Regional Laboratory, Chicago, Illinois, (unpublished).

	Name	λ in nm		Name	λ in nm
Ag	Silver	328.1	Mg	Magnesium	279.6
Al	Aluminum	396.2	Mn	Manganese	257.6
B	Boron	249.7	Mo	Molybdenum	203.8
Ba	Barium	233.5	Ni	Nickel	341.5
Ca(1)	Calcium	393.4	Pb	Lead	220.3
Ca(2)	Calcium	364.4			
Cd	Cadmium	226.5	Sn	Tin	190.0
Co	Cobalt	238.9	Ti	Titanium	334.7
Cr	Chromium	267.7	V	Vanadium	309.3
Cu	Copper	324.8	Y	Yttrium	417.8
Fe	Iron	259.5	Zn	Zinc	213.9

ELEMENT LIST AND ANALYTICAL LINES

TABLE I

A list of the elements currently analyzed by the CRL ICAP-AES instrument and the emission line chosen for each element.

	D.L. µg/l	LQD µg/l		D.L. µg/l	LQD µg/l
Ag	4	20	Mg	<0.5	1
Al	7	35	Mn	1	5
B	3	15	Mo	5	25
Ba	1	5	Ni	15	75
Ca	<0.5	1	Pb	12	60
Cd	2	10	Sn	12	60
Co	4	20	Ti	1	5
Cr	1	5	V	1	5
Cu	1	5	Y	~1	5
Fe	2	10	Zn	1	5

*Five Runs over Three Months

MEAN* DETECTION LIMITS

AND LOWEST QUANTITATIVELY DETERMINABLE CONCENTRATIONS (LQD)

TABLE 2

The detection limit (D.L.) is the amount of material that will produce a signal that is twice as large as the standard deviation of the noise. The lowest quantitative determinable concentration (LQD) is 5 times the D.L. and is the lowest concentration one can expect to report.

APPENDIX E

LIST OF PRIORITY POLLUTANTS

APPENDIX E

List of 129 Priority Pollutants

Compound Name

1. *acenaphthene

2. *acrolein

3. *acrylonitrile

4. *benzene

5. *benzidine

6. *carbon tetrachloride (tetrachloromethane)

*Chlorinated benezenes (other than dichlorobenzenes)

7. chlorobenezene

8. 1,2,4-trichlorobenzene

9. hexachlorobenzene

*Chlorinated ethanes (including 1,2-dichloroethane, 1,1,1-trichloroethane and hexachloroethane)

10. 1,2-dichloroethane

11. 1,1,1-trichloroethane

12. hexachloroethane

13. 1,1-dichloroethane

14. 1,1,2-trichloroethane

15. 1,1,2,2-tetrachloroethane

16. chloroethane

*Chloroalkyl ethers (chloromethyl, chloroethyl and mixed ethers)

17. bis(chloromethyl) ether

*Specific compounds and chemical classes as listed in the consent degree.

18. bis(2-chloroethly) ether

19. 2-chloroethyl vinyl ether (mixed)

*Chlorinated naphtalene

20. 2-chloronaphthalene

*Chlorinated phenols (other than those listed elsewhere; includes trichlorophenols and chlorinated cresols)

21. 2,4,6-trichlorophenol

22. parachlorometa cresol

23. *chloroform (trichloromethane)

24. *2-chlorophenol

*Dichlorobenzenes

25. 1,2-dichlorobenzene

26. 1,3-dichlorobenzene

27. 1,4-dichlorobenzene

*Dichlorobenzidine

28. 3,3'-dichlorobenzidine

*Dichloroethylenes (1,1-dichloroethylene and 1,2-dichloroethylene)

29. 1,1-dichloroethylene

30. 1,2-trans-dichloroethylene

31. *2,4-dichlorophenol

*Dichloropropane and dichloropropene

32. 1,2-dichloropropane

33. 1,2-dichloropropylene (1,3-dichloropropene)

34. *2,4-dimethylphenol

*Dinitrotoluene

35. 2,4-dinitrotoluene

36. 2,6,-dinitrotoluene

37. *1,2-diphenylhydrazine

38. *ethylbenzene

39. *fluoranthene

*Haloethers (other than those listed elsewhere)

40. 4-chlorophenyl phenyl ether

41. 4-bromophenyl phenyl ether

42. bis(2-chloroisopropyl) ether

43. bis(2-chloroethoxy) methane

*Halomethanes (other than those listed elsewhere)

44. methylene chloride (dichloromethane)

45. methyl chloride (chloromethane)

46. methyl bromide (bromomethane)

47. bromoform (tribromomethane)

48. dichlorobromomethane

49. trichlorofluoromethane

50. dichlorodifluoromethane

51. chlorodibromomethane

52. *hexachlorobutadiene

53. *hexachlorocyclopentadiene

54. *isophorone

55. *naphthalene

56. *nitrobenzene

*Nitrophenols (including 2,4-dinitrophenol and dinitrocresol)

57. 2-nitrophenol

58. 4-nitrophenol

59. *2,4-dinitrophenol

60. 4,6-dinitro-o-cresol

*Nitrosamines

61. N-nitrosodimethylamine

62. N-nitrosodiphenylamine

63. N-nitrosodi-n-propylamine

64. *pentachlorophenol

65. *phenol

*Phthalate esters

66. bis(2-ethylhexyl) phthalate

67. butyl benzyl phthalate

68. di-n-butyl phthalate

69. di-n-octyl phthalate

70. diethyl phthalate

71. dimethyl phthalate

*Polynuclear aromatic hydracarbons

72. benzo(a)anthracene (1,2-benzanthracene)

73. benzo (a) pyrene (3,4-benzopyrene)

74. 3,4-benzofluoranthene

75. benzo(k)fluoranthane (11,12-benzofluoranthene)

76. chrysene

77. acenaphthylene

78 anthracene

79. benzo(ghi)perylene (1,12-benzoperylene)

80. fluroene

81. phenathrene

82. dibenzo (a,h)anthracene (1,2,5,6-dibenzanthracene)

83. indeno (1,2,3-cd)pyrene (2,3-o-phenylenepyrene)

84. pyrene

85. *tetrachloroethylene

86. *toluene

87. *trichloroethylene

88. *vinyl chloride (chloroethylene)

<u>Pesticides and Metabolites</u>

89. *aldrin

90. *dieldrin

91. *chlordane (technical mixture & metabolites)

<u>*DDT and metabolites</u>

92. 4,4'-DDT

93. 4,4'-DDE (p,p'-DDX)

94. 4,4'-DDD (p,p'-TDE)

*endosulfan and metabolites

95. a-endosulfan-Alpha

96. b-endosulfan-Beta

97. endosulfan sulfate

*endrin and metabolites

98. endrin

99. endrin aldehyde

*heptachlor and metabolites

100. heptachlor

101. heptachlor epoxide

*hexachlorocyclohexane (all isomers)

102. a-BHC-Alpha

103. b-BHC-Beta

104. r-BHC (lindane)-Gamma

105. g-BHC-Delta

*polychlorinated biphenyls (PCB's)

106. PCB-1242 (Arochlor 1242)

107. PCB-1254 (Arochlor 1254)

108. PCB-1221 (Arochlor 1221)

109. PCB-1232 (Arochlor 1232)

110. PCB-1248 (Arochlor 1248)

111. PCB-1260 (Arochlor 1260)

112. PCB-1016 (Arochlor 1016)

113. *Toxaphene

114. *Antimony (Total

115. *Arsenic (Total)

116. *Asbestos (Fibrous)

117. *Beryllium (Total)

118. *Cadmium (Total)

119. *Chromium (Total)

120. *Copper (Total)

121. *Cyanide (Total)

122. *Lead (Total)

123. *Mercury (Total)

124. *Nickel (Total)

125. *Selenium (Total)

126. *Silver (Total)

127. *Thallium (Total)

128. *Zinc (Total)

129. **2,3,7,8 - tetrachlorodibenzo-p-dioxin (TCDD)

*Specific compounds and chemical classes as listed in the consent degree.

**This compound was specifically listed in the consent degree. Because of the extreme toxicity (TCDD). We are recommending that laboratories <u>not</u> acquire analytical standard for this compound.

APPENDIX F

SAMPLING PROCEDURES

SAMPLING PROCEDURES

Following the selection of sampling sites, final preparations were made for the field activities. The sampling protocol developed by EPA (Draft EPA Sampling Protocol for Measurement of Toxics, October 1976) was used as a basis for sample collection. However, due to the nature of wastewater treatment at the sites selected, some modifications to the EPA protocol were required. These modifications, which were approved by the Project Officer, are described below. Additionally, all samples analyzed for toxic substances were run in accordance with EPA Draft Analytical Protocol for the Measurement of Toxic Substances, October 1976.

Protocol Modifications

The protocol developed for priority pollutant sampling recommends the collection of composite samples. Since most paint process wastewater is collected over a period of time for batch treatment, the recommended composite sampling method was not necessary. Consequently, grab samples were taken at the majority of the sampling plants. At the remaining plants, composite samples were taken since the wastewater streams were either continuous or semicontinuous.

Beside the collection of grab samples, some modifications of the protocol's sample preservation methods were required. In order to correlate the data between this sampling program and the one conducted during the 1976 study, the preservation method recommended in the protocol for the phenol fraction was changed. The protocol shows phosphoric or sulfuric acid alone being used for phenol sample preservation. For the 1976 study, samples were preserved in accordance with the guidelines established under section 304g of the Act (Methods for Chemical Analysis of Water and Wastes, U.S. EPA, Monitoring and Support Laboratory, 1974). Specifically, the phenol fractions were preserved with copper sulfate plus phosphoric acid. To maintain uniformity, copper sulfate and phosphoric acid were also used to preserve phenol samples collected during the 1977 sampling program.

An additional variation related to the protocol required precautions against the presence of residual chlorine in samples. Sample fractions collected during the 1977 sampling program were not checked for residual chlorine in the field. This procedure was deemed unnecessary because all of the plants sampled discharge to publicly owned treatment works precluding the need for effluent chlorination. This fact was verified in the field by the sampling teams.

Sample Collection

Table F-1 summarizes the samples taken during the 1977 sampling program. The five possible sampling points at each plant were as follows:

(1) Intake Water or Plant water supply: These samples were collected and analyzed to obtain background measurements.

(2) Untreated wastewater: Process wastewater (tank and equipment cleaning wastewater) collected before treatment. In the batch treatment operations, the wastewater collected in the treatment tank was mixed to insure a representative sample for the collection period. The length of the collection period ranged from a few hours to over a week, depending upon each plant's production schedule. At the two plants that did not have batch treatment, composite samples were taken of the untreated wastewater as it flowed into the treatment system.

(3) Treated wastewater: Sampled at the end of the plant's normal treatment and settling period, usually the following day. The samples were taken immediately before or, as the supernatant was being discharged to the sewer.

(4) Sludge: Sampled, if available, and if the consistancy was sufficiently fluid to allow analysis.

(5) Sampler Blanks: Deionized water was run through the automatic samplers used when taking composite samples. This was done to ascertain the amount of hydrocarbon contamination introduced by the sampler tubing.

At a majority of plants, more than one treatment batch was sampled to account for possible variability in wastewater composition. After the samples were taken, they were properly labeled, packed in ice, and shipped to the appropriate laboratories for analyses. The samples were shipped by air freight and received at the labs within 24 hours after sampling. A chain of custody form, signed by the samplers, accompanied each set of samples back to the labs.

Sampling Teams

For each sampling plant, a two-man team collected the appropriate samples. During the initial visit to a plant, the engineer would determine the location of sampling points and set up the sampling schedule with the plant representative.

Inventory of Sampling Points

Table F-2 presents pertinent information regarding each sample taken during the 1977 study.

TABLE F-1

NUMBER OF SAMPLES TAKEN AT EACH SAMPLE POINT

Plant	Type of Treatment	Type of Sample Taken	Wastewater Intake	Wastewater Untreated	Wastewater Treated	Sludge	Lagoon	Sampler Blank
1	PC	Grab	1	3	3			
2	PC	Grab	1	4	3	3		
3	PC	Grab	1	3	3	3		
4	PC	Grab	1	3	3	3		
5	PC	Grab	1	4	3	3		
6	PC	Grab	1	3	3	3		
8	PC	Grab	1	3	3	3		
9	PC	Grab	1	3	3	3		
11	GS	Grab	1	1				
12	Neut	Grab	1	1				
13	PC	Grab	1	3	3	3		
14	PC	Grab	1	2	2	2		
15	PC	Composite	1	3	3			2
16	PC	Grab	1	1				
17	PC	Composite	1	3	3			2
18	PC	Grab	1	3	3	1		
20	PC	Grab	1	3	3	2		
24	PC	Grab	1	3	3	1		
25	PC	Grab	1	2	2			
26	PC	Grab	1	1	1	1		
27	PC	Grab	1	1	1	1	1	
28	PC	Grab	1	1				
Total			22	54	48	32	1	4

PC - physical/chemical
Neut - neutralization
GS - gravity separation

TABLE F-2

1977-1978 Inventory of Sample Points
Paint/Ink Industry

Part A: Burns and Roe/Richardson Associates Sampling Program

B&R Code	EHRA Code	Sampling Date	Airbill to Carborundum	Personnel B&R	Present EHRA	Ship Date/AB# to Richardson	Data Rec'd Date	Remarks
1-1-R	5-A-002	9/14/77	EWR 3321297	P.S.,M.S.	T.D.,A.C.	Hand Carried	Note: All Classical Data Rec'd by 2/24/78 All Priority Pollutant and Metals Data Received by 11/1/78	B&R Code not assigned to fraction bottles
1-1-I	5-A-001	9/14/77	"	P.S.,M.S.	T.D.,A.C.	"		
1-1-T	5-B-016	9/27/77	PHL 4074075	H.C.	E.H.	Hand Carried		Tank clogged-treated water in tank 2 wks.
1-2-R	5-L-001	10/25/77		M.S.	L.W.	Hand Carried		
1-2-T	5-L-002	10/26/77		M.S.	L.W.	Hand Carried		
1-3-R	5-L-004	11/3/77		M.S.	L.W.	Hand Carried		
1-3-T	5-H-008	11/7/77		P.S.	A.C.	Hand Carried		
2-1-R	5-G-016	9/21/77	ORD 4472043	M.S.	B.E.	ORD 4472044		
2-1-I	5-G-017	9/21/77	ORD 4472043	M.S.	B.E.	ORD 4472044		
2-1-T	5-G-021	9/22/77	ORD 4486391	M.S.	B.E.	ORD 88212913		
2-1-S	5-G-022	9/22/77	ORD 4486391	M.S.	B.E.	ORD 88212913		
2-2-R	5-G-023	9/23/77		M.S.				No treated taken- batch released before sampling
2-3-R	5-F-024	9/26/77		P.S.,M.S.		ORD 89328245		
2-3-T	5-F-025	9/27/77		M.S.		ORD 88213753		
2-3-S	5-F-026	9/27/77		M.S.		ORD 88213753		
2-4-R	5-F-067	11/9/77		M.S.		ORD 89256204		
2-4-T	5-F-068	11/10/77			E.K.	ORD 46765121		
2-4-S	5-F-069	11/10/77			E.K.	ORD 46765121		
3-1-R	5-F-001	9/19/77		P.S.,M.S.	E.K.,B.E.			
3-1-T	5-F-002	9/19/77		P.S.,M.S.	E.K.,B.E.			
3-1-I	5-F-003	9/19/77		P.S.,M.S.	E.K.,B.E.			
3-1-S	5-F-004	9/19/77		P.S.,M.S.	E.K.,B.E.			
3-2-R	5-G-018	9/21/77		M.S.	B.E.	ORD 4472044		
3-2-T	5-G-019	9/21/77		M.S.	B.E.	ORD 4472044		
3-2-S	5-G-020	9/21/77		M.S.	B.E.	ORD 4472044		
3-3-R	5-F-027	9/27/77		M.S.		ORD 88213753		
3-3-T	5-F-028	9/27/77		M.S.		ORD 88213753		
3-3-S	5-F-029	9/27/77		M.S.		ORD 88213753		
4-1-R	5-F-005	9/20/77		P.S.,M.S.	E.K.,B.E.			
4-1-I	5-F-006	9/20/77		P.S.,M.S.	E.K.,B.E.			
4-1-T	5-G-008	9/21/77	ORD 4472043	P.S.,M.S.	B.E.	ORD 4472044		
4-1-S	5-G-007	9/21/77		P.S.,M.S.	B.E.	ORD 4472044		
4-2-R	5-F-030	9/27/77		M.S.		ORD 88213753		
4-2-T	5-F-031	9/28/77		M.S.		ORD 89328282		
4-2-S	5-F-032	9/28/77		M.S.		ORD 89328282		
4-3-R	5-F-036	9/28/77		M.S.	E.K.	ORD 88213915		
4-3-T	5-F-037	9/29/77		M.S.	E.K.	ORD 48304255		
4-3-S	5-F-038	9/20/77		M.S.	E.K.	ORD 48304255		
5-1-R	5-F-009	9/21/77	MKE 2647099		E.K.	MKE 2647098		
5-1-I	5-F-010	9/21/77	MKE 2647099		E.K.	MKE 2647098		
5-1-T	5-F-011	9/22/77	MKE 2650103		E.K.	MKE 41466972		
5-1-S	5-F-012	9/22/77			E.K.	MKE 41466972		
5-2-R	5-F-013	9/22/77			E.K.	MKE 2650103		Treatment didn't work, released as sludge
5-3-R	5-F-033	9/27/77			E.K.	MKE 45183526		
5-3-T	5-F-034	9/28/77		P.S.	E.K.	MKE 45163366		
5-3-S	5-F-035	9/28/77		P.S.	E.K.	MKE 45163366		
5-3-R*	5-F-060	11/8/77		M.S.,T.F.	E.K.	MKE 48913410		*Fractions should be assigned 5-4-R,T,S, not 5-3-R,T,S
5-3-T*	5-F-063	11/9/77		T.F.	E.K.	ORD 89256204		
5-3-S*	5-F-064	11/9/77		T.F.	E.K.	ORD 89256204		
6-1-R	5-G-040	9/27/77	ORD 4474418	P.S.	B.E.	ORD 88213720		
6-1-I	5-G-039	9/27/77	ORD 4474418	P.S.	B.E.	ORD 88213720		
6-1-T	5-G-041	9/27/77	ORD 4474418	P.S.	B.E.	ORD 88213720		
6-1-S	5-G-042	9/27/77		P.S.	B.E.	ORD 88213720		
6-2-R	5-G-043	9/28/77		P.S.	B.E.	ORD 88213915		Treatment done twice
6-2-T	5-G-044	9/29/77		P.S.	B.E.	ORD 48304255		
6-2-S	5-G-045	9/29/77		P.S.	B.E.	ORD 48304255		
6-3-R	5-G-046	9/29/77		P.S.	B.E.	ORD 48304255		
6-3-T	5-G-047	9/29/77			B.E.,E.K.	ORD 48304255		
6-3-S	5-G-048	9/29/77			B.E.,E.K.	ORD 48304255		
7-1-R	5-G-049	9/29/77		P.S.,M.S.		MKE 86856011		
7-2-R	5-F-061	11/8/77	MKE 2661714	T.F.,M.S.	E.K.	MKE 48913410		Tot.metal not processed-taken from extra sample fraction
7-2-I	5-F-062	11/9/77	MKE 2661714	T.F.,M.S.	E.K.	MKE 48913410		
8-1-R	5-C-037	10/11/77		P.S.,M.S.	G.A.,A.C.	LAX 43290730		
8-1-T	5-C-038	10/11/77		P.S.,M.S.	G.A.,A.C.	LAX 43290730		
8-1-S	5-C-039	10/11/77		P.S.,M.S.	G.A.,A.C.	LAX 43290730		
8-2-R	5-H-003	10/13/77	LAX 3960383	P.S.	A.C.	LAX 43291614		
8-2-I	5-H-004	10/13/77	LAX 3960383	P.S.	A.C.	LAX 43291614		
8-2-T	5-H-006	10/13/77	LAX 3960383	P.S.,M.S.	G.A.,A.C.	LAX 43291614		
8-2-S	5-H-005	10/13/77		P.S.,M.S.	G.A.,A.C.	LAX 43291614		
8-3-R	5-C-049	10/18/77		M.S.	A.C.	LAX 43291625		
8-3-T	5-C-050	10/18/77		M.S.	A.C.,G.A.	LAX 43291625		
8-3-S	5-C-051	10/18/77		M.S.	A.C.,G.A.	LAX 43291625		
9-1-R	5-C-042	10/12/77		P.S.,M.S.		LAX 43291010		
9-1-T	5-C-043	10/13/77		M.S.	G.A.	LAX 43291614		
9-1-S	5-C-044	10/13/77		M.S.	G.A.	LAX 43291614		
9-1-I	5-C-045	10/13/77	LAX 3960383	M.S.	G.A.	LAX 43291614		
9-2-R	5-C-046	10/13/77	LAX 3960383	P.S.,M.S.	G.A.,A.C.	LAX 43291614		
9-2-T	5-H-007	10/14/77	LAX 3962056	P.S.	A.C.	LAX 43292476		

Part A (Cont.)

B&R Code	EHRA Code	Sampling Date	Airbill to Carborundum	Personnel B&R	Present EHRA	Ship Date/AB# to Richardson	Data Rec'd Date	Remarks
9-2-S	5-H-008	10/14/77		P.S.	A.C.	LAX 43292476		
9-3-R	5-C-048	10/17/77		M.S.	G.A.,A.C.			
9-3-T	5-C-052	10/18/77			G.A.	LAX 43291625		
9-3-S	5-C-053	10/18/77			G.A.	LAX 43291625		
10-1-R	5-C-040	10/12/77	LAX 3960333	P.S.,M.S.	A.C.,G.A.	LAX 43291010		Composite
10-1-I	5-C-041	10/12/77	LAX 3960333	P.S.,M.S.	A.C.,G.A.	LAX 43291010		
10-2-R	5-C-047	10/14/77		M.S.	G.A.	LAX 43292476		Composite
10-3-R	5-C-054	10/20/77		M.S.	G.A.,A.C.			Composite
11-1-R	5-F-065	11/10/77	ORD 4509943	M.S.,T.F.		ORD 46765121		
11-1-I	5-F-066	11/10/77	ORD 4509943	M.S.,T.F.		ORD 46765121		
12-1-R	5-F-070	11/10/77	ORD 4509943	T.F.	E.K.	ORD 46765121		
12-1-I	5-F-071	11/10/77	ORD 4509943	T.F.	E.K.	ORD 46765121		
13-1-R	5-H-010	11/14/77	SEA 5476736	P.S.,M.S.	G.A.,A.C.	SEA 5476738		
13-1-I	5-H-011	11/14/77	SEA 5476736	P.S.,M.S.	G.A.,A.C.	SEA 5476738		
13-1-T	5-H-012	11/15/77	SEA 5476740	P.S.,M.S.	G.A.,A.C.	SEA 62486410		
13-1-S	5-H-013	11/15/77		P.S.,M.S.	G.A.,A.C.	SEA 62486410		
13-2-R	5-C-055	11/17/77		P.S.	G.A.	SEA 35533562		
13-2-T	5-C-056	11/18/77		P.S.	G.A.	SEA 26397276		
13-2-S	5-C-057	11/18/77		P.S.	G.A.	SEA 26397276		
13-3-R	5-C-058	11/21/77		M.S.	G.A.,A.C.	SEA 62486082		
13-3-T	5-C-059	11/22/77		M.S.	G.A.,A.C.	SEA 46286903		
13-3-S	5-C-060	11/22/77		M.S.	G.A.,A.C.	SEA 46286903		
14-1-R	5-H-014	11/15/77	SEA 5476740	P.S.,M.S.	G.A.,A.C.	SEA 62486410		
14-1-I	5-H-015	11/15/77	SEA 5476740	P.S.,M.S.	G.A.,A.C.	SEA 62486410		
14-1-T	5-H-016	11/16/77	SEA 5476741	M.S.	G.A.	SEA 35520612		
14-1-S	5-H-017	11/16/77		M.S.	G.A.	SEA 35520612		
14-2-R	5-H-018	11/15/77		P.S.,M.S.	G.A.,A.C.	SEA 62486410		
14-2-T	5-H-019	11/16/77		M.S.	G.A.	SEA 35502612		
14-2-S	5-H-020	11/16/77		M.S.	G.A.	SEA 35502612		
15-1-I	5-H-021	11/16/77	PDX 5366966		A.C.	PDX 26765185		
15-1-R	5-H-022	11/16/77	PDX 5366966		A.C.	PDX 26765185		Composite
15-1-T	5-H-023	11/16/77	PDX 5366966		A.C.	PDX 26765185		Composite
15-2-R	5-H-024	11/17/77			A.C.	PDX 26896645		Composite
15-2-T	5-H-025	11/17/77			A.C.	PDX 26896645		Composite
15-3-R	5-H-026	11/18/77		M.S.	A.C.	PDX 26896756		Composite
15-3-T	5-H-027	11/18/77		M.S.	A.C.	PDX 26896756		Composite
16-1-R	5-H-028A	11/17/77	PDX 5366997	P.S.,M.S.	G.A.	PDX 26896645		
16-1-I	5-H-029A	11/17/77	PDX 5366997	P.S.,M.S.	G.A.	PDX 26896645		
17-1-R	5-H-028B	11/30/77	JFK 5454956		G.A.,A.C.	EWR 09965244		Composite
17-1-I	5-H-029B	11/30/77	JFK 5454956		G.A.,A.C.	EWR 09965244		
17-1-T	5-H-030	11/30/77	JFK 5454956		G.A.,A.C.	EWR 09965244		Composite
17-2-R	5-H-031	12/1/77			G.A.,A.C.	EWR 09965362		Composite
17-2-T	5-H-032	12/1/77			G.A.,A.C.	EWR 09965362		Composite
17-3-R	5-C-064	12/6/77			G.A.,A.C.	EWR 14921255		Composite
17-3-T	5-C-065	12/6/77			G.A.,A.C.	EWR 14921255		Composite
18-1-R	5-H-033	12/2/77	JFK 5454591	P.S.,M.S.	G.A.,A.C.	Hand Carried		
18-1-I	5-H-034	12/2/77	JFK 5454591	P.S.,M.S.	G.A.,A.C.	Hand Carried		
18-1-T	5-C-063	12/5/77	EWR 6022816	P.S.,M.S.		EWR 09965804		
18-2-R	5-C-073	12/9/77		M.S.	G.A.	Hand Carried		
18-2-T	5-H-037	12/12/77		P.S.,M.S.		EWR 15449210		
18-3-R	5-J-001	12/16/77		M.S.		EWR 15449534		
18-3-T	5-J-002	12/19/77		M.S.				
18-3-S	5-J-003	12/19/77		M.S.				No preservative in Cyanide
19-1-R	5-C-061	12/7/77	EWR 6022839	M.S.	G.A.,A.C.			
19-1-I	5-C-062	12/7/77	EWR 6022839		A.C.			
20-1-R	5-C-066	12/7/77	EWR 6022839	M.S.	G.A.			
20-1-I	5-C-067	12/7/77	EWR 6022839	M.S.	G.A.			
20-1-T	5-C-068	12/8/77	EWR 6022855	M.S.	G.A.,A.C.	EWR 15449022		
20-1-S	5-C-069	12/8/77		M.S.	G.A.,A.C.	EWR 15449022		
20-2-R	5-C-070	12/8/77			G.A.,A.C.	EWR 15449022		
20-2-T	5-C-071	12/9/77		M.S.	G.A.	Hand Carried		
20-2-S	5-C-072	12/9/77		M.S.	G.A.	Hand Carried		
20-3-R	5-H-038	12/12/77		M.S.	A.C.	EWR 15449210		
20-3-T	5-H-039	12/13/77		M.S.	A.C.	Hand Carried		
21-1-R	5-H-035	12/9/77	EWR 6047003	P.S.	A.C.	Hand Carried		
21-1-I	5-H-036	12/9/77	EWR 6047003	P.S.	A.C.	Hand Carried		
22-1-R	5-E-001	1/10/78			A.M.			
22-1-I	5-E-002	1/10/78			A.M.			
22-1-T	5-E-003	1/10/78			A.M.			
23-1-R	5-J-006	1/31/78		M.S.				
23-1-I	5-J-007	1/31/78		M.S.				COD not preserved, no VOA blank sent to Carborundum.

PERSONNEL

Burns and Roe

Henry Celestino
Tom Fieldsend
Mark Sadowski
Paul Storch

E.H. Richardson

Garret Area
Angelo Conte
Tom Dean
Bill Elliott
Eric Hoffe
Earl Kunkle
Albert Merena
Larry Willey

TABLE F-2

PART B: EPA REGIONAL OFFICES SAMPLING PROGRAM

B&R Code	EGD-SCC* Code	Regional Sample Code	Sample Point	Sampling Date	Personnel Present: B&R	Personnel Present: Regional, EPA	Data Rec'd Date	Remarks
2	00215	08-05-CM19S02	R	10/2/78	MS	EM	The majority	
2	00214	08-05-CM19S01	I	10/3/78		EM	of the	
2	00216	08-05-CM19S03	T	10/4/78	MS	EM	organic data	
2	00217	08-05-CM19S04	S	10/4/78	MS	EM	received by	
3	00129	08-05-CM29S02	R	10/3/78	MS,PS	CM	12/18/78	
3	00128	08-05-CM29S01	I	10/3/78	MS,PS	EM		
3	00130	08-05-CM29S03	T	10/3/78	MS,PS	EM		
3	00131	08-05-CM29S04	S	10/3/78	MS,PS	EM		
4	00119	CB30S02	R	10/5/78	MS,PS	SB		
4	00118	CB30S01	I	10/5/78	MS,PS	SB		
4	00120	CB30S03	T	10/6/78	MS	SB		
4	00121	CB30S04	S	10/6/78	MS	SB		
5	00062		R	9/19/78	MS	WK		
5	00061		I	9/19/78	MS	WK		
5	00063		T	9/20/78	MS	WK		
5	00064		S	9/20/78	MS	WK		
6	00113	CB01S02	R	10/4/78	MS,PS	SB		
6	00112	CB01S01	I	10/4/78	MS,PS	SB		
6	00114	CB01S03	T	10/4/78	MS,PS	SB		
6	00115	CB01S04	S	10/4/78	MS,PS	SB		
7	00069		R	9/19/78	MS	WK		
7	00067		I	9/19/78	MS	WK		
12	00123	CB31S02	R	10/5/78	MS,PS	SB		
12	00122	CB31S01	I	10/5/78	MS,PS	SB		
12	00124	CB31S03	T	10/6/78	MS	SB		
12	00125	CB31S04	S	10/6/78	MS	SB		
22		08-05-E61502	R	10/11/78	MS	CB		
22		08-05-E619503	I	10/11/78	MS	CB		
22		08-05-E619504	T	10/11/78	MS	CB		
22			S	10/11/78	MS	CB		
24		S01	R	6/26/78	PS	PG		
24		S04	T	6/27/78	PS	PG		
24		S09	I	6/27/78	PS	PG		
24		S02	R	6/27/78	PS	PG		
24		S05	T	6/27/78	PS	PG		
24		S03	R	6/27/78	PS	PG		
24		S06	T	6/27/78	PS	PG		
24		S07	S	6/27/78	PS	PG		- One sludge sample
25		152D	R	7/11/78	MS	GD		represents all 3
25		1521	T	7/11/78	MS	GD		batches of ww.
25		1523	R	7/12/78		GD		
25		1524	T	7/12/78		GD		
25		1525	I	7/12/78		GD		
26		1519	R	7/11/78	MS	KC		
26		1518	I	7/11/78	MS	KC		
26		1544	T	7/14/78		KC		
26		1545	S	7/14/78		KC		
27		0805EG18S02	R	8/16/78		JG		
27		0805EG18S01	I	8/16/78		JG		
27		0805EG18S04	T	8/21/78		JG		- Sample taken of
27		0805EG18S03	S	8/18/78		JG		a later batch
27		0805EG18S06	L	8/16/78		JG		of ww.
28		PS-1	R	1/25/78	HF	RR		- No treated
28		PS-4	I	1/25/78	HF	RR		sample taken

Sample Points

R - Raw Wastewater
T - Treated Wastewater
S - Sludge
I - Tap Water

EGD-SCC - Effluent Guidelines Division Sample Control Center

Personnel

Burns and Roe
HF - Howard Feiler
MS - Mark Sadowski
PS - Paul Storch

U.S. EPA Regional S&A
CB - Charles Beiers - Region V
SB - Sylvester Bernotas - Region V
KC - Kenneth Cooper - Region VI
GD - Glen Draper - Region VI
PG - Philip Gehring - Region V
JG - Joseph Good - Region V
WK - Wayne Kaiser - Region V
EM - Everett Mortenson - Region V
RR - Robert Reeves - Region VI

APPENDIX G

ANALYTICAL DATA FROM INDIVIDUAL PLANT SITES

PLANT	BATCH	PP	------PARAMETER----------	INFLUENT		EFFLUENT	REMOVAL(%)	SLUDGE		TAP WATER
				ALL UNITS UG/L UNLESS OTHERWISE NOTED						
1	1	4	BENZENE	300		N-D	100	NOT RUN		N-D
1	1	6	CARBON TETRACHLORIDE	N-D		N-D		NOT RUN	L	10
1	1	9	HEXACHLOROBENZENE	92		N-D	100	NOT RUN		N-D
1	1	10	1,2-DICHLOROETHANE	25		N-D	100	NOT RUN		N-D
1	1	11	1,1,1-TRICHLOROETHANE	N-D	L	10	0	NOT RUN		N-D
1	1	14	1,1,2-TRICHLOROETHANE	N-D		N-D		NOT RUN		N-D
1	1	15	1,1,2,2-TETRACHLOROETHANE	30		N-D	100	NOT RUN		N-D
1	1	23	CHLOROFORM	160		N-D	100	NOT RUN		45
1	1	29	1,1-DICHLOROETHYLENE	N-D	L	10	0	NOT RUN		N-D
1	1	32	1,2-DICHLOROPROPANE	L 10		N-D	100	NOT RUN		N-D
1	1	38	ETHYLBENZENE	1300		390	70	NOT RUN		N-D
1	1	40	4-DHLOROPHENYL PHENYL ETHER	266		N-D	100	NOT RUN		N-D
1	1	44	METHYLENE CHLORIDE	4800		110	97	NOT RUN		690
1	1	66	BIS(2-ETHYLHEXYL) PHTHALATE	N-D	L	10	0	NOT RUN		N-D
1	1	85	TETRACHLOROETHYLENE	18		N-D	100	NOT RUN	L	10
1	1	86	TOLUENE	2700		720	73	NOT RUN		N-D
1	1	87	TRICHLOROETHYLENE	250		17	93	NOT RUN	L	10
1	1	114	ANTIMONY	L 25	L	25	0	NOT RUN	L	10
1	1	115	ARSENIC	340	L	25	92	NOT RUN	L	25
1	1	117	BERYLLIUM	L 10	L	10	0	NOT RUN	L	10
1	1	118	CADMIUM	L 20	L	20	0	NOT RUN	L	20
1	1	119	CHROMIUM	3000		300	90	NOT RUN		100
1	1	120	COPPER	500	L	60	88	NOT RUN		200
1	1	121	CYANIDE	L 20	L	100	0	NOT RUN	L	20
1	1	122	LEAD	10000	L	200	98	NOT RUN		400
1	1	123	MERCURY	17	L	1	94	NOT RUN	L	1
1	1	124	NICKEL	6000	L	50	99	NOT RUN		200
1	1	125	SELENIUM	L 25	L	25	0	NOT RUN	L	25
1	1	126	SILVER	L 10	L	10	0	NOT RUN	L	10
1	1	127	THALLIUM	L 10	L	10	0	NOT RUN	L	10
1	1	128	ZINC	3000		600	80	NOT RUN		1000
1	1		PH(UNITS)	7		7		NOT RUN		6
1	1		BOD(MG-L)	2200		2800	0	NOT RUN	L	2
1	1		COD(MG-L)	81000		11000	86	NOT RUN	L	5
1	1		TOC(MG-L)	16000		2200	86	NOT RUN	L	1
1	1		OIL & GREASE(MG-L)	1650		4	99	NOT RUN	L	1
1	1		TOTAL PHENOLS	12		120	0	NOT RUN		12
1	1		TOTAL SOLIDS(MG-L)	24000		4200	82	NOT RUN		59
1	1		TOTAL DISS. SOLIDS(MG-L)	12000		4140	65	NOT RUN		56
1	1		TOTAL SUSP. SOLIDS(MG-L)	12000		60	99	NOT RUN		3
1	1		SETTLEABLE SOLIDS(ML-L)	2	L	0	100	NOT RUN	L	0
1	1		TOTAL VOLATILE SOLIDS(MG-L)	14000		2700	80	NOT RUN		30
1	1		VOLATILE DISS. SOLIDS(MG-L)	6400		2665	58	NOT RUN		28
1	1		TOTAL VOL. SUS. SOLIDS(MG-L)	7600		35	99	NOT RUN		2
1	1		ALUMINUM	400000		2000	99	NOT RUN		600
1	1		BARIUM	400	L	50	87	NOT RUN		100
1	1		IRON	100000	L	2000	98	NOT RUN		2000
1	1		MANGANESE	1000		80	92	NOT RUN	L	50
1	1		CALCIUM(MG-L)	170	L	50	70	NOT RUN	L	50
1	1		MAGNESIUM(MG-L)	12		4	66	NOT RUN		3
1	1		BORON	L 500	L	500	0	NOT RUN	L	500
1	1		COBALT	6000		800	86	NOT RUN	L	50
1	1		MOLYBDENUM	500		80	84	NOT RUN	L	50
1	1		TIN	600	L	50	91	NOT RUN		200
1	1		TITANIUM	6000	L	200	96	NOT RUN		200
1	1		VANADIUM	L 100	L	100	0	NOT RUN	L	100
1	1		YTTRIUM	L 200	L	200	0	NOT RUN	L	200
1	1		SODIUM	340		470	0	NOT RUN	L	150

N-D NOT DETECTED; L-LESS THAN; PP- PRIORITY POLLUTANT NUMBER
PRIORITY POLLUTANTS NOT DETECTED IN ANY SAMPLES ARE NOT LISTED. FRACTIONS NOT ANALYZED ARE NOT LISTED.

PLANT	BATCH	PP	------PARAMETER----------	INFLUENT		EFFLUENT		REMOVAL(%)	SLUDGE	TAP WATER
				ALL UNITS UG/L UNLESS OTHERWISE NOTED						
1	2	114	ANTIMONY	L	25	L	25	0	NOT RUN	NOT RUN
1	2	115	ARSENIC		75	L	25	66	NOT RUN	NOT RUN
1	2	117	BERYLLIUM	L	10	L	10	0	NOT RUN	NOT RUN
1	2	118	CADMIUM	L	20	L	20	0	NOT RUN	NOT RUN
1	2	119	CHROMIUM		400	L	50	87	NOT RUN	NOT RUN
1	2	120	COPPER		300		70	76	NOT RUN	NOT RUN
1	2	121	CYANIDE	L	200	L	100	50	NOT RUN	NOT RUN
1	2	122	LEAD		3000	L	200	93	NOT RUN	NOT RUN
1	2	123	MERCURY		89	L	5	94	NOT RUN	NOT RUN
1	2	124	NICKEL	L	50	L	50	0	NOT RUN	NOT RUN
1	2	125	SELENIUM	L	25	L	25	0	NOT RUN	NOT RUN
1	2	126	SILVER	L	10	L	10	0	NOT RUN	NOT RUN
1	2	127	THALLIUM	L	10	L	10	0	NOT RUN	NOT RUN
1	2	128	ZINC		1000	L	600	40	NOT RUN	NOT RUN
1	2		PH(UNITS)		7		7		NOT RUN	NOT RUN
1	2		BOD(MG-L)		280		2500	0	NOT RUN	NOT RUN
1	2		COD(MG-L)		18000		4400	75	NOT RUN	NOT RUN
1	2		TOC(MG-L)		5100		1400	72	NOT RUN	NOT RUN
1	2		OIL & GREASE(MG-L)		1240		25	97	NOT RUN	NOT RUN
1	2		TOTAL PHENOLS	L	44		48	0	NOT RUN	NOT RUN
1	2		TOTAL SOLIDS(MG-L)		7100		2100	70	NOT RUN	NOT RUN
1	2		TOTAL DISS. SOLIDS(MG-L)		2800		1800	35	NOT RUN	NOT RUN
1	2		TOTAL SUSP. SOLIDS(MG-L)		4300		300	93	NOT RUN	NOT RUN
1	2		SETTLEABLE SOLIDS(ML-L)		1	L	0	100	NOT RUN	RUN
1	2		TOTAL VOLATILE SOLIDS(MG-L)		4600		860	81	NOT RUN	.f RUN
1	2		VOLATILE DISS. SOLIDS(MG-L)		1600		590	63	NOT RUN	NOT RUN
1	2		TOTAL VOL. SUS. SOLIDS(MG-L)		3000		270	91	NOT RUN	NOT RUN
1	2		ALUMINUM		200000		10000	95	NOT RUN	NOT RUN
1	2		BARIUM		500	L	50	90	NOT RUN	NOT RUN
1	2		IRON		30000	L	2000	93	NOT RUN	NOT RUN
1	2		MANGANESE		900		200	77	NOT RUN	NOT RUN
1	2		CALCIUM(MG-L)		220	L	50	77	NOT RUN	NOT RUN
1	2		MAGNESIUM(MG-L)		50		3	94	NOT RUN	NOT RUN
1	2		BORON	L	500	L	500	0	NOT RUN	NOT RUN
1	2		COBALT		300	L	50	83	NOT RUN	NOT RUN
1	2		MOLYBDENUM		300	L	50	83	NOT RUN	NOT RUN
1	2		TIN		600	L	50	91	NOT RUN	NOT RUN
1	2		TITANIUM		7000	L	200	97	NOT RUN	NOT RUN
1	2		VANADIUM	L	100	L	100	0	NOT RUN	NOT RUN
1	2		YTTRIUM	L	200	L	200	0	NOT RUN	NOT RUN
1	2		SODIUM		250		240	4	NOT RUN	NOT RUN

N-D NOT DETECTED; L-LESS THAN; PP- PRIORITY POLLUTANT NUMBER
PRIORITY POLLUTANTS NOT DETECTED IN ANY SAMPLES ARE NOT LISTED. FRACTIONS NOT ANALYZED ARE NOT LISTED.

PLANT	BATCH	PP	------PARAMETER----------	INFLUENT		EFFLUENT		REMOVAL(%)	SLUDGE	TAP WATER
				ALL UNITS UG/L UNLESS OTHERWISE NOTED						
1	3	114	ANTIMONY	L	25	L	25	0	NOT RUN	NOT RUN
1	3	115	ARSENIC	L	25	L	25	0	NOT RUN	NOT RUN
1	3	117	BERYLLIUM	L	10	L	10	0	NOT RUN	NOT RUN
1	3	118	CADMIUM	L	20	L	20	0	NOT RUN	NOT RUN
1	3	119	CHROMIUM		300	L	50	83	NOT RUN	NOT RUN
1	3	120	COPPER		400		100	75	NOT RUN	NOT RUN
1	3	121	CYANIDE	L	100	L	40	60	NOT RUN	NOT RUN
1	3	122	LEAD		2000	L	200	90	NOT RUN	NOT RUN
1	3	123	MERCURY		80		9	88	NOT RUN	NOT RUN
1	3	124	NICKEL	L	50	L	50	0	NOT RUN	NOT RUN
1	3	125	SELENIUM	L	25	L	25	0	NOT RUN	NOT RUN
1	3	126	SILVER	L	10	L	10	0	NOT RUN	NOT RUN
1	3	127	THALLIUM	L	10	L	10	0	NOT RUN	NOT RUN
1	3	128	ZINC		1000		600	40	NOT RUN	NOT RUN
1	3		PH(UNITS)		7		5		NOT RUN	NOT RUN
1	3		BOD(MG-L)		6600		3000	54	NOT RUN	NOT RUN
1	3		COD(MG-L)		53000		24000	54	NOT RUN	NOT RUN
1	3		TOC(MG-L)		9000		6000	33	NOT RUN	NOT RUN
1	3		OIL & GREASE(MG-L)		620		430	30	NOT RUN	NOT RUN
1	3		TOTAL PHENOLS		110		72	34	NOT RUN	NOT RUN
1	3		TOTAL SOLIDS(MG-L)		16300		10600	34	NOT RUN	NOT RUN
1	3		TOTAL DISS. SOLIDS(MG-L)		600		3300	0	NOT RUN	NOT RUN
1	3		TOTAL SUSP. SOLIDS(MG-L)		15700		7300	53	NOT RUN	NOT RUN
1	3		TOTAL VOLATILE SOLIDS(MG-L)		15000		9200	38	NOT RUN	NOT RUN
1	3		VOLATILE DISS. SOLIDS(MG-L)		NOT RUN		8640	0	NOT RUN	NOT RUN
1	3		TOTAL VOL. SUS. SOLIDS(MG-L)		NOT RUN		560	0	NOT RUN	NOT RUN
1	3		ALUMINUM		60000		3000	95	NOT RUN	NOT RUN
1	3		BARIUM		300		900	0	NOT RUN	NOT RUN
1	3		IRON		9000		6000	33	NOT RUN	NOT RUN
1	3		MANGANESE		500		300	40	NOT RUN	NOT RUN
1	3		CALCIUM(MG-L)	L	50	L	50	0	NOT RUN	NOT RUN
1	3		MAGNESIUM(MG-L)		4		3	25	NOT RUN	NOT RUN
1	3		BORON	L	500	L	500	0	NOT RUN	NOT RUN
1	3		COBALT		300		100	66	NOT RUN	NOT RUN
1	3		MOLYBDENUM		100	L	50	50	NOT RUN	NOT RUN
1	3		TIN		300	L	50	83	NOT RUN	NOT RUN
1	3		TITANIUM		600		200	66	NOT RUN	NOT RUN
1	3		VANADIUM	L	100	L	100	0	NOT RUN	NOT RUN
1	3		YTTRIUM	L	200	L	200	0	NOT RUN	NOT RUN
1	3		SODIUM		200		180	10	NOT RUN	NOT RUN

N-D NOT DETECTED; L-LESS THAN; PP- PRIORITY POLLUTANT NUMBER
PRIORITY POLLUTANTS NOT DETECTED IN ANY SAMPLES ARE NOT LISTED. FRACTIONS NOT ANALYZED ARE NOT LISTED.

PLANT	BATCH	PP	------PARAMETER----------	INFLUENT	EFFLUENT	REMOVAL(%)	SLUDGE	TAP WATER
				ALL UNITS UG/L UNLESS OTHERWISE NOTED				
2	1	10	1,2-DICHLOROETHANE	N-D	17	0	NOT RUN	N-D
2	1	13	1,1-DICHLOROETHANE	N-D	L 10	0	NOT RUN	N-D
2	1	23	CHLOROFORM	N-D	22	0	NOT RUN	N-D
2	1	38	ETHYLBENZENE	N-D	4600	0	NOT RUN	420
2	1	44	METHYLENE CHLORIDE	85	N-D	100	NOT RUN	N-D
2	1	56	NITROBENZENE	110	35	68	NOT RUN	N-D
2	1	65	PHENOL	96	N-D	100	NOT RUN	N-D
2	1	68	DI-N-BUTYL PHTHALATE	160	N-D	100	NOT RUN	N-D
2	1	85	TETRACHLOROETHYLENE	N-D	45	0	NOT RUN	N-D
2	1	86	TOLUENE	N-D	2500	0	NOT RUN	N-D
2	1	87	TRICHLOROETHYLENE	210	190	9	NOT RUN	L 10
2	1	114	ANTIMONY	L 10	L 10	0	L 460	12
2	1	115	ARSENIC	NOT RUN	NOT RUN	0	NOT RUN	L 25
2	1	117	BERYLLIUM	L 10	L 10	0	30	L 10
2	1	118	CADMIUM	90	L 20	77	100	60
2	1	119	CHROMIUM	70	L 50	28	300	100
2	1	120	COPPER	300	L 60	80	800	L 60
2	1	121	CYANIDE	L 20	L 20	0	L 20	L 20
2	1	122	LEAD	L 200	L 200	0	3000	L 200
2	1	123	MERCURY	L 5	L 5	0	L 5	L 1
2	1	124	NICKEL	L 50	L 50	0	L 50	L 50
2	1	125	SELENIUM	L 25	L 25	0	L 750	L 25
2	1	126	SILVER	L 10	L 10	0	L 10	L 10
2	1	127	THALLIUM	L 10	L 10	0	NOT RUN	L 10
2	1	128	ZINC	30000	L 600	98	200000	2000
2	1		PH(UNITS)	8	7		8	7
2	1		BOD(MG-L)	4500	2800	37	7000	L 6
2	1		COD(MG-L)	25000	5800	76	130000	L 5
2	1		TOC(MG-L)	6400	1600	75	26000	3
2	1		OIL & GREASE(MG-L)	2560	12	99	8060	L 1
2	1		TOTAL PHENOLS	L 100	90	10	L 100	L 10
2	1		TOTAL SOLIDS(MG-L)	26000	5100	80	170000	1100
2	1		TOTAL DISS. SOLIDS(MG-L)	18100	5084	71	100200	1094
2	1		TOTAL SUSP. SOLIDS(MG-L)	7900	16	99	6800	6
2	1		SETTLEABLE SOLIDS(ML-L)	1	L 0	100	NOT RUN	L 0
2	1		TOTAL VOLATILE SOLIDS(MG-L)	11000	670	93	47000	190
2	1		VOLATILE DISS. SOLIDS(MG-L)	3400	662	80	40400	188
2	1		TOTAL VOL. SUS. SOLIDS(MG-L)	7600	8	99	6600	2
2	1		ALUMINUM	200000	1000	99	2000000	L 500
2	1		BARIUM	800	L 50	93	3000	L 50
2	1		IRON	70000	L 2000	97	300000	2000
2	1		MANGANESE	300	400	0	5000	70
2	1		CALCIUM(MG-L)	290	220	24	510	190
2	1		MAGNESIUM(MG-L)	65	52	20	150	79
2	1		BORON	L 500	700	0	L 500	L 500
2	1		COBALT	2000	L 50	97	6000	L 50
2	1		MOLYBDENUM	200	L 50	75	2000	L 50
2	1		TIN	400	2000	0	3000	200
2	1		TITANIUM	10000	L 200	98	60000	L 200
2	1		VANADIUM	L 100	L 100	0	300	L 100
2	1		YTTRIUM	L 200	L 200	0	L 200	L 200
2	1		SODIUM	270	1220	0	260	160

N-D NOT DETECTED; L-LESS THAN; PP- PRIORITY POLLUTANT NUMBER
PRIORITY POLLUTANTS NOT DETECTED IN ANY SAMPLES ARE NOT LISTED. FRACTIONS NOT ANALYZED ARE NOT LISTED.

PLANT	BATCH	PP	------PARAMETER----------	INFLUENT	EFFLUENT	REMOVAL(%)	SLUDGE	TAP WATER
				ALL UNITS UG/L UNLESS OTHERWISE NOTED				
2	2	114	ANTIMONY	L 10	L 10	0	NOT RUN	NOT RUN
2	2	117	BERYLLIUM	L 10	L 10	0	30	NOT RUN
2	2	118	CADMIUM	100	L 20	80	400	NOT RUN
2	2	119	CHROMIUM	L 50	L 50	0	200	NOT RUN
2	2	120	COPPER	100	L 60	40	600	NOT RUN
2	2	121	CYANIDE	L 20	L 20	0	L 200	NOT RUN
2	2	122	LEAD	L 200	L 200	0	2000	NOT RUN
2	2	123	MERCURY	L 5	L 1	80	L 5	NOT RUN
2	2	124	NICKEL	200	L 50	75	7000	NOT RUN
2	2	125	SELENIUM	L 25	L 25	0	NOT RUN	NOT RUN
2	2	126	SILVER	L 10	L 10	0	L 10	NOT RUN
2	2	127	THALLIUM	L 10	L 10	0	NOT RUN	NOT RUN
2	2	128	ZINC	100000	20000	80	400000	NOT RUN
2	2		PH(UNITS)	7	8		6	NOT RUN
2	2		BOD(MG-L)	2000	1900	5	3300	NOT RUN
2	2		COD(MG-L)	25000	6000	76	150000	NOT RUN
2	2		TOC(MG-L)	9000	1200	86	26000	NOT RUN
2	2		OIL & GREASE(MG-L)	1680	3	99	4850	NOT RUN
2	2		TOTAL PHENOLS	L 100	L 100	0	L 100	NOT RUN
2	2		TOTAL SOLIDS(MG-L)	9800	15000	0	77000	NOT RUN
2	2		TOTAL DISS. SOLIDS(MG-L)	4100	14966	0	1000	NOT RUN
2	2		TOTAL SUSP. SOLIDS(MG-L)	5700	34	99	76000	NOT RUN
2	2		SETTLEABLE SOLIDS(ML-L)	NOT RUN	0	0	NOT RUN	NOT RUN
2	2		TOTAL VOLATILE SOLIDS(MG-L)	8000	10000	0	38000	NOT RUN
2	2		VOLATILE DISS. SOLIDS(MG-L)	3600	9990	0	9000	NOT RUN
2	2		TOTAL VOL. SUS. SOLIDS(MG-L)	5400	10	99	29000	NOT RUN
2	2		ALUMINUM	80000	4000	95	2000000	NOT RUN
2	2		BARIUM	300	L 50	83	600	NOT RUN
2	2		IRON	10000	2000	80	200000	NOT RUN
2	2		MANGANESE	200	900	0	4000	NOT RUN
2	2		CALCIUM(MG-L)	150	160	0	250	NOT RUN
2	2		MAGNESIUM(MG-L)	56	45	19	110	NOT RUN
2	2		BORON	L 500	L 500	0	L 500	NOT RUN
2	2		COBALT	400	60	85	1000	NOT RUN
2	2		MOLYBDENUM	60	L 50	16	2000	NOT RUN
2	2		TIN	300	L 50	83	2000	NOT RUN
2	2		TITANIUM	4000	L 200	95	30000	NOT RUN
2	2		VANADIUM	L 100	L 100	0	300	NOT RUN
2	2		YTTRIUM	L 200	L 200	0	L 200	NOT RUN
2	2		SODIUM	270	270	0	240	NOT RUN

N-D NOT DETECTED; L-LESS THAN; PP- PRIORITY POLLUTANT NUMBER
PRIORITY POLLUTANTS NOT DETECTED IN ANY SAMPLES ARE NOT LISTED. FRACTIONS NOT ANALYZED ARE NOT LISTED.

PLANT	BATCH	PP	------PARAMETER----------	INFLUENT	EFFLUENT	REMOVAL(%)	SLUDGE	TAP WATER
				ALL UNITS UG/L UNLESS OTHERWISE NOTED				
2	3	114	ANTIMONY	31	NOT RUN	100	NOT RUN	NOT RUN
2	3	117	BERYLLIUM	L 10	L 2	80	20	NOT RUN
2	3	118	CADMIUM	200	L 4	98	300	NOT RUN
2	3	119	CHROMIUM	5000	20	99	5000	NOT RUN
2	3	120	COPPER	1000	200	80	1000	NOT RUN
2	3	121	CYANIDE	L 20	L 20	0	L 20	NOT RUN
2	3	122	LEAD	800	L 40	95	1000	NOT RUN
2	3	123	MERCURY	L 5	L 5	0	L 5	NOT RUN
2	3	124	NICKEL	L 20	L 10	50	80	NOT RUN
2	3	125	SELENIUM	L 25	L 25	0	L 100	NOT RUN
2	3	126	SILVER	L 10	L 2	80	L 4	NOT RUN
2	3	127	THALLIUM	L 10	L 10	0	NOT RUN	NOT RUN
2	3	128	ZINC	100000	6000	94	100000	NOT RUN
2	3		PH(UNITS)	8	8		8	NOT RUN
2	3		BOD(MG-L)	1900	4000	0	140000	NOT RUN
2	3		COD(MG-L)	29000	11000	62	180000	NOT RUN
2	3		TOC(MG-L)	7000	1700	75	30000	NOT RUN
2	3		OIL & GREASE(MG-L)	1200	18	98	6100	NOT RUN
2	3		TOTAL PHENOLS	28	L 20	28	L 40	NOT RUN
2	3		TOTAL SOLIDS(MG-L)	18000	5600	68	131000	NOT RUN
2	3		TOTAL DISS. SOLIDS(MG-L)	3000	5500	0	4800	NOT RUN
2	3		TOTAL SUSP. SOLIDS(MG-L)	15000	100	99	140000	NOT RUN
2	3		TOTAL VOLATILE SOLIDS(MG-L)	9000	480	94	49500	NOT RUN
2	3		VOLATILE DISS. SOLIDS(MG-L)	2000	460	77	NOT RUN	NOT RUN
2	3		TOTAL VOL. SUS. SOLIDS(MG-L)	7000	20	99	60000	NOT RUN
2	3		ALUMINUM	200000	800	99	500000	NOT RUN
2	3		BARIUM	100000	L 10	99	50000	NOT RUN
2	3		IRON	200000	L 300	99	300000	NOT RUN
2	3		MANGANESE	700	600	14	5000	NOT RUN
2	3		CALCIUM(MG-L)	580	340	41	750	NOT RUN
2	3		MAGNESIUM(MG-L)	90	37	58	150	NOT RUN
2	3		BORON	1000	1000	0	2000	NOT RUN
2	3		COBALT	600	L 10	98	900	NOT RUN
2	3		MOLYBDENUM	300	10	96	800	NOT RUN
2	3		TIN	400	40	90	1000	NOT RUN
2	3		TITANIUM	20000	L 30	99	30000	NOT RUN
2	3		VANADIUM	200	L 20	90	200	NOT RUN
2	3		YTTRIUM	L 200	L 30	85	L 60	NOT RUN
2	3		SODIUM	300	300	0	310	NOT RUN

N-D NOT DETECTED; L-LESS THAN; PP- PRIORITY POLLUTANT NUMBER
PRIORITY POLLUTANTS NOT DETECTED IN ANY SAMPLES ARE NOT LISTED. FRACTIONS NOT ANALYZED ARE NOT LISTED.

PLANT	BATCH	PP	------PARAMETER----------		INFLUENT	EFFLUENT	REMOVAL(%)	SLUDGE	TAP WATER
					ALL UNITS UG/L UNLESS OTHERWISE NOTED				
2	4	114	ANTIMONY	L	10	NOT RUN		NOT RUN	NOT RUN
2	4	117	BERYLLIUM	L	10	NOT RUN		NOT RUN	NOT RUN
2	4	118	CADMIUM	L	20	NOT RUN		NOT RUN	NOT RUN
2	4	119	CHROMIUM	L	50	NOT RUN		NOT RUN	NOT RUN
2	4	120	COPPER		200	NOT RUN		NOT RUN	NOT RUN
2	4	121	CYANIDE	L	200	NOT RUN		NOT RUN	NOT RUN
2	4	122	LEAD	L	200	NOT RUN		NOT RUN	NOT RUN
2	4	123	MERCURY	L	5	NOT RUN		NOT RUN	NOT RUN
2	4	124	NICKEL		1000	NOT RUN		NOT RUN	NOT RUN
2	4	125	SELENIUM	L	25	NOT RUN		NOT RUN	NOT RUN
2	4	126	SILVER	L	10	NOT RUN		NOT RUN	NOT RUN
2	4	127	THALLIUM	L	10	NOT RUN		NOT RUN	NOT RUN
2	4	128	ZINC		8000	NOT RUN		NOT RUN	NOT RUN
2	4		PH(UNITS)		6	NOT RUN		NOT RUN	NOT RUN
2	4		BOD(MG-L)		1700	NOT RUN		NOT RUN	NOT RUN
2	4		COD(MG-L)		30000	NOT RUN		NOT RUN	NOT RUN
2	4		TOC(MG-L)		6600	NOT RUN		NOT RUN	NOT RUN
2	4		OIL & GREASE(MG-L)		1040	NOT RUN		NOT RUN	NOT RUN
2	4		TOTAL PHENOLS		200	NOT RUN		NOT RUN	NOT RUN
2	4		TOTAL SOLIDS(MG-L)		13000	NOT RUN		NOT RUN	NOT RUN
2	4		TOTAL DISS. SOLIDS(MG-L)		6200	NOT RUN		NOT RUN	NOT RUN
2	4		TOTAL SUSP. SOLIDS(MG-L)		6800	NOT RUN		NOT RUN	NOT RUN
2	4		SETTLEABLE SOLIDS(ML-L)		1	NOT RUN		NOT RUN	NOT RUN
2	4		TOTAL VOLATILE SOLIDS(MG-L)		10000	NOT RUN		NOT RUN	NOT RUN
2	4		VOLATILE DISS. SOLIDS(MG-L)		3400	NOT RUN		NOT RUN	NOT RUN
2	4		TOTAL VOL. SUS. SOLIDS(MG-L)		6600	NOT RUN		NOT RUN	NOT RUN
2	4		ALUMINUM		80000	NOT RUN		NOT RUN	NOT RUN
2	4		BARIUM		1000	NOT RUN		NOT RUN	NOT RUN
2	4		IRON		40000	NOT RUN		NOT RUN	NOT RUN
2	4		MANGANESE		90	NOT RUN		NOT RUN	NOT RUN
2	4		CALCIUM(MG-L)		150	NOT RUN		NOT RUN	NOT RUN
2	4		MAGNESIUM(MG-L)		58	NOT RUN		NOT RUN	NOT RUN
2	4		BORON	L	500	NOT RUN		NOT RUN	NOT RUN
2	4		COBALT		1000	NOT RUN		NOT RUN	NOT RUN
2	4		MOLYBDENUM	L	50	NOT RUN		NOT RUN	NOT RUN
2	4		TIN		100	NOT RUN		NOT RUN	NOT RUN
2	4		TITANIUM		8000	NOT RUN		NOT RUN	NOT RUN
2	4		VANADIUM	L	100	NOT RUN		NOT RUN	NOT RUN
2	4		YTTRIUM	L	200	NOT RUN		NOT RUN	NOT RUN
2	4		SODIUM		280	NOT RUN		NOT RUN	NOT RUN

N-D NOT DETECTED; L-LESS THAN; PP- PRIORITY POLLUTANT NUMBER
PRIORITY POLLUTANTS NOT DETECTED IN ANY SAMPLES ARE NOT LISTED. FRACTIONS NOT ANALYZED ARE NOT LISTED.

PLANT	BATCH	PP	------PARAMETER----------	INFLUENT	EFFLUENT	REMOVAL(%)	SLUDGE	TAP WATER
				ALL UNITS UG/L UNLESS OTHERWISE NOTED				
2	5	10	1,2-DICHLOROETHANE	N-D	N-D		17	N-D
2	5	13	1,1-DICHLOROETHANE	13	N-D	100	N-D	N-D
2	5	15	1,1,2,2-TETRACHLOROETHANE	L 10	N-D	100	N-D	N-D
2	5	23	CHLOROFORM	N-D	N-D		N-D	L 10
2	5	38	ETHYLBENZENE	110	N-D	100	26	N-D
2	5	44	METHYLENE CHLORIDE	220	N-D	100	540	N-D
2	5	65	PHENOL	L 10	36	0	L 10	N-D
2	5	66	BIS(2-ETHYLHEXYL) PHTHALATE	L 10	L 10	0	18	L 10
2	5	67	BUTYL BENZYL PHTHALATE	L 10	L 10	0	18	N-D
2	5	68	DI-N-BUTYL PHTHALATE	L 10	L 10	0	N-D	L 10
2	5	85	TETRACHLOROETHYLENE	L 10	N-D	100	N-D	N-D
2	5	86	TOLUENE	210	43	79	130	N-D
2	5	87	TRICHLOROETHYLENE	23	L 10	56	L 10	L 10
2	5	114	ANTIMONY	L 2000	L 2000	0	L 2000	L 2
2	5	115	ARSENIC	L 2000	L 2000	0	L 2000	4
2	5	117	BERYLLIUM	3990	L 1	99	2990	L 1
2	5	118	CADMIUM	15600	L 2	99	11800	L 2
2	5	119	CHROMIUM	16300	L 5	99	12300	33
2	5	120	COPPER	16600	18	99	12400	959
2	5	121	CYANIDE	L 1	L 1	0	L 1	L 1
2	5	122	LEAD	14500	25	99	11200	25
2	5	123	MERCURY	1	L 1	0	5	L 1
2	5	124	NICKEL	16500	L 5	99	12400	L 5
2	5	125	SELENIUM	L 2000	L 2000	0	L 2000	L 2
2	5	127	THALLIUM	L 2000	L 2000	0	L 2000	L 2
2	5	128	ZINC	19300	80	99	24100	125
2	5		PH(UNITS)	8	9		9	7
2	5		COD(MG-L)	16800	4880	70	90000	L 3
2	5		TOC(MG-L)	3800	1568	58	13590	L 2
2	5		OIL & GREASE(MG-L)	610	560	8	880	NOT RUN
2	5		TOTAL PHENOLS	24	16	33	32	8
2	5		ALUMINUM	57500	7340	87	226000	L 50

N-D NOT DETECTED; L-LESS THAN; PP- PRIORITY POLLUTANT NUMBER
PRIORITY POLLUTANTS NOT DETECTED IN ANY SAMPLES ARE NOT LISTED. FRACTIONS NOT ANALYZED ARE NOT LISTED.

PLANT	BATCH	PP	------PARAMETER----------	INFLUENT	EFFLUENT	REMOVAL(%)	SLUDGE	TAP WATER
				ALL UNITS UG/L UNLESS OTHERWISE NOTED				
3	1	4	BENZENE	1900	715	62	NOT RUN	47
3	1	10	1,2-DICHLOROETHANE	33	L 10	69	NOT RUN	N-D
3	1	11	1,1,1-TRICHLOROETHANE	17	L 10	41	NOT RUN	18
3	1	23	CHLOROFORM	310	65	79	NOT RUN	N-D
3	1	29	1,1-DICHLOROETHYLENE	N-D	13	0	NOT RUN	13
3	1	30	1,2-TRANS-DICHLOROETHYLENE	N-D	34	0	NOT RUN	N-D
3	1	32	1,2-DICHLOROPROPANE	N-D	24	0	NOT RUN	N-D
3	1	38	ETHYLBENZENE	15000	3200	78	NOT RUN	N-D
3	1	44	METHYLENE CHLORIDE	N-D	4000	0	NOT RUN	21
3	1	55	NAPHTHALENE	7000	N-D	100	NOT RUN	N-D
3	1	68	DI-N-BUTYL PHTHALATE	8000	230	97	NOT RUN	N-D
3	1	85	TETRACHLOROETHYLENE	74	25	66	NOT RUN	N-D
3	1	86	TOLUENE	5500	1200	78	NOT RUN	N-D
3	1	87	TRICHLOROETHYLENE	L 10	L 10	0	NOT RUN	N-D
3	1	114	ANTIMONY	L 25	L 25	0	NOT RUN	13
3	1	115	ARSENIC	630	L 25	96	NOT RUN	L 25
3	1	117	BERYLLIUM	L 10	L 10	0	L 10	L 10
3	1	118	CADMIUM	200	L 20	90	500	200
3	1	119	CHROMIUM	60	L 50	16	400	L 50
3	1	120	COPPER	200	L 60	70	1000	L 60
3	1	121	CYANIDE	L 20	L 20	0	L 20	L 20
3	1	122	LEAD	500	L 200	60	4000	L 200
3	1	123	MERCURY	L 5	L 5	0	L 5	L 5
3	1	124	NICKEL	L 50	L 50	0	700	L 50
3	1	125	SELENIUM	L 25	L 25	0	L 350	L 25
3	1	126	SILVER	L 10	L 10	0	L 10	L 10
3	1	127	THALLIUM	L 25	L 10	60	NOT RUN	L 10
3	1	128	ZINC	1000	L 600	40	L 600	5000
3	1		PH(UNITS)	7	7		7	7
3	1		BOD(MG-L)	6200	4900	20	66000	L 6
3	1		COD(MG-L)	68000	36000	47	780000	19
3	1		TOC(MG-L)	17000	8000	52	108000	9
3	1		OIL & GREASE(MG-L)	1010	390	61	2360	L 1
3	1		TOTAL PHENOLS	80	33	58	160	32
3	1		TOTAL SOLIDS(MG-L)	47000	14000	70	58000	1500
3	1		TOTAL DISS. SOLIDS(MG-L)	25000	7100	71	21000	1491
3	1		TOTAL SUSP. SOLIDS(MG-L)	22000	6900	68	37000	9
3	1		SETTLEABLE SOLIDS(ML-L)	0	L 0	0	NOT RUN	L 0
3	1		TOTAL VOLATILE SOLIDS(MG-L)	30000	12000	60	46000	88
3	1		VOLATILE DISS. SOLIDS(MG-L)	13000	5100	60	14000	88
3	1		TOTAL VOL. SUS. SOLIDS(MG-L)	17000	6900	59	32000	L 1
3	1		ALUMINUM	300000	20000	93	2000000	L 500
3	1		BARIUM	100	L 50	50	3000	L 50
3	1		IRON	10000	2000	80	100000	3000
3	1		MANGANESE	300	100	66	2000	L 50
3	1		CALCIUM(MG-L)	180	170	5	460	210
3	1		MAGNESIUM(MG-L)	57	64	0	60	74
3	1		BORON	3000	4000	0	2000	L 500
3	1		COBALT	L 50	L 50	0	L 50	L 50
3	1		MOLYBDENUM	300	L 50	83	3000	L 50
3	1		TIN	400	L 50	87	4000	L 50
3	1		TITANIUM	3000	600	80	10000	L 200
3	1		VANADIUM	L 100	L 100	0	1000	L 100
3	1		YTTRIUM	L 200	L 200	0	L 200	L 200
3	1		SODIUM	320	350	0	300	210

N-D NOT DETECTED; L-LESS THAN; PP- PRIORITY POLLUTANT NUMBER
PRIORITY POLLUTANTS NOT DETECTED IN ANY SAMPLES ARE NOT LISTED. FRACTIONS NOT ANALYZED ARE NOT LISTED.

PLANT	BATCH	PP	------PARAMETER----------	INFLUENT	EFFLUENT	REMOVAL(%)	SLUDGE	TAP WATER
				ALL UNITS UG/L UNLESS OTHERWISE NOTED				
3	2	114	ANTIMONY	L 25	L 25	0	L 10	NOT RUN
3	2	115	ARSENIC	63	L 25	60	NOT RUN	NOT RUN
3	2	117	BERYLLIUM	L 10	L 10	0	L 10	NOT RUN
3	2	118	CADMIUM	L 20	L 20	0	100	NOT RUN
3	2	119	CHROMIUM	60	400	0	3000	NOT RUN
3	2	120	COPPER	300	300	0	4000	NOT RUN
3	2	121	CYANIDE	L 20	L 20	0	L 20	NOT RUN
3	2	122	LEAD	L 200	L 200	0	4000	NOT RUN
3	2	123	MERCURY	L 5	L 5	0	45	NOT RUN
3	2	124	NICKEL	L 50	100	0	500	NOT RUN
3	2	125	SELENIUM	L 25	L 25	0	L 100	NOT RUN
3	2	126	SILVER	L 10	L 10	0	L 10	NOT RUN
3	2	127	THALLIUM	L 10	L 10	0	NOT RUN	NOT RUN
3	2	128	ZINC	L 600	L 600	0	20000	NOT RUN
3	2		PH(UNITS)	8	8		7	NOT RUN
3	2		BOD(MG-L)	6800	8600	0	14000	NOT RUN
3	2		COD(MG-L)	40000	25000	37	260000	NOT RUN
3	2		TOC(MG-L)	11000	4600	58	42000	NOT RUN
3	2		OIL & GREASE(MG-L)	3310	1370	58	7660	NOT RUN
3	2		TOTAL PHENOLS	L 10	L 10	0	L 100	NOT RUN
3	2		TOTAL SOLIDS(MG-L)	34000	8700	74	40000	NOT RUN
3	2		TOTAL DISS. SOLIDS(MG-L)	29000	4800	83	37800	NOT RUN
3	2		TOTAL SUSP. SOLIDS(MG-L)	4400	3900	11	2200	NOT RUN
3	2		SETTLEABLE SOLIDS(ML-L)	NOT RUN	L 0	0	NOT RUN	NOT RUN
3	2		TOTAL VOLATILE SOLIDS(MG-L)	17000	6500	61	16000	NOT RUN
3	2		VOLATILE DISS. SOLIDS(MG-L)	12900	3000	76	15120	NOT RUN
3	2		TOTAL VOL. SUS. SOLIDS(MG-L)	4100	3500	14	880	NOT RUN
3	2		ALUMINUM	100000	9000	91	1000000	NOT RUN
3	2		BARIUM	L 50	60	0	3000	NOT RUN
3	2		IRON	10000	10000	0	500000	NOT RUN
3	2		MANGANESE	300	100	66	5000	NOT RUN
3	2		CALCIUM(MG-L)	240	130	45	2100	NOT RUN
3	2		MAGNESIUM(MG-L)	66	52	21	130	NOT RUN
3	2		BORON	3000	2000	33	2000	NOT RUN
3	2		COBALT	400	100	75	1000	NOT RUN
3	2		MOLYBDENUM	L 50	L 50	0	2000	NOT RUN
3	2		TIN	200	L 50	75	3000	NOT RUN
3	2		TITANIUM	1000	400	60	8000	NOT RUN
3	2		VANADIUM	L 100	L 100	0	600	NOT RUN
3	2		YTTRIUM	L 200	L 200	0	200	NOT RUN
3	2		SODIUM	260	200	23	350	NOT RUN

N-D NOT DETECTED; L-LESS THAN; PP- PRIORITY POLLUTANT NUMBER
PRIORITY POLLUTANTS NOT DETECTED IN ANY SAMPLES ARE NOT LISTED. FRACTIONS NOT ANALYZED ARE NOT LISTED.

PLANT	BATCH	PP	------PARAMETER----------	INFLUENT	EFFLUENT	REMOVAL(%)	SLUDGE	TAP WATER
				ALL UNITS UG/L UNLESS OTHERWISE NOTED				
3	3	114	ANTIMONY	L 25	L 25	0	NOT RUN	NOT RUN
3	3	117	BERYLLIUM	L 10	L 10	0	20	NOT RUN
3	3	118	CADMIUM	L 20	L 20	0	200	NOT RUN
3	3	119	CHROMIUM	70	L 50	28	500	NOT RUN
3	3	120	COPPER	200	L 60	70	2000	NOT RUN
3	3	121	CYANIDE	L 200	L 200	0	L 200	NOT RUN
3	3	122	LEAD	L 200	L 200	0	5000	NOT RUN
3	3	123	MERCURY	11	L 5	54	67	NOT RUN
3	3	124	NICKEL	L 50	L 50	0	2000	NOT RUN
3	3	126	SILVER	L 10	L 10	0	L 10	NOT RUN
3	3	127	THALLIUM	L 10	L 10	0	NOT RUN	NOT RUN
3	3	128	ZINC	5000	L 600	88	20000	NOT RUN
3	3		PH(UNITS)	6	8		8	NOT RUN
3	3		BOD(MG-L)	5000	5000	0	12000	NOT RUN
3	3		COD(MG-L)	20000	13000	35	140000	NOT RUN
3	3		TOC(MG-L)	6700	2800	58	50000	NOT RUN
3	3		OIL & GREASE(MG-L)	1930	480	75	16400	NOT RUN
3	3		TOTAL PHENOLS	120	L 100	16	100	NOT RUN
3	3		TOTAL SOLIDS(MG-L)	7800	23000	0	390000	NOT RUN
3	3		TOTAL DISS. SOLIDS(MG-L)	1800	1000	44	4100	NOT RUN
3	3		TOTAL SUSP. SOLIDS(MG-L)	5000	22000	0	385900	NOT RUN
3	3		SETTLEABLE SOLIDS(ML-L)	0	0	0	NOT RUN	NOT RUN
3	3		TOTAL VOLATILE SOLIDS(MG-L)	6000	7100	0	70000	NOT RUN
3	3		VOLATILE DISS. SOLIDS(MG-L)	1300	400	69	1800	NOT RUN
3	3		TOTAL VOL. SUS. SOLIDS(MG-L)	4700	6700	0	68200	NOT RUN
3	3		ALUMINUM	100000	5000	95	3000000	NOT RUN
3	3		BARIUM	100	L 50	50	2000	NOT RUN
3	3		IRON	40000	3000	92	3000000	NOT RUN
3	3		MANGANESE	300	L 50	83	9000	NOT RUN
3	3		CALCIUM(MG-L)	240	140	41	880	NOT RUN
3	3		MAGNESIUM(MG-L)	66	62	6	100	NOT RUN
3	3		COBALT	400	200	50	8000	NOT RUN
3	3		MOLYBDENUM	100	L 50	50	4000	NOT RUN
3	3		TIN	200	L 50	75	4000	NOT RUN
3	3		TITANIUM	1000	L 200	80	20000	NOT RUN
3	3		SODIUM	270	260	3	860	NOT RUN

N-D NOT DETECTED; L-LESS THAN; PP- PRIORITY POLLUTANT NUMBER
PRIORITY POLLUTANTS NOT DETECTED IN ANY SAMPLES ARE NOT LISTED. FRACTIONS NOT ANALYZED ARE NOT LISTED.

PLANT	BATCH	PP	------PARAMETER----------	INFLUENT	EFFLUENT	REMOVAL(%)	SLUDGE	TAP WATER
				ALL UNITS UG/L UNLESS OTHERWISE NOTED				
3	4	4	BENZENE	440	150	65	110	L 10
3	4	7	CHLOROBENZENE	L 10	L 10	0	12	L 10
3	4	11	1,1,1-TRICHLOROETHANE	150	23	84	220	N-D
3	4	15	1,1,2,2-TETRACHLOROETHANE	N-D	N-D		17	N-D
3	4	20	2-CHLORONAPHTHALENE	L 10	N-D	100	N-D	N-D
3	4	21	2,4,6-TRICHLOROPHENOL	N-D	N-D		L 10	N-D
3	4	23	CHLOROFORM	87	L 10	88	N-D	L 10
3	4	28	3,3'-DICHLOROBENZIDINE	L 10	N-D	100	N-D	L 10
3	4	31	2,4-DICHLOROPHENOL	L 10	N-D	100	N-D	N-D
3	4	35	2,4-DINITROTOLUENE	N-D	N-D		N-D	L 10
3	4	38	ETHYLBENZENE	640	240	62	210	N-D
3	4	39	FLUORANTHENE	L 10	N-D	100	N-D	L 10
3	4	43	BIS(2-CHLOROETHYOXY) METHANE	L 10	16	0	N-D	N-D
3	4	44	METHYLENE CHLORIDE	790	300	62	830	L 10
3	4	51	CHLORODIBROMOMETHANE	N-D	N-D		N-D	L 10
3	4	55	NAPHTHALENE	L 10	L 10	0	L 10	N-D
3	4	59	2,4-DINITROPHENOL	N-D	N-D		L 10	N-D
3	4	60	4,6-DINITRO-O-CRESOL	L 10	N-D	100	N-D	N-D
3	4	64	PENTACHLOROPHENOL	N-D	L 10	0	N-D	N-D
3	4	65	PHENOL	N-D	L 10	0	N-D	N-D
3	4	66	BIS(2-ETHYLHEXYL) PHTHALATE	N-D	N-D		L 10	L 10
3	4	67	BUTYL BENZYL PHTHALATE	18	67	0	24	N-D
3	4	68	DI-N-BUTYL PHTHALATE	L 10	N-D	100	L 10	L 10
3	4	69	DI-N-OCTYL PHTHALATE	N-D	N-D		N-D	L 10
3	4	70	DIETHYL PHTHALATE	N-D	N-D		N-D	L 10
3	4	71	DIMETHYL PHTHALATE	N-D	N-D		L 10	N-D
3	4	73	BENZO (A)PYRENE	L 10	N-D	100	N-D	N-D
3	4	74	3,4-BENZOFLUORANTHENE	N-D	N-D		N-D	L 10
3	4	75	11,12-BENZOFLUORANTHENE	N-D	N-D		N-D	L 10
3	4	78	ANTHRACENE	L 10	N-D	100	L 10	L 10
3	4	84	PYRENE	N-D	N-D		L 10	N-D
3	4	85	TETRACHLOROETHYLENE	18	N-D	100	L 10	N-D
3	4	86	TOLUENE	1280	400	68	410	L 10
3	4	87	TRICHLOROETHYLENE	74	14	81	66	L 10
3	4	114	ANTIMONY	L 2000	L 2000	0	L 2000	L 2
3	4	115	ARSENIC	L 2000	L 2000	0	L 2000	L 2
3	4	117	BERYLLIUM	L 50	L 50	0	L 50	NOT RUN
3	4	118	CADMIUM	200	150	25	150	NOT RUN
3	4	119	CHROMIUM	350	L 250	28	450	NOT RUN
3	4	120	COPPER	L 450	L 450	0	600	NOT RUN
3	4	121	CYANIDE	0	0	0	0	L 0
3	4	122	LEAD	2150	1800	16	2050	NOT RUN
3	4	124	NICKEL	L 250	L 250	0	L 250	NOT RUN
3	4	125	SELENIUM	L 2000	L 2000	0	L 2000	L 2
3	4	126	SILVER	L 50	L 50	0	L 50	NOT RUN
3	4	127	THALLIUM	L 2000	L 2000	0	L 2000	L 2
3	4	128	ZINC	L 2500	3900	0	L 2500	NOT RUN
3	4		COD(MG-L)	31600	21600	31	48000	9
3	4		TOC(MG-L)	7000	6100	12	33000	L 2
3	4		OIL & GREASE(MG-L)	780	180	76	490	NOT RUN
3	4		TOTAL PHENOLS	1	1	0	1	L 0

N-D NOT DETECTED; L-LESS THAN; PP- PRIORITY POLLUTANT NUMBER
PRIORITY POLLUTANTS NOT DETECTED IN ANY SAMPLES ARE NOT LISTED. FRACTIONS NOT ANALYZED ARE NOT LISTED.

PLANT	BATCH	PP	------PARAMETER----------	INFLUENT	EFFLUENT	REMOVAL(%)	SLUDGE	TAP WATER
				ALL UNITS UG/L UNLESS OTHERWISE NOTED				
4	1	4	BENZENE	160	91	43	NOT RUN	N-D
4	1	6	CARBON TETRACHLORIDE	12	N-D	100	NOT RUN	N-D
4	1	11	1,1,1-TRICHLOROETHANE	N-D	52	0	NOT RUN	N-D
4	1	14	1,1,2-TRICHLOROETHANE	L 10	N-D	100	NOT RUN	N-D
4	1	23	CHLOROFORM	16	74	0	NOT RUN	N-D
4	1	32	1,2-DICHLOROPROPANE	968	400	58	NOT RUN	N-D
4	1	38	ETHYLBENZENE	2000	N-D	100	NOT RUN	N-D
4	1	44	METHYLENE CHLORIDE	430	L 10	97	NOT RUN	66
4	1	55	NAPHTHALENE	N-D	L 10	0	NOT RUN	N-D
4	1	64	PENTACHLOROPHENOL	N-D	L 10	0	NOT RUN	N-D
4	1	65	PHENOL	2600	610	76	NOT RUN	N-D
4	1	66	BIS(2-ETHYLHEXYL) PHTHALATE	N-D	L 10	0	NOT RUN	N-D
4	1	68	DI-N-BUTYL PHTHALATE	13000	L 10	99	NOT RUN	N-D
4	1	86	TOLUENE	3200	N-D	100	NOT RUN	N-D
4	1	87	TRICHLOROETHYLENE	L 10	N-D	100	NOT RUN	N-D
4	1	114	ANTIMONY	L 25	L 25	0	NOT RUN	L 10
4	1	115	ARSENIC	L 25	L 25	0	NOT RUN	L 25
4	1	117	BERYLLIUM	L 10	L 10	0	30	L 10
4	1	118	CADMIUM	L 20	L 20	0	200	L 20
4	1	119	CHROMIUM	L 50	200	0	1000	L 50
4	1	120	COPPER	300	L 60	80	1000	L 60
4	1	121	CYANIDE	L 40	L 20	50	L 20	L 20
4	1	122	LEAD	L 200	L 200	0	2000	L 200
4	1	123	MERCURY	L 5	L 5	0	6	L 1
4	1	124	NICKEL	L 50	L 50	0	400	L 50
4	1	125	SELENIUM	L 25	L 25	0	L 2000	L 25
4	1	126	SILVER	L 10	L 10	0	L 10	L 10
4	1	127	THALLIUM	L 10	L 10	0	NOT RUN	L 10
4	1	128	ZINC	20000	L 600	97	100000	L 600
4	1		PH(UNITS)	7	9		10	7
4	1		BOD(MG-L)	2500	2600	0	3900	L 6
4	1		COD(MG-L)	42000	6100	85	140000	L 5
4	1		TOC(MG-L)	13000	1800	86	16000	3
4	1		OIL & GREASE(MG-L)	450	15	96	2830	L 1
4	1		TOTAL PHENOLS	720	212	70	166	L 5
4	1		TOTAL SOLIDS(MG-L)	15000	4200	72	470000	460
4	1		TOTAL DISS. SOLIDS(MG-L)	3000	3960	0	3900	459
4	1		TOTAL SUSP. SOLIDS(MG-L)	12000	240	98	466100	1
4	1		SETTLEABLE SOLIDS(ML-L)	2	NOT RUN	100	NOT RUN	L 0
4	1		TOTAL VOLATILE SOLIDS(MG-L)	13000	1100	91	90000	140
4	1		VOLATILE DISS. SOLIDS(MG-L)	3000	920	69	1000	139
4	1		TOTAL VOL. SUS. SOLIDS(MG-L)	10000	180	98	89000	1
4	1		ALUMINUM	30000	6000	80	1000000	L 500
4	1		BARIUM	10000	L 50	99	5000	L 50
4	1		IRON	20000	L 2000	90	200000	L 2000
4	1		MANGANESE	100	L 50	50	1000	L 50
4	1		CALCIUM(MG-L)	1400	800	42	9400	L 50
4	1		MAGNESIUM(MG-L)	122	9	92	190	L 1
4	1		BORON	1000	L 500	50	1000	L 500
4	1		COBALT	L 50	L 50	0	L 50	L 50
4	1		MOLYBDENUM	L 50	L 50	0	1000	L 50
4	1		TIN	90	L 50	44	2000	200
4	1		TITANIUM	3000	L 200	93	30000	L 200
4	1		VANADIUM	L 100	L 100	0	800	L 100
4	1		YTTRIUM	L 200	L 200	0	300	L 200
4	1		SODIUM	200	230	0	250	240

N-D NOT DETECTED; L-LESS THAN; PP- PRIORITY POLLUTANT NUMBER
PRIORITY POLLUTANTS NOT DETECTED IN ANY SAMPLES ARE NOT LISTED. FRACTIONS NOT ANALYZED ARE NOT LISTED.

PLANT	BATCH	PP	------PARAMETER----------	INFLUENT	EFFLUENT	REMOVAL(%)	SLUDGE	TAP WATER
				ALL UNITS UG/L UNLESS OTHERWISE NOTED				
4	2	114	ANTIMONY	L 25	L 25	0	NOT RUN	NOT RUN
4	2	115	ARSENIC	L 25	L 25	0	NOT RUN	NOT RUN
4	2	117	BERYLLIUM	L 10	L 10	0	20	NOT RUN
4	2	118	CADMIUM	L 20	L 20	0	200	NOT RUN
4	2	119	CHROMIUM	L 50	L 50	0	400	NOT RUN
4	2	120	COPPER	600	100	83	2000	NOT RUN
4	2	121	CYANIDE	L 200	L 20	90	L 20	NOT RUN
4	2	122	LEAD	L 200	L 200	0	2000	NOT RUN
4	2	123	MERCURY	L 5	L 1	80	L 5	NOT RUN
4	2	124	NICKEL	L 50	L 50	0	200	NOT RUN
4	2	125	SELENIUM	L 25	L 25	0	L 500	NOT RUN
4	2	126	SILVER	L 10	L 10	0	30	NOT RUN
4	2	127	THALLIUM	L 10	L 10	0	NOT RUN	NOT RUN
4	2	128	ZINC	300000	2000	99	500000	NOT RUN
4	2		PH(UNITS)	8	9		9	NOT RUN
4	2		BOD(MG-L)	4000	4700	0	4100	NOT RUN
4	2		COD(MG-L)	50000	9300	81	83000	NOT RUN
4	2		TOC(MG-L)	12000	2700	77	13000	NOT RUN
4	2		OIL & GREASE(MG-L)	1120	12	98	1620	NOT RUN
4	2		TOTAL PHENOLS	1600	1900	0	210	NOT RUN
4	2		TOTAL SOLIDS(MG-L)	24000	5200	78	9300	NOT RUN
4	2		TOTAL DISS. SOLIDS(MG-L)	8000	4230	47	6900	NOT RUN
4	2		TOTAL SUSP. SOLIDS(MG-L)	16000	970	93	2400	NOT RUN
4	2		SETTLEABLE SOLIDS(ML-L)	0	0	0	NOT RUN	NOT RUN
4	2		TOTAL VOLATILE SOLIDS(MG-L)	20000	2000	90	3100	NOT RUN
4	2		VOLATILE DISS. SOLIDS(MG-L)	7000	1140	83	2110	NOT RUN
4	2		TOTAL VOL. SUS. SOLIDS(MG-L)	13000	860	93	990	NOT RUN
4	2		ALUMINUM	10000	9000	10	600000	NOT RUN
4	2		BARIUM	800	L 50	93	20000	NOT RUN
4	2		IRON	6000	L 2000	66	400000	NOT RUN
4	2		MANGANESE	100	L 50	50	700	NOT RUN
4	2		CALCIUM(MG-L)	1400	680	51	300	NOT RUN
4	2		MAGNESIUM(MG-L)	36	7	80	84	NOT RUN
4	2		BORON	1000	2000	0	2000	NOT RUN
4	2		COBALT	100	L 50	50	200	NOT RUN
4	2		MOLYBDENUM	L 50	L 50	0	800	NOT RUN
4	2		TIN	400	L 50	87	2000	NOT RUN
4	2		TITANIUM	2000	L 200	90	50000	NOT RUN
4	2		VANADIUM	L 100	L 100	0	500	NOT RUN
4	2		YTTRIUM	L 200	L 200	0	200	NOT RUN
4	2		SODIUM	220	240	0	210	NOT RUN

N-D NOT DETECTED; L-LESS THAN; PP- PRIORITY POLLUTANT NUMBER
PRIORITY POLLUTANTS NOT DETECTED IN ANY SAMPLES ARE NOT LISTED. FRACTIONS NOT ANALYZED ARE NOT LISTED.

PLANT	BATCH	PP	------PARAMETER----------	INFLUENT	EFFLUENT	REMOVAL(%)	SLUDGE	TAP WATER
				ALL UNITS UG/L UNLESS OTHERWISE NOTED				
4	3	114	ANTIMONY	L 25	L 25	0	L 10	NOT RUN
4	3	115	ARSENIC	L 25	L 25	0	NOT RUN	NOT RUN
4	3	117	BERYLLIUM	L 10	L 5	50	20	NOT RUN
4	3	118	CADMIUM	100	L 10	90	80	NOT RUN
4	3	119	CHROMIUM	70	L 30	57	400	NOT RUN
4	3	120	COPPER	600	L 30	95	2000	NOT RUN
4	3	121	CYANIDE	L 200	52	74	L 20	NOT RUN
4	3	122	LEAD	700	L 200	71	900	NOT RUN
4	3	123	MERCURY	16	1	93	21	NOT RUN
4	3	124	NICKEL	L 50	L 50	0	100	NOT RUN
4	3	125	SELENIUM	L 25	L 25	0	L 750	NOT RUN
4	3	126	SILVER	L 10	L 5	50	30	NOT RUN
4	3	127	THALLIUM	L 10	L 10	0	NOT RUN	NOT RUN
4	3	128	ZINC	200000	600	99	200000	NOT RUN
4	3		PH(UNITS)	9	8		8	NOT RUN
4	3		BOD(MG-L)	3500	4500	0	6300	NOT RUN
4	3		COD(MG-L)	350000	8500	97	150000	NOT RUN
4	3		TOC(MG-L)	13000	2500	80	32000	NOT RUN
4	3		OIL & GREASE(MG-L)	930	L 20	97	5270	NOT RUN
4	3		TOTAL PHENOLS	1000	700	30	1720	NOT RUN
4	3		TOTAL SOLIDS(MG-L)	160000	4900	96	114000	NOT RUN
4	3		TOTAL DISS. SOLIDS(MG-L)	145000	4680	96	L 1	NOT RUN
4	3		TOTAL SUSP. SOLIDS(MG-L)	15000	220	98	114000	NOT RUN
4	3		SETTLEABLE SOLIDS(ML-L)	1	0	100	NOT RUN	NOT RUN
4	3		TOTAL VOLATILE SOLIDS(MG-L)	17000	1900	88	34000	NOT RUN
4	3		VOLATILE DISS. SOLIDS(MG-L)	6000	1680	72	L 1	NOT RUN
4	3		TOTAL VOL. SUS. SOLIDS(MG-L)	11000	220	98	34000	NOT RUN
4	3		ALUMINUM	70000	8000	88	500000	NOT RUN
4	3		BARIUM	2000	L 30	98	30000	NOT RUN
4	3		IRON	10000	L 2000	80	70000	NOT RUN
4	3		MANGANESE	90	L 50	44	300	NOT RUN
4	3		CALCIUM(MG-L)	1000	560	44	3200	NOT RUN
4	3		MAGNESIUM(MG-L)	36	7	80	96	NOT RUN
4	3		BORON	2000	1000	50	2000	NOT RUN
4	3		COBALT	L 50	L 30	40	L 50	NOT RUN
4	3		MOLYBDENUM	70	L 50	28	500	NOT RUN
4	3		TIN	900	200	77	2000	NOT RUN
4	3		TITANIUM	5000	200	96	40000	NOT RUN
4	3		VANADIUM	L 100	L 100	0	400	NOT RUN
4	3		YTTRIUM	L 200	L 200	0	200	NOT RUN
4	3		SODIUM	260	230	11	280	NOT RUN

N-D NOT DETECTED; L-LESS THAN; PP- PRIORITY POLLUTANT NUMBER
PRIORITY POLLUTANTS NOT DETECTED IN ANY SAMPLES ARE NOT LISTED. FRACTIONS NOT ANALYZED ARE NOT LISTED.

PLANT	BATCH	PP	------PARAMETER----------	INFLUENT		EFFLUENT		REMOVAL(%)	SLUDGE		TAP WATER	
				ALL UNITS UG/L UNLESS OTHERWISE NOTED								
4	4	2	ACROLEIN	1	10	0	55555	100	0	55555	0	55555
4	4	4	BENZENE	0	24	0	55555	100	1	10	0	55555
4	4	11	1,1,1-TRICHLOROETHANE	0	50	0	35	30	1	10	1	10
4	4	21	2,4,6-TRICHLOROPHENOL	0	55555	0	55555	333	0	55555	1	10
4	4	29	1,1-DICHLOROETHYLENE	0	55555	0	55555	333	0	55555	1	10
4	4	31	2,4-DICHLOROPHENOL	0	55555	0	55555	333	0	55555	1	10
4	4	38	ETHYLBENZENE	0	460	0	43	90	0	62	0	55555
4	4	44	METHYLENE CHLORIDE	0	4200	0	4050	3	0	4600	0	2200
4	4	55	NAPHTHALENE	0	54	0	16	70	0	1050	0	55555
4	4	64	PENTACHLOROPHENOL	0	55555	0	55555	333	0	55555	1	10
4	4	65	PHENOL	0	36	0	94	103	0	336	0	55555
4	4	66	BIS(2-ETHYLHEXYL) PHTHALATE	0	55555	0	55555	333	0	594	0	55555
4	4	67	BUTYL BENZYL PHTHALATE	0	55555	0	55555	333	0	55555	1	10
4	4	68	DI-N-BUTYL PHTHALATE	0	57	0	55555	100	0	248	0	55555
4	4	85	TETRACHLOROETHYLENE	0	270	0	13	95	0	30	0	55555
4	4	86	TOLUENE	0	580	0	145	75	0	175	1	10
4	4	87	TRICHLOROETHYLENE	0	55555	0	55555	333	1	10	0	55555
4	4	99	ENDRIN ALDEHYDE	0	55555	1	10	103	0	55555	1	10
4	4	117	BERYLLIUM	1	10	1	1	90	0	20	1	1
4	4	118	CADMIUM	1	20	1	2	90	0	70	1	2
4	4	119	CHROMIUM	1	50	1	5	90	0	730	1	5
4	4	120	COPPER	0	370	0	13	96	0	1780	0	441
4	4	121	CYANIDE	1	1	1	1	103	1	1	1	1
4	4	122	LEAD	1	200	1	20	90	0	1460	1	20
4	4	123	MERCURY	0	1	0	1	103	0	5	1	1
4	4	124	NICKEL	1	50	1	5	90	1	50	1	5
4	4	126	SILVER	1	1	1	1	103	1	10	1	1
4	4	128	ZINC	0	73100	0	313	99	0	300000	0	75
4	4		PH(UNITS)	0	10	0	10	333	0	10	0	9999
4	4		COD(MG-L)	0	21800	0	4800	77	0	75000	0	3
4	4		TOC(MG-L)	0	6428	0	1523	76	0	17468	1	2
4	4		OIL & GREASE(MG-L)	0	400	0	60	85	0	230	0	9999
4	4		TOTAL PHENOLS	0	88	0	98	103	0	120	1	5
4	4		ALUMINUM	0	82400	0	30000	63	0	940000	1	50
4	4		BARIUM	0	610	1	5	99	0	6810	0	8
4	4		IRON	0	502000	0	708	99	0	160000	1	170
4	4		MANGANESE	0	130	1	5	96	0	650	0	11
4	4		CALCIUM(MG-L)	0	283	0	782	103	0	2740	0	85
4	4		MAGNESIUM(MG-L)	0	20	0	22	103	1	1	0	81
4	4		BORON	0	1090	0	850	22	0	1670	0	310
4	4		COBALT	1	50	1	5	90	0	200	1	5
4	4		MOLYBDENUM	0	90	0	37	58	0	1110	1	5
4	4		TIN	0	400	0	90	77	0	1870	0	17
4	4		TITANIUM	0	1190	1	15	98	0	5730	1	15
4	4		VANADIUM	0	140	0	39	72	0	1190	1	12
4	4		SODIUM	1	150	0	139	7	1	150	0	33

N-D NOT DETECTED; L-LESS THAN
PRIORITY POLLUTANTS NOT DETECTED IN ANY SAMPLES ARE NOT LISTED. FRACTIONS NOT ANALYZED ARE NOT LISTED.

R; T=0.03 IO=10 ISRU=0.01 09:11:43

ALL UNITS UG/L UNLESS OTHERWISE NOTED

5	1	4	BENZENE		N-D		400	0		NOT RUN		N-D
5	1	6	CARBON TETRACHLORIDE		N-D		120	0		NOT RUN		14
5	1	10	1,2-DICHLOROETHANE		420		N-D	100		NOT RUN		N-D
5	1	11	1,1,1-TRICHLOROETHANE		N-D		N-D			NOT RUN		110
5	1	13	1,1-DICHLOROETHANE	L	10		N-D	100		NOT RUN		N-D
5	1	14	1,1,2-TRICHLOROETHANE		N-D	L	10	0		NOT RUN		N-D
5	1	23	CHLOROFORM		N-D		N-D			NOT RUN		570
5	1	29	1,1-DICHLOROETHYLENE		23		N-D	100		NOT RUN	L	10
5	1	38	ETHYLBENZENE		4500		73600	0		NOT RUN		61
5	1	44	METHYLENE CHLORIDE		900		130	85		NOT RUN		440
5	1	54	ISOPHORONE		N-D		200	0		NOT RUN		N-D
5	1	55	NAPHTHALENE		18000		790	95		NOT RUN		N-D
5	1	64	PENTACHLOROPHENOL		27000		200	99		NOT RUN		N-D
5	1	65	PHENOL		N-D		110	0		NOT RUN		N-D
5	1	66	BIS(2-ETHYLHEXYL) PHTHALATE		690		160	76		NOT RUN		N-D
5	1	67	BUTYL BENZYL PHTHALATE		N-D		18	0		NOT RUN		N-D
5	1	68	DI-N-BUTYL PHTHALATE		69000		65	99		NOT RUN		N-D
5	1	70	DIETHYL PHTHALATE		N-D		19	0		NOT RUN		N-D
5	1	86	TOLUENE		N-D		N-D			NOT RUN		2700
5	1	87	TRICHLOROETHYLENE		N-D		200	0		NOT RUN		N-D
5	1	114	ANTIMONY		55	L	25	54		325	L	10
5	1	115	ARSENIC		NOT RUN		NOT RUN	0		NOT RUN	L	25
5	1	117	BERYLLIUM	L	10	L	10	0	L	10	L	10
5	1	118	CADMIUM	L	20	L	20	0	L	20		90
5	1	119	CHROMIUM		40000		20000	50		90000		200
5	1	120	COPPER		800		100	87		1000	L	60
5	1	121	CYANIDE		30	L	20	33		160	L	20
5	1	122	LEAD		20000	L	200	99		80000	L	200
5	1	123	MERCURY	L	500		68	86		650	L	1
5	1	124	NICKEL	L	50		600	0	L	50		100
5	1	125	SELENIUM	L	25	L	25	0	L	200	L	25
5	1	126	SILVER	L	10	L	10	0	L	10	L	10
5	1	127	THALLIUM	L	10	L	10	0		NOT RUN	L	10
5	1	128	ZINC		20000		1000	95		50000	L	600
5	1		PH(UNITS)		5		6			8		9
5	1		BOD(MG-L)		51000		29000	43		70000	L	6
5	1		COD(MG-L)		120000		46000	61		120000		15
5	1		TOC(MG-L)		20000		10000	50		29000		8
5	1		OIL & GREASE(MG-L)		1250		1	99		4210	L	1
5	1		TOTAL PHENOLS	L	10		42	0		80	L	10
5	1		TOTAL SOLIDS(MG-L)		12000		9000	25		79000		210
5	1		TOTAL DISS. SOLIDS(MG-L)		2300		8962	0		9000		209
5	1		TOTAL SUSP. SOLIDS(MG-L)		9700		38	99		70000		1
5	1		SETTLEABLE SOLIDS(ML-L)		11	L	0	100		NOT RUN	L	0
5	1		TOTAL VOLATILE SOLIDS(MG-L)		7600		1400	81		37000		68
5	1		VOLATILE DISS. SOLIDS(MG-L)		6400		1376	78		1500		67
5	1		TOTAL VOL. SUS. SOLIDS(MG-L)		1200		24	98		35500		1
5	1		ALUMINUM		80000	L	500	99		1000000	L	500
5	1		BARIUM		8000	L	50	99		500	L	50
5	1		IRON		20000	L	2000	90		30000		2000
5	1		MANGANESE		2000		800	60		4000	L	50
5	1		CALCIUM(MG-L)		480		430	10		490	L	50
5	1		MAGNESIUM(MG-L)		15		11	26		21		11
5	1		BORON	L	500	L	5000	0	L	500	L	500
5	1		COBALT		2000		5000	0		4000	L	50
5	1		MOLYBDENUM	L	50	L	50	0		2000	L	50
5	1		TIN		800		200	75		7000		200
5	1		TITANIUM		500	L	200	60		1000	L	200
5	1		VANADIUM	L	100	L	100	0	L	100	L	100
5	1		YTTRIUM	L	200	L	200	0	L	200	L	200
5	1		SODIUM		1500		2000	0		1900	L	150

N-D NOT DETECTED; L-LESS THAN; PP- PRIORITY POLLUTANT NUMBER
PRIORITY POLLUTANTS NOT DETECTED IN ANY SAMPLES ARE NOT LISTED. FRACTIONS NOT ANALYZED ARE NOT LISTED.

PLANT	BATCH	PP	------PARAMETER----------	INFLUENT	EFFLUENT	REMOVAL(%)	SLUDGE	TAP WATER
				ALL UNITS UG/L UNLESS OTHERWISE NOTED				
5	2	114	ANTIMONY	L 25	L 25	0	NOT RUN	NOT RUN
5	2	117	BERYLLIUM	L 10	L 10	0	L 10	NOT RUN
5	2	118	CADMIUM	L 20	L 20	0	L 20	NOT RUN
5	2	119	CHROMIUM	10000	2000	80	30000	NOT RUN
5	2	120	COPPER	L 60	L 60	0	300	NOT RUN
5	2	121	CYANIDE	L 200	L 20	90	L 20	NOT RUN
5	2	122	LEAD	2000	L 200	90	10000	NOT RUN
5	2	123	MERCURY	500	56	88	1600	NOT RUN
5	2	124	NICKEL	L 50	L 50	0	90	NOT RUN
5	2	125	SELENIUM	L 25	L 25	0	L 200	NOT RUN
5	2	126	SILVER	L 10	L 10	0	L 10	NOT RUN
5	2	127	THALLIUM	L 10	L 10	0	NOT RUN	NOT RUN
5	2	128	ZINC	300000	100000	66	300000	NOT RUN
5	2		PH(UNITS)	9	6		7	NOT RUN
5	2		BOD(MG-L)	65500	32000	51	150000	NOT RUN
5	2		COD(MG-L)	79000	45000	43	110000	NOT RUN
5	2		TOC(MG-L)	46000	10000	78	28000	NOT RUN
5	2		OIL & GREASE(MG-L)	1360	5	99	4830	NOT RUN
5	2		TOTAL PHENOLS	280	96	65	480	NOT RUN
5	2		TOTAL SOLIDS(MG-L)	28000	5500	80	36000	NOT RUN
5	2		TOTAL DISS. SOLIDS(MG-L)	20700	5494	73	11000	NOT RUN
5	2		TOTAL SUSP. SOLIDS(MG-L)	7300	6	99	25000	NOT RUN
5	2		SETTLEABLE SOLIDS(ML-L)	28	L 0	100	NOT RUN	NOT RUN
5	2		TOTAL VOLATILE SOLIDS(MG-L)	12000	750	93	17000	NOT RUN
5	2		VOLATILE DISS. SOLIDS(MG-L)	10700	748	93	7000	NOT RUN
5	2		TOTAL VOL. SUS. SOLIDS(MG-L)	1300	2	99	10000	NOT RUN
5	2		ALUMINUM	10000	L 500	95	600000	NOT RUN
5	2		BARIUM	10000	L 50	99	1000	NOT RUN
5	2		IRON	3000	2000	33	40000	NOT RUN
5	2		MANGANESE	1000	800	20	1000	NOT RUN
5	2		CALCIUM(MG-L)	1200	780	35	1200	NOT RUN
5	2		MAGNESIUM(MG-L)	16	11	31	26	NOT RUN
5	2		BORON	9000	10000	0	10000	NOT RUN
5	2		COBALT	500	300	40	1000	NOT RUN
5	2		MOLYBDENUM	L 50	L 50	0	700	NOT RUN
5	2		TIN	400	L 50	87	2000	NOT RUN
5	2		TITANIUM	500	L 200	60	2000	NOT RUN
5	2		VANADIUM	L 100	L 100	0	L 100	NOT RUN
5	2		YTTRIUM	L 200	L 200	0	L 200	NOT RUN
5	2		SODIUM	210	640	0	500	NOT RUN

N-D NOT DETECTED; L-LESS THAN; PP- PRIORITY POLLUTANT NUMBER
PRIORITY POLLUTANTS NOT DETECTED IN ANY SAMPLES ARE NOT LISTED. FRACTIONS NOT ANALYZED ARE NOT LISTED.

PLANT	BATCH	PP	------PARAMETER----------	INFLUENT	EFFLUENT	REMOVAL(%)	SLUDGE	TAP WATER
				ALL UNITS UG/L UNLESS OTHERWISE NOTED				
5	3	114	ANTIMONY	L 25	L 25	0	NOT RUN	NOT RUN
5	3	115	ARSENIC	L 25	L 25	0	NOT RUN	NOT RUN
5	3	117	BERYLLIUM	8	L 4	50	10	NOT RUN
5	3	118	CADMIUM	40	30	25	200	NOT RUN
5	3	119	CHROMIUM	30000	30000	0	40000	NOT RUN
5	3	120	COPPER	1000	800	20	700	NOT RUN
5	3	121	CYANIDE	210	L 20	90	260	NOT RUN
5	3	122	LEAD	20000	40000	0	30000	NOT RUN
5	3	123	MERCURY	1000	300	70	2300	NOT RUN
5	3	124	NICKEL	L 20	L 20	0	L 20	NOT RUN
5	3	125	SELENIUM	L 25	L 25	0	L 350	NOT RUN
5	3	126	SILVER	L 10	L 10	0	L 10	NOT RUN
5	3	127	THALLIUM	L 10	L 10	0	NOT RUN	NOT RUN
5	3	128	ZINC	10000	3000	70	20000	NOT RUN
5	3		PH(UNITS)	13	7		7	NOT RUN
5	3		BOD(MG-L)	60000	14000	76	130000	NOT RUN
5	3		COD(MG-L)	90000	23000	74	74000	NOT RUN
5	3		TOC(MG-L)	7000	4400	37	13000	NOT RUN
5	3		OIL & GREASE(MG-L)	440	13	97	580	NOT RUN
5	3		TOTAL PHENOLS	120	170	0	310	NOT RUN
5	3		TOTAL SOLIDS(MG-L)	13200	14100	0	30500	NOT RUN
5	3		TOTAL DISS. SOLIDS(MG-L)	9500	14080	0	13400	NOT RUN
5	3		TOTAL SUSP. SOLIDS(MG-L)	3700	20	99	17100	NOT RUN
5	3		TOTAL VOLATILE SOLIDS(MG-L)	3100	780	74	7500	NOT RUN
5	3		VOLATILE DISS. SOLIDS(MG-L)	2040	762	62	NOT RUN	NOT RUN
5	3		TOTAL VOL. SUS. SOLIDS(MG-L)	1060	18	98	NOT RUN	NOT RUN
5	3		ALUMINUM	90000	30000	66	900000	NOT RUN
5	3		BARIUM	30000	30000	0	8000	NOT RUN
5	3		IRON	90000	10000	88	100000	NOT RUN
5	3		MANGANESE	300	600	0	600	NOT RUN
5	3		CALCIUM(MG-L)	280	68	75	370	NOT RUN
5	3		MAGNESIUM(MG-L)	12	15	0	17	NOT RUN
5	3		BORON	2000	800	60	3000	NOT RUN
5	3		COBALT	500	L 20	96	1000	NOT RUN
5	3		MOLYBDENUM	200	6000	0	1000	NOT RUN
5	3		TIN	300	200	33	2000	NOT RUN
5	3		TITANIUM	1000	70	93	2000	NOT RUN
5	3		VANADIUM	L 50	L 50	0	60	NOT RUN
5	3		YTTRIUM	L 2000	L 200	90	L 200	NOT RUN
5	3		SODIUM	2900	74	97	3500	NOT RUN

N-D NOT DETECTED; L-LESS THAN; PP- PRIORITY POLLUTANT NUMBER
PRIORITY POLLUTANTS NOT DETECTED IN ANY SAMPLES ARE NOT LISTED. FRACTIONS NOT ANALYZED ARE NOT LISTED.

PLANT	BATCH	PP	------PARAMETER----------		INFLUENT	EFFLUENT	REMOVAL(%)	SLUDGE	TAP WATER
					ALL UNITS UG/L UNLESS OTHERWISE NOTED				
5	4	114	ANTIMONY	L	25	NOT RUN		NOT RUN	NOT RUN
5	4	117	BERYLLIUM	L	10	NOT RUN		NOT RUN	NOT RUN
5	4	118	CADMIUM	L	20	NOT RUN		NOT RUN	NOT RUN
5	4	119	CHROMIUM		20000	NOT RUN		NOT RUN	NOT RUN
5	4	120	COPPER		700	NOT RUN		NOT RUN	NOT RUN
5	4	121	CYANIDE	L	200	NOT RUN		NOT RUN	NOT RUN
5	4	122	LEAD		30000	NOT RUN		NOT RUN	NOT RUN
5	4	123	MERCURY		1650	NOT RUN		NOT RUN	NOT RUN
5	4	124	NICKEL	L	50	NOT RUN		NOT RUN	NOT RUN
5	4	125	SELENIUM	L	25	NOT RUN		NOT RUN	NOT RUN
5	4	126	SILVER	L	10	NOT RUN		NOT RUN	NOT RUN
5	4	127	THALLIUM	L	10	NOT RUN		NOT RUN	NOT RUN
5	4	128	ZINC		10000	NOT RUN		NOT RUN	NOT RUN
5	4		PH(UNITS)		8	NOT RUN		NOT RUN	NOT RUN
5	4		BOD(MG-L)		30000	NOT RUN		NOT RUN	NOT RUN
5	4		COD(MG-L)		230000	NOT RUN		NOT RUN	NOT RUN
5	4		TOC(MG-L)		34000	NOT RUN		NOT RUN	NOT RUN
5	4		OIL & GREASE(MG-L)		1110	NOT RUN		NOT RUN	NOT RUN
5	4		TOTAL PHENOLS		136	NOT RUN		NOT RUN	NOT RUN
5	4		TOTAL SOLIDS(MG-L)		25000	NOT RUN		NOT RUN	NOT RUN
5	4		TOTAL DISS. SOLIDS(MG-L)		23200	NOT RUN		NOT RUN	NOT RUN
5	4		TOTAL SUSP. SOLIDS(MG-L)		1800	NOT RUN		NOT RUN	NOT RUN
5	4		TOTAL VOLATILE SOLIDS(MG-L)		23000	NOT RUN		NOT RUN	NOT RUN
5	4		VOLATILE DISS. SOLIDS(MG-L)		21800	NOT RUN		NOT RUN	NOT RUN
5	4		TOTAL VOL. SUS. SOLIDS(MG-L)		1200	NOT RUN		NOT RUN	NOT RUN
5	4		ALUMINUM		40000	NOT RUN		NOT RUN	NOT RUN
5	4		BARIUM		4000	NOT RUN		NOT RUN	NOT RUN
5	4		IRON		20000	NOT RUN		NOT RUN	NOT RUN
5	4		MANGANESE		900	NOT RUN		NOT RUN	NOT RUN
5	4		CALCIUM(MG-L)	L	50	NOT RUN		NOT RUN	NOT RUN
5	4		MAGNESIUM(MG-L)		8	NOT RUN		NOT RUN	NOT RUN
5	4		BORON		700	NOT RUN		NOT RUN	NOT RUN
5	4		COBALT		2000	NOT RUN		NOT RUN	NOT RUN
5	4		MOLYBDENUM	L	50	NOT RUN		NOT RUN	NOT RUN
5	4		TIN		20000	NOT RUN		NOT RUN	NOT RUN
5	4		TITANIUM		900	NOT RUN		NOT RUN	NOT RUN
5	4		VANADIUM	L	100	NOT RUN		NOT RUN	NOT RUN
5	4		YTTRIUM	L	200	NOT RUN		NOT RUN	NOT RUN
5	4		SODIUM		450	NOT RUN		NOT RUN	NOT RUN

N-D NOT DETECTED; L-LESS THAN; PP- PRIORITY POLLUTANT NUMBER
PRIORITY POLLUTANTS NOT DETECTED IN ANY SAMPLES ARE NOT LISTED. FRACTIONS NOT ANALYZED ARE NOT LISTED.

PLANT	BATCH	PP	------PARAMETER----------	INFLUENT	EFFLUENT	REMOVAL(%)	SLUDGE	TAP WATER
				ALL UNITS UG/L UNLESS OTHERWISE NOTED				
5	5	4	BENZENE	N-D	84	0	30	16
5	5	6	CARBON TETRACHLORIDE	N-D	L 10	0	L 10	N-D
5	5	11	1,1,1-TRICHLOROETHANE	N-D	N-D		14	L 10
5	5	15	1,1,2,2-TETRACHLOROETHANE	N-D	N-D		L 10	L 10
5	5	23	CHLOROFORM	N-D	N-D		N-D	L 10
5	5	29	1,1-DICHLOROETHYLENE	N-D	44	0	N-D	L 10
5	5	30	1,2-TRANS-DICHLOROETHYLENE	N-D	L 10	0	N-D	N-D
5	5	38	ETHYLBENZENE	11000	2223	79	265	N-D
5	5	44	METHYLENE CHLORIDE	N-D	520	0	2640	67
5	5	48	DICHLOROBROMOMETHANE	N-D	N-D		N-D	L 10
5	5	51	CHLORODIBROMOMETHANE	N-D	N-D		N-D	L 10
5	5	55	NAPHTHALENE	1130	1830	0	N-D	N-D
5	5	65	PHENOL	132	172	0	150	N-D
5	5	66	BIS(2-ETHYLHEXYL) PHTHALATE	2810	N-D	100	1940	N-D
5	5	67	BUTYL BENZYL PHTHALATE	70	880	0	38800	N-D
5	5	68	DI-N-BUTYL PHTHALATE	1310	1040	20	17750	L 10
5	5	70	DIETHYL PHTHALATE	680	1820	0	960	L 10
5	5	78	ANTHRACENE	N-D	N-D		410	L 10
5	5	86	TOLUENE	81000	7191	91	2210	N-D
5	5	87	TRICHLOROETHYLENE	L 10	14	0	L 10	N-D
5	5	114	ANTIMONY	L 2000	L 2000	0	L 2000	L 2
5	5	115	ARSENIC	L 2000	L 200	90	L 2000	L 2
5	5	117	BERYLLIUM	L 10	L 1	90	2	L 1
5	5	118	CADMIUM	40	34	15	49	L 2
5	5	119	CHROMIUM	4780	3220	32	7080	10
5	5	120	COPPER	220	108	50	216	33
5	5	121	CYANIDE	0	0	0	36500	L 0
5	5	122	LEAD	1320	185	85	2800	84
5	5	124	NICKEL	440	101	77	317	8
5	5	125	SELENIUM	L 2000	L 2000	0	L 2000	L 2
5	5	126	SILVER	70	6	91	18	2
5	5	127	THALLIUM	L 2000	L 2000	0	L 2000	L 2
5	5	128	ZINC	63900	6000	90	6000	634
5	5		PH(UNITS)	8	6		7	7
5	5		BOD(MG-L)	15500	6660	57	1	L 2
5	5		COD(MG-L)	29300	10100	65	7	L 3
5	5		TOC(MG-L)	5060	3550	29	20100	2
5	5		OIL & GREASE(MG-L)	2000	70	96	129000	L 5
5	5		TOTAL PHENOLS	L 1	L 1	0	4000	L 1
5	5		TOTAL SOLIDS(MG-L)	50700	5970	88	0	192
5	5		TOTAL DISS. SOLIDS(MG-L)	NOT RUN	NOT RUN	0	L 1	NOT RUN
5	5		TOTAL SUSP. SOLIDS(MG-L)	31000	21	99	211000	NOT RUN
5	5		TOTAL VOLATILE SOLIDS(MG-L)	NOT RUN	NOT RUN	0	187000	NOT RUN
5	5		ALUMINUM	99100	143	99	194000	50
5	5		BARIUM	10300	L 5	99	72	8
5	5		IRON	6810	L 170	97	22600	L 170
5	5		MANGANESE	130	583	0	761	L 5
5	5		CALCIUM(MG-L)	60	718	0	683	40
5	5		MAGNESIUM(MG-L)	8	11	0	16	12
5	5		BORON	L 500	185	63	175	70
5	5		COBALT	640	1100	0	1320	L 5
5	5		MOLYBDENUM	220	63	71	301	10
5	5		TIN	750	102	86	654	28
5	5		TITANIUM	5410	21	99	3910	L 15
5	5		VANADIUM	L 120	L 12	90	80	L 12
5	5		YTTRIUM	L 160	38	76	45	L 16
5	5		SODIUM	150	264	0	232	L 15

N-D NOT DETECTED; L-LESS THAN; PP- PRIORITY POLLUTANT NUMBER
PRIORITY POLLUTANTS NOT DETECTED IN ANY SAMPLES ARE NOT LISTED. FRACTIONS NOT ANALYZED ARE NOT LISTED.

PLANT	BATCH	PP	------PARAMETER----------	INFLUENT		EFFLUENT	REMOVAL(%)	SLUDGE		TAP WATER
				ALL UNITS UG/L UNLESS OTHERWISE NOTED						
6	1	4	BENZENE	4000		390	90	NOT RUN		10
6	1	6	CARBON TETRACHLORIDE	93		N-D	100	NOT RUN		N-D
6	1	11	1,1,1-TRICHLOROETHANE	N-D	L	10	0	NOT RUN		N-D
6	1	14	1,1,2-TRICHLOROETHANE	L 10		N-D	100	NOT RUN		N-D
6	1	23	CHLOROFORM	125	L	10	94	NOT RUN		N-D
6	1	29	1,1-DICHLOROETHYLENE	28		N-D	100	NOT RUN		12
6	1	38	ETHYLBENZENE	730		N-D	100	NOT RUN		N-D
6	1	44	METHYLENE CHLORIDE	N-D		1700	0	NOT RUN		22
6	1	47	BROMOFORM	N-D		N-D		NOT RUN	L	10
6	1	48	DICHLORODBROMOMETHANE	N-D		N-D		NOT RUN		15
6	1	51	CHLORODIBROMOMETHANE	N-D		N-D		NOT RUN		27
6	1	54	ISOPHORONE	N-D		26	0	NOT RUN		N-D
6	1	55	NAPHTHALENE	N-D	L	10	0	NOT RUN		N-D
6	1	65	PHENOL	N-D	L	10	0	NOT RUN		N-D
6	1	66	BIS(2-ETHYLHEXYL) PHTHALATE	N-D	L	10	0	NOT RUN		N-D
6	1	68	DI-N-BUTYL PHTHALATE	2000		N-D	100	NOT RUN		N-D
6	1	71	DIMETHYL PHTHALATE	N-D	L	10	0	NOT RUN		N-D
6	1	85	TETRACHLOROETHYLENE	L 10		N-D	100	NOT RUN		N-D
6	1	86	TOLUENE	17000		2800	83	NOT RUN		N-D
6	1	114	ANTIMONY	L 25	L	25	0	NOT RUN	L	10
6	1	115	ARSENIC	83	L	25	69	NOT RUN	L	25
6	1	117	BERYLLIUM	L 10	L	10	0	L 10	L	10
6	1	118	CADMIUM	L 20	L	200	0	200	L	20
6	1	119	CHROMIUM	L 50	L	50	0	300	L	50
6	1	120	COPPER	300		90	70	2000	L	60
6	1	121	CYANIDE	L 100	L	20	80	L 100		93
6	1	122	LEAD	900	L	200	77	6000	L	200
6	1	123	MERCURY	5		3	40	26	L	1
6	1	124	NICKEL	200	L	50	75	L 50	L	50
6	1	125	SELENIUM	L 25	L	25	0	L 200	L	25
6	1	126	SILVER	L 10	L	10	0	70	L	10
6	1	127	THALLIUM	L 10	L	10	0	NOT RUN	L	10
6	1	128	ZINC	200000		7000	96	800000	L	600
6	1		PH(UNITS)	8		8		8		8
6	1		BOD(MG-L)	9800		11000	0	12000	L	2
6	1		COD(MG-L)	27000		14000	48	140000	L	5
6	1		TOC(MG-L)	10000		4000	60	40000		13
6	1		OIL & GREASE(MG-L)	940		5	99	32000		2
6	1		TOTAL PHENOLS	NOT RUN		58	0	220	L	20
6	1		TOTAL SOLIDS(MG-L)	13500		3600	73	47233		470
6	1		TOTAL DISS. SOLIDS(MG-L)	12800		3490	72	3650		466
6	1		TOTAL SUSP. SOLIDS(MG-L)	700		110	84	39033		4
6	1		SETTLEABLE SOLIDS(ML-L)	0	L	0	0	NOT RUN	L	0
6	1		TOTAL VOLATILE SOLIDS(MG-L)	6500		240	96	19833		120
6	1		VOLATILE DISS. SOLIDS(MG-L)	5950		184	96	NOT RUN		118
6	1		TOTAL VOL. SUS. SOLIDS(MG-L)	550		56	89	17667		2
6	1		ALUMINUM	200000	L	500	99	900000	L	500
6	1		BARIUM	300	L	50	83	700		600
6	1		IRON	40000	L	2000	95	700000	L	2000
6	1		MANGANESE	600		700	0	4000	L	50
6	1		CALCIUM(MG-L)	120		56	53	280		56
6	1		MAGNESIUM(MG-L)	36		13	63	110		44
6	1		BORON	L 500	L	500	0	L 500	L	500
6	1		COBALT	100	L	50	50	500	L	50
6	1		MOLYBDENUM	300	L	50	83	1000	L	50
6	1		TIN	400	L	50	87	2000	L	50
6	1		TITANIUM	5000	L	200	96	20000	L	200
6	1		VANADIUM	L 100	L	100	0	300	L	100
6	1		YTTRIUM	L 200	L	200	0	L 200	L	200
6	1		SODIUM	220		960	0	700	L	150

N-D NOT DETECTED; L-LESS THAN; PP- PRIORITY POLLUTANT NUMBER
PRIORITY POLLUTANTS NOT DETECTED IN ANY SAMPLES ARE NOT LISTED. FRACTIONS NOT ANALYZED ARE NOT LISTED.

PLANT	BATCH	PP	------PARAMETER----------	INFLUENT	EFFLUENT	REMOVAL(%)	SLUDGE	TAP WATER
				ALL UNITS UG/L UNLESS OTHERWISE NOTED				
6	2	114	ANTIMONY	L 25	L 25	0	NOT RUN	NOT RUN
6	2	115	ARSENIC	270	L 25	90	NOT RUN	NOT RUN
6	2	117	BERYLLIUM	20	L 10	50	L 10	NOT RUN
6	2	118	CADMIUM	200	L 20	90	400	NOT RUN
6	2	119	CHROMIUM	70	L 50	28	100	NOT RUN
6	2	120	COPPER	800	100	87	2000	NOT RUN
6	2	121	CYANIDE	L 20	L 20	0	L 100	NOT RUN
6	2	122	LEAD	1000	L 200	80	2000	NOT RUN
6	2	123	MERCURY	20	L 1	95	46	NOT RUN
6	2	124	NICKEL	L 50	L 50	0	100	NOT RUN
6	2	125	SELENIUM	L 25	L 5	80	L 200	NOT RUN
6	2	126	SILVER	L 10	L 10	0	L 10	NOT RUN
6	2	127	THALLIUM	L 10	L 10	0	NOT RUN	NOT RUN
6	2	128	ZINC	500000	40000	92	800000	NOT RUN
6	2		PH(UNITS)	7	7		7	NOT RUN
6	2		BOD(MG-L)	5700	11000	0	15000	NOT RUN
6	2		COD(MG-L)	44000	12000	72	82000	NOT RUN
6	2		TOC(MG-L)	11000	780	92	12000	NOT RUN
6	2		OIL & GREASE(MG-L)	1100	53	95	3000	NOT RUN
6	2		TOTAL PHENOLS	360	77	78	6000	NOT RUN
6	2		TOTAL SOLIDS(MG-L)	85500	6500	92	38850	NOT RUN
6	2		TOTAL DISS. SOLIDS(MG-L)	1550	6462	0	6385	NOT RUN
6	2		TOTAL SUSP. SOLIDS(MG-L)	56900	38	99	23400	NOT RUN
6	2		SETTLEABLE SOLIDS(ML-L)	65	L 0	100	NOT RUN	NOT RUN
6	2		TOTAL VOLATILE SOLIDS(MG-L)	29800	500	98	12350	NOT RUN
6	2		VOLATILE DISS. SOLIDS(MG-L)	NOT RUN	492	0	NOT RUN	NOT RUN
6	2		TOTAL VOL. SUS. SOLIDS(MG-L)	18525	8	99	8550	NOT RUN
6	2		ALUMINUM	300000	L 500	99	300000	NOT RUN
6	2		BARIUM	100	L 50	50	300	NOT RUN
6	2		IRON	70000	4000	94	200000	NOT RUN
6	2		MANGANESE	1000	2000	0	4000	NOT RUN
6	2		CALCIUM(MG-L)	560	390	30	600	NOT RUN
6	2		MAGNESIUM(MG-L)	51	25	50	75	NOT RUN
6	2		BORON	700	L 500	28	600	NOT RUN
6	2		COBALT	100	L 50	50	400	NOT RUN
6	2		MOLYBDENUM	800	L 50	93	500	NOT RUN
6	2		TIN	800	L 50	93	800	NOT RUN
6	2		TITANIUM	8000	L 200	97	8000	NOT RUN
6	2		VANADIUM	L 100	L 100	0	L 100	NOT RUN
6	2		YTTRIUM	L 200	L 200	0	L 200	NOT RUN
6	2		SODIUM	300	15000	0	1300	NOT RUN

N-D NOT DETECTED; L-LESS THAN; PP- PRIORITY POLLUTANT NUMBER
PRIORITY POLLUTANTS NOT DETECTED IN ANY SAMPLES ARE NOT LISTED. FRACTIONS NOT ANALYZED ARE NOT LISTED.

PLANT	BATCH	PP	------PARAMETER----------	INFLUENT	EFFLUENT	REMOVAL(%)	SLUDGE	TAP WATER
				ALL UNITS UG/L UNLESS OTHERWISE NOTED				
6	3	114	ANTIMONY	L 25	L 25	0	NOT RUN	NOT RUN
6	3	115	ARSENIC	57	L 25	56	NOT RUN	NOT RUN
6	3	117	BERYLLIUM	L 10	L 10	0	20	NOT RUN
6	3	118	CADMIUM	60	L 20	66	200	NOT RUN
6	3	119	CHROMIUM	L 50	L 50	0	100	NOT RUN
6	3	120	COPPER	200	100	50	2000	NOT RUN
6	3	121	CYANIDE	L 100	L 20	80	L 200	NOT RUN
6	3	122	LEAD	500	200	60	2000	NOT RUN
6	3	123	MERCURY	8	L 1	87	12	NOT RUN
6	3	124	NICKEL	L 50	L 50	0	60	NOT RUN
6	3	125	SELENIUM	L 25	L 25	0	L 200	NOT RUN
6	3	126	SILVER	L 10	L 10	0	L 10	NOT RUN
6	3	127	THALLIUM	L 10	L 10	0	NOT RUN	NOT RUN
6	3	128	ZINC	200000	4000	98	300000	NOT RUN
6	3		PH(UNITS)	8	7		8	NOT RUN
6	3		BOD(MG-L)	5900	5100	13	6100	NOT RUN
6	3		COD(MG-L)	26000	10000	61	56000	NOT RUN
6	3		TOC(MG-L)	8500	2800	67	13000	NOT RUN
6	3		OIL & GREASE(MG-L)	890	7	99	1700	NOT RUN
6	3		TOTAL PHENOLS	180	200	0	100	NOT RUN
6	3		TOTAL SOLIDS(MG-L)	16140	5600	65	13000	NOT RUN
6	3		TOTAL DISS. SOLIDS(MG-L)	1990	5400	0	11100	NOT RUN
6	3		TOTAL SUSP. SOLIDS(MG-L)	14150	200	98	100	NOT RUN
6	3		TOTAL VOLATILE SOLIDS(MG-L)	9770	4500	53	3400	NOT RUN
6	3		VOLATILE DISS. SOLIDS(MG-L)	270	420	0	2310	NOT RUN
6	3		TOTAL VOL. SUS. SOLIDS(MG-L)	9500	4080	57	990	NOT RUN
6	3		ALUMINUM	200000	700	99	700000	NOT RUN
6	3		BARIUM	300	L 50	83	500	NOT RUN
6	3		IRON	20000	L 2000	90	300000	NOT RUN
6	3		MANGANESE	1000	1000	0	4000	NOT RUN
6	3		CALCIUM(MG-L)	230	190	17	300	NOT RUN
6	3		MAGNESIUM(MG-L)	38	20	47	50	NOT RUN
6	3		BORON	500	L 500	0	700	NOT RUN
6	3		COBALT	L 50	L 50	0	200	NOT RUN
6	3		MOLYBDENUM	200	70	65	1000	NOT RUN
6	3		TIN	600	500	16	1000	NOT RUN
6	3		TITANIUM	7000	L 200	97	20000	NOT RUN
6	3		VANADIUM	L 100	L 100	0	200	NOT RUN
6	3		YTTRIUM	L 200	L 200	0	L 200	NOT RUN
6	3		SODIUM	230	1300	0	1200	NOT RUN

N-D NOT DETECTED; L-LESS THAN; PP- PRIORITY POLLUTANT NUMBER
PRIORITY POLLUTANTS NOT DETECTED IN ANY SAMPLES ARE NOT LISTED. FRACTIONS NOT ANALYZED ARE NOT LISTED.

PLANT	BATCH	PP	------PARAMETER----------	INFLUENT		EFFLUENT	REMOVAL(%)	SLUDGE		TAP WATER
				ALL UNITS UG/L UNLESS OTHERWISE NOTED						
6	4	4	BENZENE	40	L	10	75	20	L	10
6	4	11	1,1,1-TRICHLOROETHANE	10	L	10	0	L 10		N-D
6	4	23	CHLOROFORM	N-D		N-D		N-D	L	10
6	4	38	ETHYLBENZENE	80	L	10	87	N-D		N-D
6	4	44	METHYLENE CHLORIDE	275		90	67	300		N-D
6	4	48	DICHLOROBROMOMETHANE	N-D		N-D		N-D	L	10
6	4	51	CHLORODIBROMOMETHANE	N-D		N-D		N-D	L	10
6	4	55	NAPHTHALENE	30	L	10	66	270		N-D
6	4	56	NITROBENZENE	N-D		N-D		N-D	L	10
6	4	64	PENTACHLOROPHENOL	N-D	L	10	0	190		N-D
6	4	65	PHENOL	30	L	10	66	N-D		N-D
6	4	66	BIS(2-ETHYLHEXYL) PHTHALATE	20		N-D	100	220		N-D
6	4	68	DI-N-BUTYL PHTHALATE	L 10	L	10	0	70		N-D
6	4	70	DIETHYL PHTHALATE	L 10	L	10	0	50		N-D
6	4	86	TOLUENE	400		60	85	300		N-D
6	4	89	ALDRIN	L 10		N-D	100	N-D		N-D
6	4	90	DIELDRIN	L 10		N-D	100	N-D		N-D
6	4	96	BETA-ENDOSULFAN	L 10		N-D	100	L 10		N-D
6	4	102	ALPHA-BHC	L 10		N-D	100	N-D	L	10
6	4	103	BETA-BHC	L 10	L	10	0	N-D		N-D
6	4	105	DELTA-BHC	L 10		N-D	100	N-D		N-D
6	4	114	ANTIMONY	L 2000	L	2000	0	L 2000	L	2
6	4	115	ARSENIC	L 2000	L	2000	0	L 2000	L	2
6	4	117	BERYLLIUM	2810	L	1	99	3760	L	1
6	4	118	CADMIUM	11400	L	2	99	14700	L	2
6	4	119	CHROMIUM	11800	L	5	99	15200		9
6	4	120	COPPER	11600		158	98	15700		8
6	4	121	CYANIDE	L 1	L	1	0	L 1	L	1
6	4	122	LEAD	10500	L	20	99	13300	L	20
6	4	123	MERCURY	L 1	L	1	0	5	L	1
6	4	124	NICKEL	11600	L	5	99	15400	L	5
6	4	125	SELENIUM	L 2000	L	2000	0	L 2000	L	2
6	4	126	SILVER	L 10		2	80	L 10	L	1
6	4	127	THALLIUM	L 2000	L	2000	0	L 2000	L	2
6	4	128	ZINC	28400		1680	94	51100		440
6	4		PH(UNITS)	8		7		6		7
6	4		COD(MG-L)	162000		5940	96	98000	L	3
6	4		TOC(MG-L)	4271		1747	59	25405	L	2
6	4		TOTAL SOLIDS(MG-L)	NOT RUN		999		NOT RUN		NOT RUN
6	4		ALUMINUM	72700		906	98	64700	L	50
6	4		BARIUM	29500	L	5	99	4690		103
6	4		IRON	39700		3010	92	139000		170
6	4		MANGANESE	12000		692	94	18600	L	5
6	4		CALCIUM(MG-L)	382		301	21	919		89
6	4		MAGNESIUM(MG-L)	282		12	95	382		41
6	4		BORON	11300		379	96	14200		98
6	4		COBALT	11600		63	99	15600	L	5
6	4		MOLYBDENUM	11200		15	99	15000		11
6	4		TIN	11400		37	99	14500		12
6	4		TITANIUM	17300	L	15	99	17500	L	15
6	4		VANADIUM	11400	L	12	99	11500	L	12
6	4		YTTRIUM	999		NOT RUN		NOT RUN		NOT RUN
6	4		SODIUM	774		1300	0	2120	L	15

N-D NOT DETECTED; L-LESS THAN; PP- PRIORITY POLLUTANT NUMBER
PRIORITY POLLUTANTS NOT DETECTED IN ANY SAMPLES ARE NOT LISTED. FRACTIONS NOT ANALYZED ARE NOT LISTED.

PLANT	BATCH	PP	------PARAMETER----------	INFLUENT	EFFLUENT	REMOVAL(%)	SLUDGE	TAP WATER
				ALL UNITS UG/L UNLESS OTHERWISE NOTED				
8	1	114	ANTIMONY	L 10	NOT RUN	100	L 10	L 10
8	1	115	ARSENIC	52	L 25	51	110	L 25
8	1	117	BERYLLIUM	L 10	L 10	0	20	L 10
8	1	118	CADMIUM	L 20	L 20	0	L 20	L 20
8	1	119	CHROMIUM	100	9	91	3000	L 50
8	1	120	COPPER	300	10000	0	50000	100
8	1	121	CYANIDE	L 200	L 40	80	L 200	NOT RUN
8	1	122	LEAD	L 200	200	0	2000	L 200
8	1	123	MERCURY	7200	1700	76	28800	L 1
8	1	124	NICKEL	L 50	80000	0	100000	L 50
8	1	125	SELENIUM	L 25	L 25	0	L 500	L 25
8	1	126	SILVER	L 10	L 10	0	90	L 10
8	1	127	THALLIUM	L 10	10	0	L 250	L 10
8	1	128	ZINC	600	800	0	5000	L 600
8	1		PH(UNITS)	8	7		7	NOT RUN
8	1		BOD(MG-L)	1400	1400	0	1300	NOT RUN
8	1		COD(MG-L)	48000	9500	80	94000	NOT RUN
8	1		TOC(MG-L)	8000	2500	68	26000	NOT RUN
8	1		OIL & GREASE(MG-L)	540	5	99	660	NOT RUN
8	1		TOTAL PHENOLS	430	120	72	670	NOT RUN
8	1		TOTAL SOLIDS(MG-L)	16000	8700	45	67000	NOT RUN
8	1		TOTAL DISS. SOLIDS(MG-L)	2000	8460	0	5000	NOT RUN
8	1		TOTAL SUSP. SOLIDS(MG-L)	14000	240	98	62000	NOT RUN
8	1		SETTLEABLE SOLIDS(ML-L)	L 0	L 0	0	NOT RUN	NOT RUN
8	1		TOTAL VOLATILE SOLIDS(MG-L)	11000	3200	70	30000	NOT RUN
8	1		VOLATILE DISS. SOLIDS(MG-L)	2300	3135	0	4000	NOT RUN
8	1		TOTAL VOL. SUS. SOLIDS(MG-L)	8700	65	99	26000	NOT RUN
8	1		ALUMINUM	30000	L 50	99	400000	900
8	1		BARIUM	700	200	71	4000	L 50
8	1		IRON	20000	50000	0	300000	2000
8	1		MANGANESE	300	4000	0	7000	L 50
8	1		CALCIUM(MG-L)	520	800	0	2700	L 50
8	1		MAGNESIUM(MG-L)	62	23	62	270	27
8	1		BORON	1000	1000	0	1000	L 500
8	1		COBALT	L 50	6000	0	8000	L 50
8	1		MOLYBDENUM	8060	20	99	1000	60
8	1		TIN	300	100	66	4000	300
8	1		TITANIUM	800	L 20	97	10000	L 200
8	1		VANADIUM	L 100	L 10	90	1000	L 100
8	1		YTTRIUM	L 200	L 200	0	300	L 200
8	1		SODIUM	180	160	11	180	L 150

N-D NOT DETECTED; L-LESS THAN; PP- PRIORITY POLLUTANT NUMBER
PRIORITY POLLUTANTS NOT DETECTED IN ANY SAMPLES ARE NOT LISTED. FRACTIONS NOT ANALYZED ARE NOT LISTED.

PLANT	BATCH	PP	------PARAMETER----------	INFLUENT	EFFLUENT	REMOVAL(%)	SLUDGE	TAP WATER
				ALL UNITS UG/L UNLESS OTHERWISE NOTED				
8	2	4	BENZENE	290	310	0	NOT RUN	572
8	2	10	1,2-DICHLOROETHANE	N-D	90	0	NOT RUN	N-D
8	2	11	1,1,1-TRICHLOROETHANE	N-D	119	0	NOT RUN	18
8	2	23	CHLOROFORM	N-D	36	0	NOT RUN	460
8	2	38	ETHYLBENZENE	180	N-D	100	NOT RUN	N-D
8	2	44	METHYLENE CHLORIDE	N-D	3100	0	NOT RUN	1500
8	2	48	DICHLOROBROMOMETHANE	N-D	N-D		NOT RUN	86
8	2	85	TETRACHLOROETHYLENE	400	700	0	NOT RUN	N-D
8	2	86	TOLUENE	73	350	0	NOT RUN	L 10
8	2	114	ANTIMONY	L 10	L 10	0	NOT RUN	NOT RUN
8	2	115	ARSENIC	140	L 25	82	NOT RUN	L 25
8	2	117	BERYLLIUM	L 10	L 10	0	30	NOT RUN
8	2	118	CADMIUM	L 20	L 20	0	L 20	NOT RUN
8	2	119	CHROMIUM	500	L 50	90	2000	NOT RUN
8	2	120	COPPER	10000	60000	0	80000	NOT RUN
8	2	121	CYANIDE	L 200	L 200	0	L 200	L 40
8	2	122	LEAD	600	200	66	2000	NOT RUN
8	2	123	MERCURY	3600	1000	72	7200	NOT RUN
8	2	124	NICKEL	40000	70000	0	200000	NOT RUN
8	2	125	SELENIUM	L 25	L 25	0	L 200	L 25
8	2	126	SILVER	L 10	L 10	0	40	L 10
8	2	127	THALLIUM	L 10	13	0	NOT RUN	L 10
8	2	128	ZINC	8000	1000	87	9000	NOT RUN
8	2		PH(UNITS)	7	7		2	8
8	2		BOD(MG-L)	2900	L 60	97	27000	L 2
8	2		COD(MG-L)	29000	8000	72	130000	27
8	2		TOC(MG-L)	10400	2100	79	76000	16
8	2		OIL & GREASE(MG-L)	745	10	98	1200	1
8	2		TOTAL PHENOLS	120	130	0	210	L 10
8	2		TOTAL SOLIDS(MG-L)	7700	3200	58	24000	670
8	2		TOTAL DISS. SOLIDS(MG-L)	2000	3040	0	14500	667
8	2		TOTAL SUSP. SOLIDS(MG-L)	5700	160	97	9500	3
8	2		SETTLEABLE SOLIDS(ML-L)	80	1	98	NOT RUN	L 0
8	2		TOTAL VOLATILE SOLIDS(MG-L)	3000	1100	63	9200	21
8	2		VOLATILE DISS. SOLIDS(MG-L)	1500	990	34	7800	20
8	2		TOTAL VOL. SUS. SOLIDS(MG-L)	1500	110	92	1400	1
8	2		ALUMINUM	300000	L 500	99	1000000	NOT RUN
8	2		BARIUM	2000	600	70	10000	NOT RUN
8	2		IRON	600000	70000	88	400000	NOT RUN
8	2		MANGANESE	3000	6000	0	10000	NOT RUN
8	2		CALCIUM(MG-L)	380	1220	0	480	NOT RUN
8	2		MAGNESIUM(MG-L)	69	81	0	230	NOT RUN
8	2		BORON	1000	800	20	2000	NOT RUN
8	2		COBALT	3000	5000	0	10000	NOT RUN
8	2		MOLYBDENUM	400	60	85	2000	NOT RUN
8	2		TIN	700	800	0	6000	NOT RUN
8	2		TITANIUM	7000	L 200	97	30000	NOT RUN
8	2		VANADIUM	200	L 100	50	1000	NOT RUN
8	2		YTTRIUM	L 200	L 200	0	200	NOT RUN
8	2		SODIUM	170	210	0	190	NOT RUN

N-D NOT DETECTED; L-LESS THAN; PP- PRIORITY POLLUTANT NUMBER
PRIORITY POLLUTANTS NOT DETECTED IN ANY SAMPLES ARE NOT LISTED. FRACTIONS NOT ANALYZED ARE NOT LISTED.

PLANT	BATCH	PP	------PARAMETER----------	INFLUENT	EFFLUENT	REMOVAL(%)	SLUDGE	TAP WATER
				ALL UNITS UG/L, UNLESS OTHERWISE NOTED				
8	3	114	ANTIMONY	NOT RUN	L 25	0	NOT RUN	NOT RUN
8	3	115	ARSENIC	71	L 25	64	L 1000	NOT RUN
8	3	117	BERYLLIUM	L 10	L 10	0	30	NOT RUN
8	3	118	CADMIUM	L 20	L 20	0	L 20	NOT RUN
8	3	119	CHROMIUM	L 50	L 50	0	2000	NOT RUN
8	3	120	COPPER	700	10000	0	20000	NOT RUN
8	3	121	CYANIDE	L 80	L 130	0	L 130	NOT RUN
8	3	122	LEAD	L 200	L 200	0	3000	NOT RUN
8	3	123	MERCURY	2200	180	91	25600	NOT RUN
8	3	124	NICKEL	L 50	3000	0	60000	NOT RUN
8	3	125	SELENIUM	L 25	L 25	0	L 500	NOT RUN
8	3	126	SILVER	L 10	L 10	0	40	NOT RUN
8	3	127	THALLIUM	L 10	L 10	0	NOT RUN	NOT RUN
8	3	128	ZINC	1000	L 600	40	10000	NOT RUN
8	3		PH(UNITS)	8	NOT RUN		NOT RUN	NOT RUN
8	3		BOD(MG-L)	7400	7400	0	6200	NOT RUN
8	3		COD(MG-L)	46000	11000	76	210000	NOT RUN
8	3		TOC(MG-L)	8400	2800	66	86000	NOT RUN
8	3		OIL & GREASE(MG-L)	820	NOT RUN	100	1560	NOT RUN
8	3		TOTAL PHENOLS	190	70	63	1300	NOT RUN
8	3		TOTAL SOLIDS(MG-L)	28000	1300	95	33000	NOT RUN
8	3		TOTAL DISS. SOLIDS(MG-L)	1000	1284	0	NOT RUN	NOT RUN
8	3		TOTAL SUSP. SOLIDS(MG-L)	27000	16	99	33000	NOT RUN
8	3		SETTLEABLE SOLIDS(ML-L)	NOT RUN	1	0	NOT RUN	NOT RUN
8	3		TOTAL VOLATILE SOLIDS(MG-L)	8900	410	95	11000	NOT RUN
8	3		VOLATILE DISS. SOLIDS(MG-L)	500	400	20	L 1	NOT RUN
8	3		TOTAL VOL. SUS. SOLIDS(MG-L)	8400	10	99	11000	NOT RUN
8	3		ALUMINUM	70000	L 500	99	1000000	NOT RUN
8	3		BARIUM	20000	700	96	40000	NOT RUN
8	3		IRON	200000	8000	96	5000000	NOT RUN
8	3		MANGANESE	2000	900	55	10000	NOT RUN
8	3		CALCIUM(MG-L)	200	160	20	660	NOT RUN
8	3		MAGNESIUM(MG-L)	82	25	69	150	NOT RUN
8	3		BORON	10000	10000	0	10000	NOT RUN
8	3		COBALT	L 50	90	0	3000	NOT RUN
8	3		MOLYBDENUM	L 50	L 50	0	2000	NOT RUN
8	3		TIN	500	L 50	90	3000	NOT RUN
8	3		TITANIUM	6000	L 200	96	50000	NOT RUN
8	3		VANADIUM	L 100	L 100	0	2000	NOT RUN
8	3		YTTRIUM	L 200	L 200	0	300	NOT RUN
8	3		SODIUM	190	220	0	180	NOT RUN

N-D NOT DETECTED; L-LESS THAN; PP- PRIORITY POLLUTANT NUMBER
PRIORITY POLLUTANTS NOT DETECTED IN ANY SAMPLES ARE NOT LISTED. FRACTIONS NOT ANALYZED ARE NOT LISTED.

PLANT	BATCH	PP	------PARAMETER----------	INFLUENT	EFFLUENT	REMOVAL(%)	SLUDGE	TAP WATER
				ALL UNITS UG/L UNLESS OTHERWISE NOTED				
9	1	114	ANTIMONY	L 25	35	0	NOT RUN	L 10
9	1	115	ARSENIC	180	L 25	86	750	L 25
9	1	117	BERYLLIUM	L 10	L 10	0	L 10	L 10
9	1	118	CADMIUM	L 20	L 20	0	L 20	L 20
9	1	119	CHROMIUM	60	L 50	16	L 50	L 50
9	1	120	COPPER	600	200	66	700	L 60
9	1	121	CYANIDE	L 200	L 80	60	L 200	L 20
9	1	122	LEAD	L 200	L 200	0	1000	L 200
9	1	123	MERCURY	18000	950	94	84000	L 1
9	1	124	NICKEL	L 50	L 50	0	L 50	L 50
9	1	125	SELENIUM	L 25	L 25	0	L 100	L 25
9	1	126	SILVER	L 10	L 10	0	L 10	L 10
9	1	127	THALLIUM	L 10	L 10	0	NOT RUN	L 10
9	1	128	ZINC	900	L 600	33	1000	L 600
9	1		PH(UNITS)	8	7		7	8
9	1		BOD(MG-L)	1600	2900	0	31000	L 2
9	1		COD(MG-L)	70000	11000	84	240000	L 5
9	1		TOC(MG-L)	28000	2800	90	50000	8
9	1		OIL & GREASE(MG-L)	937	9	99	4250	L 1
9	1		TOTAL PHENOLS	100	430	0	840	24
9	1		TOTAL SOLIDS(MG-L)	28000	2300	91	25000	382
9	1		TOTAL DISS. SOLIDS(MG-L)	7000	2240	68	13000	379
9	1		TOTAL SUSP. SOLIDS(MG-L)	21000	60	99	12000	3
9	1		SETTLEABLE SOLIDS(ML-L)	1	L 0	100	NOT RUN	L 0
9	1		TOTAL VOLATILE SOLIDS(MG-L)	24000	1500	93	14000	24
9	1		VOLATILE DISS. SOLIDS(MG-L)	6000	1460	75	6500	23
9	1		TOTAL VOL. SUS. SOLIDS(MG-L)	18000	40	99	7500	1
9	1		ALUMINUM	200000	500	99	200000	L 500
9	1		BARIUM	10000	L 50	99	30000	70
9	1		IRON	100000	L 2000	98	200000	L 2000
9	1		MANGANESE	10000	200	98	20000	L 50
9	1		CALCIUM(MG-L)	870	L 50	94	2100	L 50
9	1		MAGNESIUM(MG-L)	27	7	74	49	6
9	1		BORON	600	L 500	16	500	L 500
9	1		COBALT	200	L 50	75	200	L 50
9	1		MOLYBDENUM	L 50	L 50	0	200	L 50
9	1		TIN	800	300	62	800	L 50
9	1		TITANIUM	10000	L 200	98	20000	L 200
9	1		VANADIUM	200	L 100	50	500	L 100
9	1		YTTRIUM	L 200	L 200	0	L 200	L 200
9	1		SODIUM	180	230	0	260	L 150

N-D NOT DETECTED; L-LESS THAN; PP- PRIORITY POLLUTANT NUMBER
PRIORITY POLLUTANTS NOT DETECTED IN ANY SAMPLES ARE NOT LISTED. FRACTIONS NOT ANALYZED ARE NOT LISTED.

PLANT	BATCH	PP	------PARAMETER----------	INFLUENT	EFFLUENT	REMOVAL(%)	SLUDGE	TAP WATER
				ALL UNITS UG/L UNLESS OTHERWISE NOTED				
9	2	4	BENZENE	9900	2400	75	NOT RUN	13
9	2	6	CARBON TETRACHLORIDE	10	N-D	100	NOT RUN	N-D
9	2	11	1,1,1-TRICHLOROETHANE	N-D	10	0	NOT RUN	N-D
9	2	14	1,1,2-TRICHLOROETHANE	N-D	N-D		NOT RUN	L 10
9	2	23	CHLOROFORM	92	N-D	100	NOT RUN	220
9	2	29	1,1-DICHLOROETHYLENE	N-D	L 10	0	NOT RUN	N-D
9	2	37	1,2-DIPHENYLHYDRAZINE	N-D	L 10	0	NOT RUN	N-D
9	2	38	ETHYLBENZENE	240	L 10	95	NOT RUN	N-D
9	2	44	METHYLENE CHLORIDE	310	N-D	100	NOT RUN	530
9	2	47	BROMOFORM	N-D	N-D		NOT RUN	14
9	2	48	DICHLOROBROMOMETHANE	N-D	N-D		NOT RUN	71
9	2	51	CHLORODIBROMOMETHANE	N-D	N-D		NOT RUN	113
9	2	65	PHENOL	N-D	16	0	NOT RUN	N-D
9	2	66	BIS(2-ETHYLHEXYL) PHTHALATE	15	L 10	33	NOT RUN	N-D
9	2	68	DI-N-BUTYL PHTHALATE	102	L 10	90	NOT RUN	51
9	2	70	DIETHYL PHTHALATE	N-D	L 10	0	NOT RUN	N-D
9	2	71	DIMETHYL PHTHALATE	N-D	L 10	0	NOT RUN	N-D
9	2	78	ANTHRACENE	N-D	L 10	0	NOT RUN	N-D
9	2	81	PHENANTHRENE	N-D	L 10	0	NOT RUN	N-D
9	2	85	TETRACHLOROETHYLENE	4900	210	95	NOT RUN	N-D
9	2	86	TOLUENE	1700	180	89	NOT RUN	L 10
9	2	87	TRICHLOROETHYLENE	18	L 10	44	NOT RUN	N-D
9	2	114	ANTIMONY	L 25	L 25	0	NOT RUN	NOT RUN
9	2	115	ARSENIC	100	L 25	75	NOT RUN	NOT RUN
9	2	117	BERYLLIUM	L 10	L 10	0	L 10	NOT RUN
9	2	118	CADMIUM	L 20	L 20	0	L 20	NOT RUN
9	2	119	CHROMIUM	L 50	L 50	0	70	NOT RUN
9	2	120	COPPER	700	200	71	800	NOT RUN
9	2	121	CYANIDE	L 200	L 200	0	L 100	NOT RUN
9	2	122	LEAD	400	L 200	50	L 200	NOT RUN
9	2	123	MERCURY	16000	410	97	220000	NOT RUN
9	2	124	NICKEL	L 50	L 50	0	60	NOT RUN
9	2	125	SELENIUM	L 25	L 25	0	L 200	NOT RUN
9	2	126	SILVER	L 10	L 10	0	L 10	NOT RUN
9	2	127	THALLIUM	L 10	L 10	0	NOT RUN	NOT RUN
9	2	128	ZINC	900	L 600	33	2000	NOT RUN
9	2		PH(UNITS)	8	7		NOT RUN	NOT RUN
9	2		BOD(MG-L)	16000	1800	88	5100	NOT RUN
9	2		COD(MG-L)	130000	7100	94	140000	NOT RUN
9	2		TOC(MG-L)	11000	2200	80	54000	NOT RUN
9	2		OIL & GREASE(MG-L)	2560	82	96	4360	NOT RUN
9	2		TOTAL PHENOLS	320	L 70	78	190	NOT RUN
9	2		TOTAL SOLIDS(MG-L)	24000	2100	91	12000	NOT RUN
9	2		TOTAL DISS. SOLIDS(MG-L)	11000	2000	81	8000	NOT RUN
9	2		TOTAL SUSP. SOLIDS(MG-L)	13000	125	99	4000	NOT RUN
9	2		SETTLEABLE SOLIDS(ML-L)	9	0	100	NOT RUN	NOT RUN
9	2		TOTAL VOLATILE SOLIDS(MG-L)	20000	980	95	10000	NOT RUN
9	2		VOLATILE DISS. SOLIDS(MG-L)	11700	890	92	6500	NOT RUN
9	2		TOTAL VOL. SUS. SOLIDS(MG-L)	8300	95	98	3500	NOT RUN
9	2		ALUMINUM	200000	L 500	99	200000	NOT RUN
9	2		BARIUM	1000	L 50	95	3000	NOT RUN
9	2		IRON	200000	L 2000	99	500000	NOT RUN
9	2		MANGANESE	3000	90	97	7000	NOT RUN
9	2		CALCIUM(MG-L)	380	L 50	86	1300	NOT RUN
9	2		MAGNESIUM(MG-L)	15	7	53	34	NOT RUN
9	2		BORON	L 500	L 500	0	600	NOT RUN
9	2		COBALT	300	L 50	83	700	NOT RUN
9	2		MOLYBDENUM	200	60	70	200	NOT RUN
9	2		TIN	800	300	62	1000	NOT RUN
9	2		TITANIUM	9000	L 200	97	20000	NOT RUN

9	2	VANADIUM		200	L	100		50			300	NOT RUN
9	2	YTTRIUM	L	200	L	200		0		L	200	NOT RUN
9	2	SODIUM		180		250		0			240	NOT RUN

N-D NOT DETECTED; L-LESS THAN; PP- PRIORITY POLLUTANT NUMBER
PRIORITY POLLUTANTS NOT DETECTED IN ANY SAMPLES ARE NOT LISTED. FRACTIONS NOT ANALYZED ARE NOT LISTED.

PLANT	BATCH	PP	------PARAMETER----------	INFLUENT	EFFLUENT	REMOVAL(%)	SLUDGE	TAP WATER
				ALL UNITS UG/L UNLESS OTHERWISE NOTED				
9	3	114	ANTIMONY	L 25	L 25	0	NOT RUN	NOT RUN
9	3	115	ARSENIC	240	L 25	89	L 200	NOT RUN
9	3	117	BERYLLIUM	L 10	L 10	0	L 10	NOT RUN
9	3	118	CADMIUM	L 20	L 20	0	L 20	NOT RUN
9	3	119	CHROMIUM	L 50	L 50	0	L 50	NOT RUN
9	3	120	COPPER	800	200	75	300	NOT RUN
9	3	121	CYANIDE	L 80	L 40	50	L 200	NOT RUN
9	3	122	LEAD	300	L 200	33	L 200	NOT RUN
9	3	123	MERCURY	3000	200	93	1600	NOT RUN
9	3	124	NICKEL	L 50	L 50	0	L 50	NOT RUN
9	3	125	SELENIUM	L 25	L 25	0	L 100	NOT RUN
9	3	126	SILVER	L 10	L 10	0	L 10	NOT RUN
9	3	127	THALLIUM	L 10	L 10	0	NOT RUN	NOT RUN
9	3	128	ZINC	700	L 600	14	L 600	NOT RUN
9	3		PH(UNITS)	7	7		7	NOT RUN
9	3		BOD(MG-L)	2600	2500	3	8400	NOT RUN
9	3		COD(MG-L)	52000	6900	86	250000	NOT RUN
9	3		TOC(MG-L)	NOT RUN	2000	0	44000	NOT RUN
9	3		OIL & GREASE(MG-L)	1870	70	96	3090	NOT RUN
9	3		TOTAL PHENOLS	100	67	33	400	NOT RUN
9	3		TOTAL SOLIDS(MG-L)	39000	2100	94	8	NOT RUN
9	3		TOTAL DISS. SOLIDS(MG-L)	13000	1370	89	18733	NOT RUN
9	3		TOTAL SUSP. SOLIDS(MG-L)	26000	730	97	34100	NOT RUN
9	3		SETTLEABLE SOLIDS(ML-L)	5	L 0	100	NOT RUN	NOT RUN
9	3		TOTAL VOLATILE SOLIDS(MG-L)	23000	1100	95	9200	NOT RUN
9	3		VOLATILE DISS. SOLIDS(MG-L)	6000	500	91	NOT RUN	NOT RUN
9	3		TOTAL VOL. SUS. SOLIDS(MG-L)	17000	600	96	17267	NOT RUN
9	3		ALUMINUM	200000	2000	99	50000	NOT RUN
9	3		BARIUM	3000	100	96	20000	NOT RUN
9	3		IRON	20000	5000	75	90000	NOT RUN
9	3		MANGANESE	2000	100	95	1000	NOT RUN
9	3		CALCIUM(MG-L)	680	L 50	92	400	NOT RUN
9	3		MAGNESIUM(MG-L)	34	8	76	18	NOT RUN
9	3		BORON	500	L 500	0	600	NOT RUN
9	3		COBALT	400	L 50	87	100	NOT RUN
9	3		MOLYBDENUM	200	L 50	75	L 50	NOT RUN
9	3		TIN	600	300	50	300	NOT RUN
9	3		TITANIUM	4000	200	95	5000	NOT RUN
9	3		VANADIUM	L 100	L 100	0	L 100	NOT RUN
9	3		YTTRIUM	L 200	L 200	0	L 200	NOT RUN
9	3		SODIUM	190	270	0	170	NOT RUN

N-D NOT DETECTED; L-LESS THAN; PP- PRIORITY POLLUTANT NUMBER
PRIORITY POLLUTANTS NOT DETECTED IN ANY SAMPLES ARE NOT LISTED. FRACTIONS NOT ANALYZED ARE NOT LISTED.

PLANT	BATCH	PP	-------PARAMETER----------	INFLUENT	EFFLUENT	REMOVAL(%)	SLUDGE	TAP WATER
				ALL UNITS UG/L UNLESS OTHERWISE NOTED				
11	1	4	BENZENE	8200	NOT RUN		NOT RUN	N-D
11	1	11	1,1,1-TRICHLOROETHANE	82	NOT RUN		NOT RUN	N-D
11	1	21	2,4,6-TRICHLOROPHENOL	L 10	NOT RUN		NOT RUN	N-D
11	1	23	CHLOROFORM	N-D	NOT RUN		NOT RUN	11
11	1	29	1,1-DICHLOROETHYLENE	N-D	NOT RUN		NOT RUN	L 10
11	1	31	2,4-DICHLOROPHENOL	L 10	NOT RUN		NOT RUN	N-D
11	1	38	ETHYLBENZENE	1500	NOT RUN		NOT RUN	N-D
11	1	44	METHYLENE CHLORIDE	N-D	NOT RUN		NOT RUN	30
11	1	48	DICHLOROBROMOMETHANE	27	NOT RUN		NOT RUN	19
11	1	65	PHENOL	L 10	NOT RUN		NOT RUN	N-D
11	1	68	DI-N-BUTYL PHTHALATE	L 10	NOT RUN		NOT RUN	N-D
11	1	85	TETRACHLOROETHYLENE	84	NOT RUN		NOT RUN	N-D
11	1	86	TOLUENE	259700	NOT RUN		NOT RUN	34
11	1	87	TRICHLOROETHYLENE	190	NOT RUN		NOT RUN	N-D
11	1	114	ANTIMONY	L 25	NOT RUN		NOT RUN	L 10
11	1	115	ARSENIC	L 25	NOT RUN		NOT RUN	L 25
11	1	117	BERYLLIUM	L 4	NOT RUN		NOT RUN	L 2
11	1	118	CADMIUM	50	NOT RUN		NOT RUN	30
11	1	119	CHROMIUM	80	NOT RUN		NOT RUN	10
11	1	120	COPPER	400	NOT RUN		NOT RUN	200
11	1	121	CYANIDE	L 40	NOT RUN		NOT RUN	L 20
11	1	122	LEAD	300	NOT RUN		NOT RUN	L 40
11	1	123	MERCURY	11	NOT RUN		NOT RUN	L 1
11	1	124	NICKEL	L 20	NOT RUN		NOT RUN	L 10
11	1	125	SELENIUM	L 25	NOT RUN		NOT RUN	L 25
11	1	126	SILVER	L 4	NOT RUN		NOT RUN	L 2
11	1	127	THALLIUM	L 10	NOT RUN		NOT RUN	L 10
11	1	128	ZINC	2000	NOT RUN		NOT RUN	300
11	1		PH(UNITS)	8	NOT RUN		NOT RUN	8
11	1		BOD(MG-L)	1300	NOT RUN		NOT RUN	6
11	1		COD(MG-L)	9800	NOT RUN		NOT RUN	8
11	1		TOC(MG-L)	1500	NOT RUN		NOT RUN	11
11	1		OIL & GREASE(MG-L)	42	NOT RUN		NOT RUN	L 1
11	1		TOTAL PHENOLS	380	NOT RUN		NOT RUN	L 20
11	1		TOTAL SOLIDS(MG-L)	1600	NOT RUN		NOT RUN	152
11	1		TOTAL DISS. SOLIDS(MG-L)	1320	NOT RUN		NOT RUN	151
11	1		TOTAL SUSP. SOLIDS(MG-L)	280	NOT RUN		NOT RUN	1
11	1		TOTAL VOLATILE SOLIDS(MG-L)	960	NOT RUN		NOT RUN	33
11	1		VOLATILE DISS. SOLIDS(MG-L)	770	NOT RUN		NOT RUN	32
11	1		TOTAL VOL. SUS. SOLIDS(MG-L)	190	NOT RUN		NOT RUN	1
11	1		ALUMINUM	8000	NOT RUN		NOT RUN	20000
11	1		BARIUM	7000	NOT RUN		NOT RUN	40
11	1		IRON	3000	NOT RUN		NOT RUN	L 300
11	1		MANGANESE	40	NOT RUN		NOT RUN	10
11	1		CALCIUM(MG-L)	56	NOT RUN		NOT RUN	34
11	1		MAGNESIUM(MG-L)	11	NOT RUN		NOT RUN	11
11	1		BORON	1000	NOT RUN		NOT RUN	500
11	1		COBALT	L 20	NOT RUN		NOT RUN	L 10
11	1		MOLYBDENUM	L 20	NOT RUN		NOT RUN	20
11	1		TIN	50	NOT RUN		NOT RUN	40
11	1		TITANIUM	80	NOT RUN		NOT RUN	L 30
11	1		VANADIUM	L 50	NOT RUN		NOT RUN	L 20
11	1		YTTRIUM	L 60	NOT RUN		NOT RUN	L 30
11	1		SODIUM	L 60	NOT RUN		NOT RUN	L 30

N-D NOT DETECTED; L-LESS THAN; PP- PRIORITY POLLUTANT NUMBER
PRIORITY POLLUTANTS NOT DETECTED IN ANY SAMPLES ARE NOT LISTED. FRACTIONS NOT ANALYZED ARE NOT LISTED.

PLANT	BATCH	PP	PARAMETER	INFLUENT	EFFLUENT	REMOVAL (%)	SLUDGE	TAP WATER
				ALL UNITS UG/L UNLESS OTHERWISE NOTED				
12	1	4	BENZENE	73	NOT RUN		NOT RUN	11
12	1	7	CHLOROBENZENE	5500	NOT RUN		NOT RUN	N-D
12	1	11	1,1,1-TRICHLOROETHANE	43	NOT RUN		NOT RUN	74
12	1	29	1,1-DICHLOROETHYLENE	L 10	NOT RUN		NOT RUN	L 10
12	1	38	ETHYLBENZENE	8200	NOT RUN		NOT RUN	N-D
12	1	44	METHYLENE CHLORIDE	N-D	NOT RUN		NOT RUN	51
12	1	48	DICHLOROBROMOMETHANE	N-D	NOT RUN		NOT RUN	28
12	1	51	CHLORODIBROMOMETHANE	N-D	NOT RUN		NOT RUN	13
12	1	55	NAPHTHALENE	260	NOT RUN		NOT RUN	N-D
12	1	64	PENTACHLOROPHENOL	7500	NOT RUN		NOT RUN	N-D
12	1	66	BIS(2-ETHYLHEXYL) PHTHALATE	140	NOT RUN		NOT RUN	N-D
12	1	87	TRICHLOROETHYLENE	17	NOT RUN		NOT RUN	N-D
12	1	114	ANTIMONY	104	NOT RUN		NOT RUN	L 10
12	1	115	ARSENIC	L 25	NOT RUN		NOT RUN	L 25
12	1	117	BERYLLIUM	L 4	NOT RUN		NOT RUN	L 4
12	1	118	CADMIUM	L 8	NOT RUN		NOT RUN	L 8
12	1	119	CHROMIUM	4000	NOT RUN		NOT RUN	20
12	1	120	COPPER	600	NOT RUN		NOT RUN	600
12	1	121	CYANIDE	310	NOT RUN		NOT RUN	L 20
12	1	122	LEAD	20000	NOT RUN		NOT RUN	100
12	1	123	MERCURY	L 1	NOT RUN		NOT RUN	L 1
12	1	124	NICKEL	L 20	NOT RUN		NOT RUN	L 20
12	1	125	SELENIUM	L 25	NOT RUN		NOT RUN	L 25
12	1	126	SILVER	L 4	NOT RUN		NOT RUN	L 4
12	1	127	THALLIUM	L 10	NOT RUN		NOT RUN	L 10
12	1	128	ZINC	1000	NOT RUN		NOT RUN	400
12	1		PH(UNITS)	12	NOT RUN		NOT RUN	8
12	1		BOD(MG-L)	3100	NOT RUN		NOT RUN	L 6
12	1		COD(MG-L)	73000	NOT RUN		NOT RUN	16
12	1		TOC(MG-L)	1800	NOT RUN		NOT RUN	19
12	1		OIL & GREASE(MG-L)	1100	NOT RUN		NOT RUN	L 1
12	1		TOTAL PHENOLS	150	NOT RUN		NOT RUN	L 10
12	1		TOTAL SOLIDS(MG-L)	10100	NOT RUN		NOT RUN	161
12	1		TOTAL DISS. SOLIDS(MG-L)	9300	NOT RUN		NOT RUN	157
12	1		TOTAL SUSP. SOLIDS(MG-L)	800	NOT RUN		NOT RUN	4
12	1		TOTAL VOLATILE SOLIDS(MG-L)	1430	NOT RUN		NOT RUN	35
12	1		VOLATILE DISS. SOLIDS(MG-L)	1270	NOT RUN		NOT RUN	31
12	1		TOTAL VOL. SUS. SOLIDS(MG-L)	160	NOT RUN		NOT RUN	4
12	1		ALUMINUM	30000	NOT RUN		NOT RUN	4000
12	1		BARIUM	7000	NOT RUN		NOT RUN	50
12	1		IRON	20000	NOT RUN		NOT RUN	L 700
12	1		MANGANESE	300	NOT RUN		NOT RUN	L 20
12	1		CALCIUM(MG-L)	L 20	NOT RUN		NOT RUN	27
12	1		MAGNESIUM(MG-L)	7	NOT RUN		NOT RUN	10
12	1		BORON	3000	NOT RUN		NOT RUN	300
12	1		COBALT	L 20	NOT RUN		NOT RUN	L 20
12	1		MOLYBDENUM	500	NOT RUN		NOT RUN	L 20
12	1		TIN	90	NOT RUN		NOT RUN	60
12	1		TITANIUM	1000	NOT RUN		NOT RUN	L 60
12	1		VANADIUM	L 50	NOT RUN		NOT RUN	L 50
12	1		YTTRIUM	L 60	NOT RUN		NOT RUN	L 60
12	1		SODIUM	1900	NOT RUN		NOT RUN	L 60

N-D NOT DETECTED; L-LESS THAN; PP- PRIORITY POLLUTANT NUMBER
PRIORITY POLLUTANTS NOT DETECTED IN ANY SAMPLES ARE NOT LISTED. FRACTIONS NOT ANALYZED ARE NOT LISTED.

PLANT	BATCH	PP	------PARAMETER----------	INFLUENT		EFFLUENT		REMOVAL(%)	SLUDGE		TAP WATER
				ALL UNITS UG/L UNLESS OTHERWISE NOTED							
12	2	4	BENZENE		N-D	L	10	0		N-D	N-D
12	2	11	1,1,1-TRICHLOROETHANE	L	10	L	10	0	L	10	L 10
12	2	23	CHLOROFORM		N-D		N-D			N-D	15
12	2	33	1,3-DICHLOROPROPYLENE		N-D		N-D			N-D	N-D
12	2	38	ETHYLBENZENE		1300		235	81		205	L 10
12	2	44	METHYLENE CHLORIDE		450		430	4		700	140
12	2	48	DICHLOROBROMOMETHANE		N-D		N-D			N-D	L 10
12	2	51	CHLORODIBROMOMETHANE		N-D		N-D			N-D	L 10
12	2	55	NAPHTHALENE		40		17	57		135	N-D
12	2	64	PENTACHLOROPHENOL		1160		485	58		1100	N-D
12	2	65	PHENOL		1270		1240	2		1120	N-D
12	2	66	BIS(2-ETHYLHEXYL) PHTHALATE		35		27	22		640	N-D
12	2	85	TETRACHLOROETHYLENE		N-D		N-D			170	N-D
12	2	86	TOLUENE		560		235	58		N-D	L 10
12	2	93	4,4'-DDE	L	10		N-D	100		N-D	N-D
12	2	99	ENDRIN ALDEHYDE	L	10		N-D	100		N-D	N-D
12	2	102	ALPHA-BHC	L	10		N-D	100		N-D	N-D
12	2	103	BETA-BHC		N-D		N-D			N-D	L 10
12	2	104	GAMMA-BHC	L	10		N-D	100		N-D	L 10
12	2	114	ANTIMONY	L	25	L	25	0		NOT RUN	NOT RUN
12	2	115	ARSENIC	L	25	L	25	0		NOT RUN	NOT RUN
12	2	117	BERYLLIUM	L	10	L	10	0		20	1
12	2	118	CADMIUM	L	20	L	20	0		200	2
12	2	119	CHROMIUM		70	L	50	28		500	5
12	2	120	COPPER		200	L	60	70		2000	6
12	2	122	LEAD		25100		21300	15		39100	20
12	2	123	MERCURY		11	L	5	54		67	1
12	2	124	NICKEL	L	50	L	50	0		2000	5
12	2	125	SELENIUM	L	25	L	25	0	L	200	NOT RUN
12	2	126	SILVER	L	10	L	10	0	L	10	1
12	2	127	THALLIUM	L	10	L	10	0		NOT RUN	NOT RUN
12	2	128	ZINC		5000	L	600	88		20000	67
12	2		PH(UNITS)		10		10			10	NOT RUN
12	2		BOD(MG-L)		3500		4135	0		8400	3
12	2		COD(MG-L)		1201		1350	0		2355	2
12	2		OIL & GREASE(MG-L)		50		110	0		690	NOT RUN
12	2		ALUMINUM		100000		5000	95		3000000	50
12	2		BARIUM		100	L	50	50		2000	10
12	2		IRON		40000		3000	92		3000000	170
12	2		MANGANESE		300	L	50	83		9000	5
12	2		CALCIUM(MG-L)		240		140	41		880	36
12	2		MAGNESIUM(MG-L)		66		62	6		100	10
12	2		BORON		2000		2000	0		2000	NOT RUN
12	2		COBALT		400		200	50		8000	5
12	2		MOLYBDENUM		100	L	50	50		4000	5
12	2		TIN		200	L	50	75		4000	NOT RUN
12	2		TITANIUM		1000	L	200	80		20000	15
12	2		VANADIUM	L	100	L	100	0		1000	12
12	2		YTTRIUM	L	200	L	200	0		200	NOT RUN
12	2		SODIUM		270		260	3		860	15

N-D NOT DETECTED; L-LESS THAN; PP- PRIORITY POLLUTANT NUMBER
PRIORITY POLLUTANTS NOT DETECTED IN ANY SAMPLES ARE NOT LISTED. FRACTIONS NOT ANALYZED ARE NOT LISTED.

PLANT	BATCH	PP	PARAMETER	INFLUENT	EFFLUENT	REMOVAL(%)	SLUDGE	TAP WATER
				ALL UNITS UG/L UNLESS OTHERWISE NOTED				
13	1	4	BENZENE	280	N-D	100	NOT RUN	110
13	1	6	CARBON TETRACHLORIDE	L 10	N-D	100	NOT RUN	N-D
13	1	7	CHLOROBENZENE	23	N-D	100	NOT RUN	N-D
13	1	11	1,1,1-TRICHLOROETHANE	140	N-D	100	NOT RUN	N-D
13	1	14	1,1,2-TRICHLOROETHANE	N-D	1600	0	NOT RUN	N-D
13	1	23	CHLOROFORM	220	N-D	100	NOT RUN	N-D
13	1	30	1,2-TRANS-DICHLOROETHYLENE	N-D	L 10	0	NOT RUN	N-D
13	1	38	ETHYLBENZENE	1200	1300	0	NOT RUN	N-D
13	1	44	METHYLENE CHLORIDE	N-D	140	0	NOT RUN	N-D
13	1	64	PENTACHLOROPHENOL	340	13	96	NOT RUN	N-D
13	1	65	PHENOL	N-D	32	0	NOT RUN	N-D
13	1	66	BIS(2-ETHYLHEXYL) PHTHALATE	N-D	L 10	0	NOT RUN	N-D
13	1	68	DI-N-BUTYL PHTHALATE	5500	27	99	NOT RUN	N-D
13	1	85	TETRACHLOROETHYLENE	311	503	0	NOT RUN	N-D
13	1	86	TOLUENE	1800	N-D	100	NOT RUN	N-D
13	1	87	TRICHLOROETHYLENE	N-D	18	0	NOT RUN	N-D
13	1	114	ANTIMONY	L 25	L 25	0	L 10	L 10
13	1	115	ARSENIC	210	L 25	88	NOT RUN	L 25
13	1	117	BERYLLIUM	8	L 2	75	10	L 2
13	1	118	CADMIUM	100	10	90	100	8
13	1	119	CHROMIUM	1000	800	20	700	20
13	1	120	COPPER	500	200	60	600	200
13	1	121	CYANIDE	L 20	530	0	NOT RUN	40
13	1	122	LEAD	5000	80	98	4000	70
13	1	123	MERCURY	5600	550	90	3200	L 1
13	1	124	NICKEL	80	L 10	87	L 20	L 10
13	1	125	SELENIUM	L 25	L 25	0	L 200	L 25
13	1	126	SILVER	L 1	2	0	L 4	L 2
13	1	127	THALLIUM	L 10	L 10	0	NOT RUN	L 10
13	1	128	ZINC	70000	10000	85	100000	200
13	1		PH(UNITS)	8	8		8	6
13	1		BOD(MG-L)	3000	420	86	5000	L 2
13	1		COD(MG-L)	4000	8200	0	84000	16
13	1		TOC(MG-L)	6500	1800	72	23000	2
13	1		OIL & GREASE(MG-L)	830	89	89	3200	L 1
13	1		TOTAL PHENOLS	62	32	48	48	L 20
13	1		TOTAL SOLIDS(MG-L)	16500	1260	92	84600	30
13	1		TOTAL DISS. SOLIDS(MG-L)	500	1246	0	15600	29
13	1		TOTAL SUSP. SOLIDS(MG-L)	16000	14	99	19000	1
13	1		TOTAL VOLATILE SOLIDS(MG-L)	9200	690	92	37900	27
13	1		VOLATILE DISS. SOLIDS(MG-L)	NOT RUN	677	0	NOT RUN	26
13	1		TOTAL VOL. SUS. SOLIDS(MG-L)	NOT RUN	13	0	NOT RUN	1
13	1		ALUMINUM	100000	1000	99	100000	200
13	1		BARIUM	800	20	97	2000	10
13	1		IRON	100000	800	99	100000	L 300
13	1		MANGANESE	6000	100	98	10000	L 10
13	1		CALCIUM(MG-L)	940	13	98	2000	L 10
13	1		MAGNESIUM(MG-L)	32	2	93	38	1
13	1		BORON	9000	9000	0	9000	100
13	1		COBALT	300	10	96	600	L 10
13	1		MOLYBDENUM	200	L 10	95	100	L 10
13	1		TIN	400	20	95	400	30
13	1		TITANIUM	30000	L 30	99	30000	L 30
13	1		VANADIUM	200	L 20	90	100	L 20
13	1		YTTRIUM	L 60	L 30	50	L 60	L 30
13	1		SODIUM	64	160	0	170	L 30

N-D NOT DETECTED; L-LESS THAN; PP- PRIORITY POLLUTANT NUMBER
PRIORITY POLLUTANTS NOT DETECTED IN ANY SAMPLES ARE NOT LISTED. FRACTIONS NOT ANALYZED ARE NOT LISTED.

PLANT	BATCH	PP	------PARAMETER----------	INFLUENT	EFFLUENT	REMOVAL(%)	SLUDGE	TAP WATER
				ALL UNITS UG/L UNLESS OTHERWISE NOTED				
13	2	114	ANTIMONY	L 25	L 25	0	L 25	NOT RUN
13	2	115	ARSENIC	L 25	L 25	0	L 25	NOT RUN
13	2	117	BERYLLIUM	8	L 4	50	L 4	NOT RUN
13	2	118	CADMIUM	70	10	85	L 8	NOT RUN
13	2	119	CHROMIUM	800	400	50	400	NOT RUN
13	2	120	COPPER	500	400	20	1000	NOT RUN
13	2	121	CYANIDE	L 20	L 20	0	L 20	NOT RUN
13	2	122	LEAD	2000	L 80	96	100	NOT RUN
13	2	123	MERCURY	13000	1100	91	630	NOT RUN
13	2	124	NICKEL	L 20	L 20	0	L 20	NOT RUN
13	2	125	SELENIUM	L 25	L 25	0	L 25	NOT RUN
13	2	126	SILVER	L 4	L 4	0	L 4	NOT RUN
13	2	127	THALLIUM	L 10	L 10	0	L 10	NOT RUN
13	2	128	ZINC	80000	20000	75	200000	NOT RUN
13	2		PH(UNITS)	9	8		9	NOT RUN
13	2		BOD(MG-L)	1800	L 6	99	430	NOT RUN
13	2		COD(MG-L)	37000	8300	77	18000	NOT RUN
13	2		TOC(MG-L)	9000	2300	74	24000	NOT RUN
13	2		OIL & GREASE(MG-L)	820	62	92	1400	NOT RUN
13	2		TOTAL PHENOLS	290	60	79	160	NOT RUN
13	2		TOTAL SOLIDS(MG-L)	26100	1775	93	112000	NOT RUN
13	2		TOTAL DISS. SOLIDS(MG-L)	8800	1745	80	18000	NOT RUN
13	2		TOTAL SUSP. SOLIDS(MG-L)	17300	30	99	94000	NOT RUN
13	2		TOTAL VOLATILE SOLIDS(MG-L)	14300	1040	92	53000	NOT RUN
13	2		VOLATILE DISS. SOLIDS(MG-L)	NOT RUN	1020	0	NOT RUN	NOT RUN
13	2		TOTAL VOL. SUS. SOLIDS(MG-L)	NOT RUN	22	0	NOT RUN	NOT RUN
13	2		ALUMINUM	80000	500	99	60000	NOT RUN
13	2		BARIUM	10000	100	99	10000	NOT RUN
13	2		IRON	80000	900	98	500000	NOT RUN
13	2		MANGANESE	1000	40	96	5000	NOT RUN
13	2		CALCIUM(MG-L)	350	L 20	94	1800	NOT RUN
13	2		MAGNESIUM(MG-L)	130	2	98	35	NOT RUN
13	2		BORON	6000	5000	16	4000	NOT RUN
13	2		COBALT	30	L 20	33	200	NOT RUN
13	2		MOLYBDENUM	300	30	90	200	NOT RUN
13	2		TIN	700	50	92	500	NOT RUN
13	2		TITANIUM	20000	L 60	99	20000	NOT RUN
13	2		VANADIUM	200	L 50	75	100	NOT RUN
13	2		YTTRIUM	L 60	L 60	0	L 60	NOT RUN
13	2		SODIUM	68	190	0	200	NOT RUN

N-D NOT DETECTED; L-LESS THAN; PP- PRIORITY POLLUTANT NUMBER
PRIORITY POLLUTANTS NOT DETECTED IN ANY SAMPLES ARE NOT LISTED. FRACTIONS NOT ANALYZED ARE NOT LISTED.

PLANT	BATCH	PP	------PARAMETER----------	INFLUENT	EFFLUENT	REMOVAL (%)	.SLUDGE	TAP WATER
				ALL UNITS UG/L UNLESS OTHERWISE NOTED				
13	3	114	ANTIMONY	L 25	L 25	0	NOT RUN	NOT RUN
13	3	115	ARSENIC	110	L 25	77	NOT RUN	NOT RUN
13	3	117	BERYLLIUM	10	L 4	60	L 40	NOT RUN
13	3	118	CADMIUM	300	L 8	97	600	NOT RUN
13	3	119	CHROMIUM	6000	400	93	30000	NOT RUN
13	3	120	COPPER	800	400	50	1000	NOT RUN
13	3	121	CYANIDE	L 20	L 20	0	L 80	NOT RUN
13	3	122	LEAD	30000	200	99	80000	NOT RUN
13	3	123	MERCURY	8000	1400	82	24000	NOT RUN
13	3	124	NICKEL	300	L 20	93	L 200	NOT RUN
13	3	125	SELENIUM	L 25	L 25	0	L 300	NOT RUN
13	3	126	SILVER	3	L 1	66	L 40	NOT RUN
13	3	127	THALLIUM	L 10	L 10	0	NOT RUN	NOT RUN
13	3	128	ZINC	900000	40000	95	2000000	NOT RUN
13	3		PH(UNITS)	8	8		9	NOT RUN
13	3		BOD(MG-L)	3500	4300	0	78	NOT RUN
13	3		COD(MG-L)	64000	9800	84	96000	NOT RUN
13	3		TOC(MG-L)	20000	2800	86	26000	NOT RUN
13	3		OIL & GREASE(MG-L)	1600	77	95	700	NOT RUN
13	3		TOTAL PHENOLS	180	96	46	600	NOT RUN
13	3		TOTAL SOLIDS(MG-L)	46000	2500	94	164000	NOT RUN
13	3		TOTAL DISS. SOLIDS(MG-L)	14500	2366	83	2000	NOT RUN
13	3		TOTAL SUSP. SOLIDS(MG-L)	31500	134	99	162000	NOT RUN
13	3		TOTAL VOLATILE SOLIDS(MG-L)	22100	1370	93	50000	NOT RUN
13	3		VOLATILE DISS. SOLIDS(MG-L)	NOT RUN	1320	0	NOT RUN	NOT RUN
13	3		TOTAL VOL. SUS. SOLIDS(MG-L)	NOT RUN	54	0	NOT RUN	NOT RUN
13	3		ALUMINUM	20000	2000	90	600000	NOT RUN
13	3		BARIUM	1000	50	95	4000	NOT RUN
13	3		IRON	200000	L 700	99	240000	NOT RUN
13	3		MANGANESE	4000	100	97	10000	NOT RUN
13	3		CALCIUM(MG-L)	38000	25	99	11200	NOT RUN
13	3		MAGNESIUM(MG-L)	190	3	98	520	NOT RUN
13	3		BORON	6000	6000	0	8000	NOT RUN
13	3		COBALT	700	100	85	1000	NOT RUN
13	3		MOLYBDENUM	300	30	90	700	NOT RUN
13	3		TIN	800	50	93	7000	NOT RUN
13	3		TITANIUM	40000	200	99	130000	NOT RUN
13	3		VANADIUM	300	L 50	83	L 500	NOT RUN
13	3		YTTRIUM	200	L 60	70	L 600	NOT RUN
13	3		SODIUM	75	280	0	L 600	NOT RUN

N-D NOT DETECTED; L-LESS THAN; PP- PRIORITY POLLUTANT NUMBER
PRIORITY POLLUTANTS NOT DETECTED IN ANY SAMPLES ARE NOT LISTED. FRACTIONS NOT ANALYZED ARE NOT LISTED.

PLANT	BATCH	PP	------PARAMETER----------	INFLUENT	EFFLUENT	REMOVAL(%)	SLUDGE	TAP WATER
				ALL UNITS UG/L UNLESS OTHERWISE NOTED				
14	1	4	BENZENE	1100	720	34	NOT RUN	N-D
14	1	6	CARBON TETRACHLORIDE	L 10	N-D	100	NOT RUN	N-D
14	1	21	2,4,6-TRICHLOROPHENOL	N-D	N-D		NOT RUN	L 10
14	1	23	CHLOROFORM	N-D	11	0	NOT RUN	N-D
14	1	30	1,2-TRANS-DICHLOROETHYLENE	N-D	21	0	NOT RUN	N-D
14	1	33	1,3-DICHLOROPROPYLENE	N-D	44	0	NOT RUN	N-D
14	1	38	ETHYLBENZENE	690	130	81	NOT RUN	N-D
14	1	44	METHYLENE CHLORIDE	N-D	130	0	NOT RUN	N-D
14	1	65	PHENOL	N-D	74	0	NOT RUN	N-D
14	1	66	BIS(2-ETHYLHEXYL) PHTHALATE	390	L 10	97	NOT RUN	N-D
14	1	68	DI-N-BUTYL PHTHALATE	4000	L 10	99	NOT RUN	N-D
14	1	71	DIMETHYL PHTHALATE	N-D	219	0	NOT RUN	N-D
14	1	77	ACENAPHTHYLENE	N-D	L 10	0	NOT RUN	N-D
14	1	85	TETRACHLOROETHYLENE	N-D	L 10	0	NOT RUN	N-D
14	1	86	TOLUENE	3100	1900	38	NOT RUN	14
14	1	87	TRICHLOROETHYLENE	N-D	14	0	NOT RUN	L 10
14	1	114	ANTIMONY	L 25	L 10	60	150	L 10
14	1	115	ARSENIC	L 25	L 25	0	NOT RUN	L 25
14	1	117	BERYLLIUM	L 4	L 4	0	8	L 4
14	1	118	CADMIUM	50	100	0	80	60
14	1	119	CHROMIUM	90	L 20	77	80	L 20
14	1	120	COPPER	700	400	42	600	700
14	1	121	CYANIDE	L 20	L 20	0	L 20	L 20
14	1	122	LEAD	8000	200	97	4000	L 80
14	1	123	MERCURY	11000	170	98	62000	L 0
14	1	124	NICKEL	L 20	L 20	0	40	L 20
14	1	125	SELENIUM	L 25	L 20	20	L 500	L 25
14	1	126	SILVER	L 10	L 10	0	L 10	L 10
14	1	127	THALLIUM	L 10	L 10	0	NOT RUN	L 10
14	1	128	ZINC	30000	4000	86	90000	800
14	1		PH(UNITS)	7	7		7	6
14	1		BOD(MG-L)	5100	4000	21	17000	L 2
14	1		COD(MG-L)	24000	7300	69	230000	L 5
14	1		TOC(MG-L)	10000	1500	85	40000	20
14	1		OIL & GREASE(MG-L)	1200	24	98	3000	L 1
14	1		TOTAL PHENOLS	260	150	42	170	L 20
14	1		TOTAL SOLIDS(MG-L)	16400	880	94	139000	180
14	1		TOTAL DISS. SOLIDS(MG-L)	4300	844	80	3000	180
14	1		TOTAL SUSP. SOLIDS(MG-L)	12100	36	99	136000	L 1
14	1		TOTAL VOLATILE SOLIDS(MG-L)	11900	550	95	79000	110
14	1		VOLATILE DISS. SOLIDS(MG-L)	NOT RUN	521	0	NOT RUN	110
14	1		TOTAL VOL. SUS. SOLIDS(MG-L)	NOT RUN	29	0	NOT RUN	L 1
14	1		ALUMINUM	70000	700	99	50000	700
14	1		BARIUM	3000	400	86	7000	30
14	1		IRON	100000	L 700	99	200000	L 700
14	1		MANGANESE	10000	200	98	20000	L 20
14	1		CALCIUM(MG-L)	180	L 20	88	1100	L 20
14	1		MAGNESIUM(MG-L)	11	4	63	26	12
14	1		BORON	2000	900	55	3000	1000
14	1		COBALT	100	L 20	80	400	L 20
14	1		MOLYBDENUM	70	L 20	71	100	L 20
14	1		TIN	200	50	75	200	60
14	1		TITANIUM	8000	100	98	10000	70
14	1		VANADIUM	100	L 50	50	200	L 50
14	1		YTTRIUM	L 60	L 60	0	L 60	L 60
14	1		SODIUM	L 60	100	0	100	L 60

N-D NOT DETECTED; L-LESS THAN; PP- PRIORITY POLLUTANT NUMBER
PRIORITY POLLUTANTS NOT DETECTED IN ANY SAMPLES ARE NOT LISTED. FRACTIONS NOT ANALYZED ARE NOT LISTED.

PLANT	BATCH	PP	------PARAMETER----------	INFLUENT		EFFLUENT		REMOVAL(%)	SLUDGE	TAP WATER
				ALL UNITS UG/L UNLESS OTHERWISE NOTED						
14	2	114	ANTIMONY	L	25	L	25	0	15	NOT RUN
14	2	115	ARSENIC	L	25	L	25	0	NOT RUN	NOT RUN
14	2	117	BERYLLIUM		8	L	4	50	10	NOT RUN
14	2	118	CADMIUM		40		100	0	300	NOT RUN
14	2	119	CHROMIUM		100		30	70	300	NOT RUN
14	2	120	COPPER		400		400	0	600	NOT RUN
14	2	121	CYANIDE	L	20	L	20	0	L 20	NOT RUN
14	2	122	LEAD		2000	L	80	96	5000	NOT RUN
14	2	123	MERCURY		380		90	76	2000	NOT RUN
14	2	124	NICKEL	L	20	L	20	0	100	NOT RUN
14	2	125	SELENIUM	L	25	L	25	0	L 200	NOT RUN
14	2	126	SILVER	L	10	L	10	0	L 10	NOT RUN
14	2	127	THALLIUM	L	10	L	10	0	NOT RUN	NOT RUN
14	2	128	ZINC		80000		8000	90	300000	NOT RUN
14	2		PH(UNITS)		8		8		8	NOT RUN
14	2		BOD(MG-L)		4400		5000	0	19000	NOT RUN
14	2		COD(MG-L)		31000		8600	72	200000	NOT RUN
14	2		TOC(MG-L)		8500		1800	78	36000	NOT RUN
14	2		OIL & GREASE(MG-L)		930		20	97	2300	NOT RUN
14	2		TOTAL PHENOLS		280		150	46	230	NOT RUN
14	2		TOTAL SOLIDS(MG-L)		18400		1000	94	110000	NOT RUN
14	2		TOTAL DISS. SOLIDS(MG-L)		5800		958	83	NOT RUN	NOT RUN
14	2		TOTAL SUSP. SOLIDS(MG-L)		12600		42	99	110000	NOT RUN
14	2		TOTAL VOLATILE SOLIDS(MG-L)		13300		510	96	59000	NOT RUN
14	2		VOLATILE DISS. SOLIDS(MG-L)		5000		470	90	NOT RUN	NOT RUN
14	2		TOTAL VOL. SUS. SOLIDS(MG-L)		8300		40	99	NOT RUN	NOT RUN
14	2		ALUMINUM		100000		600	99	300000	NOT RUN
14	2		BARIUM		2000		200	90	20000	NOT RUN
14	2		IRON		20000	L	700	96	200000	NOT RUN
14	2		MANGANESE		1000		60	94	5000	NOT RUN
14	2		CALCIUM(MG-L)		180	L	20	88	910	NOT RUN
14	2		MAGNESIUM(MG-L)		11		6	45	32	NOT RUN
14	2		BORON		1000		2000	0	2000	NOT RUN
14	2		COBALT		60	L	20	66	300	NOT RUN
14	2		MOLYBDENUM		100	L	20	80	500	NOT RUN
14	2		TIN		200		50	75	900	NOT RUN
14	2		TITANIUM		7000		90	98	40000	NOT RUN
14	2		VANADIUM		50	L	50	0	200	NOT RUN
14	2		YTTRIUM	L	60	L	60	0	L 60	NOT RUN
14	2		SODIUM		66		160	0	170	NOT RUN

N-D NOT DETECTED; L-LESS THAN; PP- PRIORITY POLLUTANT NUMBER
PRIORITY POLLUTANTS NOT DETECTED IN ANY SAMPLES ARE NOT LISTED. FRACTIONS NOT ANALYZED ARE NOT LISTED.

PLANT	BATCH	PP	------PARAMETER----------	INFLUENT	EFFLUENT	REMOVAL(%)	SLUDGE	TAP WATER
				ALL UNITS UG/L UNLESS OTHERWISE NOTED				
15	1	4	BENZENE	N-D	N-D		NOT RUN	45
15	1	6	CARBON TETRACHLORIDE	30000	1800	94	NOT RUN	N-D
15	1	23	CHLOROFORM	N-D	550	0	NOT RUN	N-D
15	1	29	1,1-DICHLOROETHYLENE	620	N-D	100	NOT RUN	N-D
15	1	30	1,2-TRANS-DICHLOROETHYLENE	260	188	27	NOT RUN	N-D
15	1	44	METHYLENE CHLORIDE	156000	11900	92	NOT RUN	N-D
15	1	65	PHENOL	N-D	L 10	0	NOT RUN	N-D
15	1	68	DI-N-BUTYL PHTHALATE	5555	N-D	100	NOT RUN	N-D
15	1	85	TETRACHLOROETHYLENE	N-D	N-D		NOT RUN	N-D
15	1	114	ANTIMONY	L 10	L 10	0	NOT RUN	L 10
15	1	115	ARSENIC	NOT RUN	L 25	0	NOT RUN	L 25
15	1	117	BERYLLIUM	L 4	L 4	0	NOT RUN	L 4
15	1	118	CADMIUM	20	40	0	NOT RUN	20
15	1	119	CHROMIUM	4000	100	97	NOT RUN	40
15	1	120	COPPER	1000	600	40	NOT RUN	500
15	1	121	CYANIDE	57	60	0	NOT RUN	L 20
15	1	122	LEAD	10000	1000	90	NOT RUN	100
15	1	123	MERCURY	25000	4200	83	NOT RUN	L 1
15	1	124	NICKEL	L 20	L 20	0	NOT RUN	L 20
15	1	125	SELENIUM	L 25	L 25	0	NOT RUN	L 25
15	1	126	SILVER	L 10	L 10	0	NOT RUN	L 10
15	1	127	THALLIUM	L 10	L 10	0	NOT RUN	L 10
15	1	128	ZINC	6000	2000	66	NOT RUN	8000
15	1		PH(UNITS)	8	7		NOT RUN	7
15	1		BOD(MG-L)	18000	3900	78	NOT RUN	L 2
15	1		COD(MG-L)	63000	28000	55	NOT RUN	L 5
15	1		TOC(MG-L)	12000	8000	33	NOT RUN	18
15	1		OIL & GREASE(MG-L)	890	760	14	NOT RUN	1
15	1		TOTAL PHENOLS	130	140	0	NOT RUN	34
15	1		TOTAL SOLIDS(MG-L)	22500	7900	64	NOT RUN	195
15	1		TOTAL DISS. SOLIDS(MG-L)	7200	2300	68	NOT RUN	194
15	1		TOTAL SUSP. SOLIDS(MG-L)	15300	5600	63	NOT RUN	1
15	1		TOTAL VOLATILE SOLIDS(MG-L)	18000	6700	62	NOT RUN	17
15	1		VOLATILE DISS. SOLIDS(MG-L)	NOT RUN	2000	0	NOT RUN	16
15	1		TOTAL VOL. SUS. SOLIDS(MG-L)	NOT RUN	4700	0	NOT RUN	L 1
15	1		ALUMINUM	100000	60000	40	NOT RUN	500
15	1		BARIUM	10000	2000	80	NOT RUN	30
15	1		IRON	10000	3000	70	NOT RUN	L 700
15	1		MANGANESE	200	100	50	NOT RUN	60
15	1		CALCIUM(MG-L)	130	25	80	NOT RUN	L 20
15	1		MAGNESIUM(MG-L)	20	10	50	NOT RUN	14
15	1		BORON	40000	10000	75	NOT RUN	700
15	1		COBALT	400	500	0	NOT RUN	L 20
15	1		MOLYBDENUM	200	90	55	NOT RUN	L 20
15	1		TIN	1000	400	60	NOT RUN	60
15	1		TITANIUM	7000	5000	28	NOT RUN	L 60
15	1		VANADIUM	100	L 50	50	NOT RUN	L 50
15	1		YTTRIUM	L 60	L 60	0	NOT RUN	L 60
15	1		SODIUM	71	L 60	15	NOT RUN	L 60

N-D NOT DETECTED; L-LESS THAN; PP- PRIORITY POLLUTANT NUMBER
PRIORITY POLLUTANTS NOT DETECTED IN ANY SAMPLES ARE NOT LISTED. FRACTIONS NOT ANALYZED ARE NOT LISTED.

PLANT	BATCH	PP	------PARAMETER----------	INFLUENT	EFFLUENT	REMOVAL(%)	SLUDGE	TAP WATER
				ALL UNITS UG/L UNLESS OTHERWISE NOTED				
15	2	114	ANTIMONY	L 10	L 10	0	NOT RUN	NOT RUN
15	2	115	ARSENIC	400	L 25	93	NOT RUN	NOT RUN
15	2	117	BERYLLIUM	L 4	L 10	0	NOT RUN	NOT RUN
15	2	118	CADMIUM	L 8	L 20	0	NOT RUN	NOT RUN
15	2	119	CHROMIUM	500	L 50	90	NOT RUN	NOT RUN
15	2	120	COPPER	600	300	50	NOT RUN	NOT RUN
15	2	121	CYANIDE	32	33	0	NOT RUN	NOT RUN
15	2	122	LEAD	4000	500	87	NOT RUN	NOT RUN
15	2	123	MERCURY	62000	3800	93	NOT RUN	NOT RUN
15	2	124	NICKEL	L 20	L 50	0	NOT RUN	NOT RUN
15	2	125	SELENIUM	L 25	L 25	0	NOT RUN	NOT RUN
15	2	126	SILVER	L 10	L 10	0	NOT RUN	NOT RUN
15	2	127	THALLIUM	L 10	L 10	0	NOT RUN	NOT RUN
15	2	128	ZINC	3000	1000	66	NOT RUN	NOT RUN
15	2		PH(UNITS)	8	7		NOT RUN	NOT RUN
15	2		BOD(MG-L)	6200	3900	37	NOT RUN	NOT RUN
15	2		COD(MG-L)	49000	28000	42	NOT RUN	NOT RUN
15	2		TOC(MG-L)	10000	5000	50	NOT RUN	NOT RUN
15	2		OIL & GREASE(MG-L)	3400	580	82	NOT RUN	NOT RUN
15	2		TOTAL PHENOLS	200	96	52	NOT RUN	NOT RUN
15	2		TOTAL SOLIDS(MG-L)	18000	9300	48	NOT RUN	NOT RUN
15	2		TOTAL DISS. SOLIDS(MG-L)	2000	1900	5	NOT RUN	NOT RUN
15	2		TOTAL SUSP. SOLIDS(MG-L)	16000	7400	53	NOT RUN	NOT RUN
15	2		TOTAL VOLATILE SOLIDS(MG-L)	14000	7900	43	NOT RUN	NOT RUN
15	2		VOLATILE DISS. SOLIDS(MG-L)	NOT RUN	1600	0	NOT RUN	NOT RUN
15	2		TOTAL VOL. SUS. SOLIDS(MG-L)	NOT RUN	6300	0	NOT RUN	NOT RUN
15	2		ALUMINUM	200000	40000	80	NOT RUN	NOT RUN
15	2		BARIUM	30000	8000	73	NOT RUN	NOT RUN
15	2		IRON	60000	10000	83	NOT RUN	NOT RUN
15	2		MANGANESE	100	100	0	NOT RUN	NOT RUN
15	2		CALCIUM(MG-L)	52	L 50	3	NOT RUN	NOT RUN
15	2		MAGNESIUM(MG-L)	15	12	20	NOT RUN	NOT RUN
15	2		BORON	40000	10000	75	NOT RUN	NOT RUN
15	2		COBALT	100	400	0	NOT RUN	NOT RUN
15	2		MOLYBDENUM	300	L 50	83	NOT RUN	NOT RUN
15	2		TIN	900	600	33	NOT RUN	NOT RUN
15	2		TITANIUM	10000	4000	60	NOT RUN	NOT RUN
15	2		VANADIUM	200	L 100	50	NOT RUN	NOT RUN
15	2		YTTRIUM	L 60	L 200	0	NOT RUN	NOT RUN
15	2		SODIUM	79	L 150	0	NOT RUN	NOT RUN

N-D NOT DETECTED; L-LESS THAN; PP- PRIORITY POLLUTANT NUMBER
PRIORITY POLLUTANTS NOT DETECTED IN ANY SAMPLES ARE NOT LISTED. FRACTIONS NOT ANALYZED ARE NOT LISTED.

PLANT	BATCH	PP	------PARAMETER----------	INFLUENT	EFFLUENT	REMOVAL(%)	SLUDGE	TAP WATER
				ALL UNITS UG/L UNLESS OTHERWISE NOTED				
15	3	114	ANTIMONY	L 10	L 10	0	NOT RUN	NOT RUN
15	3	115	ARSENIC	NOT RUN	L 25	0	NOT RUN	NOT RUN
15	3	117	BERYLLIUM	8	L 4	50	NOT RUN	NOT RUN
15	3	118	CADMIUM	200	80	60	NOT RUN	NOT RUN
15	3	119	CHROMIUM	200	100	50	NOT RUN	NOT RUN
15	3	120	COPPER	900	600	33	NOT RUN	NOT RUN
15	3	121	CYANIDE	21	130	0	NOT RUN	NOT RUN
15	3	122	LEAD	3000	900	70	NOT RUN	NOT RUN
15	3	123	MERCURY	21000	4400	79	NOT RUN	NOT RUN
15	3	124	NICKEL	L 20	L 20	0	NOT RUN	NOT RUN
15	3	125	SELENIUM	L 25	L 25	0	NOT RUN	NOT RUN
15	3	126	SILVER	L 10	L 10	0	NOT RUN	NOT RUN
15	3	127	THALLIUM	25	L 10	60	NOT RUN	NOT RUN
15	3	128	ZINC	10000	1000	90	NOT RUN	NOT RUN
15	3		PH(UNITS)	8	8		NOT RUN	NOT RUN
15	3		BOD(MG-L)	1000	3600	0	NOT RUN	NOT RUN
15	3		COD(MG-L)	32000	33000	0	NOT RUN	NOT RUN
15	3		TOC(MG-L)	6000	5500	8	NOT RUN	NOT RUN
15	3		OIL & GREASE(MG-L)	950	1300	0	NOT RUN	NOT RUN
15	3		TOTAL PHENOLS	350	110	68	NOT RUN	NOT RUN
15	3		TOTAL SOLIDS(MG-L)	14200	7900	44	NOT RUN	NOT RUN
15	3		TOTAL DISS. SOLIDS(MG-L)	2800	2800	0	NOT RUN	NOT RUN
15	3		TOTAL SUSP. SOLIDS(MG-L)	11400	5100	55	NOT RUN	NOT RUN
15	3		TOTAL VOLATILE SOLIDS(MG-L)	10300	7100	31	NOT RUN	NOT RUN
15	3		VOLATILE DISS. SOLIDS(MG-L)	NOT RUN	2400	0	NOT RUN	NOT RUN
15	3		TOTAL VOL. SUS. SOLIDS(MG-L)	NOT RUN	4700	0	NOT RUN	NOT RUN
15	3		ALUMINUM	200000	80000	60	NOT RUN	NOT RUN
15	3		BARIUM	80000	1000	98	NOT RUN	NOT RUN
15	3		IRON	40000	3000	92	NOT RUN	NOT RUN
15	3		MANGANESE	400	100	75	NOT RUN	NOT RUN
15	3		CALCIUM(MG-L)	40	47	0	NOT RUN	NOT RUN
15	3		MAGNESIUM(MG-L)	13	12	7	NOT RUN	NOT RUN
15	3		BORON	20000	10000	50	NOT RUN	NOT RUN
15	3		COBALT	2000	500	75	NOT RUN	NOT RUN
15	3		MOLYBDENUM	200	100	50	NOT RUN	NOT RUN
15	3		TIN	800	400	50	NOT RUN	NOT RUN
15	3		TITANIUM	8000	4000	50	NOT RUN	NOT RUN
15	3		VANADIUM	200	L 50	75	NOT RUN	NOT RUN
15	3		YTTRIUM	L 60	L 60	0	NOT RUN	NOT RUN
15	3		SODIUM	65	L 60	7	NOT RUN	NOT RUN

N-D NOT DETECTED; L-LESS THAN; PP- PRIORITY POLLUTANT NUMBER
PRIORITY POLLUTANTS NOT DETECTED IN ANY SAMPLES ARE NOT LISTED. FRACTIONS NOT ANALYZED ARE NOT LISTED.

PLANT	BATCH	PP	------PARAMETER----------	INFLUENT	EFFLUENT	REMOVAL(%)	SLUDGE	TAP WATER
				ALL UNITS UG/L UNLESS OTHERWISE NOTED				
16	1	4	BENZENE	5000	NOT RUN		NOT RUN	150
16	1	10	1,2-DICHLOROETHANE	105	NOT RUN		NOT RUN	N-D
16	1	11	1,1,1-TRICHLOROETHANE	380	NOT RUN		NOT RUN	N-D
16	1	23	CHLOROFORM	N-D	NOT RUN		NOT RUN	41
16	1	29	1,1-DICHLOROETHYLENE	L 10	NOT RUN		NOT RUN	L 10
16	1	32	1,2-DICHLOROPROPANE	12	NOT RUN		NOT RUN	N-D
16	1	44	METHYLENE CHLORIDE	N-D	NOT RUN		NOT RUN	710
16	1	68	DI-N-BUTYL PHTHALATE	L 10	NOT RUN		NOT RUN	N-D
16	1	85	TETRACHLOROETHYLENE	120	NOT RUN		NOT RUN	N-D
16	1	86	TOLUENE	53000	NOT RUN		NOT RUN	L 10
16	1	87	TRICHLOROETHYLENE	140	NOT RUN		NOT RUN	N-D
16	1	114	ANTIMONY	L 25	NOT RUN		NOT RUN	L 10
16	1	115	ARSENIC	89	NOT RUN		NOT RUN	L 25
16	1	117	BERYLLIUM	L 4	NOT RUN		NOT RUN	L 4
16	1	118	CADMIUM	L 8	NOT RUN		NOT RUN	L 8
16	1	119	CHROMIUM	900	NOT RUN		NOT RUN	L 20
16	1	120	COPPER	400	NOT RUN		NOT RUN	100
16	1	121	CYANIDE	120	NOT RUN		NOT RUN	L 20
16	1	122	LEAD	3000	NOT RUN		NOT RUN	L 80
16	1	123	MERCURY	24	NOT RUN		NOT RUN	L 1
16	1	124	NICKEL	L 20	NOT RUN		NOT RUN	L 20
16	1	125	SELENIUM	L 25	NOT RUN		NOT RUN	L 25
16	1	126	SILVER	L 10	NOT RUN		NOT RUN	L 10
16	1	127	THALLIUM	L 10	NOT RUN		NOT RUN	L 10
16	1	128	ZINC	4000	NOT RUN		NOT RUN	300
16	1		PH(UNITS)	8	NOT RUN		NOT RUN	6
16	1		BOD(MG-L)	6100	NOT RUN		NOT RUN	L 2
16	1		COD(MG-L)	46000	NOT RUN		NOT RUN	40
16	1		TOC(MG-L)	10000	NOT RUN		NOT RUN	2
16	1		OIL & GREASE(MG-L)	620	NOT RUN		NOT RUN	L 1
16	1		TOTAL PHENOLS	180	NOT RUN		NOT RUN	40
16	1		TOTAL SOLIDS(MG-L)	26500	NOT RUN		NOT RUN	70
16	1		TOTAL DISS. SOLIDS(MG-L)	16800	NOT RUN		NOT RUN	68
16	1		TOTAL SUSP. SOLIDS(MG-L)	9700	NOT RUN		NOT RUN	2
16	1		TOTAL VOLATILE SOLIDS(MG-L)	19400	NOT RUN		NOT RUN	24
16	1		VOLATILE DISS. SOLIDS(MG-L)	NOT RUN	NOT RUN		NOT RUN	24
16	1		TOTAL VOL. SUS. SOLIDS(MG-L)	NOT RUN	NOT RUN		NOT RUN	L 1
16	1		ALUMINUM	100000	NOT RUN		NOT RUN	400
16	1		BARIUM	2000	NOT RUN		NOT RUN	50
16	1		IRON	20000	NOT RUN		NOT RUN	L 700
16	1		MANGANESE	2000	NOT RUN		NOT RUN	40
16	1		CALCIUM(MG-L)	120	NOT RUN		NOT RUN	L 20
16	1		MAGNESIUM(MG-L)	30	NOT RUN		NOT RUN	L 1
16	1		BORON	1000	NOT RUN		NOT RUN	300
16	1		COBALT	200	NOT RUN		NOT RUN	L 20
16	1		MOLYBDENUM	200	NOT RUN		NOT RUN	L 20
16	1		TIN	400	NOT RUN		NOT RUN	50
16	1		TITANIUM	30000	NOT RUN		NOT RUN	L 60
16	1		VANADIUM	100	NOT RUN		NOT RUN	L 50
16	1		YTTRIUM	L 60	NOT RUN		NOT RUN	L 60
16	1		SODIUM	1200	NOT RUN		NOT RUN	L 60

N-D NOT DETECTED; L-LESS THAN; PP- PRIORITY POLLUTANT NUMBER
PRIORITY POLLUTANTS NOT DETECTED IN ANY SAMPLES ARE NOT LISTED. FRACTIONS NOT ANALYZED ARE NOT LISTED.

PLANT	BATCH	PP	------PARAMETER----------	INFLUENT	EFFLUENT	REMOVAL(%)	SLUDGE	TAP WATER
				ALL UNITS UG/L UNLESS OTHERWISE NOTED				
17	1	4	BENZENE	1300	N-D	100	NOT RUN	N-D
17	1	6	CARBON TETRACHLORIDE	16	N-D	100	NOT RUN	15
17	1	10	1,2-DICHLOROETHANE	N-D	170	0	NOT RUN	N-D
17	1	11	1,1,1-TRICHLOROETHANE	90	N-D	100	NOT RUN	110
17	1	13	1,1-DICHLOROETHANE	N-D	180	0	NOT RUN	N-D
17	1	14	1,1,2-TRICHLOROETHANE	N-D	2100	0	NOT RUN	18
17	1	23	CHLOROFORM	200	300	0	NOT RUN	200
17	1	29	1,1-DICHLOROETHYLENE	N-D	N-D		NOT RUN	L 10
17	1	30	1,2-TRANS-DICHLOROETHYLENE	N-D	47	0	NOT RUN	N-D
17	1	44	METHYLENE CHLORIDE	15	N-D	100	NOT RUN	43
17	1	48	DICHLOROBROMOMETHANE	N-D	N-D		NOT RUN	34
17	1	55	NAPHTHALENE	33	N-D	100	NOT RUN	N-D
17	1	56	NITROBENZENE	L 10	N-D	100	NOT RUN	N-D
17	1	68	DI-N-BUTYL PHTHALATE	N-D	1300	0	NOT RUN	N-D
17	1	70	DIETHYL PHTHALATE	L 10	N-D	100	NOT RUN	N-D
17	1	85	TETRACHLOROETHYLENE	730	N-D	100	NOT RUN	L 10
17	1	86	TOLUENE	1700	N-D	100	NOT RUN	L 10
17	1	87	TRICHLOROETHYLENE	100	N-D	100	NOT RUN	N-D
17	1	114	ANTIMONY	L 10	L 10	0	NOT RUN	L 10
17	1	115	ARSENIC	L 25	39	0	NOT RUN	NOT RUN
17	1	117	BERYLLIUM	L 4	L 10	0	NOT RUN	L 1
17	1	118	CADMIUM	30	L 20	33	NOT RUN	L 2
17	1	119	CHROMIUM	80	100	0	NOT RUN	L 5
17	1	120	COPPER	400	400	0	NOT RUN	30
17	1	121	CYANIDE	L 20	L 20	0	NOT RUN	L 20
17	1	122	LEAD	100	300	0	NOT RUN	L 20
17	1	123	MERCURY	1400	1400	0	NOT RUN	L 5
17	1	124	NICKEL	100	100	0	NOT RUN	L 5
17	1	125	SELENIUM	L 25	L 25	0	NOT RUN	NOT RUN
17	1	126	SILVER	20	L 10	50	NOT RUN	L 1
17	1	127	THALLIUM	30	L 10	66	NOT RUN	NOT RUN
17	1	128	ZINC	20000	30000	0	NOT RUN	L 60
17	1		PH(UNITS)	8	7		NOT RUN	7
17	1		BOD(MG-L)	11000	6900	37	NOT RUN	L 2
17	1		COD(MG-L)	32000	39000	0	NOT RUN	15
17	1		TOC(MG-L)	10000	12000	0	NOT RUN	9
17	1		OIL & GREASE(MG-L)	1300	1700	0	NOT RUN	L 1
17	1		TOTAL PHENOLS	180	190	0	NOT RUN	L 20
17	1		TOTAL SOLIDS(MG-L)	26600	20100	24	NOT RUN	70
17	1		TOTAL DISS. SOLIDS(MG-L)	16100	4200	73	NOT RUN	69
17	1		TOTAL SUSP. SOLIDS(MG-L)	10500	15900	0	NOT RUN	1
17	1		TOTAL VOLATILE SOLIDS(MG-L)	19400	11600	40	NOT RUN	24
17	1		VOLATILE DISS. SOLIDS(MG-L)	NOT RUN	3400	0	NOT RUN	23
17	1		TOTAL VOL. SUS. SOLIDS(MG-L)	NOT RUN	8200	0	NOT RUN	L 1
17	1		ALUMINUM	40000	10000	75	NOT RUN	L 50
17	1		BARIUM	10000	9000	10	NOT RUN	5
17	1		IRON	100000	60000	40	NOT RUN	L 200
17	1		MANGANESE	2000	600	70	NOT RUN	70
17	1		CALCIUM(MG-L)	1500	950	36	NOT RUN	11
17	1		MAGNESIUM(MG-L)	83	49	40	NOT RUN	3
17	1		BORON	20000	2000	90	NOT RUN	L 50
17	1		COBALT	300	L 50	83	NOT RUN	L 5
17	1		MOLYBDENUM	80	300	0	NOT RUN	7
17	1		TIN	300	90	70	NOT RUN	30
17	1		TITANIUM	7000	10000	0	NOT RUN	L 20
17	1		VANADIUM	100	200	0	NOT RUN	L 10
17	1		YTTRIUM	90	L 200	0	NOT RUN	L 20
17	1		SODIUM	66	L 150	0	NOT RUN	L 150

N-D NOT DETECTED; L-LESS THAN; PP- PRIORITY POLLUTANT NUMBER
PRIORITY POLLUTANTS NOT DETECTED IN ANY SAMPLES ARE NOT LISTED. FRACTIONS NOT ANALYZED ARE NOT LISTED.

PLANT	BATCH	PP	------PARAMETER----------	INFLUENT		EFFLUENT		REMOVAL (%)	SLUDGE	TAP WATER
				ALL UNITS UG/L UNLESS OTHERWISE NOTED						
17	2	114	ANTIMONY		40	L	30	25	NOT RUN	NOT RUN
17	2	115	ARSENIC	L	25	L	25	0	NOT RUN	NOT RUN
17	2	117	BERYLLIUM	L	10	L	10	0	NOT RUN	NOT RUN
17	2	118	CADMIUM	L	20		40	0	NOT RUN	NOT RUN
17	2	119	CHROMIUM		100		200	0	NOT RUN	NOT RUN
17	2	120	COPPER		200		400	0	NOT RUN	NOT RUN
17	2	121	CYANIDE	L	20	L	20	0	NOT RUN	NOT RUN
17	2	122	LEAD	L	200		300	0	NOT RUN	NOT RUN
17	2	123	MERCURY		4800		3400	29	NOT RUN	NOT RUN
17	2	124	NICKEL	L	50		70	0	NOT RUN	NOT RUN
17	2	125	SELENIUM	L	25	L	25	0	NOT RUN	NOT RUN
17	2	126	SILVER	L	10	L	10	0	NOT RUN	NOT RUN
17	2	127	THALLIUM		14	L	10	28	NOT RUN	NOT RUN
17	2	128	ZINC		7000		20000	0	NOT RUN	NOT RUN
17	2		PH(UNITS)		9		8		NOT RUN	NOT RUN
17	2		BOD(MG-L)		5100		7400	0	NOT RUN	NOT RUN
17	2		COD(MG-L)		27000		34000	0	NOT RUN	NOT RUN
17	2		TOC(MG-L)		6500		7000	0	NOT RUN	NOT RUN
17	2		OIL & GREASE(MG-L)		1000		1400	0	NOT RUN	NOT RUN
17	2		TOTAL PHENOLS		320		290	9	NOT RUN	NOT RUN
17	2		TOTAL SOLIDS(MG-L)		28500		10500	63	NOT RUN	NOT RUN
17	2		TOTAL DISS. SOLIDS(MG-L)		3600		6500	0	NOT RUN	NOT RUN
17	2		TOTAL SUSP. SOLIDS(MG-L)		24900		4000	83	NOT RUN	NOT RUN
17	2		TOTAL VOLATILE SOLIDS(MG-L)		9700		7200	25	NOT RUN	NOT RUN
17	2		VOLATILE DISS. SOLIDS(MG-L)		NOT RUN		4600	0	NOT RUN	NOT RUN
17	2		TOTAL VOL. SUS. SOLIDS(MG-L)		NOT RUN		2600	0	NOT RUN	NOT RUN
17	2		ALUMINUM		70000		100000	0	NOT RUN	NOT RUN
17	2		BARIUM		30000		20000	33	NOT RUN	NOT RUN
17	2		IRON		200000		200000	0	NOT RUN	NOT RUN
17	2		MANGANESE		1000		1000	0	NOT RUN	NOT RUN
17	2		CALCIUM(MG-L)		2400	L	1200	50	NOT RUN	NOT RUN
17	2		MAGNESIUM(MG-L)		69		54	21	NOT RUN	NOT RUN
17	2		BORON		5000		4000	20	NOT RUN	NOT RUN
17	2		COBALT	L	50		70	0	NOT RUN	NOT RUN
17	2		MOLYBDENUM		200		200	0	NOT RUN	NOT RUN
17	2		TIN		80		300	0	NOT RUN	NOT RUN
17	2		TITANIUM		10000		30000	0	NOT RUN	NOT RUN
17	2		VANADIUM		200		200	0	NOT RUN	NOT RUN
17	2		YTTRIUM	L	200	L	200	0	NOT RUN	NOT RUN
17	2		SODIUM	L	150	L	150	0	NOT RUN	NOT RUN

N-D NOT DETECTED; L-LESS THAN; PP- PRIORITY POLLUTANT NUMBER
PRIORITY POLLUTANTS NOT DETECTED IN ANY SAMPLES ARE NOT LISTED. FRACTIONS NOT ANALYZED ARE NOT LISTED.

PLANT	BATCH	PP	------PARAMETER----------	INFLUENT		EFFLUENT		REMOVAL(%)	SLUDGE	TAP WATER
				ALL UNITS UG/L UNLESS OTHERWISE NOTED						
17	3	114	ANTIMONY	L	10	L	10	0	NOT RUN	NOT RUN
17	3	115	ARSENIC	L	25	L	25	0	NOT RUN	NOT RUN
17	3	117	BERYLLIUM	L	10	L	10	0	NOT RUN	NOT RUN
17	3	118	CADMIUM	L	20	L	20	0	NOT RUN	NOT RUN
17	3	119	CHROMIUM		200		100	50	NOT RUN	NOT RUN
17	3	120	COPPER		1000		300	70	NOT RUN	NOT RUN
17	3	121	CYANIDE	L	20	L	20	0	NOT RUN	NOT RUN
17	3	122	LEAD	L	200	L	200	0	NOT RUN	NOT RUN
17	3	123	MERCURY		3900		2200	43	NOT RUN	NOT RUN
17	3	124	NICKEL	L	50		70	0	NOT RUN	NOT RUN
17	3	125	SELENIUM	L	25	L	25	0	NOT RUN	NOT RUN
17	3	126	SILVER	L	10	L	10	0	NOT RUN	NOT RUN
17	3	127	THALLIUM	L	10	L	10	0	NOT RUN	NOT RUN
17	3	128	ZINC	L	600		3000	0	NOT RUN	NOT RUN
17	3		PH(UNITS)		7		9		NOT RUN	NOT RUN
17	3		BOD(MG-L)		3700		3300	10	NOT RUN	NOT RUN
17	3		COD(MG-L)		27000		15000	44	NOT RUN	NOT RUN
17	3		TOC(MG-L)		8000		4400	45	NOT RUN	NOT RUN
17	3		OIL & GREASE(MG-L)		700		320	54	NOT RUN	NOT RUN
17	3		TOTAL PHENOLS		540		320	40	NOT RUN	NOT RUN
17	3		TOTAL SOLIDS(MG-L)		11550		6100	47	NOT RUN	NOT RUN
17	3		TOTAL DISS. SOLIDS(MG-L)		3410		4000	0	NOT RUN	NOT RUN
17	3		TOTAL SUSP. SOLIDS(MG-L)		8150		2100	74	NOT RUN	NOT RUN
17	3		TOTAL VOLATILE SOLIDS(MG-L)		6300		3700	41	NOT RUN	NOT RUN
17	3		VOLATILE DISS. SOLIDS(MG-L)		NOT RUN		2500	0	NOT RUN	NOT RUN
17	3		TOTAL VOL. SUS. SOLIDS(MG-L)		NOT RUN		1200	0	NOT RUN	NOT RUN
17	3		ALUMINUM		60000		30000	50	NOT RUN	NOT RUN
17	3		BARIUM		2000		3000	0	NOT RUN	NOT RUN
17	3		IRON		50000		40000	20	NOT RUN	NOT RUN
17	3		MANGANESE		2000		400	80	NOT RUN	NOT RUN
17	3		CALCIUM(MG-L)		650		260	60	NOT RUN	NOT RUN
17	3		MAGNESIUM(MG-L)		32		8	75	NOT RUN	NOT RUN
17	3		BORON	L	500		5000	0	NOT RUN	NOT RUN
17	3		COBALT	L	50	L	50	0	NOT RUN	NOT RUN
17	3		MOLYBDENUM		200		100	50	NOT RUN	NOT RUN
17	3		TIN		100	L	50	50	NOT RUN	NOT RUN
17	3		TITANIUM		7000		5000	28	NOT RUN	NOT RUN
17	3		VANADIUM	L	100	L	100	0	NOT RUN	NOT RUN
17	3		YTTRIUM	L	200	L	200	0	NOT RUN	NOT RUN
17	3		SODIUM		190		180	5	NOT RUN	NOT RUN

N-D NOT DETECTED; L-LESS THAN; PP- PRIORITY POLLUTANT NUMBER
PRIORITY POLLUTANTS NOT DETECTED IN ANY SAMPLES ARE NOT LISTED. FRACTIONS NOT ANALYZED ARE NOT LISTED.

PLANT	BATCH	PP	------PARAMETER----------	INFLUENT	EFFLUENT	REMOVAL(%)	SLUDGE	TAP WATER
				ALL UNITS UG/L UNLESS OTHERWISE NOTED				
18	1	4	BENZENE	1500	304	79	NOT RUN	N-D
18	1	11	1,1,1-TRICHLOROETHANE	10	L 10	50	NOT RUN	N-D
18	1	23	CHLOROFORM	470	46	90	NOT RUN	N-D
18	1	30	1,2-TRANS-DICHLOROETHYLENE	L 10	N-D	100	NOT RUN	N-D
18	1	42	BIS(2-CHLOROISOPROPYL) ETHER	3200	N-D	100	NOT RUN	N-D
18	1	44	METHYLENE CHLORIDE	28	N-D	100	NOT RUN	N-D
18	1	56	NITROBENZENE	180	N-D	100	NOT RUN	N-D
18	1	64	PENTACHLOROPHENOL	92	N-D	100	NOT RUN	N-D
18	1	65	PHENOL	3800	N-D	100	NOT RUN	N-D
18	1	66	BIS(2-ETHYLHEXYL) PHTHALATE	329	N-D	100	NOT RUN	N-D
18	1	68	DI-N-BUTYL PHTHALATE	53	N-D	100	NOT RUN	N-D
18	1	85	TETRACHLOROETHYLENE	387	N-D	100	NOT RUN	N-D
18	1	86	TOLUENE	3400	N-D	100	NOT RUN	N-D
18	1	87	TRICHLOROETHYLENE	52	N-D	100	NOT RUN	N-D
18	1	114	ANTIMONY	260	L 10	96	NOT RUN	L 10
18	1	115	ARSENIC	L 25	L 25	0	NOT RUN	L 25
18	1	117	BERYLLIUM	L 100	L 10	90	NOT RUN	L 1
18	1	118	CADMIUM	500	L 20	96	NOT RUN	L 2
18	1	119	CHROMIUM	10000	300	97	NOT RUN	L 5
18	1	120	COPPER	40000	100	99	NOT RUN	100
18	1	121	CYANIDE	L 40	L 40	0	NOT RUN	L 20
18	1	122	LEAD	80000	L 200	99	NOT RUN	L 20
18	1	123	MERCURY	27000	200	99	NOT RUN	L 1
18	1	124	NICKEL	L 500	100	80	NOT RUN	L 5
18	1	125	SELENIUM	L 25	L 25	0	NOT RUN	L 25
18	1	126	SILVER	L 100	L 10	90	NOT RUN	L 10
18	1	127	THALLIUM	L 10	L 10	0	NOT RUN	L 10
18	1	128	ZINC	150000	1000	99	NOT RUN	1000
18	1		PH(UNITS)	6	5		NOT RUN	6
18	1		BOD(MG-L)	18000	1600	91	NOT RUN	L 2
18	1		COD(MG-L)	68000	4600	93	NOT RUN	12
18	1		TOC(MG-L)	11000	1200	89	NOT RUN	19
18	1		OIL & GREASE(MG-L)	740	14	98	NOT RUN	L 1
18	1		TOTAL PHENOLS	770	770	0	NOT RUN	L 40
18	1		TOTAL SOLIDS(MG-L)	120000	10900	90	NOT RUN	234
18	1		TOTAL DISS. SOLIDS(MG-L)	3200	10280	0	NOT RUN	232
18	1		TOTAL SUSP. SOLIDS(MG-L)	116700	620	99	NOT RUN	2
18	1		TOTAL VOLATILE SOLIDS(MG-L)	11400	2500	78	NOT RUN	94
18	1		VOLATILE DISS. SOLIDS(MG-L)	NOT RUN	2350	0	NOT RUN	27
18	1		TOTAL VOL. SUS. SOLIDS(MG-L)	NOT RUN	150	0	NOT RUN	L 1
18	1		ALUMINUM	3000000	L 500	99	NOT RUN	L 50
18	1		BARIUM	10000	L 50	99	NOT RUN	40
18	1		IRON	6000000	2000000	66	NOT RUN	L 200
18	1		MANGANESE	40000	30000	25	NOT RUN	7
18	1		CALCIUM(MG-L)	36000	340	99	NOT RUN	26
18	1		MAGNESIUM(MG-L)	2100	28	98	NOT RUN	5
18	1		BORON	L 500	L 500	0	NOT RUN	L 50
18	1		COBALT	2000	200	90	NOT RUN	L 5
18	1		MOLYBDENUM	4000	400	90	NOT RUN	L 5
18	1		TIN	3000	L 50	98	NOT RUN	7
18	1		TITANIUM	200000	L 200	99	NOT RUN	L 20
18	1		VANADIUM	2000	200	90	NOT RUN	L 10
18	1		YTTRIUM	L 200	L 200	0	NOT RUN	L 20
18	1		SODIUM	L 1500	1200	20	NOT RUN	15

N-D NOT DETECTED; L-LESS THAN; PP- PRIORITY POLLUTANT NUMBER
PRIORITY POLLUTANTS NOT DETECTED IN ANY SAMPLES ARE NOT LISTED. FRACTIONS NOT ANALYZED ARE NOT LISTED.

PLANT	BATCH	PP	------PARAMETER----------	INFLUENT		EFFLUENT	REMOVAL(%)	SLUDGE	TAP WATER
				ALL UNITS UG/L UNLESS OTHERWISE NOTED					
18	2	114	ANTIMONY	148	L	10	93	NOT RUN	NOT RUN
18	2	115	ARSENIC	L 25	L	25	0	NOT RUN	NOT RUN
18	2	117	BERYLLIUM	20	L	10	50	NOT RUN	NOT RUN
18	2	118	CADMIUM	L 20	L	20	0	NOT RUN	NOT RUN
18	2	119	CHROMIUM	300		600	0	NOT RUN	NOT RUN
18	2	120	COPPER	6000	L	60	99	NOT RUN	NOT RUN
18	2	121	CYANIDE	L 20	L	20	0	NOT RUN	NOT RUN
18	2	122	LEAD	3000	L	200	93	NOT RUN	NOT RUN
18	2	123	MERCURY	4700		170	96	NOT RUN	NOT RUN
18	2	124	NICKEL	L 50	L	50	0	NOT RUN	NOT RUN
18	2	125	SELENIUM	L 25	L	25	0	NOT RUN	NOT RUN
18	2	126	SILVER	L 10	L	10	0	NOT RUN	NOT RUN
18	2	127	THALLIUM	L 10	L	10	0	NOT RUN	NOT RUN
18	2	128	ZINC	9000	L	600	93	NOT RUN	NOT RUN
18	2		PH(UNITS)	6		6		NOT RUN	NOT RUN
18	2		BOD(MG-L)	6300		4500	28	NOT RUN	NOT RUN
18	2		COD(MG-L)	34000		5600	83	NOT RUN	NOT RUN
18	2		TOC(MG-L)	7000		1600	77	NOT RUN	NOT RUN
18	2		OIL & GREASE(MG-L)	590		13	97	NOT RUN	NOT RUN
18	2		TOTAL PHENOLS	1500		940	37	NOT RUN	NOT RUN
18	2		TOTAL SOLIDS(MG-L)	10700		8100	24	NOT RUN	NOT RUN
18	2		TOTAL DISS. SOLIDS(MG-L)	3000		7900	0	NOT RUN	NOT RUN
18	2		TOTAL SUSP. SOLIDS(MG-L)	7700		200	97	NOT RUN	NOT RUN
18	2		TOTAL VOLATILE SOLIDS(MG-L)	6800		1000	85	NOT RUN	NOT RUN
18	2		VOLATILE DISS. SOLIDS(MG-L)	NOT RUN		820	0	NOT RUN	NOT RUN
18	2		TOTAL VOL. SUS. SOLIDS(MG-L)	NOT RUN		180	0	NOT RUN	NOT RUN
18	2		ALUMINUM	200000	L	500	99	NOT RUN	NOT RUN
18	2		BARIUM	500	L	50	90	NOT RUN	NOT RUN
18	2		IRON	700000		700000	0	NOT RUN	NOT RUN
18	2		MANGANESE	7000		10000	0	NOT RUN	NOT RUN
18	2		CALCIUM(MG-L)	2600		230	91	NOT RUN	NOT RUN
18	2		MAGNESIUM(MG-L)	120		28	76	NOT RUN	NOT RUN
18	2		BORON	800	L	500	37	NOT RUN	NOT RUN
18	2		COBALT	200	L	50	75	NOT RUN	NOT RUN
18	2		MOLYBDENUM	400		200	50	NOT RUN	NOT RUN
18	2		TIN	400	L	50	87	NOT RUN	NOT RUN
18	2		TITANIUM	30000		400	98	NOT RUN	NOT RUN
18	2		VANADIUM	200	L	100	50	NOT RUN	NOT RUN
18	2		YTTRIUM	L 200	L	200	0	NOT RUN	NOT RUN
18	2		SODIUM	440		1600	0	NOT RUN	NOT RUN

N-D NOT DETECTED; L-LESS THAN; PP- PRIORITY POLLUTANT NUMBER
PRIORITY POLLUTANTS NOT DETECTED IN ANY SAMPLES ARE NOT LISTED. FRACTIONS NOT ANALYZED ARE NOT LISTED.

PLANT	BATCH	PP	------PARAMETER----------	INFLUENT	EFFLUENT	REMOVAL(%)	SLUDGE	TAP WATER
				ALL UNITS UG/L UNLESS OTHERWISE NOTED				
18	3	114	ANTIMONY	NOT RUN	L 10	0	NOT RUN	NOT RUN
18	3	117	BERYLLIUM	L 100	L 10	90	L 100	NOT RUN
18	3	118	CADMIUM	L 200	L 20	90	300	NOT RUN
18	3	119	CHROMIUM	8000	L 50	99	10000	NOT RUN
18	3	120	COPPER	40000	100	99	60000	NOT RUN
18	3	121	CYANIDE	L 20	L 20	0	L 20	NOT RUN
18	3	122	LEAD	40000	L 200	99	50000	NOT RUN
18	3	123	MERCURY	29500	220	99	39300	NOT RUN
18	3	124	NICKEL	L 500	L 50	90	L 500	NOT RUN
18	3	125	SELENIUM	L 25	L 25	0	L 1000	NOT RUN
18	3	126	SILVER	L 100	L 10	90	L 100	NOT RUN
18	3	127	THALLIUM	L 10	L 10	0	NOT RUN	NOT RUN
18	3	128	ZINC	80000	L 600	99	110000	NOT RUN
18	3		PH(UNITS)	7	5		7	NOT RUN
18	3		BOD(MG-L)	15000	1500	90	13000	NOT RUN
18	3		COD(MG-L)	100000	59000	41	370000	NOT RUN
18	3		TOC(MG-L)	21000	1800	91	30000	NOT RUN
18	3		OIL & GREASE(MG-L)	2000	13	99	1400	NOT RUN
18	3		TOTAL PHENOLS	1900	1400	26	L 160	NOT RUN
18	3		TOTAL SOLIDS(MG-L)	95300	11300	88	180600	NOT RUN
18	3		TOTAL DISS. SOLIDS(MG-L)	4300	10950	0	10600	NOT RUN
18	3		TOTAL SUSP. SOLIDS(MG-L)	91000	350	99	170000	NOT RUN
18	3		TOTAL VOLATILE SOLIDS(MG-L)	31700	2900	90	41200	NOT RUN
18	3		VOLATILE DISS. SOLIDS(MG-L)	NOT RUN	2630	0	NOT RUN	NOT RUN
18	3		TOTAL VOL. SUS. SOLIDS(MG-L)	NOT RUN	270	0	NOT RUN	NOT RUN
18	3		ALUMINUM	1000000	6000	99	2000000	NOT RUN
18	3		BARIUM	6000	L 50	99	8000	NOT RUN
18	3		IRON	4000000	1000000	75	8000000	NOT RUN
18	3		MANGANESE	30000	20000	33	50000	NOT RUN
18	3		CALCIUM(MG-L)	21500	180	99	30200	NOT RUN
18	3		MAGNESIUM(MG-L)	1200	47	96	1500	NOT RUN
18	3		BORON	L 500	L 500	0	L 500	NOT RUN
18	3		COBALT	800	L 50	93	900	NOT RUN
18	3		MOLYBDENUM	3000	300	90	3000	NOT RUN
18	3		TIN	3000	L 50	98	2000	NOT RUN
18	3		TITANIUM	210000	1000	99	230000	NOT RUN
18	3		VANADIUM	2000	200	90	3000	NOT RUN
18	3		YTTRIUM	L 200	L 200	0	L 200	NOT RUN
18	3		SODIUM	L 1500	1500	0	1600	NOT RUN

N-D NOT DETECTED; L-LESS THAN; PP- PRIORITY POLLUTANT NUMBER
PRIORITY POLLUTANTS NOT DETECTED IN ANY SAMPLES ARE NOT LISTED. FRACTIONS NOT ANALYZED ARE NOT LISTED.

PLANT	BATCH	PP	------PARAMETER----------	INFLUENT	EFFLUENT	REMOVAL(%)	SLUDGE	TAP WATER
				ALL UNITS UG/L UNLESS OTHERWISE NOTED				
20	1	4	BENZENE	N-D	3800	0	NOT RUN	N-D
20	1	6	CARBON TETRACHLORIDE	19	N-D	100	NOT RUN	N-D
20	1	10	1,2-DICHLOROETHANE	L 10	N-D	100	NOT RUN	N-D
20	1	11	1,1,1-TRICHLOROETHANE	N-D	115	0	NOT RUN	18
20	1	14	1,1,2-TRICHLOROETHANE	2800	N-D	100	NOT RUN	N-D
20	1	16	CHLOROETHANE	N-D	L 10	0	NOT RUN	N-D
20	1	23	CHLOROFORM	55	4700	0	NOT RUN	25
20	1	38	ETHYLBENZENE	110	N-D	100	NOT RUN	N-D
20	1	44	METHYLENE CHLORIDE	L 10	9800	0	NOT RUN	N-D
20	1	48	DICHLOROBROMOMETHANE	N-D	N-D		NOT RUN	13
20	1	68	DI-N-BUTYL PHTHALATE	358	L 10	97	NOT RUN	N-D
20	1	85	TETRACHLOROETHYLENE	540	N-D	100	NOT RUN	N-D
20	1	86	TOLUENE	3800	4200	0	NOT RUN	N-D
20	1	87	TRICHLOROETHYLENE	250	300	0	NOT RUN	N-D
20	1	114	ANTIMONY	L 25	L 25	0	NOT RUN	L 25
20	1	115	ARSENIC	L 25	L 25	0	NOT RUN	NOT RUN
20	1	117	BERYLLIUM	L 10	L 10	0	20	L 10
20	1	118	CADMIUM	L 20	L 20	0	L 20	L 20
20	1	119	CHROMIUM	300	L 50	83	900	L 50
20	1	120	COPPER	400	100	75	2000	L 60
20	1	121	CYANIDE	L 20	L 20	0	L 20	L 20
20	1	122	LEAD	L 200	L 200	0	900	L 200
20	1	123	MERCURY	2400	1100	54	8800	1
20	1	124	NICKEL	L 50	L 50	0	200	L 50
20	1	125	SELENIUM	L 25	L 25	0	L 500	L 25
20	1	126	SILVER	L 10	L 10	0	L 10	L 10
20	1	127	THALLIUM	23	L 10	56	NOT RUN	L 10
20	1	128	ZINC	1000	L 600	40	5000	L 600
20	1		PH(UNITS)	8	6		6	6
20	1		BOD(MG-L)	2500	1800	28	1600	L 2
20	1		COD(MG-L)	17000	3200	81	62000	5
20	1		TOC(MG-L)	3000	460	84	15000	5
20	1		OIL & GREASE(MG-L)	250	8	96	580	3
20	1		TOTAL PHENOLS	190	30	84	L 80	L 20
20	1		TOTAL SOLIDS(MG-L)	22750	5180	77	139000	49
20	1		TOTAL DISS. SOLIDS(MG-L)	3110	4860	0	11000	38
20	1		TOTAL SUSP. SOLIDS(MG-L)	19640	320	98	128000	11
20	1		TOTAL VOLATILE SOLIDS(MG-L)	6260	1430	77	33400	12
20	1		VOLATILE DISS. SOLIDS(MG-L)	NOT RUN	1360	0	NOT RUN	4
20	1		TOTAL VOL. SUS. SOLIDS(MG-L)	NOT RUN	70	0	NOT RUN	8
20	1		ALUMINUM	100000	20000	80	400000	L 500
20	1		BARIUM	2000	500	75	6000	L 50
20	1		IRON	100000	40000	60	3000000	L 2000
20	1		MANGANESE	1000	3000	0	9000	L 50
20	1		CALCIUM(MG-L)	2400	1100	54	11000	L 50
20	1		MAGNESIUM(MG-L)	85	10	88	530	L 1
20	1		BORON	5000	1000	80	7000	L 500
20	1		COBALT	L 50	L 50	0	L 50	L 50
20	1		MOLYBDENUM	200	80	60	1000	L 50
20	1		TIN	200	L 50	75	1000	L 50
20	1		TITANIUM	30000	800	97	70000	L 200
20	1		VANADIUM	L 100	L 100	0	900	L 100
20	1		YTTRIUM	L 200	L 200	0	600	L 200
20	1		SODIUM	L 150	L 150	0	L 150	L 150

N-D NOT DETECTED; L-LESS THAN; PP- PRIORITY POLLUTANT NUMBER
PRIORITY POLLUTANTS NOT DETECTED IN ANY SAMPLES ARE NOT LISTED. FRACTIONS NOT ANALYZED ARE NOT LISTED.

PLANT	BATCH	PP	------PARAMETER----------	INFLUENT	EFFLUENT	REMOVAL(%)	SLUDGE	TAP WATER
				ALL UNITS UG/L UNLESS OTHERWISE NOTED				
20	2	114	ANTIMONY	L 25	L 25	0	NOT RUN	NOT RUN
20	2	115	ARSENIC	76	L 25	67	NOT RUN	NOT RUN
20	2	117	BERYLLIUM	L 10	L 10	0	20	NOT RUN
20	2	118	CADMIUM	30	L 20	33	L 20	NOT RUN
20	2	119	CHROMIUM	80	L 50	37	700	NOT RUN
20	2	120	COPPER	300	100	66	700	NOT RUN
20	2	121	CYANIDE	L 20	L 20	0	L 20	NOT RUN
20	2	122	LEAD	400	L 200	50	1000	NOT RUN
20	2	123	MERCURY	4800	1500	68	25600	NOT RUN
20	2	124	NICKEL	100	L 50	50	600	NOT RUN
20	2	125	SELENIUM	L 25	L 25	0	L 750	NOT RUN
20	2	126	SILVER	L 10	L 10	0	L 10	NOT RUN
20	2	127	THALLIUM	10	L 10	0	NOT RUN	NOT RUN
20	2	128	ZINC	1000	L 600	40	5000	NOT RUN
20	2		PH(UNITS)	8	6		6	NOT RUN
20	2		BOD(MG-L)	7400	240	96	1200	NOT RUN
20	2		COD(MG-L)	28000	4600	83	120000	NOT RUN
20	2		TOC(MG-L)	7400	1200	83	30000	NOT RUN
20	2		OIL & GREASE(MG-L)	500	15	97	2500	NOT RUN
20	2		TOTAL PHENOLS	L 40	L 40	0	300	NOT RUN
20	2		TOTAL SOLIDS(MG-L)	24200	4700	80	132000	NOT RUN
20	2		TOTAL DISS. SOLIDS(MG-L)	9700	4510	53	25000	NOT RUN
20	2		TOTAL SUSP. SOLIDS(MG-L)	14500	190	98	107000	NOT RUN
20	2		TOTAL VOLATILE SOLIDS(MG-L)	11300	1500	86	49000	NOT RUN
20	2		VOLATILE DISS. SOLIDS(MG-L)	NOT RUN	1430	0	NOT RUN	NOT RUN
20	2		TOTAL VOL. SUS. SOLIDS(MG-L)	NOT RUN	70	0	NOT RUN	NOT RUN
20	2		ALUMINUM	200000	30000	85	900000	NOT RUN
20	2		BARIUM	100	100	0	4000	NOT RUN
20	2		IRON	200000	L 2000	99	3000000	NOT RUN
20	2		MANGANESE	800	3000	0	7000	NOT RUN
20	2		CALCIUM(MG-L)	1800	940	47	7700	NOT RUN
20	2		MAGNESIUM(MG-L)	48	10	79	220	NOT RUN
20	2		BORON	3000	900	70	5000	NOT RUN
20	2		COBALT	400	200	50	400	NOT RUN
20	2		MOLYBDENUM	400	L 50	87	2000	NOT RUN
20	2		TIN	700	L 50	92	2000	NOT RUN
20	2		TITANIUM	60000	2000	96	200000	NOT RUN
20	2		VANADIUM	200	L 100	50	1000	NOT RUN
20	2		YTTRIUM	L 200	L 200	0	500	NOT RUN
20	2		SODIUM	L 150	L 150	0	L 150	NOT RUN

N-D NOT DETECTED; L-LESS THAN; PP- PRIORITY POLLUTANT NUMBER
PRIORITY POLLUTANTS NOT DETECTED IN ANY SAMPLES ARE NOT LISTED. FRACTIONS NOT ANALYZED ARE NOT LISTED.

PLANT	BATCH	PP	------PARAMETER----------	INFLUENT		EFFLUENT		REMOVAL(%)	SLUDGE	TAP WATER
				ALL UNITS UG/L UNLESS OTHERWISE NOTED						
20	3	114	ANTIMONY	L	25	L	25	0	NOT RUN	NOT RUN
20	3	115	ARSENIC	L	25	L	25	0	NOT RUN	NOT RUN
20	3	117	BERYLLIUM	L	10	L	10	0	NOT RUN	NOT RUN
20	3	118	CADMIUM	L	20	L	20	0	NOT RUN	NOT RUN
20	3	119	CHROMIUM		60		400	0	NOT RUN	NOT RUN
20	3	120	COPPER		200		300	0	NOT RUN	NOT RUN
20	3	121	CYANIDE	L	20	L	20	0	NOT RUN	NOT RUN
20	3	122	LEAD	L	200		300	0	NOT RUN	NOT RUN
20	3	123	MERCURY		1200		1300	0	NOT RUN	NOT RUN
20	3	124	NICKEL	L	50	L	50	0	NOT RUN	NOT RUN
20	3	125	SELENIUM	L	25	L	25	0	NOT RUN	NOT RUN
20	3	126	SILVER	L	10	L	10	0	NOT RUN	NOT RUN
20	3	127	THALLIUM		15	L	10	33	NOT RUN	NOT RUN
20	3	128	ZINC		600		3000	0	NOT RUN	NOT RUN
20	3		PH(UNITS)		7		3		NOT RUN	NOT RUN
20	3		BOD(MG-L)		4100		1300	68	NOT RUN	NOT RUN
20	3		COD(MG-L)		14000		13000	7	NOT RUN	NOT RUN
20	3		TOC(MG-L)		3300		3100	6	NOT RUN	NOT RUN
20	3		OIL & GREASE(MG-L)		430		250	41	NOT RUN	NOT RUN
20	3		TOTAL PHENOLS	L	40		63	0	NOT RUN	NOT RUN
20	3		TOTAL SOLIDS(MG-L)		9500		7000	26	NOT RUN	NOT RUN
20	3		TOTAL DISS. SOLIDS(MG-L)		2100		3400	0	NOT RUN	NOT RUN
20	3		TOTAL SUSP. SOLIDS(MG-L)		7400		3600	51	NOT RUN	NOT RUN
20	3		TOTAL VOLATILE SOLIDS(MG-L)		4800		3000	37	NOT RUN	NOT RUN
20	3		VOLATILE DISS. SOLIDS(MG-L)		NOT RUN		1100	0	NOT RUN	NOT RUN
20	3		TOTAL VOL. SUS. SOLIDS(MG-L)		NOT RUN		1900	0	NOT RUN	NOT RUN
20	3		ALUMINUM		50000		60000	0	NOT RUN	NOT RUN
20	3		BARIUM		400		400	0	NOT RUN	NOT RUN
20	3		IRON		10000		700000	0	NOT RUN	NOT RUN
20	3		MANGANESE		200		300	0	NOT RUN	NOT RUN
20	3		CALCIUM(MG-L)		220		390	0	NOT RUN	NOT RUN
20	3		MAGNESIUM(MG-L)		10		11	0	NOT RUN	NOT RUN
20	3		BORON		800		3000	0	NOT RUN	NOT RUN
20	3		COBALT	L	50	L	50	0	NOT RUN	NOT RUN
20	3		MOLYBDENUM		100		300	0	NOT RUN	NOT RUN
20	3		TIN	L	50	L	50	0	NOT RUN	NOT RUN
20	3		TITANIUM		10000		20000	0	NOT RUN	NOT RUN
20	3		VANADIUM	L	100	L	100	0	NOT RUN	NOT RUN
20	3		YTTRIUM	L	200	L	200	0	NOT RUN	NOT RUN
20	3		SODIUM	L	150	L	150	0	NOT RUN	NOT RUN

N-D NOT DETECTED; L-LESS THAN; PP- PRIORITY POLLUTANT NUMBER
PRIORITY POLLUTANTS NOT DETECTED IN ANY SAMPLES ARE NOT LISTED. FRACTIONS NOT ANALYZED ARE NOT LISTED.

PLANT	BATCH	PP	------PARAMETER----------	INFLUENT	EFFLUENT	REMOVAL (%)	SLUDGE	TAP WATER
				ALL UNITS UG/L UNLESS OTHERWISE NOTED				
24	1	7	CHLOROBENZENE	90	N-D	100	NOT RUN	N D
24	1	11	1,1,1-TRICHLOROETHANE	150	N-D	100	NOT RUN	L 10
24	1	14	1,1,2-TRICHLOROETHANE	12	N-D	100	NOT RUN	N-D
24	1	23	CHLOROFORM	43	19	55	NOT RUN	170
24	1	38	ETHYLBENZENE	1900	370	80	NOT RUN	N-D
24	1	44	METHYLENE CHLORIDE	160000	13000	91	NOT RUN	20
24	1	48	DICHLOROBROMOMETHANE	N-D	N-D		NOT RUN	L 10
24	1	51	CHLORODIBROMOMETHANE	N-D	N-D		NOT RUN	L 10
24	1	59	2,4-DINITROPHENOL	250	N-D	100	NOT RUN	N-D
24	1	66	BIS(2-ETHYLHEXYL) PHTHALATE	N-D	N-D		NOT RUN	L 10
24	1	68	DI-N-BUTYL PHTHALATE	N-D	N-D		NOT RUN	L 10
24	1	85	TETRACHLOROETHYLENE	1900	N-D	100	NOT RUN	N-D
24	1	86	TOLUENE	2500	6200	0	NOT RUN	N-D
24	1	87	TRICHLOROETHYLENE	L 10	N-D	100	NOT RUN	N-D
24	1	114	ANTIMONY	50	30	40	NOT RUN	4
24	1	115	ARSENIC	480	L 10	97	NOT RUN	4
24	1	117	BERYLLIUM	4	L 1	75	NOT RUN	L 1
24	1	118	CADMIUM	48	L 2	95	NOT RUN	L 2
24	1	119	CHROMIUM	1120	1630	0	NOT RUN	L 5
24	1	120	COPPER	176	63	64	NOT RUN	38
24	1	121	CYANIDE	L 0	L 1	0	NOT RUN	L 0
24	1	122	LEAD	90	L 20	77	NOT RUN	L 20
24	1	123	MERCURY	573	NOT RUN		NOT RUN	NOT RUN
24	1	124	NICKEL	508	L 5	99	NOT RUN	L 5
24	1	125	SELENIUM	50	L 2	96	NOT RUN	6
24	1	126	SILVER	L 1	L 1	0	NOT RUN	L 1
24	1	127	THALLIUM	6	L 10	0	NOT RUN	L 20
24	1	128	ZINC	903	L 60	93	NOT RUN	571
24	1		PH(UNITS)	8	8		NOT RUN	9
24	1		BOD(MG-L)	3400	1100	67	NOT RUN	L 1
24	1		COD(MG-L)	39000	10000	74	NOT RUN	L 3
24	1		TOTAL PHENOLS	NOT RUN	L 1	0	NOT RUN	L 0
24	1		TOTAL SOLIDS(MG-L)	58000	2700	95	NOT RUN	182
24	1		TOTAL DISS. SOLIDS(MG-L)	NOT RUN	1860	0	NOT RUN	159
24	1		TOTAL SUSP. SOLIDS(MG-L)	NOT RUN	400	0	NOT RUN	L 5
24	1		ALUMINUM	285000	5450	98	NOT RUN	58
24	1		BARIUM	819	18	97	NOT RUN	14
24	1		IRON	25000	725	97	NOT RUN	176
24	1		MANGANESE	369	18	95	NOT RUN	7
24	1		CALCIUM(MG-L)	100	25	75	NOT RUN	18
24	1		MAGNESIUM(MG-L)	12	7	41	NOT RUN	8
24	1		BORON	131	168	0	NOT RUN	L 50
24	1		COBALT	3200	361	88	NOT RUN	L 5
24	1		MOLYBDENUM	L 5	L 5	0	NOT RUN	L 5
24	1		TIN	377	L 5	98	NOT RUN	L 5
24	1		TITANIUM	6340	184	97	NOT RUN	L 15
24	1		VANADIUM	65	L 12	81	NOT RUN	L 12
24	1		YTTRIUM	L 16	L 16	0	NOT RUN	L 16
24	1		SODIUM	243	197	18	NOT RUN	L 15

N-D NOT DETECTED; L-LESS THAN; PP- PRIORITY POLLUTANT NUMBER
PRIORITY POLLUTANTS NOT DETECTED IN ANY SAMPLES ARE NOT LISTED. FRACTIONS NOT ANALYZED ARE NOT LISTED.

PLANT	BATCH	PP	------PARAMETER----------	INFLUENT	EFFLUENT	REMOVAL(%)	SLUDGE	TAP WATER
				ALL UNITS UG/L UNLESS OTHERWISE NOTED				
24	2	11	1,1,1-TRICHLOROETHANE	930	170	81	NOT RUN	NOT RUN
24	2	14	1,1,2-TRICHLOROETHANE	N-D	11	0	NOT RUN	NOT RUN
24	2	23	CHLOROFORM	80	34	57	NOT RUN	NOT RUN
24	2	38	ETHYLBENZENE	2800	650	76	NOT RUN	NOT RUN
24	2	44	METHYLENE CHLORIDE	29000	16000	44	NOT RUN	NOT RUN
24	2	59	2,4-DINITROPHENOL	160	N-D	100	NOT RUN	NOT RUN
24	2	66	BIS(2-ETHYLHEXYL) PHTHALATE	L 10	N-D	100	NOT RUN	NOT RUN
24	2	85	TETRACHLOROETHYLENE	230	N-D	100	NOT RUN	NOT RUN
24	2	86	TOLUENE	4800	1600	66	NOT RUN	NOT RUN
24	2	87	TRICHLOROETHYLENE	L 10	N-D	100	NOT RUN	NOT RUN
24	2	114	ANTIMONY	L 200	70	65	NOT RUN	NOT RUN
24	2	115	ARSENIC	100	6	94	NOT RUN	NOT RUN
24	2	117	BERYLLIUM	2	2	0	NOT RUN	NOT RUN
24	2	118	CADMIUM	37	20	45	NOT RUN	NOT RUN
24	2	119	CHROMIUM	1890	1260	33	NOT RUN	NOT RUN
24	2	120	COPPER	176	59	66	NOT RUN	NOT RUN
24	2	121	CYANIDE	L 0	0	0	NOT RUN	NOT RUN
24	2	122	LEAD	399	L 20	94	NOT RUN	NOT RUN
24	2	124	NICKEL	L 5	L 5	0	NOT RUN	NOT RUN
24	2	125	SELENIUM	20	L 2	90	NOT RUN	NOT RUN
24	2	126	SILVER	L 1	L 1	0	NOT RUN	NOT RUN
24	2	127	THALLIUM	13	L 20	0	NOT RUN	NOT RUN
24	2	128	ZINC	1030	99	90	NOT RUN	NOT RUN
24	2		PH(UNITS)	8	8		NOT RUN	NOT RUN
24	2		BOD(MG-L)	41000	1100	97	NOT RUN	NOT RUN
24	2		COD(MG-L)	39000	11000	71	NOT RUN	NOT RUN
24	2		TOTAL PHENOLS	L 1	L 1	0	NOT RUN	NOT RUN
24	2		TOTAL SOLIDS(MG-L)	34000	2700	92	NOT RUN	NOT RUN
24	2		TOTAL DISS. SOLIDS(MG-L)	NOT RUN	1800	0	NOT RUN	NOT RUN
24	2		TOTAL SUSP. SOLIDS(MG-L)	NOT RUN	700	0	NOT RUN	NOT RUN
24	2		ALUMINUM	207000	4200	97	NOT RUN	NOT RUN
24	2		BARIUM	540	31	94	NOT RUN	NOT RUN
24	2		IRON	16000	2140	86	NOT RUN	NOT RUN
24	2		MANGANESE	873	44	94	NOT RUN	NOT RUN
24	2		CALCIUM(MG-L)	219	31	85	NOT RUN	NOT RUN
24	2		MAGNESIUM(MG-L)	10	7	30	NOT RUN	NOT RUN
24	2		BORON	167	137	17	NOT RUN	NOT RUN
24	2		COBALT	2300	473	79	NOT RUN	NOT RUN
24	2		MOLYBDENUM	234	L 5	97	NOT RUN	NOT RUN
24	2		TIN	270	L 5	98	NOT RUN	NOT RUN
24	2		TITANIUM	2510	260	89	NOT RUN	NOT RUN
24	2		VANADIUM	32	L 12	62	NOT RUN	NOT RUN
24	2		YTTRIUM	L 16	L 16	0	NOT RUN	NOT RUN
24	2		SODIUM	196	151	22	NOT RUN	NOT RUN

N-D NOT DETECTED; L-LESS THAN; PP- PRIORITY POLLUTANT NUMBER
PRIORITY POLLUTANTS NOT DETECTED IN ANY SAMPLES ARE NOT LISTED. FRACTIONS NOT ANALYZED ARE NOT LISTED.

PLANT	BATCH	PP	PARAMETER	INFLUENT	EFFLUENT	REMOVAL(%)	SLUDGE	TAP WATER
				ALL UNITS UG/L UNLESS OTHERWISE NOTED				
24	3	7	CHLOROBENZENE	N-D	N-D		340	NOT RUN
24	3	11	1,1,1-TRICHLOROETHANE	70	N-D	100	3200	NOT RUN
24	3	14	1,1,2-TRICHLOROETHANE	L 10	N-D	100	N-D	NOT RUN
24	3	23	CHLOROFORM	21	26	0	1000	NOT RUN
24	3	34	2,4-DIMETHYLPHENOL	N-D	N-D		L 10	NOT RUN
24	3	38	ETHYLBENZENE	850	370	56	99000	NOT RUN
24	3	44	METHYLENE CHLORIDE	210000	10000	95	900000	NOT RUN
24	3	59	2,4-DINITROPHENOL	110	N-D	100	27	NOT RUN
24	3	64	PENTACHLOROPHENOL	N-D	N-D		60	NOT RUN
24	3	65	PHENOL	N-D	L 10	0	N-D	NOT RUN
24	3	66	BIS(2-ETHYLHEXYL) PHTHALATE	N-D	N-D		L 10	NOT RUN
24	3	85	TETRACHLOROETHYLENE	95	N-D	100	8200	NOT RUN
24	3	86	TOLUENE	1300	960	26	350000	NOT RUN
24	3	87	TRICHLOROETHYLENE	N-D	N-D		130	NOT RUN
24	3	89	ALDRIN	N-D	N-D		L 10	NOT RUN
24	3	94	4,4'-DDD	L 10	N-D	100	N-D	NOT RUN
24	3	96	BETA-ENDOSULFAN	L 10	N-D	100	N-D	NOT RUN
24	3	105	DELTA-BHC	N-D	N-D		L 10	NOT RUN
24	3	114	ANTIMONY	100	L 100	0	20	NOT RUN
24	3	115	ARSENIC	200	4	98	160	NOT RUN
24	3	117	BERYLLIUM	2	L 1	50	18	NOT RUN
24	3	118	CADMIUM	16	12	25	230	NOT RUN
24	3	119	CHROMIUM	1190	1180	0	2630	NOT RUN
24	3	120	COPPER	127	79	37	1350	NOT RUN
24	3	121	CYANIDE	L 0	L 1	0	L 1	NOT RUN
24	3	122	LEAD	330	L 20	93	4200	NOT RUN
24	3	124	NICKEL	L 5	L 5	0	324	NOT RUN
24	3	125	SELENIUM	9	3	66	8	NOT RUN
24	3	126	SILVER	L 1	L 1	0	L 2	NOT RUN
24	3	127	THALLIUM	30	L 20	33	25	NOT RUN
24	3	128	ZINC	740	232	68	5010	NOT RUN
24	3		PH(UNITS)	8	8		7	NOT RUN
24	3		BOD(MG-L)	4700	1200	74	20000	NOT RUN
24	3		COD(MG-L)	31000	11000	64	220000	NOT RUN
24	3		TOTAL PHENOLS	L 1	L 1	0	L 1	NOT RUN
24	3		TOTAL SOLIDS(MG-L)	30000	3600	88	413000	NOT RUN
24	3		TOTAL DISS. SOLIDS(MG-L)	NOT RUN	2100	0	15000	NOT RUN
24	3		TOTAL SUSP. SOLIDS(MG-L)	NOT RUN	1300	0	323000	NOT RUN
24	3		ALUMINUM	140000	11000	92	1400000	NOT RUN
24	3		BARIUM	419	23	94	3260	NOT RUN
24	3		IRON	42000	5370	87	186000	NOT RUN
24	3		MANGANESE	638	47	92	5210	NOT RUN
24	3		CALCIUM(MG-L)	158	31	80	1150	NOT RUN
24	3		MAGNESIUM(MG-L)	7	80	0	35	NOT RUN
24	3		BORON	168	159	5	276	NOT RUN
24	3		COBALT	2200	1320	40	600	NOT RUN
24	3		MOLYBDENUM	173	L 5	97	2550	NOT RUN
24	3		TIN	250	11	95	3400	NOT RUN
24	3		TITANIUM	4740	616	87	85000	NOT RUN
24	3		VANADIUM	38	L 12	68	422	NOT RUN
24	3		YTTRIUM	L 16	L 16	0	84	NOT RUN
24	3		SODIUM	123	132	0	586	NOT RUN

N-D NOT DETECTED; L-LESS THAN; PP- PRIORITY POLLUTANT NUMBER
PRIORITY POLLUTANTS NOT DETECTED IN ANY SAMPLES ARE NOT LISTED. FRACTIONS NOT ANALYZED ARE NOT LISTED.

PLANT	BATCH	PP	------PARAMETER----------	INFLUENT	EFFLUENT	REMOVAL(%)	SLUDGE	TAP WATER
				ALL UNITS UG/L UNLESS OTHERWISE NOTED				
25	1	21	2,4,6-TRICHLOROPHENOL	4900	3700	24	NOT RUN	N-D
25	1	23	CHLOROFORM	N-D	N-D		NOT RUN	120
25	1	38	ETHYLBENZENE	112800	43400	61	NOT RUN	N-D
25	1	48	DICHLOROBROMOMETHANE	N-D	N-D		NOT RUN	15
25	1	51	CHLORODIBROMOMETHANE	N-D	N-D		NOT RUN	L 10
25	1	65	PHENOL	220	200	9	NOT RUN	N-D
25	1	86	TOLUENE	26700	13200	50	NOT RUN	N-D
25	1	114	ANTIMONY	42	37	11	NOT RUN	L 20
25	1	115	ARSENIC	30	21	30	NOT RUN	L 20
25	1	117	BERYLLIUM	L 20	L 20	0	NOT RUN	L 20
25	1	118	CADMIUM	L 20	L 20	0	NOT RUN	L 20
25	1	119	CHROMIUM	630	1220	0	NOT RUN	L 20
25	1	120	COPPER	120	180	0	NOT RUN	L 20
25	1	121	CYANIDE	L 0	L 0	0	NOT RUN	NOT RUN
25	1	122	LEAD	3600	1400	61	NOT RUN	L 20
25	1	123	MERCURY	10	1325	0	NOT RUN	1
25	1	124	NICKEL	30	112	0	NOT RUN	L 20
25	1	125	SELENIUM	L 10	L 10	0	NOT RUN	L 10
25	1	126	SILVER	L 20	L 20	0	NOT RUN	L 20
25	1	127	THALLIUM	L 20	L 20	0	NOT RUN	L 20
25	1	128	ZINC	32000	30000	6	NOT RUN	40
25	1		BOD(MG-L)	1600	1400	12	NOT RUN	NOT RUN
25	1		TOTAL PHENOLS	5	5	0	NOT RUN	NOT RUN
25	1		TOTAL SUSP. SOLIDS(MG-L)	10000	1800	82	NOT RUN	NOT RUN

N-D NOT DETECTED; L-LESS THAN; PP- PRIORITY POLLUTANT NUMBER
PRIORITY POLLUTANTS NOT DETECTED IN ANY SAMPLES ARE NOT LISTED. FRACTIONS NOT ANALYZED ARE NOT LISTED.

PLANT	BATCH	PP	------PARAMETER----------	INFLUENT	EFFLUENT	REMOVAL(%)	SLUDGE	TAP WATER
				ALL UNITS UG/L UNLESS OTHERWISE NOTED				
25	2	21	2,4,6-TRICHLOROPHENOL	N-D	1100	0	NOT RUN	NOT RUN
25	2	38	ETHYLBENZENE	13150	11300	14	NOT RUN	NOT RUN
25	2	65	PHENOL	N-D	140	0	NOT RUN	NOT RUN
25	2	86	TOLUENE	7800	5500	29	NOT RUN	NOT RUN
25	2	114	ANTIMONY	L 20	L 20	0	NOT RUN	NOT RUN
25	2	115	ARSENIC	L 20	L 20	0	NOT RUN	NOT RUN
25	2	117	BERYLLIUM	L 20	L 20	0	NOT RUN	NOT RUN
25	2	118	CADMIUM	L 20	L 20	0	NOT RUN	NOT RUN
25	2	119	CHROMIUM	90	100	0	NOT RUN	NOT RUN
25	2	120	COPPER	50	70	0	NOT RUN	NOT RUN
25	2	121	CYANIDE	L 0	L 0	0	NOT RUN	NOT RUN
25	2	122	LEAD	810	190	76	NOT RUN	NOT RUN
25	2	123	MERCURY	2600	800	69	NOT RUN	NOT RUN
25	2	124	NICKEL	80	90	0	NOT RUN	NOT RUN
25	2	125	SELENIUM	L 10	L 10	0	NOT RUN	NOT RUN
25	2	126	SILVER	L 20	L 20	0	NOT RUN	NOT RUN
25	2	127	THALLIUM	L 20	L 20	0	NOT RUN	NOT RUN
25	2	128	ZINC	23000	3450	85	NOT RUN	NOT RUN
25	2		PH(UNITS)	12	11		NOT RUN	NOT RUN
25	2		BOD(MG-L)	NOT RUN	615	0	NOT RUN	NOT RUN
25	2		OIL & GREASE(MG-L)	160	47	70	NOT RUN	NOT RUN
25	2		TOTAL PHENOLS	5	2	60	NOT RUN	NOT RUN
25	2		TOTAL SUSP. SOLIDS(MG-L)	NOT RUN	1300	0	NOT RUN	NOT RUN

N-D NOT DETECTED; L-LESS THAN; PP- PRIORITY POLLUTANT NUMBER
PRIORITY POLLUTANTS NOT DETECTED IN ANY SAMPLES ARE NOT LISTED. FRACTIONS NOT ANALYZED ARE NOT LISTED.

PLANT	BATCH	PP	------PARAMETER----------	INFLUENT	EFFLUENT	REMOVAL(%)	SLUDGE	TAP WATER
				ALL UNITS UG/L UNLESS OTHERWISE NOTED				
26	1	4	BENZENE	20	N-D	100	N-D	N-D
26	1	11	1,1,1-TRICHLOROETHANE	15	N-D	100	N-D	N-D
26	1	23	CHLOROFORM	20	N-D	100	N-D	110
26	1	32	1,2-DICHLOROPROPANE	70	N-D	100	N-D	N-D
26	1	38	ETHYLBENZENE	5600	4050	27	6850	N-D
26	1	48	DICHLOROBROMOMETHANE	N-D	N-D		N-D	15
26	1	51	CHLORODIBROMOMETHANE	N-D	N-D		N-D	L 10
26	1	66	BIS(2-ETHYLHEXYL) PHTHALATE	150	110	26	210	N-D
26	1	67	BUTYL BENZYL PHTHALATE	1800	2500	0	2800	N-D
26	1	68	DI-N-BUTYL PHTHALATE	N-D	N-D		N-D	100
26	1	70	DIETHYL PHTHALATE	N-D	N-D		100	N-D
26	1	86	TOLUENE	900	990	0	1400	N-D
26	1	87	TRICHLOROETHYLENE	L 10	N-D	100	N-D	N-D
26	1	93	4,4'-DDE	N-D	L 10	0	N-D	N-D
26	1	114	ANTIMONY	1040	180	82	4800	L 20
26	1	115	ARSENIC	67	L 20	70	70	L 20
26	1	117	BERYLLIUM	L 20	L 20	0	L 20	L 20
26	1	118	CADMIUM	40	30	25	290	L 20
26	1	119	CHROMIUM	240	30	87	1550	L 20
26	1	120	COPPER	250	80	68	1730	L 20
26	1	122	LEAD	700	190	72	5750	L 20
26	1	123	MERCURY	6	8	0	150	L 1
26	1	124	NICKEL	210	310	0	2670	L 20
26	1	125	SELENIUM	L 10	L 10	0	L 10	L 10
26	1	126	SILVER	30	L 20	33	90	L 20
26	1	127	THALLIUM	80	L 20	75	L 20	L 20
26	1	128	ZINC	270000	8200	96	1450000	670
26	1		TOTAL PHENOLS	24	L 20	16	76	L 10
26	1		TOTAL SOLIDS(MG-L)	90	30	66	30	L 10

N-D NOT DETECTED; L-LESS THAN; PP- PRIORITY POLLUTANT NUMBER
PRIORITY POLLUTANTS NOT DETECTED IN ANY SAMPLES ARE NOT LISTED. FRACTIONS NOT ANALYZED ARE NOT LISTED.

PLANT	BATCH	PP	------PARAMETER----------	INFLUENT	EFFLUENT	REMOVAL (%)	SLUDGE	TAP WATER
				ALL UNITS UG/L UNLESS OTHERWISE NOTED				
27	1	4	BENZENE	280	200	28	1900	N-D
27	1	6	CARBON TETRACHLORIDE	N-D	N-D		L 10	N-D
27	1	11	1,1,1-TRICHLOROETHANE	120	560	0	2600	L 10
27	1	23	CHLOROFORM	N-D	23	0	840	37
27	1	38	ETHYLBENZENE	730	N-D	100	7600	N-D
27	1	44	METHYLENE CHLORIDE	6300	31000	0	52000	740
27	1	48	DICHLOROBROMOMETHANE	N-D	N-D		N-D	L 10
27	1	51	CHLORODIBROMOMETHANE	N-D	N-D		N-D	L 10
27	1	64	PENTACHLOROPHENOL	L 10	L 10	0	35	N-D
27	1	65	PHENOL	L 10	L 10	0	L 10	N-D
27	1	66	BIS(2-ETHYLHEXYL) PHTHALATE	N-D	N-D		N-D	L 10
27	1	68	DI-N-BUTYL PHTHALATE	L 10	L 10	0	36	L 10
27	1	85	TETRACHLOROETHYLENE	110	25	77	2300	N-D
27	1	86	TOLUENE	290	200	31	3300	N-D
27	1	87	TRICHLOROETHYLENE	N-D	N-D		L 10	N-D
27	1	99	ENDRIN ALDEHYDE	N-D	N-D		N-D	L 10
27	1	114	ANTIMONY	L 1000	170	83	13000	NOT RUN
27	1	115	ARSENIC	440	400	9	240	3
27	1	117	BERYLLIUM	7	2	71	30	2
27	1	118	CADMIUM	130	58	55	310	L 2
27	1	119	CHROMIUM	1450	105	92	12290	7
27	1	120	COPPER	264	115	56	680	16
27	1	121	CYANIDE	NOT RUN	NOT RUN	0	NOT RUN	L 0
27	1	122	LEAD	12000	98	99	27900	NOT RUN
27	1	123	MERCURY	1010	142	85	2464	L 1
27	1	124	NICKEL	450	L 5	98	560	NOT RUN
27	1	125	SELENIUM	L 200	400	0	300	NOT RUN
27	1	126	SILVER	L 10	L 1	90	L 10	L 1
27	1	127	THALLIUM	L 200	100	50	L 400	NOT RUN
27	1	128	ZINC	60000	4200	93	200000	NOT RUN
27	1		PH(UNITS)	7	7		7	8
27	1		BOD(MG-L)	25000	23400	6	26000	L 1
27	1		COD(MG-L)	70000	260000	0	950000	10
27	1		TOC(MG-L)	7500	25000	0	81000	4
27	1		TOTAL PHENOLS	1	1	0	2	L 0
27	1		TOTAL SUSP. SOLIDS(MG-L)	46000	400	99	210000	L 5
27	1		ALUMINUM	300000	2200	99	1700000	70
27	1		BARIUM	5600	10	99	21500	13
27	1		IRON	8080	1160	85	34700	L 17
27	1		MANGANESE	1220	40	96	1170	NOT RUN
27	1		CALCIUM(MG-L)	364	8	97	1400	38
27	1		MAGNESIUM(MG-L)	17	6	64	48	8
27	1		COBALT	160	48	70	520	L 5
27	1		TIN	1130	480	57	2830	NOT RUN
27	1		TITANIUM	6700	80	98	12300	NOT RUN
27	1		VANADIUM	420	25	94	950	NOT RUN
27	1		YTTRIUM	56	L 16	71	L 160	NOT RUN
27	1		SODIUM	1224	398	67	370	L 15

N-D NOT DETECTED; L-LESS THAN; PP- PRIORITY POLLUTANT NUMBER
PRIORITY POLLUTANTS NOT DETECTED IN ANY SAMPLES ARE NOT LISTED. FRACTIONS NOT ANALYZED ARE NOT LISTED.

PLANT	BATCH	PP	--- --PARAMETER----------	INFLUENT		EFFLUENT	REMOVAL(%)	SLUDGE		TAP WATER
				ALL UNITS UG/L UNLESS OTHERWISE NOTED						
28	1	23	CHLOROFORM	900	L	10	98	NOT RUN		75
28	1	33	1,3-DICHLOROPROPYLENE	100		N-D	100	NOT RUN		N-D
28	1	48	DICHLOROBROMOMETHANE	N-D		N-D		NOT RUN		33
28	1	51	CHLORODIBROMOMETHANE	N-D		N-D		NOT RUN		10
28	1	86	TOLUENE	95		N-D	100	NOT RUN		N-D
28	1	114	ANTIMONY	25	L	25	0	15	L	10
28	1	115	ARSENIC	800	L	25	96	NOT RUN	L	10
28	1	117	BERYLLIUM	L 20	L	4	80	10	L	20
28	1	118	CADMIUM	810		100	87	300	L	20
28	1	119	CHROMIUM	280		30	89	300	L	20
28	1	120	COPPER	710		400	43	600	L	20
28	1	121	CYANIDE	L 1	L	20	0	L 20	L	0
28	1	122	LEAD	22	L	80	0	5000	L	10
28	1	123	MERCURY	NOT RUN		90	0	2000	L	1
28	1	124	NICKEL	470	L	20	95	100	L	20
28	1	125	SELENIUM	122	L	25	79	L 200		14
28	1	126	SILVER	100	L	10	90	L 10	L	20
28	1	127	THALLIUM	30	L	10	66	NOT RUN	L	20
28	1	128	ZINC	428000		8000	98	300000		50
28	1		PH(UNITS)	NOT RUN		8		8		NOT RUN
28	1		BOD(MG-L)	5900		5400	8	19000	L	1
28	1		COD(MG-L)	89000		8600	90	200000		5
28	1		TOC(MG-L)	NOT RUN		1800	0	36000		NOT RUN
28	1		OIL & GREASE(MG-L)	NOT RUN		20	0	2300		NOT RUN
28	1		TOTAL PHENOLS	L 1		300	0	960	L	0
28	1		TOTAL SOLIDS(MG-L)	NOT RUN		1000	0	110000		NOT RUN
28	1		TOTAL DISS. SOLIDS(MG-L)	NOT RUN		958	0	L 1		NOT RUN
28	1		TOTAL SUSP. SOLIDS(MG-L)	148000		42	99	110000		6
28	1		TOTAL VOLATILE SOLIDS(MG-L)	NOT RUN		510	0	59000		NOT RUN
28	1		VOLATILE DISS. SOLIDS(MG-L)	NOT RUN		470	0	NOT RUN		NOT RUN
28	1		TOTAL VOL. SUS. SOLIDS(MG-L)	25000		40	99	NOT RUN		4
28	1		ALUMINUM	NOT RUN		600	0	300000		NOT RUN
28	1		BARIUM	NOT RUN		200	0	20000		NOT RUN
28	1		IRON	NOT RUN	L	700	0	200000		NOT RUN
28	1		MANGANESE	NOT RUN		60	0	5000		NOT RUN
28	1		CALCIUM(MG-L)	NOT RUN	L	20	0	910		NOT RUN
28	1		MAGNESIUM(MG-L)	NOT RUN		6	0	32		NOT RUN
28	1		BORON	NOT RUN		2000	0	2000		NOT RUN
28	1		COBALT	NOT RUN	L	20	0	300		NOT RUN
28	1		MOLYBDENUM	NOT RUN	L	20	0	500		NOT RUN
28	1		TIN	NOT RUN		50	0	900		NOT RUN
28	1		TITANIUM	NOT RUN		90	0	40000		NOT RUN
28	1		VANADIUM	NOT RUN	L	50	0	200		NOT RUN
28	1		YTTRIUM	NOT RUN	L	60	0	L 60		NOT RUN
28	1		SODIUM	NOT RUN		160	0	170		NOT RUN

EOF:

APPENDIX H

TABULATION OF ANSWERS TO SELECTED QUESTIONS FROM THE DCP

(Refer to Appendix A)

STATE STATE

CATEGORY LABEL	CODE	ABSOLUTE FREQ	RELATIVE FREQ (PCT)	ADJUSTED FREQ (PCT)	CUM FREQ (PCT)
	AK	1	0.1	0.1	0.1
	AL	12	0.9	0.9	0.9
	AR	7	0.5	0.5	1.5
	AZ	6	0.4	0.4	1.9
	CA	196	14.3	14.3	16.2
	CO	11	0.8	0.8	17.0
	CT	10	0.7	0.7	17.7
	DE	3	0.2	0.2	17.9
	FL	69	5.0	5.0	22.9
	GA	35	2.5	2.5	25.5
	IA	13	0.9	0.9	26.4
	ID	2	0.1	0.1	26.6
	IL	106	7.7	7.7	34.3
	IN	34	2.5	2.5	36.8
	KS	10	0.7	0.7	37.5
	KY	22	1.6	1.6	39.1
	LA	15	1.1	1.1	40.2
	MA	54	3.9	3.9	44.1
	MD	20	1.5	1.5	45.6
	ME	3	0.2	0.2	45.8
	MI	47	3.4	3.4	49.2
	MN	19	1.4	1.4	50.6
	MO	51	3.7	3.7	54.3

MS	5	0.4	0.4	54.7
MT	3	0.2	0.2	54.9
NC	20	1.5	1.5	56.3
NE	2	0.1	0.1	56.5
NH	3	0.2	0.2	56.7
NJ	112	8.2	8.2	64.8
NM	3	0.2	0.2	65.1
NV	1	0.1	0.1	65.1
NY	109	7.9	7.9	73.1
OH	103	7.5	7.5	80.6
OK	9	0.7	0.7	81.2
OR	20	1.5	1.5	82.7
PA	66	4.8	4.8	87.5
PR	6	0.4	0.4	87.9
RI	5	0.4	0.4	88.3
SC	5	0.4	0.4	88.6
SD	1	0.1	0.1	88.7
TN	17	1.2	1.2	90.0
TX	58	4.2	4.2	94.2
UT	4	0.3	0.3	94.5
VA	13	0.9	0.9	95.4
VT	2	0.1	0.1	95.6
WA	22	1.6	1.6	97.2
WI	34	2.5	2.5	99.6
WV	4	0.3	0.3	99.9
WY	1	0.1	0.1	100.0
TOTAL	1374	100.0	100.0	

03/23/78 FILE - PAINT - CREATED 03/23/78

ORGNTYPE TYPE OF ORGANIZATION

CATEGORY LABEL	CODE	ABSOLUTE FREQ	RELATIVE FREQ (PCT)	ADJUSTED FREQ (PCT)	CUM FREQ (PCT)
PUBLIC CORP	A	301	21.9	22.3	22.3
PRIVATE CORP	B	963	70.1	71.2	93.5
PARTNERSHIP	C	22	1.6	1.6	95.1
PROPRIETORSHIP	D	61	4.4	4.5	99.6
COOPERATIVE	E	5	0.4	0.4	100.0
		22	1.6	MISSING	100.0
	TOTAL	1374	100.0	100.0	

VALID CASES 1352 MISSING CASES 22

SITETYPE STATUS OF PLANT SITE

CATEGORY LABEL	CODE	ABSOLUTE FREQ	RELATIVE FREQ (PCT)	ADJUSTED FREQ (PCT)	CUM FREQ (PCT)
ONLY LOCATION	A	864	62.9	63.5	63.5
BRANCH PLANT	B	311	22.6	22.9	86.4
DIVISION	C	175	12.7	12.9	99.3
CAPTIVE SITE	D	10	0.7	0.7	100.0
		14	1.0	MISSING	100.0
	TOTAL	1374	100.0	100.0	

VALID CASES 1360 MISSING CASES 14

03/23/78 FILE - PAINT - CREATED 03/23/78

COSTPROF COST CENTER OR PROFIT CENTER

CATEGORY LABEL	CODE	ABSOLUTE FREQ	RELATIVE FREQ (PCT)	ADJUSTED FREQ (PCT)	CUM FREQ (PCT)
COST CENTER	A	103	7.5	20.9	20.9
PROFIT CENTER	B	390	28.4	79.1	100.0
		881	64.1	MISSING	100.0
	TOTAL	1374	100.0	100.0	

VALID CASES 493 MISSING CASES 881

AVRGEMP AVERAGE NUMBER OF EMPLOYEES 1976

CATEGORY LABEL	CODE	ABSOLUTE FREQ	RELATIVE FREQ (PCT)	ADJUSTED FREQ (PCT)	CUM FREQ (PCT)
LESS THAN 10	A	562	40.9	41.7	41.7
10 TO 20	B	286	20.8	21.2	62.9
21 TO 30	C	134	9.8	9.9	72.8
31 TO 40	D	64	4.7	4.7	77.5
41 TO 50	E	66	4.8	4.9	82.4
51 TO 60	F	49	3.6	3.6	86.1
61 TO 70	G	30	2.2	2.2	88.3
71 TO 80	H	15	1.1	1.1	89.4
81 TO 90	I	19	1.4	1.4	90.8
91 TO 100	J	19	1.4	1.4	92.2
101 TO 150	K	52	3.8	3.9	96.1
OVER 150	L	53	3.9	3.9	100.0
		25	1.8	MISSING	100.0
	TOTAL	1374	100.0	100.0	

VALID CASES 1349 MISSING CASES 25

MAXEMPL MAXIMUM NUMBER OF EMPLOYEES 1976

CATEGORY LABEL	CODE	ABSOLUTE FREQ	RELATIVE FREQ (PCT)	ADJUSTED FREQ (PCT)	CUM FREQ (PCT)
LESS THAN 10	A	476	34.6	38.4	38.4
10 TO 20	B	262	19.1	21.2	59.6
21 TO 30	C	123	9.0	9.9	69.5
31 TO 40	D	72	5.2	5.8	75.4
41 TO 50	E	54	3.9	4.4	79.7
51 TO 60	F	54	3.9	4.4	84.1
61 TO 70	G	31	2.3	2.5	86.6
71 TO 80	H	19	1.4	1.5	88.1
81 TO 90	I	23	1.7	1.9	90.0
91 TO 100	J	14	1.0	1.1	91.1
101 TO 150	K	59	4.3	4.8	95.9
OVER 150	L	51	3.7	4.1	100.0
		136	9.9	MISSING	100.0
	TOTAL	1374	100.0	100.0	

VALID CASES 1238 MISSING CASES 136

VARIATN DOES MONTHLY PRODUCTION VARY BY 25 PRCNT

CATEGORY LABEL	CODE	ABSOLUTE FREQ	RELATIVE FREQ (PCT)	ADJUSTED FREQ (PCT)	CUM FREQ (PCT)
YES	A	728	53.0	54.7	54.7
NO	B	603	43.9	45.3	100.0
		43	3.1	MISSING	100.0
	TOTAL	1374	100.0	100.0	

VALID CASES 1331 MISSING CASES 43

03/23/78 FILE - PAINT - CREATED 03/23/78

PLANTAGE AGE OF MANUFACTURING FACILITIES

CATEGORY LABEL	CODE	ABSOLUTE FREQ	RELATIVE FREQ (PCT)	ADJUSTED FREQ (PCT)	CUM FREQ (PCT)
LESS THAN 3 YEARS	A	67	4.9	5.0	5.0
3 TO 5 YEARS	B	102	7.4	7.5	12.5
6 TO 10 YEARS	C	168	12.2	12.4	24.9
11 TO 20 YEARS	D	321	23.4	23.7	48.7
21 TO 30 YEARS	E	268	19.5	19.8	68.5
OVER 30 YEARS	F	426	31.0	31.5	100.0
		22	1.6	MISSING	100.0
	TOTAL	1374	100.0	100.0	

VALID CASES 1352 MISSING CASES 22

VOLUME76 1976 ANNUAL PRODUCTION GALS.

CATEGORY LABEL	CODE	ABSOLUTE FREQ	RELATIVE FREQ (PCT)	ADJUSTED FREQ (PCT)	CUM FREQ (PCT)
LESS THAN 50000	A	355	25.8	26.5	26.5
50001 TO 200000	B	339	24.7	25.3	51.9
200K TO 1 MILLION	C	416	30.3	31.1	83.0
1 TO 5 MILLION	D	194	14.1	14.5	97.5
OVER 5 MILLION	E	34	2.5	2.5	100.0
		36	2.6	MISSING	100.0
	TOTAL	1374	100.0	100.0	

VALID CASES 1338 MISSING CASES 36

03/23/78 FILE - PAINT - CREATED 03/23/78

PRCNTUSE PERCENT OF MAXIMUM CAPACITY USED IN 1976

CATEGORY LABEL	CODE	ABSOLUTE FREQ	RELATIVE FREQ (PCT)	ADJUSTED FREQ (PCT)	CUM FREQ (PCT)
0 TO 10	A	50	3.6	3.8	3.8
11 TO 20	B	31	2.3	2.4	6.2
21 TO 30	C	55	4.0	4.2	10.4
31 TO 40	D	79	5.7	6.0	16.4
41 TO 50	E	140	10.2	10.7	27.2
51 TO 60	F	140	10.2	10.7	37.9
61 TO 70	G	229	16.7	17.5	55.4
71 TO 80	H	342	24.9	26.2	81.6
81 TO 90	I	169	12.3	12.9	94.5
91 TO 100	J	72	5.2	5.5	100.0
		67	4.9	MISSING	100.0
	TOTAL	1374	100.0	100.0	

VALID CASES 1307 MISSING CASES 67

AVGPRODN AVERAGE ANNUAL PRODUCTION PAST 5 YEARS

CATEGORY LABEL	CODE	ABSOLUTE FREQ	RELATIVE FREQ (PCT)	ADJUSTED FREQ (PCT)	CUM FREQ (PCT)
LESS THAN 50000	A	373	27.1	28.1	28.1
50001 TO 200000	B	359	26.1	27.1	55.2
200K TO 1 MILLION	C	387	28.2	29.2	84.3
1 TO 5 MILLION	D	181	13.2	13.6	98.0
OVER 5 MILLION	E	27	2.0	2.0	100.0
		47	3.4	MISSING	100.0
	TOTAL	1374	100.0	100.0	

VALID CASES 1327 MISSING CASES 47

MRKTVALU MARKET VALUE OF PLANT PRODUCTION

CATEGORY LABEL	CODE	ABSOLUTE FREQ	RELATIVE FREQ (PCT)	ADJUSTED FREQ (PCT)	CUM FREQ (PCT)
UNDER $250000	A	302	22.0	22.7	22.7
$250K TO 500K	B	185	13.5	13.9	36.5
$500K TO 1.5 MILLIO	C	328	23.9	24.6	61.1
$1.5 TO 3 MILLION	D	191	13.9	14.3	75.5
$3 TO 5 MILLION	E	105	7.6	7.9	83.3
$5 TO 10 MILLION	F	111	8.1	8.3	91.7
OVER $10 MILLION	G	111	8.1	8.3	100.0
		41	3.0	MISSING	100.0
	TOTAL	1374	100.0	100.0	

VALID CASES 1333 MISSING CASES 41

03/23/78 FILE - PAINT - CREATED 03/23/78

TANKSIZ1 NUMBER OF TANKS LESS THAN 250 GALS

CATEGORY LABEL	CODE	ABSOLUTE FREQ	RELATIVE FREQ (PCT)	ADJUSTED FREQ (PCT)	CUM FREQ (PCT)
0	A	106	7.7	8.5	8.5
1 TO 5	B	466	33.9	37.4	45.9
6 TO 10	C	232	16.9	18.6	64.6
11 TO 20	D	182	13.2	14.6	79.2
21 TO 50	E	187	13.6	15.0	94.2
OVER 50	F	72	5.2	5.8	100.0
		129	9.4	MISSING	100.0
	TOTAL	1374	100.0	100.0	

VALID CASES 1245 MISSING CASES 129

TANKSIZ2 NUMBER OF TANKS 251 TO 500 GALS

CATEGORY LABEL	CODE	ABSOLUTE FREQ	RELATIVE FREQ (PCT)	ADJUSTED FREQ (PCT)	CUM FREQ (PCT)
0	A	160	11.6	17.2	17.2
1 TO 5	B	433	31.5	46.7	63.9
6 TO 10	C	151	11.0	16.3	80.2
11 TO 20	D	95	6.9	10.2	90.4
21 TO 50	E	70	5.1	7.5	98.0
OVER 50	F	19	1.4	2.0	100.0
		446	32.5	MISSING	100.0
	TOTAL	1374	100.0	100.0	

VALID CASES 928 MISSING CASES 446

TANKSIZ3 NUMBER OF TANKS 501 TO 1000 GALS

CATEGORY LABEL	CODE	ABSOLUTE FREQ	RELATIVE FREQ (PCT)	ADJUSTED FREQ (PCT)	CUM FREQ (PCT)
0	A	211	15.4	26.9	26.9
1 TO 5	B	336	24.5	42.9	69.8
6 TO 10	C	117	8.5	14.9	84.7
11 TO 20	D	68	4.9	8.7	93.4
21 TO 50	E	44	3.2	5.6	99.0
OVER 50	F	8	0.6	1.0	100.0
		590	42.9	MISSING	100.0
	TOTAL	1374	100.0	100.0	

VALID CASES 784 MISSING CASES 590

TANKSIZ4 NUMBER OF TANKS 1001 TO 1500 GALS

CATEGORY LABEL	CODE	ABSOLUTE FREQ	RELATIVE FREQ (PCT)	ADJUSTED FREQ (PCT)	CUM FREQ (PCT)
0	A	296	21.5	46.8	46.8
1 TO 5	B	212	15.4	33.5	80.4
6 TO 10	C	62	4.5	9.8	90.2
11 TO 20	D	44	3.2	7.0	97.2
21 TO 50	E	14	1.0	2.2	99.4
OVER 50	F	4	0.3	0.6	100.0
		742	54.0	MISSING	100.0
	TOTAL	1374	100.0	100.0	

VALID CASES 632 MISSING CASES 742

TANKSIZ5 NUMBER OF TANKS 1501 TO 2500 GALS

CATEGORY LABEL	CODE	ABSOLUTE FREQ	RELATIVE FREQ (PCT)	ADJUSTED FREQ (PCT)	CUM FREQ (PCT)
0	A	313	22.8	52.3	52.3
1 TO 5	B	186	13.5	31.1	83.4
6 TO 10	C	61	4.4	10.2	93.6
11 TO 20	D	28	2.0	4.7	98.3
21 TO 50	E	8	0.6	1.3	99.7
OVER 50	F	2	0.1	0.3	100.0
		776	56.5	MISSING	100.0
	TOTAL	1374	100.0	100.0	

VALID CASES 598 MISSING CASES 776

TANKSIZ6 NUMBER OF TANKS 2501 TO 6000 GALS

CATEGORY LABEL	CODE	ABSOLUTE FREQ	RELATIVE FREQ (PCT)	ADJUSTED FREQ (PCT)	CUM FREQ (PCT)
0	A	375	27.3	68.4	68.4
1 TO 5	B	107	7.8	19.5	88.0
6 TO 10	C	34	2.5	6.2	94.2
11 TO 20	D	18	1.3	3.3	97.4
21 TO 50	E	14	1.0	2.6	100.0
		826	60.1	MISSING	100.0
	TOTAL	1374	100.0	100.0	

VALID CASES 548 MISSING CASES 826

03/23/78 FILE - PAINT - CREATED 03/23/78

TANKSIZ7 NUMBER OF TANKS OVER 6000 GALS

CATEGORY LABEL	CODE	ABSOLUTE FREQ	RELATIVE FREQ (PCT)	ADJUSTED FREQ (PCT)	CUM FREQ (PCT)
0	A	449	32.7	94.3	94.3
1 TO 5	B	18	1.3	3.8	98.1
6 TO 10	C	7	0.5	1.5	99.6
21 TO 50	E	1	0.1	0.2	99.8
OVER 50	F	1	0.1	0.2	100.0
		898	65.4	MISSING	100.0
	TOTAL	1374	100.0	100.0	

VALID CASES 476 MISSING CASES 898

NOFSHFTS NUMBER OF SHIFTS PER DAY

CATEGORY LABEL	CODE	ABSOLUTE FREQ	RELATIVE FREQ (PCT)	ADJUSTED FREQ (PCT)	CUM FREQ (PCT)
1 SHIFT	A	1128	82.1	87.3	87.3
2 SHIFTS	B	119	8.7	9.2	96.5
3 SHIFTS	C	45	3.3	3.5	100.0
		82	6.0	MISSING	100.0
	TOTAL	1374	100.0	100.0	

VALID CASES 1292 MISSING CASES 82

SHFTLGTH LENGTH OF SHIFTS IN HOURS

CATEGORY LABEL	CODE	ABSOLUTE FREQ	RELATIVE FREQ (PCT)	ADJUSTED FREQ (PCT)	CUM FREQ (PCT)
7 HOURS	A	55	4.0	4.1	4.1
8 HOURS	B	1195	87.0	89.9	94.1
10 HOURS	C	51	3.7	3.8	97.9
12 HOURS	D	1	0.1	0.1	98.0
9 HOURS	E	27	2.0	2.0	100.0
		45	3.3	MISSING	100.0
	TOTAL	1374	100.0	100.0	

VALID CASES 1329 MISSING CASES 45

DAYSPRWK NUMBER OF DAYS PER WEEK OF OPERATION

CATEGORY LABEL	CODE	ABSOLUTE FREQ	RELATIVE FREQ (PCT)	ADJUSTED FREQ (PCT)	CUM FREQ (PCT)
UNDER 4	A	130	9.5	9.6	9.6
4	B	79	5.7	5.8	15.5
5	C	1119	81.4	82.8	98.2
6	D	23	1.7	1.7	99.9
7	E	1	0.1	0.1	100.0
		22	1.6	MISSING	100.0
	TOTAL	1374	100.0	100.0	

VALID CASES 1352 MISSING CASES 22

DAYSPRYR DAYS PER YEAR OF PLANT OPERATION

CATEGORY LABEL	CODE	ABSOLUTE FREQ	RELATIVE FREQ (PCT)	ADJUSTED FREQ (PCT)	CUM FREQ (PCT)
150 TO 200	A	125	9.1	9.3	9.3
201 TO 250	B	533	38.8	39.9	49.2
251 TO 300	C	557	40.5	41.7	90.9
301 TO 365	D	87	6.3	6.5	97.4
UNDER 150	E	35	2.5	2.6	100.0
		37	2.7	MISSING	100.0
	TOTAL	1374	100.0	100.0	

VALID CASES 1337 MISSING CASES 37

WATRCONS PLANT WATER CONSUMPTION FOR ALL USES

CATEGORY LABEL	CODE	ABSOLUTE FREQ	RELATIVE FREQ (PCT)	ADJUSTED FREQ (PCT)	CUM FREQ (PCT)
UNDER 10000 GPD	A	1100	80.1	85.7	85.7
10K TO 25K GPD	B	78	5.7	6.1	91.7
25K TO 50K GPD	C	52	3.8	4.0	95.8
50K TO 100K GPD	D	22	1.6	1.7	97.5
100K TO 500K GPD	E	26	1.9	2.0	99.5
OVER 500K GPD	F	6	0.4	0.5	100.0
		90	6.6	MISSING	100.0
	TOTAL	1374	100.0	100.0	

VALID CASES 1284 MISSING CASES 90

03/23/78 FILE - PAINT - CREATED 03/23/78

WATERUS1 WATER USED IN PRODUCT PERCENT

CATEGORY LABEL	CODE	ABSOLUTE FREQ	RELATIVE FREQ (PCT)	ADJUSTED FREQ (PCT)	CUM FREQ (PCT)
0	A	297	21.6	22.8	22.8
1 TO 10	B	416	30.3	32.0	54.8
11 TO 20	C	100	7.3	7.7	62.5
21 TO 30	D	63	4.6	4.8	67.3
31 TO 40	E	38	2.8	2.9	70.3
41 TO 50	F	59	4.3	4.5	74.8
51 TO 60	G	46	3.3	3.5	78.3
61 TO 70	H	53	3.9	4.1	82.4
71 TO 80	I	69	5.0	5.3	87.7
81 TO 90	J	66	4.8	5.1	92.8
91 TO 99	K	78	5.7	6.0	98.8
100	L	16	1.2	1.2	100.0
		73	5.3	MISSING	100.0
	TOTAL	1374	100.0	100.0	

VALID CASES 1301 MISSING CASES 73

03/23/78 FILE - PAINT - CREATED 03/23/78

WATERUS2 WATER USED FOR COOLING PERCENT

CATEGORY LABEL	CODE	ABSOLUTE FREQ	RELATIVE FREQ (PCT)	ADJUSTED FREQ (PCT)	CUM FREQ (PCT)
0	A	484	35.2	41.7	41.7
1 TO 10	B	236	17.2	20.3	62.0
11 TO 20	C	62	4.5	5.3	67.4
21 TO 30	D	51	3.7	4.4	71.7
31 TO 40	E	35	2.5	3.0	74.8
41 TO 50	F	45	3.3	3.9	78.6
51 TO 60	G	41	3.0	3.5	82.2
61 TO 70	H	42	3.1	3.6	85.8
71 TO 80	I	45	3.3	3.9	89.7
81 TO 90	J	67	4.9	5.8	95.4
91 TO 99	K	51	3.7	4.4	99.8
100	L	2	0.1	0.2	100.0
		213	15.5	MISSING	100.0
	TOTAL	1374	100.0	100.0	

VALID CASES 1161 MISSING CASES 213

03/23/78 FILE - PAINT - CREATED 03/23/78

WATERUS3 PERCENT OF WATER USED FOR BOILER FEED

CATEGORY LABEL	CODE	ABSOLUTE FREQ	RELATIVE FREQ (PCT)	ADJUSTED FREQ (PCT)	CUM FREQ (PCT)
0	A	562	40.9	50.3	50.3
1 TO 10	B	446	32.5	39.9	90.2
11 TO 20	C	48	3.5	4.3	94.5
21 TO 30	D	23	1.7	2.1	96.6
31 TO 40	E	7	0.5	0.6	97.2
41 TO 50	F	13	0.9	1.2	98.4
51 TO 60	G	5	0.4	0.4	98.8
61 TO 70	H	1	0.1	0.1	98.9
71 TO 80	I	3	0.2	0.3	99.2
81 TO 90	J	7	0.5	0.6	99.8
91 TO 99	K	2	0.1	0.2	100.0
		257	18.7	MISSING	100.0
	TOTAL	1374	100.0	100.0	

VALID CASES 1117 MISSING CASES 257

03/23/78 FILE - PAINT - CREATED 03/23/78

WATERUS4 PERCENT OF WATER USED FOR TANK CLEANING

CATEGORY LABEL	CODE	ABSOLUTE FREQ	RELATIVE FREQ (PCT)	ADJUSTED FREQ (PCT)	CUM FREQ (PCT)
0	A	427	31.1	35.3	35.3
1 TO 10	B	602	43.8	49.8	85.1
11 TO 20	C	84	6.1	6.9	92.1
21 TO 30	D	43	3.1	3.6	95.6
31 TO 40	E	26	1.9	2.2	97.8
41 TO 50	F	13	0.9	1.1	98.8
51 TO 60	G	6	0.4	0.5	99.3
61 TO 70	H	7	0.5	0.6	99.9
71 TO 80	I	1	0.1	0.1	100.0
		165	12.0	MISSING	100.0
	TOTAL	1374	100.0	100.0	

VALID CASES 1209 MISSING CASES 165

03/23/78 FILE - PAINT - CREATED 03/23/78

WATERUS5 PERCENT OF WATER USED FOR SANITARY

CATEGORY LABEL	CODE	ABSOLUTE FREQ	RELATIVE FREQ (PCT)	ADJUSTED FREQ (PCT)	CUM FREQ (PCT)
0	A	112	8.2	9.0	9.0
1 TO 10	B	539	39.2	43.3	52.3
11 TO 20	C	129	9.4	10.4	62.7
21 TO 30	D	70	5.1	5.6	68.3
31 TO 40	E	59	4.3	4.7	73.1
41 TO 50	F	55	4.0	4.4	77.5
51 TO 60	G	35	2.5	2.8	80.3
61 TO 70	H	37	2.7	3.0	83.3
71 TO 80	I	42	3.1	3.4	86.7
81 TO 90	J	44	3.2	3.5	90.2
91 TO 99	K	78	5.7	6.3	96.5
100	L	44	3.2	3.5	100.0
		130	9.5	MISSING	100.0
	TOTAL	1374	100.0	100.0	

VALID CASES 1244 MISSING CASES 130

03/23/78 FILE - PAINT - CREATED 03/23/78

WATERUS6 PERCENT OF WATER USED FOR AIR POLL CONTR

CATEGORY LABEL	CODE	ABSOLUTE FREQ	RELATIVE FREQ (PCT)	ADJUSTED FREQ (PCT)	CUM FREQ (PCT)
0	A	952	69.3	93.7	93.7
1 TO 10	B	55	4.0	5.4	99.1
11 TO 20	C	3	0.2	0.3	99.4
21 TO 30	D	2	0.1	0.2	99.6
31 TO 40	E	1	0.1	0.1	99.7
51 TO 60	G	1	0.1	0.1	99.8
71 TO 80	I	1	0.1	0.1	99.9
91 TO 99	K	1	0.1	0.1	100.0
		358	26.1	MISSING	100.0
	TOTAL	1374	100.0	100.0	

VALID CASES 1016 MISSING CASES 358

WATERUS7 PERCENT OF WATER USED FOR OTHER PURPOSES

CATEGORY LABEL	CODE	ABSOLUTE FREQ	RELATIVE FREQ (PCT)	ADJUSTED FREQ (PCT)	CUM FREQ (PCT)
0	A	359	26.1	82.7	82.7
1 TO 10	B	46	3.3	10.6	93.3
11 TO 20	C	10	0.7	2.3	95.6
21 TO 30	D	10	0.7	2.3	97.9
31 TO 40	E	1	0.1	0.2	98.2
41 TO 50	F	3	0.2	0.7	98.8
61 TO 70	H	1	0.1	0.2	99.1
71 TO 80	I	1	0.1	0.2	99.3
81 TO 90	J	2	0.1	0.5	99.8
91 TO 99	K	1	0.1	0.2	100.0
		940	68.4	MISSING	100.0
	TOTAL	1374	100.0	100.0	

VALID CASES 434 MISSING CASES 940

TRADESLS PERCENT OF TRADESALES PAINT

CATEGORY LABEL	CODE	ABSOLUTE FREQ	RELATIVE FREQ (PCT)	ADJUSTED FREQ (PCT)	CUM FREQ (PCT)
0	A	464	33.8	35.4	35.4
1 TO 10	B	125	9.1	9.5	44.9
11 TO 20	C	39	2.8	3.0	47.9
21 TO 30	D	44	3.2	3.4	51.2
31 TO 40	E	39	2.8	3.0	54.2
41 TO 50	F	58	4.2	4.4	58.6
51 TO 60	G	34	2.5	2.6	61.2
61 TO 70	H	47	3.4	3.6	64.8
71 TO 80	I	43	3.1	3.3	68.1
81 TO 90	J	77	5.6	5.9	73.9
91 TO 99	K	160	11.6	12.2	86.1
100	L	182	13.2	13.9	100.0
		62	4.5	MISSING	100.0
	TOTAL	1374	100.0	100.0	

VALID CASES 1312 MISSING CASES 62

03/23/78 FILE - PAINT - CREATED 03/23/78

INDSLS PERCENT OF INDUSTRIAL PRODUCTS

CATEGORY LABEL	CODE	ABSOLUTE FREQ	RELATIVE FREQ (PCT)	ADJUSTED FREQ (PCT)	CUM FREQ (PCT)
0	A	295	21.5	22.6	22.6
1 TO 10	B	190	13.8	14.6	37.2
11 TO 20	C	62	4.5	4.8	41.9
21 TO 30	D	56	4.1	4.3	46.2
31 TO 40	E	38	2.8	2.9	49.1
41 TO 50	F	66	4.8	5.1	54.2
51 TO 60	G	26	1.9	2.0	56.2
61 TO 70	H	33	2.4	2.5	58.7
71 TO 80	I	44	3.2	3.4	62.1
81 TO 90	J	44	3.2	3.4	65.4
91 TO 99	K	111	8.1	8.5	73.9
100	L	340	24.7	26.1	100.0
		69	5.0	MISSING	100.0
	TOTAL	1374	100.0	100.0	

VALID CASES 1305 MISSING CASES 69

OTHRSLS PERCENT OF OTHER PRODUCTS

CATEGORY LABEL	CODE	ABSOLUTE FREQ	RELATIVE FREQ (PCT)	ADJUSTED FREQ (PCT)	CUM FREQ (PCT)
0	A	919	66.9	73.4	73.4
1 TO 10	B	170	12.4	13.6	87.0
11 TO 20	C	22	1.6	1.8	88.7
21 TO 30	D	17	1.2	1.4	90.1
31 TO 40	E	22	1.6	1.8	91.9
41 TO 50	F	15	1.1	1.2	93.1
51 TO 60	G	6	0.4	0.5	93.5
61 TO 70	H	4	0.3	0.3	93.8
71 TO 80	I	7	0.5	0.6	94.4
81 TO 90	J	8	0.6	0.6	95.0
91 TO 99	K	25	1.8	2.0	97.0
100	L	37	2.7	3.0	100.0
		122	8.9	MISSING	100.0
	TOTAL	1374	100.0	100.0	

VALID CASES 1252 MISSING CASES 122

WTRBASE PERCENT OF WATER BASE PAINT

CATEGORY LABEL	CODE	ABSOLUTE FREQ	RELATIVE FREQ (PCT)	ADJUSTED FREQ (PCT)	CUM FREQ (PCT)
0	A	345	25.1	26.5	26.5
1 TO 10	B	274	19.9	21.0	47.5
11 TO 20	C	86	6.3	6.6	54.1
21 TO 30	D	53	3.9	4.1	58.1
31 TO 40	E	52	3.8	4.0	62.1
41 TO 50	F	63	4.6	4.8	66.9
51 TO 60	G	83	6.0	6.4	73.3
61 TO 70	H	99	7.2	7.6	80.9
71 TO 80	I	79	5.7	6.1	87.0
81 TO 90	J	61	4.4	4.7	91.6
91 TO 99	K	54	3.9	4.1	95.8
100	L	55	4.0	4.2	100.0
		70	5.1	MISSING	100.0
	TOTAL	1374	100.0	100.0	

VALID CASES 1304 MISSING CASES 70

03/23/78 FILE - PAINT - CREATED 03/23/78

SOLVBASE PERCENT OF SOLVENT BASE PRODUCTION

CATEGORY LABEL	CODE	ABSOLUTE FREQ	RELATIVE FREQ (PCT)	ADJUSTED FREQ (PCT)	CUM FREQ (PCT)
0	A	135	9.8	10.3	10.3
1 TO 10	B	98	7.1	7.5	17.8
11 TO 20	C	66	4.8	5.0	22.9
21 TO 30	D	100	7.3	7.6	30.5
31 TO 40	E	78	5.7	6.0	36.5
41 TO 50	F	114	8.3	8.7	45.2
51 TO 60	G	60	4.4	4.6	49.8
61 TO 70	H	50	3.6	3.8	53.6
71 TO 80	I	51	3.7	3.9	57.5
81 TO 90	J	97	7.1	7.4	64.9
91 TO 99	K	229	16.7	17.5	82.4
100	L	230	16.7	17.6	100.0
		66	4.8	MISSING	100.0
	TOTAL	1374	100.0	100.0	

VALID CASES 1308 MISSING CASES 66

03/23/78 FILE - PAINT - CREATED 03/23/78

OTHRBASE PERCENT OF OTHER BASE PAINT PRODUCTION

CATEGORY LABEL	CODE	ABSOLUTE FREQ	RELATIVE FREQ (PCT)	ADJUSTED FREQ (PCT)	CUM FREQ (PCT)
0	A	1056	76.9	88.6	88.6
1 TO 10	B	59	4.3	4.9	93.5
11 TO 20	C	11	0.8	0.9	94.5
21 TO 30	D	7	0.5	0.6	95.1
31 TO 40	E	5	0.4	0.4	95.5
41 TO 50	F	8	0.6	0.7	96.1
51 TO 60	G	7	0.5	0.6	96.7
61 TO 70	H	4	0.3	0.3	97.1
71 TO 80	I	1	0.1	0.1	97.1
81 TO 90	J	10	0.7	0.8	98.0
91 TO 99	K	8	0.6	0.7	98.7
100	L	16	1.2	1.3	100.0
		182	13.2	MISSING	100.0
	TOTAL	1374	100.0	100.0	

VALID CASES 1192 MISSING CASES 182

03/23/78 FILE - PAINT - CREATED 03/23/78

TINTBASE PERCENT OF PAINT IN WHITE OR TINTBASE

CATEGORY LABEL	CODE	ABSOLUTE FREQ	RELATIVE FREQ (PCT)	ADJUSTED FREQ (PCT)	CUM FREQ (PCT)
0	A	122	8.9	9.5	9.5
1 TO 10	B	159	11.6	12.4	21.9
11 TO 20	C	106	7.7	8.2	30.1
21 TO 30	D	87	6.3	6.8	36.9
31 TO 40	E	102	7.4	7.9	44.8
41 TO 50	F	122	8.9	9.5	54.3
51 TO 60	G	95	6.9	7.4	61.7
61 TO 70	H	106	7.7	8.2	70.0
71 TO 80	I	113	8.2	8.8	78.8
81 TO 90	J	109	7.9	8.5	87.2
91 TO 99	K	115	8.4	8.9	96.2
100	L	49	3.6	3.8	100.0
		89	6.5	MISSING	100.0
	TOTAL	1374	100.0	100.0	

VALID CASES 1285 MISSING CASES 89

03/23/78 FILE - PAINT - CREATED 03/23/78

COLORPNT PERCENT OF PAINT TINTED

CATEGORY LABEL	CODE	ABSOLUTE FREQ	RELATIVE FREQ (PCT)	ADJUSTED FREQ (PCT)	CUM FREQ (PCT)
0	A	125	9.1	9.9	9.9
1 TO 10	B	200	14.6	15.8	25.6
11 TO 20	C	121	8.8	9.5	35.2
21 TO 30	D	127	9.2	10.0	45.2
31 TO 40	E	91	6.6	7.2	52.4
41 TO 50	F	145	10.6	11.4	63.8
51 TO 60	G	105	7.6	8.3	72.1
61 TO 70	H	71	5.2	5.6	77.7
71 TO 80	I	88	6.4	6.9	84.6
81 TO 90	J	87	6.3	6.9	91.5
91 TO 99	K	68	4.9	5.4	96.8
100	L	40	2.9	3.2	100.0
		106	7.7	MISSING	100.0
	TOTAL	1374	100.0	100.0	

VALID CASES 1268 MISSING CASES 106

03/23/78 FILE - PAINT - CREATED 03/23/78

ORGANIC PERCENTAGE OF ORGANIC PIGMENTS EXC TIO2

CATEGORY LABEL	CODE	ABSOLUTE FREQ	RELATIVE FREQ (PCT)	ADJUSTED FREQ (PCT)	CUM FREQ (PCT)
0	A	163	11.9	13.7	13.7
1 TO 10	B	437	31.8	36.8	50.6
11 TO 20	C	159	11.6	13.4	64.0
21 TO 30	D	92	6.7	7.8	71.8
31 TO 40	E	43	3.1	3.6	75.4
41 TO 50	F	92	6.7	7.8	83.1
51 TO 60	G	22	1.6	1.9	85.0
61 TO 70	H	29	2.1	2.4	87.4
71 TO 80	I	31	2.3	2.6	90.1
81 TO 90	J	39	2.8	3.3	93.3
91 TO 99	K	51	3.7	4.3	97.6
100	L	28	2.0	2.4	100.0
		188	13.7	MISSING	100.0
	TOTAL	1374	100.0	100.0	

VALID CASES 1186 MISSING CASES 188

03/23/78 FILE - PAINT - CREATED 03/23/78

INORGNIC PERCENT OF INORGANIC PIGMENTS EXC TIO2

CATEGORY LABEL	CODE	ABSOLUTE FREQ	RELATIVE FREQ (PCT)	ADJUSTED FREQ (PCT)	CUM FREQ (PCT)
0	A	92	6.7	7.6	7.6
1 TO 10	B	113	8.2	9.4	17.0
11 TO 20	C	49	3.6	4.1	21.1
21 TO 30	D	39	2.8	3.2	24.4
31 TO 40	E	25	1.8	2.1	26.4
41 TO 50	F	86	6.3	7.1	33.6
51 TO 60	G	44	3.2	3.7	37.2
61 TO 70	H	52	3.8	4.3	41.6
71 TO 80	I	104	7.6	8.6	50.2
81 TO 90	J	156	11.4	13.0	63.2
91 TO 99	K	344	25.0	28.6	91.8
100	L	99	7.2	8.2	100.0
		171	12.4	MISSING	100.0
	TOTAL	1374	100.0	100.0	

VALID CASES 1203 MISSING CASES 171

MNFRSNS ARE RESINS MANUFACTURED ON THIS SITE

CATEGORY LABEL	CODE	ABSOLUTE FREQ	RELATIVE FREQ (PCT)	ADJUSTED FREQ (PCT)	CUM FREQ (PCT)
YES	A	112	8.2	8.4	8.4
NO	B	1220	88.8	91.6	100.0
		42	3.1	MISSING	100.0
	TOTAL	1374	100.0	100.0	

VALID CASES 1332 MISSING CASES 42

MNFVRNSH VARNISH IS PRODUCED

CATEGORY LABEL	CODE	ABSOLUTE FREQ	RELATIVE FREQ (PCT)	ADJUSTED FREQ (PCT)	CUM FREQ (PCT)
NO. OF PLANTS	A	716	52.1	100.0	100.0
		658	47.9	MISSING	100.0
	TOTAL	1374	100.0	100.0	

VALID CASES 716 MISSING CASES 658

MNFSHLLC SHELLAC IS MANUFACTURED

CATEGORY LABEL	CODE	ABSOLUTE FREQ	RELATIVE FREQ (PCT)	ADJUSTED FREQ (PCT)	CUM FREQ (PCT)
NO. OF PLANTS	B	32	2.3	100.0	100.0
		1342	97.7	MISSING	100.0
	TOTAL	1374	100.0	100.0	

VALID CASES 32 MISSING CASES 1342

MNFCAULK CAULK COMPOUNDS ARE PRODUCED

CATEGORY LABEL	CODE	ABSOLUTE FREQ	RELATIVE FREQ (PCT)	ADJUSTED FREQ (PCT)	CUM FREQ (PCT)
NO. OF PLANTS	C	106	7.7	100.0	100.0
		1268	92.3	MISSING	100.0
	TOTAL	1374	100.0	100.0	

VALID CASES 106 MISSING CASES 1268

MNFPUTTY PUTTY PRODUCTS ARE PRODUCED

CATEGORY LABEL	CODE	ABSOLUTE FREQ	RELATIVE FREQ (PCT)	ADJUSTED FREQ (PCT)	CUM FREQ (PCT)
NO. OF PLANTS	D	74	5.4	100.0	100.0
		1300	94.6	MISSING	100.0
	TOTAL	1374	100.0	100.0	

VALID CASES 74 MISSING CASES 1300

MNFGRAVR GRAVURE INK IS PRODUCED ON SITE

CATEGORY LABEL	CODE	ABSOLUTE FREQ	RELATIVE FREQ (PCT)	ADJUSTED FREQ (PCT)	CUM FREQ (PCT)
NO. OF PLANTS	E	33	2.4	100.0	100.0
		1341	97.6	MISSING	100.0
	TOTAL	1374	100.0	100.0	

VALID CASES 33 MISSING CASES 1341

MNFPWDER POWDER COATINGS ARE PRODUCED

CATEGORY LABEL	CODE	ABSOLUTE FREQ	RELATIVE FREQ (PCT)	ADJUSTED FREQ (PCT)	CUM FREQ (PCT)
NO. OF PLANTS	F	47	3.4	100.0	100.0
		1327	96.6	MISSING	100.0
	TOTAL	1374	100.0	100.0	

VALID CASES 47 MISSING CASES 1327

MNFRMOVR PAINT REMOVERS ARE MANUFACTURED

CATEGORY LABEL	CODE	ABSOLUTE FREQ	RELATIVE FREQ (PCT)	ADJUSTED FREQ (PCT)	CUM FREQ (PCT)
NO. OF PLANTS	G	124	9.0	100.0	100.0
		1250	91.0	MISSING	100.0
	TOTAL	1374	100.0	100.0	

VALID CASES 124 MISSING CASES 1250

MNFFLLRS WOOD FILLERS OR SEALANTS ARE MANUFACTURE

CATEGORY LABEL	CODE	ABSOLUTE FREQ	RELATIVE FREQ (PCT)	ADJUSTED FREQ (PCT)	CUM FREQ (PCT)
	H	206	15.0	100.0	100.0
		1168	85.0	MISSING	100.0
	TOTAL	1374	100.0	100.0	

VALID CASES 206 MISSING CASES 1168

WATRWASH WATER RINSE OF TANKS IS PRACTICED

CATEGORY LABEL	CODE	ABSOLUTE FREQ	RELATIVE FREQ (PCT)	ADJUSTED FREQ (PCT)	CUM FREQ (PCT)
	A	851	61.9	100.0	100.0
		523	38.1	MISSING	100.0
	TOTAL	1374	100.0	100.0	

VALID CASES 851 MISSING CASES 523

CSTCWASH CAUSTIC RINSING OF TANKS IS PRACTIC

CATEGORY LABEL	CODE	ABSOLUTE FREQ	RELATIVE FREQ (PCT)	ADJUSTED FREQ (PCT)	CUM FREQ (PCT)
NO. OF PLANTS	B	163	11.9	100.0	100.0
		1211	88.1	MISSING	100.0
	TOTAL	1374	100.0	100.0	

VALID CASES 163 MISSING CASES 1211

SOLVWASH SOLVENT RINSING OF TANKS IS PRACTICED

CATEGORY LABEL	CODE	ABSOLUTE FREQ	RELATIVE FREQ (PCT)	ADJUSTED FREQ (PCT)	CUM FREQ (PCT)
NO. OF PLANTS	C	1101	80.1	100.0	100.0
		273	19.9	MISSING	100.0
	TOTAL	1374	100.0	100.0	

VALID CASES 1101 MISSING CASES 273

DRYCLNTK DRY CLEAN UP OF TANKS IS PRACTICED

CATEGORY LABEL	CODE	ABSOLUTE FREQ	RELATIVE FREQ (PCT)	ADJUSTED FREQ (PCT)	CUM FREQ (PCT)
NO. OF PLANTS	D	189	13.8	100.0	100.0
		1185	86.2	MISSING	100.0
	TOTAL	1374	100.0	100.0	

VALID CASES 189 MISSING CASES 1185

CSTCSOAK PERIODIC CAUSTIC SOAKS OF TANKS

CATEGORY LABEL	CODE	ABSOLUTE FREQ	RELATIVE FREQ (PCT)	ADJUSTED FREQ (PCT)	CUM FREQ (PCT)
NO. OF PLANTS	E	164	11.9	100.0	100.0
		1210	88.1	MISSING	100.0
	TOTAL	1374	100.0	100.0	

VALID CASES 164 MISSING CASES 1210

CSTCTYPE TYPE OF CAUSTIC SYSTEM USED

CATEGORY LABEL	CODE	ABSOLUTE FREQ	RELATIVE FREQ (PCT)	ADJUSTED FREQ (PCT)	CUM FREQ (PCT)
CLOSED LOOP	A	70	5.1	27.9	27.9
OPEN	B	101	7.4	40.2	68.1
PARTIAL RECYCLE	C	80	5.8	31.9	100.0
		1123	81.7	MISSING	100.0
	TOTAL	1374	100.0	100.0	

VALID CASES 251 MISSING CASES 1123

WATRPRES WATER PRESSURE USED FOR TANK RINSING

CATEGORY LABEL	CODE	ABSOLUTE FREQ	RELATIVE FREQ (PCT)	ADJUSTED FREQ (PCT)	CUM FREQ (PCT)
LESS THAN 50 PSI	A	576	41.9	67.7	67.7
50 TO 100 PSI	B	226	16.4	26.6	94.2
101 TO 150 PSI	C	20	1.5	2.4	96.6
OVER 150 PSI	D	29	2.1	3.4	100.0
		523	38.1	MISSING	100.0
	TOTAL	1374	100.0	100.0	

VALID CASES 851 MISSING CASES 523

DRYCLNFL SPILLS PICKED UP BY DRY CLEANING METHODS

CATEGORY LABEL	CODE	ABSOLUTE FREQ	RELATIVE FREQ (PCT)	ADJUSTED FREQ (PCT)	CUM FREQ (PCT)
YES	A	1014	73.8	82.0	82.0
NO	B	223	16.2	18.0	100.0
		137	10.0	MISSING	100.0
	TOTAL	1374	100.0	100.0	

VALID CASES 1237 MISSING CASES 137

03/23/78 FILE - PAINT - CREATED 03/23/78

CLNGFREQ FREQUENCY OF TANK RINSING

CATEGORY LABEL	CODE	ABSOLUTE FREQ	RELATIVE FREQ (PCT)	ADJUSTED FREQ (PCT)	CUM FREQ (PCT)
ALL OF THE TIME	A	403	29.3	30.2	30.2
MOST OF THE TIME	B	522	38.0	39.1	69.3
OCCASIONALLY	C	307	22.3	23.0	92.4
NEVER	D	102	7.4	7.6	100.0
		40	2.9	MISSING	100.0
	TOTAL	1374	100.0	100.0	

VALID CASES 1334 MISSING CASES 40

REUSEPRD REUSE OF WASHWATER IN SUBSEQUENT BATCHES

CATEGORY LABEL	CODE	ABSOLUTE FREQ	RELATIVE FREQ (PCT)	ADJUSTED FREQ (PCT)	CUM FREQ (PCT)
ALL OF THE TIME	A	131	9.5	13.1	13.1
MOST OF THE TIME	B	219	15.9	21.9	35.0
OCCASIONALLY	C	185	13.5	18.5	53.5
NEVER	D	465	33.8	46.5	100.0
		374	27.2	MISSING	100.0
	TOTAL	1374	100.0	100.0	

VALID CASES 1000 MISSING CASES 374

REUSEWSH REUSE OF WASHWATER TO CLEAN TANKS

CATEGORY LABEL	CODE	ABSOLUTE FREQ	RELATIVE FREQ (PCT)	ADJUSTED FREQ (PCT)	CUM FREQ (PCT)
ALL OF THE TIME	A	69	5.0	7.3	7.3
MOST OF THE TIME	B	152	11.1	16.1	23.5
OCCASIONALLY	C	226	16.4	24.0	47.5
NEVER	D	495	36.0	52.5	100.0
		432	31.4	MISSING	100.0
	TOTAL	1374	100.0	100.0	

VALID CASES 942 MISSING CASES 432

DRAINSTR FLOOR DRAINS ARE CONNECTED TO STORM SEWE

CATEGORY LABEL	CODE	ABSOLUTE FREQ	RELATIVE FREQ (PCT)	ADJUSTED FREQ (PCT)	CUM FREQ (PCT)
YES	A	202	14.7	15.5	15.5
NO	B	1104	80.3	84.5	100.0
		68	4.9	MISSING	100.0
	TOTAL	1374	100.0	100.0	

VALID CASES 1306 MISSING CASES 68

DRAINSAN FLOOR DRAINS CONNECTED TO SANITARY SEWER

CATEGORY LABEL	CODE	ABSOLUTE FREQ	RELATIVE FREQ (PCT)	ADJUSTED FREQ (PCT)	CUM FREQ (PCT)
YES	A	441	32.1	33.8	33.8
NO	B	862	62.7	66.2	100.0
		71	5.2	MISSING	100.0
	TOTAL	1374	100.0	100.0	

VALID CASES 1303 MISSING CASES 71

TNKSIZE1 WATER USED TO CLEAN TANKS UNDER 250 GALS

CATEGORY LABEL	CODE	ABSOLUTE FREQ	RELATIVE FREQ (PCT)	ADJUSTED FREQ (PCT)	CUM FREQ (PCT)
0 TO 60 GALS	A	834	60.7	97.9	97.9
61 TO 100 GALS	B	13	0.9	1.5	99.4
101 TO 200 GALS	C	4	0.3	0.5	99.9
OVER 200 GALS	D	1	0.1	0.1	100.0
		522	38.0	MISSING	100.0
	TOTAL	1374	100.0	100.0	

VALID CASES 852 MISSING CASES 522

TNKSIZE2 WATER USED TO CLEAN TANKS 251-500 GALS

CATEGORY LABEL	CODE	ABSOLUTE FREQ	RELATIVE FREQ (PCT)	ADJUSTED FREQ (PCT)	CUM FREQ (PCT)
0 TO 60 GALS	A	470	34.2	91.1	91.1
61 TO 100 GALS	B	33	2.4	6.4	97.5
101 TO 200 GALS	C	9	0.7	1.7	99.2
OVER 200 GALS	D	4	0.3	0.8	100.0
		858	62.4	MISSING	100.0
	TOTAL	1374	100.0	100.0	

VALID CASES 516 MISSING CASES 858

TNKSIZE3 WATER USED TO CLEAN TANKS 501-1000 GALS

CATEGORY LABEL	CODE	ABSOLUTE FREQ	RELATIVE FREQ (PCT)	ADJUSTED FREQ (PCT)	CUM FREQ (PCT)
0 TO 60 GALS	A	295	21.5	81.3	81.3
61 TC 100 GALS	B	46	3.3	12.7	93.9
101 TO 200 GALS	C	10	0.7	2.8	96.7
OVER 200 GALS	D	12	0.9	3.3	100.0
		1011	73.6	MISSING	100.0
	TOTAL	1374	100.0	100.0	

VALID CASES 363 MISSING CASES 1011

TNKSIZE4 WATER USED TO CLEAN TANKS 1001-1500 GALS

CATEGORY LABEL	CODE	ABSOLUTE FREQ	RELATIVE FREQ (PCT)	ADJUSTED FREQ (PCT)	CUM FREQ (PCT)
0 TO 60 GALS	A	141	10.3	67.1	67.1
61 TO 100 GALS	B	42	3.1	20.0	87.1
101 TO 200 GALS	C	17	1.2	8.1	95.2
OVER 200 GALS	D	10	0.7	4.8	100.0
		1164	84.7	MISSING	100.0
	TOTAL	1374	100.0	100.0	

VALID CASES 210 MISSING CASES 1164

TNKSIZE5 WATER USED TO CLEAN TANKS 1501-2500 GALS

CATEGORY LABEL	CODE	ABSOLUTE FREQ	RELATIVE FREQ (PCT)	ADJUSTED FREQ (PCT)	CUM FREQ (PCT)
0 TO 60 GALS	A	114	8.3	60.3	60.3
61 TO 100 GALS	B	37	2.7	19.6	79.9
101 TO 200 GALS	C	18	1.3	9.5	89.4
OVER 200 GALS	D	20	1.5	10.6	100.0
		1185	86.2	MISSING	100.0
	TOTAL	1374	100.0	100.0	

VALID CASES 189 MISSING CASES 1185

TNKSIZE6 WATER USED TO CLEAN TANKS 2501 TO 6000 G

CATEGORY LABEL	CODE	ABSOLUTE FREQ	RELATIVE FREQ (PCT)	ADJUSTED FREQ (PCT)	CUM FREQ (PCT)
0 TO 60 GALS	A	61	4.4	48.0	48.0
61 TO 100 GALS	B	27	2.0	21.3	69.3
101 TO 200 GALS	C	21	1.5	16.5	85.8
OVER 200 GALS	D	18	1.3	14.2	100.0
		1247	90.8	MISSING	100.0
	TOTAL	1374	100.0	100.0	

VALID CASES 127 MISSING CASES 1247

TNKSIZE7 WATER USED TO CLEAN TANKS OVER 6000 GALS

CATEGORY LABEL	CODE	ABSOLUTE FREQ	RELATIVE FREQ (PCT)	ADJUSTED FREQ (PCT)	CUM FREQ (PCT)
0 TO 60 GALS	A	33	2.4	71.7	71.7
61 TO 100 GALS	B	5	0.4	10.9	82.6
101 TO 200 GALS	C	4	0.3	8.7	91.3
OVER 200 GALS	D	4	0.3	8.7	100.0
		1328	96.7	MISSING	100.0
	TOTAL	1374	100.0	100.0	

VALID CASES 46 MISSING CASES 1328

03/23/78 FILE - PAINT - CREATED 03/23/78

REDISTIL IS SPENT SOLVENT REDISTILLED

CATEGORY LABEL	CODE	ABSOLUTE FREQ	RELATIVE FREQ (PCT)	ADJUSTED FREQ (PCT)	CUM FREQ (PCT)
YES	A	492	35.8	40.9	40.9
NO	B	712	51.8	59.1	100.0
		170	12.4	MISSING	100.0
	TOTAL	1374	100.0	100.0	

VALID CASES 1204 MISSING CASES 170

ONSITE IS SPENT SOLVENT REDISTILLED ONSITE

CATEGORY LABEL	CODE	ABSOLUTE FREQ	RELATIVE FREQ (PCT)	ADJUSTED FREQ (PCT)	CUM FREQ (PCT)
YES	A	69	5.0	5.5	5.5
NO	B	1195	87.0	94.5	100.0
		110	8.0	MISSING	100.0
	TOTAL	1374	100.0	100.0	

VALID CASES 1264 MISSING CASES 110

STEAMINJ STEAM INJECTION DISTILLATION IS USED

CATEGORY LABEL	CODE	ABSOLUTE FREQ	RELATIVE FREQ (PCT)	ADJUSTED FREQ (PCT)	CUM FREQ (PCT)
YES	A	25	1.8	20.2	20.2
NO	B	99	7.2	79.8	100.0
		1250	91.0	MISSING	100.0
	TOTAL	1374	100.0	100.0	

VALID CASES 124 MISSING CASES 1250

STMCOND1 STEAM CONDENSATE IS DISCHARGED TO STORM

CATEGORY LABEL	CODE	ABSOLUTE FREQ	RELATIVE FREQ (PCT)	ADJUSTED FREQ (PCT)	CUM FREQ (PCT)
NO. OF PLANTS	A	2	0.1	100.0	100.0
		1372	99.9	MISSING	100.0
	TOTAL	1374	100.0	100.0	

VALID CASES 2 MISSING CASES 1372

STMCOND2 STEAM CONDENSATE DISCHARGED TO SANITARY

CATEGORY LABEL	CODE	ABSOLUTE FREQ	RELATIVE FREQ (PCT)	ADJUSTED FREQ (PCT)	CUM FREQ (PCT)
NO. OF PLANTS	B	15	1.1	100.0	100.0
		1359	98.9	MISSING	100.0
	TOTAL	1374	100.0	100.0	

VALID CASES 15 MISSING CASES 1359

STMCOND3 STEAM CONDENSATE MIXED WITH COOLING WATE

CATEGORY LABEL	CODE	ABSOLUTE FREQ	RELATIVE FREQ (PCT)	ADJUSTED FREQ (PCT)	CUM FREQ (PCT)
NO. OF PLANTS	C	4	0.3	100.0	100.0
		1370	99.7	MISSING	100.0
	TOTAL	1374	100.0	100.0	

VALID CASES 4 MISSING CASES 1370

STMCOND4 STEAM CONDENSATE MIXED WITH PROCESS WAST

CATEGORY LABEL	CODE	ABSOLUTE FREQ	RELATIVE FREQ (PCT)	ADJUSTED FREQ (PCT)	CUM FREQ (PCT)
NO. OF PLANTS	D	7	0.5	100.0	100.0
		1367	99.5	MISSING	100.0
	TOTAL	1374	100.0	100.0	

VALID CASES 7 MISSING CASES 1367

STMCOND5 STEAM CONDENSATE HAS OTHER DISPOSAL METH

CATEGORY LABEL	CODE	ABSOLUTE FREQ	RELATIVE FREQ (PCT)	ADJUSTED FREQ (PCT)	CUM FREQ (PCT)
NO. OF PLANTS	E	18	1.3	100.0	100.0
		1356	98.7	MISSING	100.0
	TOTAL	1374	100.0	100.0	

VALID CASES 18 MISSING CASES 1356

CSTCDSCH SPENT CAUSTIC IS DISCHARGED TO SANITARY

CATEGORY LABEL	CODE	ABSOLUTE FREQ	RELATIVE FREQ (PCT)	ADJUSTED FREQ (PCT)	CUM FREQ (PCT)
YES	A	91	6.6	21.1	21.1
NO	B	341	24.8	78.9	100.0
		942	68.6	MISSING	100.0
	TOTAL	1374	100.0	100.0	

VALID CASES 432 MISSING CASES 942

SOLVDSCH SPENT SOLVENT IS DISCHARGED TO SANITARY

CATEGORY LABEL	CODE	ABSOLUTE FREQ	RELATIVE FREQ (PCT)	ADJUSTED FREQ (PCT)	CUM FREQ (PCT)
YES	A	13	0.9	1.1	1.1
NO	B	1171	85.2	98.9	100.0
		190	13.8	MISSING	100.0
	TOTAL	1374	100.0	100.0	

VALID CASES 1184 MISSING CASES 190

SPRYBTHS PLANT OPERATES SPRAY BOOTHS

CATEGORY LABEL	CODE	ABSOLUTE FREQ	RELATIVE FREQ (PCT)	ADJUSTED FREQ (PCT)	CUM FREQ (PCT)
YES	A	27	2.0	2.0	2.0
NO	B	1323	96.3	98.0	100.0
		24	1.7	MISSING	100.0
	TOTAL	1374	100.0	100.0	

VALID CASES 1350 MISSING CASES 24

SCRBBERS PLANT OPERATES WET SCRUBBERS

CATEGORY LABEL	CODE	ABSOLUTE FREQ	RELATIVE FREQ (PCT)	ADJUSTED FREQ (PCT)	CUM FREQ (PCT)
YES	A	52	3.8	3.9	3.9
NO	B	1271	92.5	96.1	100.0
		51	3.7	MISSING	100.0
	TOTAL	1374	100.0	100.0	

VALID CASES 1323 MISSING CASES 51

AFTRBRNR PLANT USES AFTERBURNERS

CATEGORY LABEL	CODE	ABSOLUTE FREQ	RELATIVE FREQ (PCT)	ADJUSTED FREQ (PCT)	CUM FREQ (PCT)
NO. OF PLANTS	A	18	1.3	100.0	100.0
		1356	98.7	MISSING	100.0
	TOTAL	1374	100.0	100.0	

VALID CASES 18 MISSING CASES 1356

ELECPRCP PLANT OPERATES ELECTRCSTATIC PRECIPITATO

CATEGORY LABEL	CODE	ABSOLUTE FREQ	RELATIVE FREQ (PCT)	ADJUSTED FREQ (PCT)	CUM FREQ (PCT)
NO. CF PLANTS	B	6	0.4	100.0	100.0
		1368	99.6	MISSING	100.0
	TOTAL	1374	100.0	100.0	

VALID CASES 6 MISSING CASES 1368

BAGHOUSE PLANT USES BAGHOUSE COLLECTORS

CATEGORY LABEL	CODE	ABSOLUTE FREQ	RELATIVE FREQ (PCT)	ADJUSTED FREQ (PCT)	CUM FREQ (PCT)
NO. CF PLANTS	C	356	25.9	100.0	100.0
		1018	74.1	MISSING	100.0
	TOTAL	1374	100.0	100.0	

VALID CASES 356 MISSING CASES 1018

CYCLCNE PLANT OPERATES CYCLCNES

CATEGORY LABEL	CODE	ABSOLUTE FREQ	RELATIVE FREQ (PCT)	ADJUSTED FREQ (PCT)	CUM FREQ (PCT)
NO. CF PLANTS	D	61	4.4	100.0	100.0
		1313	95.6	MISSING	100.0
	TOTAL	1374	100.0	100.0	

VALID CASES 61 MISSING CASES 1313

03/23/78 FILE - PAINT - CREATED 03/23/78

FILTERS PLANT USES FILTERS FOR DUST CONTROL

CATEGORY LABEL	CODE	ABSOLUTE FREQ	RELATIVE FREQ (PCT)	ADJUSTED FREQ (PCT)	CUM FREQ (PCT)
NO. OF PLANTS	E	333	24.2	100.0	100.0
		1041	75.8	MISSING	100.0
	TOTAL	1374	100.0	100.0	

VALID CASES 333 MISSING CASES 1041

SOURCE1 WET SCRUBBER WASTE IS COMBINED

CATEGORY LABEL	CODE	ABSOLUTE FREQ	RELATIVE FREQ (PCT)	ADJUSTED FREQ (PCT)	CUM FREQ (PCT)
NO. OF PLANTS	A	24	1.7	100.0	100.0
		1350	98.3	MISSING	100.0
	TOTAL	1374	100.0	100.0	

VALID CASES 24 MISSING CASES 1350

SOURCE2 SPRAY BOOTH WASTE WATER IS COMBINED

CATEGORY LABEL	CODE	ABSOLUTE FREQ	RELATIVE FREQ (PCT)	ADJUSTED FREQ (PCT)	CUM FREQ (PCT)
NO. OF PLANTS	B	5	0.4	100.0	100.0
		1369	99.6	MISSING	100.0
	TOTAL	1374	100.0	100.0	

VALID CASES 5 MISSING CASES 1369

SOURCE3 BOILER BLOWDOWN IS COMBINED

CATEGORY LABEL	CODE	ABSOLUTE FREQ	RELATIVE FREQ (PCT)	ADJUSTED FREQ (PCT)	CUM FREQ (PCT)
NO. OF PLANTS	C	75	5.5	100.0	100.0
		1299	94.5	MISSING	100.0
	TOTAL	1374	100.0	100.0	

VALID CASES 75 MISSING CASES 1299

SOURCE4 BOILER CLEANING WASTE IS COMBINED

CATEGORY LABEL	CODE	ABSOLUTE FREQ	RELATIVE FREQ (PCT)	ADJUSTED FREQ (PCT)	CUM FREQ (PCT)
NO. OF PLANTS	D	34	2.5	100.0	100.0
		1340	97.5	MISSING	100.0
	TOTAL	1374	100.0	100.0	

VALID CASES 34 MISSING CASES 1340

SOURCE5 SANITARY WASTE WATER IS COMBINED

CATEGORY LABEL	CODE	ABSOLUTE FREQ	RELATIVE FREQ (PCT)	ADJUSTED FREQ (PCT)	CUM FREQ (PCT)
NO. OF PLANTS	E	162	11.8	100.0	100.0
		1212	88.2	MISSING	100.0
	TOTAL	1374	100.0	100.0	

VALID CASES 162 MISSING CASES 1212

SOURCE6 NON CONTACT COOLING WATER IS COMBINED

CATEGORY LABEL	CODE	ABSOLUTE FREQ	RELATIVE FREQ (PCT)	ADJUSTED FREQ (PCT)	CUM FREQ (PCT)
NO. OF PLANTS	F	100	7.3	100.0	100.0
		1274	92.7	MISSING	100.0
	TOTAL	1374	100.0	100.0	

VALID CASES 100 MISSING CASES 1274

SOURCE7 LABORATORY WASTEWATER IS COMBINED

CATEGORY LABEL	CODE	ABSOLUTE FREQ	RELATIVE FREQ (PCT)	ADJUSTED FREQ (PCT)	CUM FREQ (PCT)
NO. OF PLANTS	G	115	8.4	100.0	100.0
		1259	91.6	MISSING	100.0
	TOTAL	1374	100.0	100.0	

VALID CASES 115 MISSING CASES 1259

SOURCE8 STEAM CONDENSATE WASTEWATER IS COMBINED

CATEGORY LABEL	CODE	ABSOLUTE FREQ	RELATIVE FREQ (PCT)	ADJUSTED FREQ (PCT)	CUM FREQ (PCT)
NO. OF PLANTS	H	38	2.8	100.0	100.0
		1336	97.2	MISSING	100.0
	TOTAL	1374	100.0	100.0	

VALID CASES 38 MISSING CASES 1336

WSWTRGEN VOLUME OF RAW WASTEWATER GENERATED DAILY

CATEGORY LABEL	CODE	ABSOLUTE FREQ	RELATIVE FREQ (PCT)	ADJUSTED FREQ (PCT)	CUM FREQ (PCT)
0	A	339	24.7	27.0	27.0
1 TO 100 GPD	B	536	39.0	42.7	69.8
101 TO 500 GPD	C	156	11.4	12.4	82.2
501 TO 1000 GPD	D	56	4.1	4.5	86.7
1000 TO 6000 GPD	E	81	5.9	6.5	93.1
6K TO 12000 GPD	F	23	1.7	1.8	95.0
OVER 12000 GPD	G	63	4.6	5.0	100.0
		120	8.7	MISSING	100.0
	TOTAL	1374	100.0	100.0	

VALID CASES 1254 MISSING CASES 120

PEAKGEN PEAK VOLUME OF WASTEWATER GENERATED DAIL

CATEGORY LABEL	CODE	ABSOLUTE FREQ	RELATIVE FREQ (PCT)	ADJUSTED FREQ (PCT)	CUM FREQ (PCT)
0	A	235	17.1	21.7	21.7
1 TO 100 GPD	B	418	30.4	38.6	60.2
101 TO 500 GPD	C	184	13.4	17.0	77.2
501 TO 1000 GPD	D	76	5.5	7.0	84.2
1000 TO 6000 GPD	E	81	5.9	7.5	91.7
6K TO 12000 GPD	F	29	2.1	2.7	94.4
OVER 12000 GPD	G	61	4.4	5.6	100.0
		290	21.1	MISSING	100.0
	TOTAL	1374	100.0	100.0	

VALID CASES 1084 MISSING CASES 290

COMREUSE WASTEWATER DISPOSAL BY COMPLETE REUSE

CATEGORY LABEL	CODE	ABSOLUTE FREQ	RELATIVE FREQ (PCT)	ADJUSTED FREQ (PCT)	CUM FREQ (PCT)
NO. OF PLANTS	A	88	6.4	100.0	100.0
		1286	93.6	MISSING	100.0
	TOTAL	1374	100.0	100.0	

VALID CASES 88 MISSING CASES 1286

EVAPORTN EVAPORATION OF WASTEWATER

CATEGORY LABEL	CODE	ABSOLUTE FREQ	RELATIVE FREQ (PCT)	ADJUSTED FREQ (PCT)	CUM FREQ (PCT)
NO. OF PLANTS	B	125	9.1	100.0	100.0
		1249	90.9	MISSING	100.0
	TOTAL	1374	100.0	100.0	

VALID CASES 125 MISSING CASES 1249

PRTREUSE PARTIAL REUSE OF WASTEWATER

CATEGORY LABEL	CODE	ABSOLUTE FREQ	RELATIVE FREQ (PCT)	ADJUSTED FREQ (PCT)	CUM FREQ (PCT)
NO. OF PLANTS	C	262	19.1	100.0	100.0
		1112	80.9	MISSING	100.0
	TOTAL	1374	100.0	100.0	

VALID CASES 262 MISSING CASES 1112

CITYSEWR DISCHARGE OF WASTEWATER TO CITY SEWER

CATEGORY LABEL	CODE	ABSOLUTE FREQ	RELATIVE FREQ (PCT)	ADJUSTED FREQ (PCT)	CUM FREQ (PCT)
NO. OF PLANTS	D	475	34.6	100.0	100.0
		899	65.4	MISSING	100.0
	TOTAL	1374	100.0	100.0	

VALID CASES 475 MISSING CASES 899

STRMSEWR DISCHARGE OF WASTEWATER TO STORM SEWER

CATEGORY LABEL	CODE	ABSOLUTE FREQ	RELATIVE FREQ (PCT)	ADJUSTED FREQ (PCT)	CUM FREQ (PCT)
NO. OF PLANTS	E	68	4.9	100.0	100.0
		1306	95.1	MISSING	100.0
	TOTAL	1374	100.0	100.0	

VALID CASES 68 MISSING CASES 1306

RECVWATR DISCHARGE OF WASTEWATER TO RECEIVING STR

CATEGORY LABEL	CODE	ABSOLUTE FREQ	RELATIVE FREQ (PCT)	ADJUSTED FREQ (PCT)	CUM FREQ (PCT)
NO. OF PLANTS	F	13	0.9	100.0	100.0
		1361	99.1	MISSING	100.0
	TOTAL	1374	100.0	100.0	

VALID CASES 13 MISSING CASES 1361

STORAGE IMPOUNDMENT OF WASTEWATER ON PLANT PROPE

CATEGORY LABEL	CODE	ABSOLUTE FREQ	RELATIVE FREQ (PCT)	ADJUSTED FREQ (PCT)	CUM FREQ (PCT)
NO. OF PLANTS	G	87	6.3	100.0	100.0
		1287	93.7	MISSING	100.0
	TOTAL	1374	100.0	100.0	

VALID CASES 87 MISSING CASES 1287

INCINERT INCINERATION OF WASTEWATER

CATEGORY LABEL	CODE	ABSOLUTE FREQ	RELATIVE FREQ (PCT)	ADJUSTED FREQ (PCT)	CUM FREQ (PCT)
NO. OF PLANTS	H	5	0.4	100.0	100.0
		1369	99.6	MISSING	100.0
	TOTAL	1374	100.0	100.0	

VALID CASES 5 MISSING CASES 1369

HAULER WASTEWATER IS REMOVED BY A CONTRACT HAUL

CATEGORY LABEL	CODE	ABSOLUTE FREQ	RELATIVE FREQ (PCT)	ADJUSTED FREQ (PCT)	CUM FREQ (PCT)
NO. OF PLANTS	J	271	19.7	100.0	100.0
		1103	80.3	MISSING	100.0
	TOTAL	1374	100.0	100.0	

VALID CASES 271 MISSING CASES 1103

LANDFILL WASTEWATER IS LANDFILLED

CATEGORY LABEL	CODE	ABSOLUTE FREQ	RELATIVE FREQ (PCT)	ADJUSTED FREQ (PCT)	CUM FREQ (PCT)
NO. OF PLANTS	K	107	7.8	100.0	100.0
		1267	92.2	MISSING	100.0
	TOTAL	1374	100.0	100.0	

VALID CASES 107 MISSING CASES 1267

DEEPWELL WASTEWATER IS DISPOSED OF BY A WELL

CATEGORY LABEL	CODE	ABSOLUTE FREQ	RELATIVE FREQ (PCT)	ADJUSTED FREQ (PCT)	CUM FREQ (PCT)
NO. OF PLANTS	L	13	0.9	100.0	100.0
		1361	99.1	MISSING	100.0
	TOTAL	1374	100.0	100.0	

VALID CASES 13 MISSING CASES 1361

SPRAYIRR WASTEWATER IS USED FOR SPRAY IRRIGATION

CATEGORY LABEL	CODE	ABSOLUTE FREQ	RELATIVE FREQ (PCT)	ADJUSTED FREQ (PCT)	CUM FREQ (PCT)
NO. OF PLANTS	M	8	0.6	100.0	100.0
		1366	99.4	MISSING	100.0
	TOTAL	1374	100.0	100.0	

VALID CASES 8 MISSING CASES 1366

03/23/78 FILE - PAINT - CREATED 03/23/78

VLMDSCHG VOLUME OF PROCESS WASTE DISCHARGE GPD

CATEGORY LABEL	CODE	ABSOLUTE FREQ	RELATIVE FREQ (PCT)	ADJUSTED FREQ (PCT)	CUM FREQ (PCT)
0	A	608	44.3	48.6	48.6
1 TO 100 GPD	B	412	30.0	32.9	81.5
101 TO 500 GPD	C	111	8.1	8.9	90.3
501 TO 1000 GPD	D	26	1.9	2.1	92.4
1000 TO 6000 GPD	E	50	3.6	4.0	96.4
6K TO 12000 GPD	F	16	1.2	1.3	97.7
OVER 12000 GPD	G	29	2.1	2.3	100.0
		122	8.9	MISSING	100.0
	TOTAL	1374	100.0	100.0	

VALID CASES 1252 MISSING CASES 122

MAXDISCH MAXIMUM VOLUME OF PAINT WASTEWATER GPD

CATEGORY LABEL	CODE	ABSOLUTE FREQ	RELATIVE FREQ (PCT)	ADJUSTED FREQ (PCT)	CUM FREQ (PCT)
0	A	471	34.3	42.9	42.9
1 TO 100 GPD	B	343	25.0	31.2	74.1
101 TO 500 GPD	C	142	10.3	12.9	87.1
501 TO 1000 GPD	D	42	3.1	3.8	90.9
1000 TO 6000 GPD	E	47	3.4	4.3	95.2
6K TO 12000 GPD	F	23	1.7	2.1	97.3
OVER 12000 GPD	G	30	2.2	2.7	100.0
		276	20.1	MISSING	100.0
	TOTAL	1374	100.0	100.0	

VALID CASES 1098 MISSING CASES 276

NPDES PLANT HAS AN NPDES PERMIT

CATEGORY LABEL	CODE	ABSOLUTE FREQ	RELATIVE FREQ (PCT)	ADJUSTED FREQ (PCT)	CUM FREQ (PCT)
YES	A	30	2.2	9.4	9.4
NO	B	288	21.0	90.6	100.0
		1056	76.9	MISSING	100.0
	TOTAL	1374	100.0	100.0	

VALID CASES 318 MISSING CASES 1056

APPNPDES HAS PLANT APPLIED FOR AN NPDES PERMIT

CATEGORY LABEL	CODE	ABSOLUTE FREQ	RELATIVE FREQ (PCT)	ADJUSTED FREQ (PCT)	CUM FREQ (PCT)
YES	A	20	1.5	3.3	3.3
NO	B	579	42.1	96.7	100.0
		775	56.4	MISSING	100.0
	TOTAL	1374	100.0	100.0	

VALID CASES 599 MISSING CASES 775

RNFPERM PLANT HAS AN NPDES FOR COOLING WATER

CATEGORY LABEL	CODE	ABSOLUTE FREQ	RELATIVE FREQ (PCT)	ADJUSTED FREQ (PCT)	CUM FREQ (PCT)
YES	A	75	5.5	10.8	10.8
NO	B	619	45.1	89.2	100.0
		680	49.5	MISSING	100.0
	TOTAL	1374	100.0	100.0	

VALID CASES 694 MISSING CASES 680

ORDINANC MUNICIPALITY USES INDUSTRIAL ORDINANCE

CATEGORY LABEL	CODE	ABSOLUTE FREQ	RELATIVE FREQ (PCT)	ADJUSTED FREQ (PCT)	CUM FREQ (PCT)
YES	A	208	15.1	100.0	100.0
		1166	84.9	MISSING	100.0
	TOTAL	1374	100.0	100.0	

VALID CASES 208 MISSING CASES 1166

SURCHRG MUNICIPALITY USES SEWER SURCHARGES

CATEGORY LABEL	CODE	ABSOLUTE FREQ	RELATIVE FREQ (PCT)	ADJUSTED FREQ (PCT)	CUM FREQ (PCT)
YES	B	413	30.1	100.0	100.0
		961	69.9	MISSING	100.0
	TOTAL	1374	100.0	100.0	

VALID CASES 413 MISSING CASES 961

SAMPLING MUNICIPALITY PERFORMS WASTEWATER SAMPLIN

CATEGORY LABEL	CODE	ABSOLUTE FREQ	RELATIVE FREQ (PCT)	ADJUSTED FREQ (PCT)	CUM FREQ (PCT)
YES	C	206	15.0	100.0	100.0
		1168	85.0	MISSING	100.0
	TOTAL	1374	100.0	100.0	

VALID CASES 206 MISSING CASES 1168

PERMIT MUNICIPALITY UTILIZES PERMIT SYSTEM

CATEGORY LABEL	CODE	ABSOLUTE FREQ	RELATIVE FREQ (PCT)	ADJUSTED FREQ (PCT)	CUM FREQ (PCT)
YES	D	137	10.0	100.0	100.0
		1237	90.0	MISSING	100.0
	TOTAL	1374	100.0	100.0	

VALID CASES 137 MISSING CASES 1237

OWNSAMPL MUNICIPALITY REQUIRES PLANT TO ANALYZE W

CATEGORY LABEL	CODE	ABSOLUTE FREQ	RELATIVE FREQ (PCT)	ADJUSTED FREQ (PCT)	CUM FREQ (PCT)
YES	E	105	7.6	100.0	100.0
		1269	92.4	MISSING	100.0
	TOTAL	1374	100.0	100.0	

VALID CASES 105 MISSING CASES 1269

TREATMNT PLANT WASTEWATER TREATED BEFORE DISCHARG

CATEGORY LABEL	CODE	ABSOLUTE FREQ	RELATIVE FREQ (PCT)	ADJUSTED FREQ (PCT)	CUM FREQ (PCT)
YES	A	216	15.7	26.2	26.2
NO	B	609	44.3	73.8	100.0
		549	40.0	MISSING	100.0
	TOTAL	1374	100.0	100.0	

VALID CASES 825 MISSING CASES 549

PROCESSW PROCESS WASTEWATER AS PERCENT OF TOTAL

CATEGORY LABEL	CODE	ABSOLUTE FREQ	RELATIVE FREQ (PCT)	ADJUSTED FREQ (PCT)	CUM FREQ (PCT)
0	A	116	8.4	39.6	39.6
1 TO 20 %	B	46	3.3	15.7	55.3
21 TO 40%	C	8	0.6	2.7	58.0
41 TO 60 %	D	9	0.7	3.1	61.1
61 TO 80%	E	11	0.8	3.8	64.8
81 TO 99%	F	20	1.5	6.8	71.7
100%	G	83	6.0	28.3	100.0
		1081	78.7	MISSING	100.0
	TOTAL	1374	100.0	100.0	

VALID CASES 293 MISSING CASES 1081

RESINWST RESIN WASTEWATER AS PERCENT OF TOTAL

CATEGORY LABEL	CODE	ABSOLUTE FREQ	RELATIVE FREQ (PCT)	ADJUSTED FREQ (PCT)	CUM FREQ (PCT)
0	A	169	12.3	87.1	87.1
1 TO 20 %	B	8	0.6	4.1	91.2
21 TO 40%	C	8	0.6	4.1	95.4
41 TO 60 %	D	1	0.1	0.5	95.9
61 TO 80%	E	1	0.1	0.5	96.4
81 TO 99%	F	2	0.1	1.0	97.4
100%	G	5	0.4	2.6	100.0
		1180	85.9	MISSING	100.0
	TOTAL	1374	100.0	100.0	

VALID CASES 194 MISSING CASES 1180

BOILERWW BOILER BLOWDOWN AS PERCENT OF TOTAL

CATEGORY LABEL	CODE	ABSOLUTE FREQ	RELATIVE FREQ (PCT)	ADJUSTED FREQ (PCT)	CUM FREQ (PCT)
0	A	172	12.5	80.4	80.4
1 TO 20 %	B	31	2.3	14.5	94.9
21 TO 40%	C	2	0.1	0.9	95.8
61 TO 80%	E	1	0.1	0.5	96.3
81 TO 99%	F	1	0.1	0.5	96.7
100%	G	7	0.5	3.3	100.0
		1160	84.4	MISSING	100.0
	TOTAL	1374	100.0	100.0	

VALID CASES 214 MISSING CASES 1160

AIRPCLLW AIR POLLUTION WASTEWATER PERCENT OF TOTA

CATEGORY LABEL	CODE	ABSOLUTE FREQ	RELATIVE FREQ (PCT)	ADJUSTED FREQ (PCT)	CUM FREQ (PCT)
0	A	172	12.5	90.5	90.5
1 TO 20 %	B	7	0.5	3.7	94.2
21 TO 40%	C	1	0.1	0.5	94.7
41 TO 60 %	D	3	0.2	1.6	96.3
61 TO 80%	E	1	0.1	0.5	96.8
81 TO 99%	F	1	0.1	0.5	97.4
100%	G	5	0.4	2.6	100.0
		1184	86.2	MISSING	100.0
	TOTAL	1374	100.0	100.0	

VALID CASES 190 MISSING CASES 1184

SANITWAS SANITARY WASTEWATER AS PERCENT OF TOTAL

CATEGORY LABEL	CODE	ABSOLUTE FREQ	RELATIVE FREQ (PCT)	ADJUSTED FREQ (PCT)	CUM FREQ (PCT)
0	A	192	14.0	76.2	76.2
1 TO 20 %	B	26	1.9	10.3	86.5
21 TO 40%	C	6	0.4	2.4	88.9
41 TO 60 %	D	4	0.3	1.6	90.5
61 TO 80%	E	6	0.4	2.4	92.9
81 TO 99%	F	6	0.4	2.4	95.2
100%	G	12	0.9	4.8	100.0
		1122	81.7	MISSING	100.0
	TOTAL	1374	100.0	100.0	

VALID CASES 252 MISSING CASES 1122

03/23/78 FILE - PAINT - CREATED 03/23/78

COOLNGWW COOLING WASTEWATER AS PERCENT OF TOTAL

CATEGORY LABEL	CODE	ABSOLUTE FREQ	RELATIVE FREQ (PCT)	ADJUSTED FREQ (PCT)	CUM FREQ (PCT)
0	A	177	12.9	76.3	76.3
1 TO 20 %	B	19	1.4	8.2	84.5
21 TO 40%	C	9	0.7	3.9	88.4
41 TO 60 %	D	8	0.6	3.4	91.8
61 TO 80%	E	5	0.4	2.2	94.0
81 TO 99%	F	7	0.5	3.0	97.0
100%	G	7	0.5	3.0	100.0
		1142	83.1	MISSING	100.0
	TOTAL	1374	100.0	100.0	

VALID CASES 232 MISSING CASES 1142

OTHERWAS OTHER WASTEWATER SOURCE PERCENT OF TOTAL

CATEGORY LABEL	CODE	ABSOLUTE FREQ	RELATIVE FREQ (PCT)	ADJUSTED FREQ (PCT)	CUM FREQ (PCT)
0	A	88	6.4	89.8	89.8
1 TO 20 %	B	5	0.4	5.1	94.9
21 TO 40%	C	1	0.1	1.0	95.9
81 TO 99%	F	1	0.1	1.0	96.9
100%	G	3	0.2	3.1	100.0
		1276	92.9	MISSING	100.0
	TOTAL	1374	100.0	100.0	

VALID CASES 98 MISSING CASES 1276

TRTMNT1 WASTEWATER IS NEUTRALIZED

CATEGORY LABEL	CODE	ABSOLUTE FREQ	RELATIVE FREQ (PCT)	ADJUSTED FREQ (PCT)	CUM FREQ (PCT)
NO. OF PLANTS	A	53	3.9	100.0	100.0
		1321	96.1	MISSING	100.0
	TOTAL	1374	100.0	100.0	

VALID CASES 53 MISSING CASES 1321

TRTMNT2 WASTEWATER IS FILTERED

CATEGORY LABEL	CODE	ABSOLUTE FREQ	RELATIVE FREQ (PCT)	ADJUSTED FREQ (PCT)	CUM FREQ (PCT)
NO. OF PLANTS	B	28	2.0	100.0	100.0
		1346	98.0	MISSING	100.0
	TOTAL	1374	100.0	100.0	

VALID CASES 28 MISSING CASES 1346

TRTMNT3 WASTEWATER IS EVAPORATED

CATEGORY LABEL	CODE	ABSOLUTE FREQ	RELATIVE FREQ (PCT)	ADJUSTED FREQ (PCT)	CUM FREQ (PCT)
NO. OF PLANTS	C	87	6.3	100.0	100.0
		1287	93.7	MISSING	100.0
	TOTAL	1374	100.0	100.0	

VALID CASES 87 MISSING CASES 1287

TRTMNT4 WASTEWATER IS TREATED BY FLOTATION

CATEGORY LABEL	CODE	ABSOLUTE FREQ	RELATIVE FREQ (PCT)	ADJUSTED FREQ (PCT)	CUM FREQ (PCT)
	G	1	0.1	4.3	4.3
NO. OF PLANTS	D	22	1.6	95.7	100.0
		1351	98.3	MISSING	100.0
	TOTAL	1374	100.0	100.0	

VALID CASES 23 MISSING CASES 1351

TRTMNT5 WASTEWATER IS TREATED BY ACTIVATED SLUDG

CATEGORY LABEL	CODE	ABSOLUTE FREQ	RELATIVE FREQ (PCT)	ADJUSTED FREQ (PCT)	CUM FREQ (PCT)
NO. OF PLANTS	E	5	0.4	100.0	100.0
		1369	99.6	MISSING	100.0
	TOTAL	1374	100.0	100.0	

VALID CASES 5 MISSING CASES 1369

TRTMNT6 WASTEWATER IS TREATED BY A TRICKLING FIL

CATEGORY LABEL	CODE	ABSOLUTE FREQ	RELATIVE FREQ (PCT)	ADJUSTED FREQ (PCT)	CUM FREQ (PCT)
NO. OF PLANTS	F	3	0.2	100.0	100.0
		1371	99.8	MISSING	100.0
	TOTAL	1374	100.0	100.0	

VALID CASES 3 MISSING CASES 1371

TRTMNT7 WASTEWATER IS TREATED BY A LAGOON

CATEGORY LABEL	CODE	ABSOLUTE FREQ	RELATIVE FREQ (PCT)	ADJUSTED FREQ (PCT)	CUM FREQ (PCT)
NO. OF PLANTS	G	24	1.7	100.0	100.0
		1350	98.3	MISSING	100.0
	TOTAL	1374	100.0	100.0	

VALID CASES 24 MISSING CASES 1350

TRTMNT8 WASTEWATER UNDERGOES GRAVITY SEPARAT

CATEGORY LABEL	CODE	ABSOLUTE FREQ	RELATIVE FREQ (PCT)	ADJUSTED FREQ (PCT)	CUM FREQ (PCT)
NO. OF PLANTS	H	132	9.6	100.0	100.0
		1242	90.4	MISSING	100.0
	TOTAL	1374	100.0	100.0	

VALID CASES 132 MISSING CASES 1242

TRTMNT9 WASTEWATER IS TREATED BY CARBON ADSORPTI

CATEGORY LABEL	CODE	ABSOLUTE FREQ	RELATIVE FREQ (PCT)	ADJUSTED FREQ (PCT)	CUM FREQ (PCT)
		1374	100.0	MISSING	100.0
	TOTAL	1374	100.0	100.0	

VALID CASES 0 MISSING CASES 1374

TRTMNT10 WASTEWATER IS EQUALIZED

CATEGORY LABEL	CODE	ABSOLUTE FREQ	RELATIVE FREQ (PCT)	ADJUSTED FREQ (PCT)	CUM FREQ (PCT)
NO. OF PLANTS	J	10	0.7	100.0	100.0
		1364	99.3	MISSING	100.0
	TOTAL	1374	100.0	100.0	

VALID CASES 10 MISSING CASES 1364

TRTMNT11 WASTEWATER IS SETTLED

CATEGORY LABEL	CODE	ABSOLUTE FREQ	RELATIVE FREQ (PCT)	ADJUSTED FREQ (PCT)	CUM FREQ (PCT)
NO. OF PLANTS	K	158	11.5	100.0	100.0
		1216	88.5	MISSING	100.0
	TOTAL	1374	100.0	100.0	

VALID CASES 158 MISSING CASES 1216

TRTMNT12 WASTEWATER IS TREATED WITH ALUM

CATEGORY LABEL	CODE	ABSOLUTE FREQ	RELATIVE FREQ (PCT)	ADJUSTED FREQ (PCT)	CUM FREQ (PCT)
NO. OF PLANTS	L	28	2.0	100.0	100.0
		1346	98.0	MISSING	100.0
	TOTAL	1374	100.0	100.0	

VALID CASES 28 MISSING CASES 1346

TRTMNT13 WASTEWATER IS TREATED WITH LIME

CATEGORY LABEL	CODE	ABSOLUTE FREQ	RELATIVE FREQ (PCT)	ADJUSTED FREQ (PCT)	CUM FREQ (PCT)
	G	1	0.1	5.3	5.3
NO. OF PLANTS	M	18	1.3	94.7	100.0
		1355	98.6	MISSING	100.0
	TOTAL	1374	100.0	100.0	

VALID CASES 19 MISSING CASES 1355

TRTMNT14 WASTEWATER IS TRATED WITH POLYMER

CATEGORY LABEL	CODE	ABSOLUTE FREQ	RELATIVE FREQ (PCT)	ADJUSTED FREQ (PCT)	CUM FREQ (PCT)
NO. OF PLANTS	N	42	3.1	100.0	100.0
		1332	96.9	MISSING	100.0
	TOTAL	1374	100.0	100.0	

VALID CASES 42 MISSING CASES 1332

TRTMNT15 WASTEWATER UNDERGOES OTHER CHEM TREATMEN

CATEGORY LABEL	CODE	ABSOLUTE FREQ	RELATIVE FREQ (PCT)	ADJUSTED FREQ (PCT)	CUM FREQ (PCT)
NO. OF PLANTS	O	24	1.7	100.0	100.0
		1350	98.3	MISSING	100.0
	TOTAL	1374	100.0	100.0	

VALID CASES 24 MISSING CASES 1350

03/23/78 FILE - PAINT - CREATED 03/23/78

BATCHTRT WASTEWATER TREATMENT BATCH OR CONTINUOUS

CATEGORY LABEL	CODE	ABSOLUTE FREQ	RELATIVE FREQ (PCT)	ADJUSTED FREQ (PCT)	CUM FREQ (PCT)
BATCH	A	199	14.5	59.6	59.6
CONTINUOUS	B	135	9.8	40.4	100.0
		1040	75.7	MISSING	100.0
	TOTAL	1374	100.0	100.0	

VALID CASES 334 MISSING CASES 1040

BATCHDIS WASTEWATER DISCHARGE BATCH OR CONTINUOUS

CATEGORY LABEL	CODE	ABSOLUTE FREQ	RELATIVE FREQ (PCT)	ADJUSTED FREQ (PCT)	CUM FREQ (PCT)
BATCH	A	342	24.9	68.4	68.4
CONTINUOUS	B	158	11.5	31.6	100.0
		874	63.6	MISSING	100.0
	TOTAL	1374	100.0	100.0	

VALID CASES 500 MISSING CASES 874

SLDGTRT1 SLUDGE STORED ON PLANT PROPERTY

CATEGORY LABEL	CODE	ABSOLUTE FREQ	RELATIVE FREQ (PCT)	ADJUSTED FREQ (PCT)	CUM FREQ (PCT)
NO. OF PLANTS	A	40	2.9	100.0	100.0
		1334	97.1	MISSING	100.0
	TOTAL	1374	100.0	100.0	

VALID CASES 40 MISSING CASES 1334

SLDGTRT2 SLUDGE IS INCINERATED

CATEGORY LABEL	CODE	ABSOLUTE FREQ	RELATIVE FREQ (PCT)	ADJUSTED FREQ (PCT)	CUM FREQ (PCT)
NO. OF PLANTS	B	1	0.1	100.0	100.0
		1373	99.9	MISSING	100.0
	TOTAL	1374	100.0	100.0	

VALID CASES 1 MISSING CASES 1373

SLDGTRT3 SLUDGE IS SOLD

CATEGORY LABEL	CODE	ABSOLUTE FREQ	RELATIVE FREQ (PCT)	ADJUSTED FREQ (PCT)	CUM FREQ (PCT)
NO. OF PLANTS	C	2	0.1	100.0	100.0
		1372	99.9	MISSING	100.0
	TOTAL	1374	100.0	100.0	

VALID CASES 2 MISSING CASES 1372

SLDGTRT4 SLUDGE IS CONTRACT HAULED

CATEGORY LABEL	CODE	ABSOLUTE FREQ	RELATIVE FREQ (PCT)	ADJUSTED FREQ (PCT)	CUM FREQ (PCT)
NO. OF PLANTS	D	248	18.0	100.0	100.0
		1126	82.0	MISSING	100.0
	TOTAL	1374	100.0	100.0	

VALID CASES 248 MISSING CASES 1126

SLDGTRT5 SLUDGE IS RECLAIMED

CATEGORY LABEL	CODE	ABSOLUTE FREQ	RELATIVE FREQ (PCT)	ADJUSTED FREQ (PCT)	CUM FREQ (PCT)
NO. OF PLANTS	E	13	0.9	100.0	100.0
		1361	99.1	MISSING	100.0
	TOTAL	1374	100.0	100.0	

VALID CASES 13 MISSING CASES 1361

SLDGTRT6 SLUDGE IS TAKEN TO LANDFILL BY PLANT

CATEGORY LABEL	CODE	ABSOLUTE FREQ	RELATIVE FREQ (PCT)	ADJUSTED FREQ (PCT)	CUM FREQ (PCT)
	G	1	0.1	1.1	1.1
NO. OF PLANTS	F	90	6.6	98.9	100.0
		1283	93.4	MISSING	100.0
	TOTAL	1374	100.0	100.0	

VALID CASES 91 MISSING CASES 1283

SLDGCNDT IS SLUDGE CONDITIONED BEFORE DISPOSAL

CATEGORY LABEL	CODE	ABSOLUTE FREQ	RELATIVE FREQ (PCT)	ADJUSTED FREQ (PCT)	CUM FREQ (PCT)
YES	A	33	2.4	6.9	6.9
NO	B	443	32.2	93.1	100.0
		898	65.4	MISSING	100.0
	TOTAL	1374	100.0	100.0	

VALID CASES 476 MISSING CASES 898

SLDGDSP1 HAULER TAKES SLUDGE TO PUBLIC LANDFILL

CATEGORY LABEL	CODE	ABSOLUTE FREQ	RELATIVE FREQ (PCT)	ADJUSTED FREQ (PCT)	CUM FREQ (PCT)
YES	A	135	9.8	100.0	100.0
		1239	90.2	MISSING	100.0
	TOTAL	1374	100.0	100.0	

VALID CASES 135 MISSING CASES 1239

SLDGDSP2 HAULER TAKES SLUDGE TO PRIVATE LANDFILL

CATEGORY LABEL	CODE	ABSOLUTE FREQ	RELATIVE FREQ (PCT)	ADJUSTED FREQ (PCT)	CUM FREQ (PCT)
YES	B	212	15.4	100.0	100.0
		1162	84.6	MISSING	100.0
	TOTAL	1374	100.0	100.0	

VALID CASES 212 MISSING CASES 1162

SLDGDSP3 CONTRACTOR INCINERATES SLUDGE

CATEGORY LABEL	CODE	ABSOLUTE FREQ	RELATIVE FREQ (PCT)	ADJUSTED FREQ (PCT)	CUM FREQ (PCT)
YES	C	73	5.3	100.0	100.0
		1301	94.7	MISSING	100.0
	TOTAL	1374	100.0	100.0	

VALID CASES 73 MISSING CASES 1301

SLDGDSP4 CONTRACTOR RECLAIMS SLUDGE

CATEGORY LABEL	CODE	ABSOLUTE FREQ	RELATIVE FREQ (PCT)	ADJUSTED FREQ (PCT)	CUM FREQ (PCT)
YES	D	108	7.9	100.0	100.0
		1266	92.1	MISSING	100.0
	TOTAL	1374	100.0	100.0	

VALID CASES 108 MISSING CASES 1266

SLDGDSP5 UNKNOWN HOW CONTRACTER DISPOSES OF SLUDG

CATEGORY LABEL	CODE	ABSOLUTE FREQ	RELATIVE FREQ (PCT)	ADJUSTED FREQ (PCT)	CUM FREQ (PCT)
YES	E	267	19.4	100.0	100.0
		1107	80.6	MISSING	100.0
	TOTAL	1374	100.0	100.0	

VALID CASES 267 MISSING CASES 1107

PCNTSLDG PERCENT OF WASTEWATER ENDING AS SLUDGE

CATEGORY LABEL	CODE	ABSOLUTE FREQ	RELATIVE FREQ (PCT)	ADJUSTED FREQ (PCT)	CUM FREQ (PCT)
0 TO 5%	A	208	15.1	71.0	71.0
6 TO 10%	B	40	2.9	13.7	84.6
11 TO 15%	C	9	0.7	3.1	87.7
16 TO 20%	D	19	1.4	6.5	94.2
21 TO 25%	E	10	0.7	3.4	97.6
OVER 25%	F	7	0.5	2.4	100.0
		1081	78.7	MISSING	100.0
	TOTAL	1374	100.0	100.0	

VALID CASES 293 MISSING CASES 1081

OFFSPEC1 OFFSPEC BATCHES DISCHARGED WITH WASTEWAT

CATEGORY LABEL	CODE	ABSOLUTE FREQ	RELATIVE FREQ (PCT)	ADJUSTED FREQ (PCT)	CUM FREQ (PCT)
NO. OF PLANTS	A	17	1.2	100.0	100.0
		1357	98.8	MISSING	100.0
	TOTAL	1374	100.0	100.0	

VALID CASES 17 MISSING CASES 1357

03/23/78 FILE - PAINT - CREATED 03/23/78

OFFSPEC2 OFFSPEC BATCHES SOLD TO SCAVENGER

CATEGORY LABEL	CODE	ABSOLUTE FREQ	RELATIVE FREQ (PCT)	ADJUSTED FREQ (PCT)	CUM FREQ (PCT)
NO. OF PLANTS	B	192	14.0	100.0	100.0
		1182	86.0	MISSING	100.0
	TOTAL	1374	100.0	100.0	

VALID CASES 192 MISSING CASES 1182

OFFSPEC3 OFFSPEC BATCHES GIVEN TO SCAVENGER

CATEGORY LABEL	CODE	ABSOLUTE FREQ	RELATIVE FREQ (PCT)	ADJUSTED FREQ (PCT)	CUM FREQ (PCT)
NO. OF PLANTS	C	182	13.2	100.0	100.0
		1192	86.8	MISSING	100.0
	TOTAL	1374	100.0	100.0	

VALID CASES 182 MISSING CASES 1192

OFFSPEC4 OFFSPEC BATCHES USED IN OTHER PRODUCTS

CATEGORY LABEL	CODE	ABSOLUTE FREQ	RELATIVE FREQ (PCT)	ADJUSTED FREQ (PCT)	CUM FREQ (PCT)
NO. OF PLANTS	D	1074	78.2	100.0	100.0
		300	21.8	MISSING	100.0
	TOTAL	1374	100.0	100.0	

VALID CASES 1074 MISSING CASES 300

OFFSPEC5 OFFSPEC BATCHES SOLD AT REDUCED PRICES

CATEGORY LABEL	CODE	ABSOLUTE FREQ	RELATIVE FREQ (PCT)	ADJUSTED FREQ (PCT)	CUM FREQ (PCT)
NO. OF PLANTS	E	29	2.1	100.0	100.0
		1345	97.9	MISSING	100.0
	TOTAL	1374	100.0	100.0	

VALID CASES 29 MISSING CASES 1345

OFFSPEC6 OFFSPEC BATCHES LANDFILLED

CATEGORY LABEL	CODE	ABSOLUTE FREQ	RELATIVE FREQ (PCT)	ADJUSTED FREQ (PCT)	CUM FREQ (PCT)
NO. OF PLANTS	F	26	1.9	100.0	100.0
		1348	98.1	MISSING	100.0
	TOTAL	1374	100.0	100.0	

VALID CASES 26 MISSING CASES 1348

OFFSPEC7 OFFSPEC BATCHES INCINERATED

CATEGORY LABEL	CODE	ABSOLUTE FREQ	RELATIVE FREQ (PCT)	ADJUSTED FREQ (PCT)	CUM FREQ (PCT)
NO. OF PLANTS	G	5	0.4	100.0	100.0
		1369	99.6	MISSING	100.0
	TOTAL	1374	100.0	100.0	

VALID CASES 5 MISSING CASES 1369

OFFSPEC8 OFFSPEC BATCHES RECLAIMED FOR SOLVENTS

CATEGORY LABEL	CODE	ABSOLUTE FREQ	RELATIVE FREQ (PCT)	ADJUSTED FREQ (PCT)	CUM FREQ (PCT)
NO. OF PLANTS	H	8	0.6	100.0	100.0
		1366	99.4	MISSING	100.0
	TOTAL	1374	100.0	100.0	

VALID CASES 8 MISSING CASES 1366

OFFSPEC9 OFFSPEC BATCHES CONTRACT HAULED

CATEGORY LABEL	CODE	ABSOLUTE FREQ	RELATIVE FREQ (PCT)	ADJUSTED FREQ (PCT)	CUM FREQ (PCT)
NO. OF PLANTS	I	34	2.5	100.0	100.0
		1340	97.5	MISSING	100.0
	TOTAL	1374	100.0	100.0	

VALID CASES 34 MISSING CASES 1340

ANALYZE1 PLANT HAS PH DATA OF WASTEWATER

CATEGORY LABEL	CODE	ABSOLUTE FREQ	RELATIVE FREQ (PCT)	ADJUSTED FREQ (PCT)	CUM FREQ (PCT)
NO. OF PLANTS	A	183	13.3	100.0	100.0
		1191	86.7	MISSING	100.0
	TOTAL	1374	100.0	100.0	

VALID CASES 183 MISSING CASES 1191

03/23/78 FILE - PAINT - CREATED 03/23/78

ANALYZE2 PLANT HAS SUSP SOLIDS DATA OF WASTEWATER

CATEGORY LABEL	CODE	ABSOLUTE FREQ	RELATIVE FREQ (PCT)	ADJUSTED FREQ (PCT)	CUM FREQ (PCT)
NO. OF PLANTS	B	155	11.3	100.0	100.0
		1219	88.7	MISSING	100.0
	TOTAL	1374	100.0	100.0	

VALID CASES 155 MISSING CASES 1219

ANALYZE3 PLANT HAS OIL AND GREASE DATA OF WASTEWA

CATEGORY LABEL	CODE	ABSOLUTE FREQ	RELATIVE FREQ (PCT)	ADJUSTED FREQ (PCT)	CUM FREQ (PCT)
NO. OF PLANTS	C	97	7.1	100.0	100.0
		1277	92.9	MISSING	100.0
	TOTAL	1374	100.0	100.0	

VALID CASES 97 MISSING CASES 1277

ANALYZE4 PLANT HAS BOD DATA OF WASTEWATER

CATEGORY LABEL	CODE	ABSOLUTE FREQ	RELATIVE FREQ (PCT)	ADJUSTED FREQ (PCT)	CUM FREQ (PCT)
NO. OF PLANTS	D	129	9.4	100.0	100.0
		1245	90.6	MISSING	100.0
	TOTAL	1374	100.0	100.0	

VALID CASES 129 MISSING CASES 1245

03/23/78 FILE - PAINT - CREATED 03/23/78

ANALYZE5 PLANT HAS TOTAL SOLIDS DATA OF WASTEWATE

CATEGORY LABEL	CODE	ABSOLUTE FREQ	RELATIVE FREQ (PCT)	ADJUSTED FREQ (PCT)	CUM FREQ (PCT)
NO. OF PLANTS	E	122	8.9	100.0	100.0
		1252	91.1	MISSING	100.0
	TOTAL	1374	100.0	100.0	

VALID CASES 122 MISSING CASES 1252

ANALYZE6 PLANT HAS TURBIDITY DATA OF WASTEWATER

CATEGORY LABEL	CODE	ABSOLUTE FREQ	RELATIVE FREQ (PCT)	ADJUSTED FREQ (PCT)	CUM FREQ (PCT)
NO. OF PLANTS	F	45	3.3	100.0	100.0
		1329	96.7	MISSING	100.0
	TOTAL	1374	100.0	100.0	

VALID CASES 45 MISSING CASES 1329

ANALYZE7 PLANT HAS COD DATA OF WASTEWATER

CATEGORY LABEL	CODE	ABSOLUTE FREQ	RELATIVE FREQ (PCT)	ADJUSTED FREQ (PCT)	CUM FREQ (PCT)
NO. OF PLANTS	G	96	7.0	100.0	100.0
		1278	93.0	MISSING	100.0
	TOTAL	1374	100.0	100.0	

VALID CASES 96 MISSING CASES 1278

03/23/78 FILE - PAINT - CREATED 03/23/78

ANALYZE8 PLANT HAS METALS DATA OF WASTEWATER

CATEGORY LABEL	CODE	ABSOLUTE FREQ	RELATIVE FREQ (PCT)	ADJUSTED FREQ (PCT)	CUM FREQ (PCT)
NO. OF PLANTS	H	119	8.7	100.0	100.0
		1255	91.3	MISSING	100.0
	TOTAL	1374	100.0	100.0	

VALID CASES 119 MISSING CASES 1255

ANALYZE9 PLANT HAS TRACE ORGANICS DATA

CATEGORY LABEL	CODE	ABSOLUTE FREQ	RELATIVE FREQ (PCT)	ADJUSTED FREQ (PCT)	CUM FREQ (PCT)
NO. OF PLANTS	I	41	3.0	100.0	100.0
		1333	97.0	MISSING	100.0
	TOTAL	1374	100.0	100.0	

VALID CASES 41 MISSING CASES 1333

03/23/78 FILE - PAINT - CREATED 03/23/78

NEWINVES NEW CAPITAL COSTS TO MEET BASELINE REGS

CATEGORY LABEL	CODE	ABSOLUTE FREQ	RELATIVE FREQ (PCT)	ADJUSTED FREQ (PCT)	CUM FREQ (PCT)
	100.	1	0.1	0.7	0.7
	200.	1	0.1	0.7	1.3
	500.	1	0.1	0.7	2.0
	1000.	4	0.3	2.6	4.6
	1500.	1	0.1	0.7	5.3
	2000.	1	0.1	0.7	5.9
	2500.	2	0.1	1.3	7.2
	3000.	3	0.2	2.0	9.2
	3500.	1	0.1	0.7	9.9
	4000.	4	0.3	2.6	12.5
	4500.	1	0.1	0.7	13.2
	5000.	14	1.0	9.2	22.4
	6000.	1	0.1	0.7	23.0
	7000.	3	0.2	2.0	25.0
	7500.	3	0.2	2.0	27.0
	8000.	1	0.1	0.7	27.6
	8400.	1	0.1	0.7	28.3
	10000.	17	1.2	11.2	39.5
	12000.	2	0.1	1.3	40.8
	15000.	4	0.3	2.6	43.4
	17000.	1	0.1	0.7	44.1
	20000.	7	0.5	4.6	48.7
	21000.	1	0.1	0.7	49.3

22000.	1	0.1	0.7	50.0
25000.	10	0.7	6.6	56.6
30000.	6	0.4	3.9	60.5
35000.	3	0.2	2.0	62.5
37000.	1	0.1	0.7	63.2
40000.	1	0.1	0.7	63.8
45000.	1	0.1	0.7	64.5
50000.	18	1.3	11.8	76.3
55000.	1	0.1	0.7	77.0
60000.	1	0.1	0.7	77.6
70000.	1	0.1	0.7	78.3
75000.	5	0.4	3.3	81.6
80000.	1	0.1	0.7	82.2
100000.	9	0.7	5.9	88.2
125000.	1	0.1	0.7	88.8
130000.	1	0.1	0.7	89.5
140000.	1	0.1	0.7	90.1
150000.	2	0.1	1.3	91.4
155000.	1	0.1	0.7	92.1
200000.	5	0.4	3.3	95.4
250000.	2	0.1	1.3	96.7
300000.	1	0.1	0.7	97.4
900000.	1	0.1	0.7	98.0
1000000.	3	0.2	2.0	100.0
0.	1222	88.9	MISSING	100.0
TOTAL	1374	100.0	100.0	

03/23/78 FILE - PAINT - CREATED 03/23/78

NEWOPCST OPERATING COSTS TO MEET BASELINE REGS

CATEGORY LABEL	CODE	ABSOLUTE FREQ	RELATIVE FREQ (PCT)	ADJUSTED FREQ (PCT)	CUM FREQ (PCT)
	75.	1	0.1	0.6	0.6
	100.	2	0.1	1.2	1.8
	105.	1	0.1	0.6	2.4
	150.	1	0.1	0.6	3.0
	200.	2	0.1	1.2	4.2
	250.	2	0.1	1.2	5.4
	270.	1	0.1	0.6	6.0
	300.	1	0.1	0.6	6.5
	400.	2	0.1	1.2	7.7
	500.	9	0.7	5.4	13.1
	800.	1	0.1	0.6	13.7
	850.	2	0.1	1.2	14.9
	1000.	13	0.9	7.7	22.6
	1200.	7	0.5	4.2	26.8
	1500.	2	0.1	1.2	28.0
	1600.	1	0.1	0.6	28.6
	2000.	5	0.4	3.0	31.5
	2500.	5	0.4	3.0	34.5
	3000.	8	0.6	4.8	39.3
	3500.	1	0.1	0.6	39.9
	3600.	1	0.1	0.6	40.5
	4000.	2	0.1	1.2	41.7
	5000.	23	1.7	13.7	55.4

5500.	1	0.1	0.6	56.0
6000.	5	0.4	3.0	58.9
7500.	2	0.1	1.2	60.1
8000.	4	0.3	2.4	62.5
8750.	1	0.1	0.6	63.1
9000.	2	0.1	1.2	64.3
10000.	15	1.1	8.9	73.2
10800.	1	0.1	0.6	73.8
11000.	1	0.1	0.6	74.4
12000.	1	0.1	0.6	75.0
15000.	6	0.4	3.6	78.6
16000.	2	0.1	1.2	79.8
17000.	2	0.1	1.2	81.0
18000.	1	0.1	0.6	81.5
20000.	2	0.1	1.2	82.7
23000.	1	0.1	0.6	83.3
25000.	6	0.4	3.6	86.9
26000.	1	0.1	0.6	87.5
30000.	3	0.2	1.8	89.3
35000.	1	0.1	0.6	89.9
40000.	2	0.1	1.2	91.1
45000.	2	0.1	1.2	92.3
50000.	6	0.4	3.6	95.8
60000.	1	0.1	0.6	96.4
75000.	1	0.1	0.6	97.0
80000.	1	0.1	0.6	97.6
100000.	2	0.1	1.2	98.8

175000.	1	0.1	0.6	99.4
200000.	1	0.1	0.6	100.0
0.	1206	87.8	MISSING	100.0
TOTAL	1374	100.0	100.0	

REGAREA1 NEW INVESTMENT REQUIRED FOR ODOR CONTROL

CATEGORY LABEL	CODE	ABSOLUTE FREQ	RELATIVE FREQ (PCT)	ADJUSTED FREQ (PCT)	CUM FREQ (PCT)
NO. OF PLANTS	A	48	3.5	100.0	100.0
		1326	96.5	MISSING	100.0
	TOTAL	1374	100.0	100.0	

VALID CASES 48 MISSING CASES 1326

REGAREA2 NEW INVESTMENT REQUIRED FOR THERMAL POLL

CATEGORY LABEL	CODE	ABSOLUTE FREQ	RELATIVE FREQ (PCT)	ADJUSTED FREQ (PCT)	CUM FREQ (PCT)
NO. OF PLANTS	B	13	0.9	100.0	100.0
		1361	99.1	MISSING	100.0
	TOTAL	1374	100.0	100.0	

VALID CASES 13 MISSING CASES 1361

03/23/78 FILE - PAINT - CREATED 03/23/78

REGAREA3 NEW INVESTMENT REQUIRED FOR SOLID WASTE

CATEGORY LABEL	CODE	ABSOLUTE FREQ	RELATIVE FREQ (PCT)	ADJUSTED FREQ (PCT)	CUM FREQ (PCT)
NO. OF PLANTS	C	274	19.9	100.0	100.0
		1100	80.1	MISSING	100.0
	TOTAL	1374	100.0	100.0	

VALID CASES 274 MISSING CASES 1100

REGAREA4 NEW INVESTMENT REQUIRED FOR OSHA REGULAT

CATEGORY LABEL	CODE	ABSOLUTE FREQ	RELATIVE FREQ (PCT)	ADJUSTED FREQ (PCT)	CUM FREQ (PCT)
NO. OF PLANTS	D	351	25.5	100.0	100.0
		1023	74.5	MISSING	100.0
	TOTAL	1374	100.0	100.0	

VALID CASES 351 MISSING CASES 1023

REGAREA5 NEW INVESTMENT REQUIRED FOR AIR POLLUTIO

CATEGORY LABEL	CODE	ABSOLUTE FREQ	RELATIVE FREQ (PCT)	ADJUSTED FREQ (PCT)	CUM FREQ (PCT)
NO. OF PLANTS	E	353	25.7	100.0	100.0
		1021	74.3	MISSING	100.0
	TOTAL	1374	100.0	100.0	

VALID CASES 353 MISSING CASES 1021

03/23/78 FILE - PAINT - CREATED 03/23/78

REGAREA6 NEW INVESTMENT REQUIRED FOR TSCA CONTROL

CATEGORY LABEL	CODE	ABSOLUTE FREQ	RELATIVE FREQ (PCT)	ADJUSTED FREQ (PCT)	CUM FREQ (PCT)
NO. OF PLANTS	F	221	16.1	100.0	100.0
		1153	83.9	MISSING	100.0
	TOTAL	1374	100.0	100.0	

VALID CASES 221 MISSING CASES 1153

REGAREA7 NEW INVESTMENT REQUIRED FOR SAFE DRINKIN

CATEGORY LABEL	CODE	ABSOLUTE FREQ	RELATIVE FREQ (PCT)	ADJUSTED FREQ (PCT)	CUM FREQ (PCT)
NO. OF PLANTS	G	26	1.9	100.0	100.0
		1348	98.1	MISSING	100.0
	TOTAL	1374	100.0	100.0	

VALID CASES 26 MISSING CASES 1348

03/23/78 FILE - PRINT - CREATED 03/23/78

OTHRCAP NEW INVESTMENT REQUIRED FOR ALL GOVT REG

CATEGORY LABEL	CODE	ABSOLUTE FREQ	RELATIVE FREQ (PCT)	ADJUSTED FREQ (PCT)	CUM FREQ (PCT)
	5.	1	0.1	0.3	0.3
	100.	2	0.1	0.7	1.0
	200.	1	0.1	0.3	1.4
	500.	3	0.2	1.0	2.4
	1000.	3	0.2	1.0	3.4
	2000.	1	0.1	0.3	3.8
	2500.	1	0.1	0.3	4.1
	3000.	5	0.4	1.7	5.8
	3500.	1	0.1	0.3	6.2
	4000.	5	0.4	1.7	7.9
	4500.	1	0.1	0.3	8.2
	5000.	17	1.2	5.8	14.1
	6000.	5	0.4	1.7	15.8
	7000.	2	0.1	0.7	16.5
	7500.	4	0.3	1.4	17.9
	8000.	3	0.2	1.0	18.9
	10000.	33	2.4	11.3	30.2
	11000.	1	0.1	0.3	30.6
	12000.	1	0.1	0.3	30.9
	12500.	1	0.1	0.3	31.3
	15000.	11	0.8	3.8	35.1
	16000.	1	0.1	0.3	35.4
	17500.	1	0.1	0.3	35.7

18000.	2	0.1	0.7	36.4
20000.	21	1.5	7.2	43.6
21000.	1	0.1	0.3	44.0
24000.	2	0.1	0.7	44.7
25000.	17	1.2	5.8	50.5
30000.	15	1.1	5.2	55.7
31000.	1	0.1	0.3	56.0
32000.	1	0.1	0.3	56.4
33000.	1	0.1	0.3	56.7
35000.	5	0.4	1.7	58.4
39000.	1	0.1	0.3	58.8
40000.	7	0.5	2.4	61.2
50000.	24	1.7	8.2	69.4
60000.	2	0.1	0.7	70.1
61000.	1	0.1	0.3	70.4
65000.	2	0.1	0.7	71.1
70000.	2	0.1	0.7	71.8
72000.	1	0.1	0.3	72.2
75000.	4	0.3	1.4	73.5
80000.	3	0.2	1.0	74.6
100000.	22	1.6	7.6	82.1
120000.	1	0.1	0.3	82.5
125000.	1	0.1	0.3	82.8
136000.	1	0.1	0.3	83.2
140000.	1	0.1	0.3	83.5
150000.	10	0.7	3.4	86.9
178000.	1	0.1	0.3	87.3

200000.	7	0.5	2.4	89.7
225000.	1	0.1	0.3	90.0
250000.	5	0.4	1.7	91.8
300000.	4	0.3	1.4	93.1
350000.	3	0.2	1.0	94.2
400000.	3	0.2	1.0	95.2
500000.	8	0.6	2.7	97.9
600000.	2	0.1	0.7	98.6
750000.	1	0.1	0.3	99.0
1500000.	1	0.1	0.3	99.3
2000000.	2	0.1	0.7	100.0
0.	1083	78.8	MISSING	100.0
TOTAL	1374	100.0	100.0	

03/23/78 FILE - PAINT - CREATED 03/23/78

OTHROPRG ANNUAL OPERATING COSTS FOR ALL GOVT REGS

CATEGORY LABEL	CODE	ABSOLUTE FREQ	RELATIVE FREQ (PCT)	ADJUSTED FREQ (PCT)	CUM FREQ (PCT)
	2.	1	0.1	0.4	0.4
	50.	1	0.1	0.4	0.7
	75.	1	0.1	0.4	1.1
	100.	4	0.3	1.5	2.6
	200.	1	0.1	0.4	3.0
	250.	1	0.1	0.4	3.3
	300.	3	0.2	1.1	4.4
	350.	1	0.1	0.4	4.8
	400.	2	0.1	0.7	5.5
	500.	12	0.9	4.4	10.0
	600.	3	0.2	1.1	11.1
	750.	2	0.1	0.7	11.8
	1000.	17	1.2	6.3	18.1
	1200.	3	0.2	1.1	19.2
	1500.	6	0.4	2.2	21.4
	1750.	1	0.1	0.4	21.8
	1800.	1	0.1	0.4	22.1
	1900.	1	0.1	0.4	22.5
	2000.	22	1.6	8.1	30.6
	2300.	1	0.1	0.4	31.0
	2400.	1	0.1	0.4	31.4
	2500.	8	0.6	3.0	34.3
	3000.	13	0.9	4.8	39.1

3500.	1	0.1	0.4	39.5
4000.	10	0.7	3.7	43.2
4500.	2	0.1	0.7	43.9
5000.	31	2.3	11.4	55.4
5400.	1	0.1	0.4	55.7
5500.	1	0.1	0.4	56.1
6000.	2	0.1	0.7	56.8
6500.	2	0.1	0.7	57.6
7000.	2	0.1	0.7	58.3
8000.	3	0.2	1.1	59.4
9000.	1	0.1	0.4	59.8
10000.	24	1.7	8.9	68.6
10400.	1	0.1	0.4	69.0
12000.	3	0.2	1.1	70.1
12500.	2	0.1	0.7	70.8
14000.	1	0.1	0.4	71.2
15000.	8	0.6	3.0	74.2
15250.	1	0.1	0.4	74.5
17500.	1	0.1	0.4	74.9
18000.	1	0.1	0.4	75.3
20000.	13	0.9	4.8	80.1
23000.	1	0.1	0.4	80.4
25000.	10	0.7	3.7	84.1
30000.	6	0.4	2.2	86.3
31000.	1	0.1	0.4	86.7
35000.	2	0.1	0.7	87.5
36700.	1	0.1	0.4	87.8

37500.	1	0.1	0.4	88.2
40000.	4	0.3	1.5	89.7
44000.	1	0.1	0.4	90.0
45000.	1	0.1	0.4	90.4
50000.	11	0.8	4.1	94.5
52000.	1	0.1	0.4	94.8
70000.	1	0.1	0.4	95.2
75000.	1	0.1	0.4	95.6
80000.	3	0.2	1.1	96.7
90000.	1	0.1	0.4	97.0
100000.	3	0.2	1.1	98.2
120000.	2	0.1	0.7	98.9
130000.	1	0.1	0.4	99.3
200000.	1	0.1	0.4	99.6
250000.	1	0.1	0.4	100.0
0.	1103	80.3	MISSING	100.0
TOTAL	1374	100.0	100.0	

RM1 WHITE LEAD PIGMENT

CATEGORY LABEL	CODE	ABSOLUTE FREQ	RELATIVE FREQ (PCT)	ADJUSTED FREQ (PCT)	CUM FREQ (PCT)
NO. PLANTS USING	A	160	11.6	100.0	100.0
		1214	88.4	MISSING	100.0
	TOTAL	1374	100.0	100.0	

VALID CASES 160 MISSING CASES 1214

RM2 ANTIMONY OXIDE

CATEGORY LABEL	CODE	ABSOLUTE FREQ	RELATIVE FREQ (PCT)	ADJUSTED FREQ (PCT)	CUM FREQ (PCT)
NO. PLANTS USING	B	166	12.1	100.0	100.0
		1208	87.9	MISSING	100.0
	TOTAL	1374	100.0	100.0	

VALID CASES 166 MISSING CASES 1208

RM3 ZINC SULFIDE

CATEGORY LABEL	CODE	ABSOLUTE FREQ	RELATIVE FREQ (PCT)	ADJUSTED FREQ (PCT)	CUM FREQ (PCT)
NO. PLANTS USING	C	77	5.6	100.0	100.0
		1297	94.4	MISSING	100.0
	TOTAL	1374	100.0	100.0	

VALID CASES 77 MISSING CASES 1297

RM4 ZINC OXIDE

CATEGORY LABEL	CODE	ABSOLUTE FREQ	RELATIVE FREQ (PCT)	ADJUSTED FREQ (PCT)	CUM FREQ (PCT)
NO. PLANTS USING	D	721	52.5	100.0	100.0
		653	47.5	MISSING	100.0
	TOTAL	1374	100.0	100.0	

VALID CASES 721 MISSING CASES 653

03/23/78 FILE - PAINT - CREATED 03/23/78

RM5 ZINC OXIDE

CATEGORY LABEL	CODE	ABSOLUTE FREQ	RELATIVE FREQ (PCT)	ADJUSTED FREQ (PCT)	CUM FREQ (PCT)
NO. PLANTS USING	E	345	25.1	100.0	100.0
		1029	74.9	MISSING	100.0
	TOTAL	1374	100.0	100.0	

VALID CASES 345 MISSING CASES 1029

RM6 ZINC YELLOW

CATEGORY LABEL	CODE	ABSOLUTE FREQ	RELATIVE FREQ (PCT)	ADJUSTED FREQ (PCT)	CUM FREQ (PCT)
NO. PLANTS USING	F	633	46.1	100.0	100.0
		741	53.9	MISSING	100.0
	TOTAL	1374	100.0	100.0	

VALID CASES 633 MISSING CASES 741

RM7 ZINC DUST

CATEGORY LABEL	CODE	ABSOLUTE FREQ	RELATIVE FREQ (PCT)	ADJUSTED FREQ (PCT)	CUM FREQ (PCT)
NO. PLANTS USING	G	318	23.1	100.0	100.0
		1056	76.9	MISSING	100.0
	TOTAL	1374	100.0	100.0	

VALID CASES 318 MISSING CASES 1056

03/23/78 FILE - PAINT - CREATED 03/23/78

RM8 MISC NI AG CU PB OR BRONZE

CATEGORY LABEL	CODE	ABSOLUTE FREQ	RELATIVE FREQ (PCT)	ADJUSTED FREQ (PCT)	CUM FREQ (PCT)
NO. PLANTS USING	H	296	21.5	100.0	100.0
		1078	78.5	MISSING	100.0
	TOTAL	1374	100.0	100.0	

VALID CASES 296 MISSING CASES 1078

RM9 CADMIUM RED

CATEGORY LABEL	CODE	ABSOLUTE FREQ	RELATIVE FREQ (PCT)	ADJUSTED FREQ (PCT)	CUM FREQ (PCT)
NO. PLANTS USING	A	183	13.3	100.0	100.0
		1191	86.7	MISSING	100.0
	TOTAL	1374	100.0	100.0	

VALID CASES 183 MISSING CASES 1191

RM10 CADMIUM

CATEGORY LABEL	CODE	ABSOLUTE FREQ	RELATIVE FREQ (PCT)	ADJUSTED FREQ (PCT)	CUM FREQ (PCT)
NO. PLANTS USING	B	68	4.9	100.0	100.0
		1306	95.1	MISSING	100.0
	TOTAL	1374	100.0	100.0	

VALID CASES 68 MISSING CASES 1306

03/23/78 FILE - PAINT - CREATED 03/23/78

RM11 CADMIUM YELLOW ORANGE

CATEGORY LABEL	CODE	ABSOLUTE FREQ	RELATIVE FREQ (PCT)	ADJUSTED FREQ (PCT)	CUM FREQ (PCT)
NO. PLANTS USING	C	160	11.6	100.0	100.0
		1214	88.4	MISSING	100.0
	TOTAL	1374	100.0	100.0	

VALID CASES 160 MISSING CASES 1214

RM12 CHROME GREEN

CATEGORY LABEL	CODE	ABSOLUTE FREQ	RELATIVE FREQ (PCT)	ADJUSTED FREQ (PCT)	CUM FREQ (PCT)
NO. PLANTS USING	D	456	33.2	100.0	100.0
		918	66.8	MISSING	100.0
	TOTAL	1374	100.0	100.0	

VALID CASES 456 MISSING CASES 918

RM13 CHROMIUM OXIDE

CATEGORY LABEL	CODE	ABSOLUTE FREQ	RELATIVE FREQ (PCT)	ADJUSTED FREQ (PCT)	CUM FREQ (PCT)
NO. PLANTS USING	E	77	5.6	100.0	100.0
		1297	94.4	MISSING	100.0
	TOTAL	1374	100.0	100.0	

VALID CASES 77 MISSING CASES 1297

03/23/78 FILE - PAINT - CREATED 03/23/78

RM14 CHROMIUM OXIDE

CATEGORY LABEL	CODE	ABSOLUTE FREQ	RELATIVE FREQ (PCT)	ADJUSTED FREQ (PCT)	CUM FREQ (PCT)
NO. PLANTS USING	F	617	44.9	100.0	100.0
		757	55.1	MISSING	100.0
	TOTAL	1374	100.0	100.0	

VALID CASES 617 MISSING CASES 757

RM15 CHROME YELLOW

CATEGORY LABEL	CODE	ABSOLUTE FREQ	RELATIVE FREQ (PCT)	ADJUSTED FREQ (PCT)	CUM FREQ (PCT)
NO. PLANTS USING	G	858	62.4	100.0	100.0
		516	37.6	MISSING	100.0
	TOTAL	1374	100.0	100.0	

VALID CASES 858 MISSING CASES 516

RM16 CHROME ORANGE

CATEGORY LABEL	CODE	ABSOLUTE FREQ	RELATIVE FREQ (PCT)	ADJUSTED FREQ (PCT)	CUM FREQ (PCT)
NO. PLANTS USING	H	178	13.0	100.0	100.0
		1196	87.0	MISSING	100.0
	TOTAL	1374	100.0	100.0	

VALID CASES 178 MISSING CASES 1196

03/23/78 FILE - PAINT - CREATED 03/23/78

RM17 MOLYBDATE ORANGE WITH CR OR PB

CATEGORY LABEL	CODE	ABSOLUTE FREQ	RELATIVE FREQ (PCT)	ADJUSTED FREQ (PCT)	CUM FREQ (PCT)
NO. PLANTS USING	I	721	52.5	100.0	100.0
		653	47.5	MISSING	100.0
	TOTAL	1374	100.0	100.0	

VALID CASES 721 MISSING CASES 653

RM18 LEAD

CATEGORY LABEL	CODE	ABSOLUTE FREQ	RELATIVE FREQ (PCT)	ADJUSTED FREQ (PCT)	CUM FREQ (PCT)
NO. PLANTS USING	J	398	29.0	100.0	100.0
		976	71.0	MISSING	100.0
	TOTAL	1374	100.0	100.0	

VALID CASES 398 MISSING CASES 976

RM19 LEAD

CATEGORY LABEL	CODE	ABSOLUTE FREQ	RELATIVE FREQ (PCT)	ADJUSTED FREQ (PCT)	CUM FREQ (PCT)
NO. PLANTS USING	K	5	0.4	100.0	100.0
		1369	99.6	MISSING	100.0
	TOTAL	1374	100.0	100.0	

VALID CASES 5 MISSING CASES 1369

03/23/78 FILE - PAINT - CREATED 03/23/78

RM20 SILVER BLUE

CATEGORY LABEL	CODE	ABSOLUTE FREQ	RELATIVE FREQ (PCT)	ADJUSTED FREQ (PCT)	CUM FREQ (PCT)
NO. OF PLANTS USING	L	207	15.1	100.0	100.0
		1167	84.9	MISSING	100.0
	TOTAL	1374	100.0	100.0	

VALID CASES 207 MISSING CASES 1167

RM21 IRON BLUE WITH CYANIDES

CATEGORY LABEL	CODE	ABSOLUTE FREQ	RELATIVE FREQ (PCT)	ADJUSTED FREQ (PCT)	CUM FREQ (PCT)
NO. PLANTS USING	M	543	39.5	100.0	100.0
		831	60.5	MISSING	100.0
	TOTAL	1374	100.0	100.0	

VALID CASES 543 MISSING CASES 831

RM22 ZINC OR CHROMIUM BROWN GREY

CATEGORY LABEL	CODE	ABSOLUTE FREQ	RELATIVE FREQ (PCT)	ADJUSTED FREQ (PCT)	CUM FREQ (PCT)
NO. PLANTS USING	N	32	2.3	100.0	100.0
		1342	97.7	MISSING	100.0
	TOTAL	1374	100.0	100.0	

VALID CASES 32 MISSING CASES 1342

03/23/78 FILE - PAINT - CREATED 03/23/78

RM23 PHTHALOCYANINE BLUE

CATEGORY LABEL	CODE	ABSOLUTE FREQ	RELATIVE FREQ (PCT)	ADJUSTED FREQ (PCT)	CUM FREQ (PCT)
NO. PLANTS USING	O	795	57.9	100.0	100.0
		579	42.1	MISSING	100.0
	TOTAL	1374	100.0	100.0	

VALID CASES 795 MISSING CASES 579

RM24 PHTHALOCYANINE GREEN

CATEGORY LABEL	CODE	ABSOLUTE FREQ	RELATIVE FREQ (PCT)	ADJUSTED FREQ (PCT)	CUM FREQ (PCT)
NO. PLANTS USING	P	772	56.2	100.0	100.0
		602	43.8	MISSING	100.0
	TOTAL	1374	100.0	100.0	

VALID CASES 772 MISSING CASES 602

RM25 CHROMIUM PIGMENTS

CATEGORY LABEL	CODE	ABSOLUTE FREQ	RELATIVE FREQ (PCT)	ADJUSTED FREQ (PCT)	CUM FREQ (PCT)
NO. PLANTS USING	A	258	18.8	100.0	100.0
		1116	81.2	MISSING	100.0
	TOTAL	1374	100.0	100.0	

VALID CASES 258 MISSING CASES 1116

03/23/78 FILE - PAINT - CREATED 03/23/78

RM26 ZINC PIGMENTS

CATEGORY LABEL	CODE	ABSOLUTE FREQ	RELATIVE FREQ (PCT)	ADJUSTED FREQ (PCT)	CUM FREQ (PCT)
NO. PLANTS USING	B	280	20.4	100.0	100.0
		1094	79.6	MISSING	100.0
	TOTAL	1374	100.0	100.0	

VALID CASES 280 MISSING CASES 1094

RM27 LEAD PIGMENTS

CATEGORY LABEL	CODE	ABSOLUTE FREQ	RELATIVE FREQ (PCT)	ADJUSTED FREQ (PCT)	CUM FREQ (PCT)
NO. PLANTS USING	C	364	26.5	100.0	100.0
		1010	73.5	MISSING	100.0
	TOTAL	1374	100.0	100.0	

VALID CASES 364 MISSING CASES 1010

RM28 DICHLOROBENZIDENE DIARYLIDE ORANGE TONER

CATEGORY LABEL	CODE	ABSOLUTE FREQ	RELATIVE FREQ (PCT)	ADJUSTED FREQ (PCT)	CUM FREQ (PCT)
NO. PLANTS USING	D	304	22.1	100.0	100.0
		1070	77.9	MISSING	100.0
	TOTAL	1374	100.0	100.0	

VALID CASES 304 MISSING CASES 1070

RM29 DICHLOROBENZIDENE DIARYLIDE YELLOW TONER

CATEGORY LABEL	CODE	ABSOLUTE FREQ	RELATIVE FREQ (PCT)	ADJUSTED FREQ (PCT)	CUM FREQ (PCT)
NO. PLANTS USING	E	144	10.5	100.0	100.0
		1230	89.5	MISSING	100.0
	TOTAL	1374	100.0	100.0	

VALID CASES 144 MISSING CASES 1230

RM30 PYRAZOLONE RED

CATEGORY LABEL	CODE	ABSOLUTE FREQ	RELATIVE FREQ (PCT)	ADJUSTED FREQ (PCT)	CUM FREQ (PCT)
NO. PLANTS USING	F	58	4.2	100.0	100.0
		1316	95.8	MISSING	100.0
	TOTAL	1374	100.0	100.0	

VALID CASES 58 MISSING CASES 1316

RM31 MISC RED WITH ZINC,CR, OR PB

CATEGORY LABEL	CODE	ABSOLUTE FREQ	RELATIVE FREQ (PCT)	ADJUSTED FREQ (PCT)	CUM FREQ (PCT)
NO. PLANTS USING	G	80	5.8	100.0	100.0
		1294	94.2	MISSING	100.0
	TOTAL	1374	100.0	100.0	

VALID CASES 80 MISSING CASES 1294

RM32 MISC YELLOW WITH ANTIMONY OR CHROMIUM

CATEGORY LABEL	CODE	ABSOLUTE FREQ	RELATIVE FREQ (PCT)	ADJUSTED FREQ (PCT)	CUM FREQ (PCT)
NO. PLANTS USING	H	44	3.2	100.0	100.0
		1330	96.8	MISSING	100.0
	TOTAL	1374	100.0	100.0	

VALID CASES 44 MISSING CASES 1330

RM33 MISC YELLOW WITH CU OR DICHLOROBENZIDENE

CATEGORY LABEL	CODE	ABSOLUTE FREQ	RELATIVE FREQ (PCT)	ADJUSTED FREQ (PCT)	CUM FREQ (PCT)
NO. PLANTS USING	I	24	1.7	100.0	100.0
		1350	98.3	MISSING	100.0
	TOTAL	1374	100.0	100.0	

VALID CASES 24 MISSING CASES 1350

RM34 MISC YELLOW WITH NICKEL

CATEGORY LABEL	CODE	ABSOLUTE FREQ	RELATIVE FREQ (PCT)	ADJUSTED FREQ (PCT)	CUM FREQ (PCT)
NO. PLANTS USING	J	156	11.4	100.0	100.0
		1218	88.6	MISSING	100.0
	TOTAL	1374	100.0	100.0	

VALID CASES 156 MISSING CASES 1218

RM35 MISC CHROMIUM BLUE

CATEGORY LABEL	CODE	ABSOLUTE FREQ	RELATIVE FREQ (PCT)	ADJUSTED FREQ (PCT)	CUM FREQ (PCT)
NO. PLANTS USING	K	27	2.0	100.0	100.0
		1347	98.0	MISSING	100.0
	TOTAL	1374	100.0	100.0	

VALID CASES 27 MISSING CASES 1347

RM36 MISC CADMIUM BLUES

CATEGORY LABEL	CODE	ABSOLUTE FREQ	RELATIVE FREQ (PCT)	ADJUSTED FREQ (PCT)	CUM FREQ (PCT)
NO. OF PLANTS USING	L	10	0.7	100.0	100.0
		1364	99.3	MISSING	100.0
	TOTAL	1374	100.0	100.0	

VALID CASES 10 MISSING CASES 1364

RM37 MISC COPPER BLACK

CATEGORY LABEL	CODE	ABSOLUTE FREQ	RELATIVE FREQ (PCT)	ADJUSTED FREQ (PCT)	CUM FREQ (PCT)
NO. PLANTS USING	M	43	3.1	100.0	100.0
		1331	96.9	MISSING	100.0
	TOTAL	1374	100.0	100.0	

VALID CASES 43 MISSING CASES 1331

03/23/78 FILE - PAINT - CREATED 03/23/78

RM38 MISC CHROMIUM BLACK

CATEGORY LABEL	CODE	ABSOLUTE FREQ	RELATIVE FREQ (PCT)	ADJUSTED FREQ (PCT)	CUM FREQ (PCT)
NO. PLANTS USING	N	22	1.6	100.0	100.0
		1352	98.4	MISSING	100.0
	TOTAL	1374	100.0	100.0	

VALID CASES 22 MISSING CASES 1352

RM39 MISC ANTIMONY LEAD OR ZINC YELLOW

CATEGORY LABEL	CODE	ABSOLUTE FREQ	RELATIVE FREQ (PCT)	ADJUSTED FREQ (PCT)	CUM FREQ (PCT)
NO. PLANTS USING	O	61	4.4	100.0	100.0
		1313	95.6	MISSING	100.0
	TOTAL	1374	100.0	100.0	

VALID CASES 61 MISSING CASES 1313

RM40 ANTIMONY WHITE AQUEOUS DISP

CATEGORY LABEL	CODE	ABSOLUTE FREQ	RELATIVE FREQ (PCT)	ADJUSTED FREQ (PCT)	CUM FREQ (PCT)
NO. PLANTS USING	P	5	0.4	100.0	100.0
		1369	99.6	MISSING	100.0
	TOTAL	1374	100.0	100.0	

VALID CASES 5 MISSING CASES 1369

03/23/78 FILE - PAINT - CREATED 03/23/78

RM41 DICHLOROBENZIDENE RED AQ

CATEGORY LABEL	CODE	ABSOLUTE FREQ	RELATIVE FREQ (PCT)	ADJUSTED FREQ (PCT)	CUM FREQ (PCT)
NO. PLANTS USING	Q	16	1.2	100.0	100.0
		1358	98.8	MISSING	100.0
	TOTAL	1374	100.0	100.0	

VALID CASES 16 MISSING CASES 1358

RM42 DICHLOROBENZIDENE YELLOW AQ

CATEGORY LABEL	CODE	ABSOLUTE FREQ	RELATIVE FREQ (PCT)	ADJUSTED FREQ (PCT)	CUM FREQ (PCT)
NO. PLANTS USING	R	76	5.5	100.0	100.0
		1298	94.5	MISSING	100.0
	TOTAL	1374	100.0	100.0	

VALID CASES 76 MISSING CASES 1298

RM43 MISC GREEN WITH CR OR CU

CATEGORY LABEL	CODE	ABSOLUTE FREQ	RELATIVE FREQ (PCT)	ADJUSTED FREQ (PCT)	CUM FREQ (PCT)
NO. PLANTS USING	S	49	3.6	100.0	100.0
		1325	96.4	MISSING	100.0
	TOTAL	1374	100.0	100.0	

VALID CASES 49 MISSING CASES 1325

03/23/78 FILE - PAINT - CREATED 03/23/78

RM44 LEAD OR CHROME YELLOW AQ

CATEGORY LABEL	CODE	ABSOLUTE FREQ	RELATIVE FREQ (PCT)	ADJUSTED FREQ (PCT)	CUM FREQ (PCT)
NO. PLANTS USING	T	141	10.3	100.0	100.0
		1233	89.7	MISSING	100.0
	TOTAL	1374	100.0	100.0	

VALID CASES 141 MISSING CASES 1233

RM45 NICKEL OR CADMIUM YELLOW AQ

CATEGORY LABEL	CODE	ABSOLUTE FREQ	RELATIVE FREQ (PCT)	ADJUSTED FREQ (PCT)	CUM FREQ (PCT)
NO. PLANTS USING	A	23	1.7	100.0	100.0
		1351	98.3	MISSING	100.0
	TOTAL	1374	100.0	100.0	

VALID CASES 23 MISSING CASES 1351

RM46 ORANGE LEAD AQ

CATEGORY LABEL	CODE	ABSOLUTE FREQ	RELATIVE FREQ (PCT)	ADJUSTED FREQ (PCT)	CUM FREQ (PCT)
NO. PLANTS USING	B	97	7.1	100.0	100.0
		1277	92.9	MISSING	100.0
	TOTAL	1374	100.0	100.0	

VALID CASES 97 MISSING CASES 1277

RM47 DICLOROBENZIDENE ORANGE AQ

CATEGORY LABEL	CODE	ABSOLUTE FREQ	RELATIVE FREQ (PCT)	ADJUSTED FREQ (PCT)	CUM FREQ (PCT)
NO. PLANTS USING	C	51	3.7	100.0	100.0
		1323	96.3	MISSING	100.0
	TOTAL	1374	100.0	100.0	

VALID CASES 51 MISSING CASES 1323

RM48 COPPER OF CYANIDE GREEN AQ

CATEGORY LABEL	CODE	ABSOLUTE FREQ	RELATIVE FREQ (PCT)	ADJUSTED FREQ (PCT)	CUM FREQ (PCT)
NO. PLANTS USING	D	449	32.7	100.0	100.0
		925	67.3	MISSING	100.0
	TOTAL	1374	100.0	100.0	

VALID CASES 449 MISSING CASES 925

RM49 CHROMIUM GREEN AQ

CATEGORY LABEL	CODE	ABSOLUTE FREQ	RELATIVE FREQ (PCT)	ADJUSTED FREQ (PCT)	CUM FREQ (PCT)
NO. PLANTS USING	E	241	17.5	100.0	100.0
		1133	82.5	MISSING	100.0
	TOTAL	1374	100.0	100.0	

VALID CASES 241 MISSING CASES 1133

03/23/78 FILE - PAINT - CREATED 03/23/78

RM50 COPPER OR CYANIDE BLUE AQ

CATEGORY LABEL	CODE	ABSOLUTE FREQ	RELATIVE FREQ (PCT)	ADJUSTED FREQ (PCT)	CUM FREQ (PCT)
NO. PLANTS USING	F	492	35.8	100.0	100.0
		882	64.2	MISSING	100.0
	TOTAL	1374	100.0	100.0	

VALID CASES 492 MISSING CASES 882

RM51 SILVER BLUE AQ

CATEGORY LABEL	CODE	ABSOLUTE FREQ	RELATIVE FREQ (PCT)	ADJUSTED FREQ (PCT)	CUM FREQ (PCT)
NO. PLANTS USING	G	28	2.0	100.0	100.0
		1346	98.0	MISSING	100.0
	TOTAL	1374	100.0	100.0	

VALID CASES 28 MISSING CASES 1346

RM52 BLUE SILVER NON AQ

CATEGORY LABEL	CODE	ABSOLUTE FREQ	RELATIVE FREQ (PCT)	ADJUSTED FREQ (PCT)	CUM FREQ (PCT)
NO. PLANTS USING	H	43	3.1	100.0	100.0
		1331	96.9	MISSING	100.0
	TOTAL	1374	100.0	100.0	

VALID CASES 43 MISSING CASES 1331

RM53 READ LEAD NON AQ

CATEGORY LABEL	CODE	ABSOLUTE FREQ	RELATIVE FREQ (PCT)	ADJUSTED FREQ (PCT)	CUM FREQ (PCT)
NO. PLANTS USING	I	139	10.1	100.0	100.0
		1235	89.9	MISSING	100.0
	TOTAL	1374	100.0	100.0	

VALID CASES 139 MISSING CASES 1235

RM54 CADMIUM OR SELENIUM RED NON AQ

CATEGORY LABEL	CODE	ABSOLUTE FREQ	RELATIVE FREQ (PCT)	ADJUSTED FREQ (PCT)	CUM FREQ (PCT)
NO. PLANTS USING	J	37	2.7	100.0	100.0
		1337	97.3	MISSING	100.0
	TOTAL	1374	100.0	100.0	

VALID CASES 37 MISSING CASES 1337

RM55 LEAD OR CHROMIUM YELLOW NON AQ

CATEGORY LABEL	CODE	ABSOLUTE FREQ	RELATIVE FREQ (PCT)	ADJUSTED FREQ (PCT)	CUM FREQ (PCT)
NO. PLANTS USING	K	345	25.1	100.0	100.0
		1029	74.9	MISSING	100.0
	TOTAL	1374	100.0	100.0	

VALID CASES 345 MISSING CASES 1029

RM56 DICHLOROBENZIDENE YELLOW NON AQ

CATEGORY LABEL	CODE	ABSOLUTE FREQ	RELATIVE FREQ (PCT)	ADJUSTED FREQ (PCT)	CUM FREQ (PCT)
NO. OF PLANTS USING	L	81	5.9	100.0	100.0
		1293	94.1	MISSING	100.0
	TOTAL	1374	100.0	100.0	

VALID CASES 81 MISSING CASES 1293

RM57 LEAD OR CHROME ORANGE NON AQ

CATEGORY LABEL	CODE	ABSOLUTE FREQ	RELATIVE FREQ (PCT)	ADJUSTED FREQ (PCT)	CUM FREQ (PCT)
NO. PLANTS USING	M	297	21.6	100.0	100.0
		1077	78.4	MISSING	100.0
	TOTAL	1374	100.0	100.0	

VALID CASES 297 MISSING CASES 1077

RM58 LEAD OR CHROMIUM GREEN NON AQ

CATEGORY LABEL	CODE	ABSOLUTE FREQ	RELATIVE FREQ (PCT)	ADJUSTED FREQ (PCT)	CUM FREQ (PCT)
NO. PLANTS USING	N	148	10.8	100.0	100.0
		1226	89.2	MISSING	100.0
	TOTAL	1374	100.0	100.0	

VALID CASES 148 MISSING CASES 1226

RM59 LEAD OR CHROMIUM BLUE NON AQ

CATEGORY LABEL	CODE	ABSOLUTE FREQ	RELATIVE FREQ (PCT)	ADJUSTED FREQ (PCT)	CUM FREQ (PCT)
NO. PLANTS USING	0	34	2.5	100.0	100.0
		1340	97.5	MISSING	100.0
	TOTAL	1374	100.0	100.0	

VALID CASES 34 MISSING CASES 1340

RM60 COPPER OR CYANIDE GREEN NON AQ

CATEGORY LABEL	CODE	ABSOLUTE FREQ	RELATIVE FREQ (PCT)	ADJUSTED FREQ (PCT)	CUM FREQ (PCT)
NO. PLANTS USING	A	527	38.4	100.0	100.0
		847	61.6	MISSING	100.0
	TOTAL	1374	100.0	100.0	

VALID CASES 527 MISSING CASES 847

RM61 ASBESTOS

CATEGORY LABEL	CODE	ABSOLUTE FREQ	RELATIVE FREQ (PCT)	ADJUSTED FREQ (PCT)	CUM FREQ (PCT)
NO. PLANTS USING	B	218	15.9	100.0	100.0
		1156	84.1	MISSING	100.0
	TOTAL	1374	100.0	100.0	

VALID CASES 218 MISSING CASES 1156

RM62 BLUE WITH COPPER OR CYANIDE NON AQ

CATEGORY LABEL	CODE	ABSOLUTE FREQ	RELATIVE FREQ (PCT)	ADJUSTED FREQ (PCT)	CUM FREQ (PCT)
NO. PLANTS USING	C	526	38.3	100.0	100.0
		848	61.7	MISSING	100.0
	TOTAL	1374	100.0	100.0	

VALID CASES 526 MISSING CASES 848

RM63 SILVER BLUE NON AQ

CATEGORY LABEL	CODE	ABSOLUTE FREQ	RELATIVE FREQ (PCT)	ADJUSTED FREQ (PCT)	CUM FREQ (PCT)
NO. PLANTS USING	D	43	3.1	100.0	100.0
		1331	96.9	MISSING	100.0
	TOTAL	1374	100.0	100.0	

VALID CASES 43 MISSING CASES 1331

RM64 LEAD DRIERS

CATEGORY LABEL	CODE	ABSOLUTE FREQ	RELATIVE FREQ (PCT)	ADJUSTED FREQ (PCT)	CUM FREQ (PCT)
NO. PLANTS USING	A	679	49.4	100.0	100.0
		695	50.6	MISSING	100.0
	TOTAL	1374	100.0	100.0	

VALID CASES 679 MISSING CASES 695

RM65 ZINC DRIERS

CATEGORY LABEL	CODE	ABSOLUTE FREQ	RELATIVE FREQ (PCT)	ADJUSTED FREQ (PCT)	CUM FREQ (PCT)
NO. PLANTS USING	B	531	38.6	100.0	100.0
		843	61.4	MISSING	100.0
	TOTAL	1374	100.0	100.0	

VALID CASES 531 MISSING CASES 843

RM66 MISC DRIERS

CATEGORY LABEL	CODE	ABSOLUTE FREQ	RELATIVE FREQ (PCT)	ADJUSTED FREQ (PCT)	CUM FREQ (PCT)
NO. PLANTS USING	C	178	13.0	100.0	100.0
		1196	87.0	MISSING	100.0
	TOTAL	1374	100.0	100.0	

VALID CASES 178 MISSING CASES 1196

RM67 NAPHTHENATE DRIERS

CATEGORY LABEL	CODE	ABSOLUTE FREQ	RELATIVE FREQ (PCT)	ADJUSTED FREQ (PCT)	CUM FREQ (PCT)
NO. PLANTS USING	D	772	56.2	100.0	100.0
		602	43.8	MISSING	100.0
	TOTAL	1374	100.0	100.0	

VALID CASES 772 MISSING CASES 602

RM68 ZINC SOAPS

CATEGORY LABEL	CODE	ABSOLUTE FREQ	RELATIVE FREQ (PCT)	ADJUSTED FREQ (PCT)	CUM FREQ (PCT)
NO. PLANTS USING	E	513	37.3	100.0	100.0
		861	62.7	MISSING	100.0
	TOTAL	1374	100.0	100.0	

VALID CASES 513 MISSING CASES 861

RM69 LEAD SOAPS

CATEGORY LABEL	CODE	ABSOLUTE FREQ	RELATIVE FREQ (PCT)	ADJUSTED FREQ (PCT)	CUM FREQ (PCT)
NO. PLANTS USING	F	22	1.6	100.0	100.0
		1352	98.4	MISSING	100.0
	TOTAL	1374	100.0	100.0	

VALID CASES 22 MISSING CASES 1352

RM70 DI N BUTYL PHTHALATE PLASTICIZERS

CATEGORY LABEL	CODE	ABSOLUTE FREQ	RELATIVE FREQ (PCT)	ADJUSTED FREQ (PCT)	CUM FREQ (PCT)
NO. PLANTS USING	G	354	25.8	100.0	100.0
		1020	74.2	MISSING	100.0
	TOTAL	1374	100.0	100.0	

VALID CASES 354 MISSING CASES 1020

RM71 DIMETHYL PHTHALATE PLASTICIZERS

CATEGORY LABEL	CODE	ABSOLUTE FREQ	RELATIVE FREQ (PCT)	ADJUSTED FREQ (PCT)	CUM FREQ (PCT)
NO. PLANTS USING	H	51	3.7	100.0	100.0
		1323	96.3	MISSING	100.0
	TOTAL	1374	100.0	100.0	

VALID CASES 51 MISSING CASES 1323

RM72 DIETHYL PHTHALATE PLASTICIZERS

CATEGORY LABEL	CODE	ABSOLUTE FREQ	RELATIVE FREQ (PCT)	ADJUSTED FREQ (PCT)	CUM FREQ (PCT)
NO. PLANTS USING	I	22	1.6	100.0	100.0
		1352	98.4	MISSING	100.0
	TOTAL	1374	100.0	100.0	

VALID CASES 22 MISSING CASES 1352

RM73 DI 2 ETHYL HEXYL PHTHALATE PLASTICIZERS

CATEGORY LABEL	CODE	ABSOLUTE FREQ	RELATIVE FREQ (PCT)	ADJUSTED FREQ (PCT)	CUM FREQ (PCT)
NO. PLANTS USING	J	338	24.6	100.0	100.0
		1036	75.4	MISSING	100.0
	TOTAL	1374	100.0	100.0	

VALID CASES 338 MISSING CASES 1036

03/23/78 FILE - PAINT - CREATED 03/23/78

RM74 LEAD STABILIZERS

CATEGORY LABEL	CODE	ABSOLUTE FREQ	RELATIVE FREQ (PCT)	ADJUSTED FREQ (PCT)	CUM FREQ (PCT)
NO. PLANTS USING	K	66	4.8	100.0	100.0
		1308	95.2	MISSING	100.0
	TOTAL	1374	100.0	100.0	

VALID CASES 66 MISSING CASES 1308

RM75 ZINC OR CADMIUM STABILIZERS

CATEGORY LABEL	CODE	ABSOLUTE FREQ	RELATIVE FREQ (PCT)	ADJUSTED FREQ (PCT)	CUM FREQ (PCT)
NO. PLANTS USING	A	82	6.0	100.0	100.0
		1292	94.0	MISSING	100.0
	TOTAL	1374	100.0	100.0	

VALID CASES 82 MISSING CASES 1292

RM76 LEAD OR PHENOL STABILIZER

CATEGORY LABEL	CODE	ABSOLUTE FREQ	RELATIVE FREQ (PCT)	ADJUSTED FREQ (PCT)	CUM FREQ (PCT)
NO. PLANTS USING	B	141	10.3	100.0	100.0
		1233	89.7	MISSING	100.0
	TOTAL	1374	100.0	100.0	

VALID CASES 141 MISSING CASES 1233

03/23/78 FILE - PAINT - CREATED 03/23/78

RM77 PHENOL WETTING AGENTS RM78 MISC W

CATEGORY LABEL	CODE	ABSOLUTE FREQ	RELATIVE FREQ (PCT)	ADJUSTED FREQ (PCT)	CUM FREQ (PCT)
NO. PLANTS USING	C	56	4.1	100.0	100.0
		1318	95.9	MISSING	100.0
	TOTAL	1374	100.0	100.0	

VALID CASES 56 MISSING CASES 1318

RM78

CATEGORY LABEL	CODE	ABSOLUTE FREQ	RELATIVE FREQ (PCT)	ADJUSTED FREQ (PCT)	CUM FREQ (PCT)
NO. PLANTS USING	D	118	8.6	100.0	100.0
		1256	91.4	MISSING	100.0
	TOTAL	1374	100.0	100.0	

VALID CASES 118 MISSING CASES 1256

RM79 TOLUENE VISCOSITY AGENTS

CATEGORY LABEL	CODE	ABSOLUTE FREQ	RELATIVE FREQ (PCT)	ADJUSTED FREQ (PCT)	CUM FREQ (PCT
NO. PLANTS USING	E	94	6.8	100.0	100.0
		1280	93.2	MISSING	100.0
	TOTAL	1374	100.0	100.0	

VALID CASES 94 MISSING CASES 1280

RM80 PHENOL ANTI SKIN AGENTS

CATEGORY LABEL	CODE	ABSOLUTE FREQ	RELATIVE FREQ (PCT)	ADJUSTED FREQ (PCT)	CUM FREQ (PCT)
NO. PLANTS USING	F	401	29.2	100.0	100.0
		973	70.8	MISSING	100.0
	TOTAL	1374	100.0	100.0	

VALID CASES 401 MISSING CASES 973

RM81 COPPER PRESERVATIVES

CATEGORY LABEL	CODE	ABSOLUTE FREQ	RELATIVE FREQ (PCT)	ADJUSTED FREQ (PCT)	CUM FREQ (PCT)
NO. PLANTS USING	G	139	10.1	100.0	100.0
		1235	89.9	MISSING	100.0
	TOTAL	1374	100.0	100.0	

VALID CASES 139 MISSING CASES 1235

RM82 MERCURY PRESERVATIVES

CATEGORY LABEL	CODE	ABSOLUTE FREQ	RELATIVE FREQ (PCT)	ADJUSTED FREQ (PCT)	CUM FREQ (PCT)
NO. PLANTS USING	H	586	42.6	100.0	100.0
		788	57.4	MISSING	100.0
	TOTAL	1374	100.0	100.0	

VALID CASES 586 MISSING CASES 788

03/23/78 FILE - PAINT - CREATED 03/23/78

RM83 PCP PRESERVATIVES

CATEGORY LABEL	CODE	ABSOLUTE FREQ	RELATIVE FREQ (PCT)	ADJUSTED FREQ (PCT)	CUM FREQ (PCT)
NO. PLANTS USING	I	190	13.8	100.0	100.0
		1184	86.2	MISSING	100.0
	TOTAL	1374	100.0	100.0	

VALID CASES 190 MISSING CASES 1184

RM84 ZINC PRESERVATIVES

CATEGORY LABEL	CODE	ABSOLUTE FREQ	RELATIVE FREQ (PCT)	ADJUSTED FREQ (PCT)	CUM FREQ (PCT)
NO. PLANTS USING	J	186	13.5	100.0	100.0
		1188	86.5	MISSING	100.0
	TOTAL	1374	100.0	100.0	

VALID CASES 186 MISSING CASES 1188

RM85 OTHER PRESERVATIVES

CATEGORY LABEL	CODE	ABSOLUTE FREQ	RELATIVE FREQ (PCT)	ADJUSTED FREQ (PCT)	CUM FREQ (PCT)
NO. PLANTS USING	K	103	7.5	100.0	100.0
		1271	92.5	MISSING	100.0
	TOTAL	1374	100.0	100.0	

VALID CASES 103 MISSING CASES 1271

RM86 NAPHTHA BASED RESINS

CATEGORY LABEL	CODE	ABSOLUTE FREQ	RELATIVE FREQ (PCT)	ADJUSTED FREQ (PCT)	CUM FREQ (PCT)
NO. PLANTS USING	A	223	16.2	100.0	100.0
		1151	83.8	MISSING	100.0
	TOTAL	1374	100.0	100.0	

VALID CASES 223 MISSING CASES 1151

RM87 TOLUENE OR ETHYLBENZENE SOLUBL

CATEGORY LABEL	CODE	ABSOLUTE FREQ	RELATIVE FREQ (PCT)	ADJUSTED FREQ (PCT)	CUM FREQ (PCT)
NO. PLANTS USING	B	332	24.2	100.0	100.0
		1042	75.8	MISSING	100.0
	TOTAL	1374	100.0	100.0	

VALID CASES 332 MISSING CASES 1042

RM88 TOLUENE OR ETHYLBENZENE SOLUBLE RESINS

CATEGORY LABEL	CODE	ABSOLUTE FREQ	RELATIVE FREQ (PCT)	ADJUSTED FREQ (PCT)	CUM FREQ (PCT)
NO. PLANTS USING	C	255	18.6	100.0	100.0
		1119	81.4	MISSING	100.0
	TOTAL	1374	100.0	100.0	

VALID CASES 255 MISSING CASES 1119

RM89 TOLUENE OR NAPHTHA SOLUBLE RESINS

CATEGORY LABEL	CODE	ABSOLUTE FREQ	RELATIVE FREQ (PCT)	ADJUSTED FREQ (PCT)	CUM FREQ (PCT)
NO. PLANTS USING	D	316	23.0	100.0	100.0
		1058	77.0	MISSING	100.0
	TOTAL	1374	100.0	100.0	

VALID CASES 316 MISSING CASES 1058

RM90 TOLUENE OR NAPHTHA ALKYD RESIN

CATEGORY LABEL	CODE	ABSOLUTE FREQ	RELATIVE FREQ (PCT)	ADJUSTED FREQ (PCT)	CUM FREQ (PCT)
NO. PLANTS USING	E	269	19.6	100.0	100.0
		1105	80.4	MISSING	100.0
	TOTAL	1374	100.0	100.0	

VALID CASES 269 MISSING CASES 1105

RM91 TOLUENE OR NAPHTHA SOLUBLE POLYESTER

CATEGORY LABEL	CODE	ABSOLUTE FREQ	RELATIVE FREQ (PCT)	ADJUSTED FREQ (PCT)	CUM FREQ (PCT)
NO. PLANTS USING	F	153	11.1	100.0	100.0
		1221	88.9	MISSING	100.0
	TOTAL	1374	100.0	100.0	

VALID CASES 153 MISSING CASES 1221

03/23/78 FILE - PAINT - CREATED 03/23/78

RM92 TOLUENE SOLUBLE EPOXY RESINS

CATEGORY LABEL	CODE	ABSOLUTE FREQ	RELATIVE FREQ (PCT)	ADJUSTED FREQ (PCT)	CUM FREQ (PCT)
NO. PLANTS USING	G	424	30.9	100.0	100.0
		950	69.1	MISSING	100.0
	TOTAL	1374	100.0	100.0	

VALID CASES 424 MISSING CASES 950

RM93 TOLUENE SOLUBLE POLYAMIDE RESINS

CATEGORY LABEL	CODE	ABSOLUTE FREQ	RELATIVE FREQ (PCT)	ADJUSTED FREQ (PCT)	CUM FREQ (PCT)
NO. PLANTS USING	H	260	18.9	100.0	100.0
		1114	81.1	MISSING	100.0
	TOTAL	1374	100.0	100.0	

VALID CASES 260 MISSING CASES 1114

RM94 TOLUENE SOLUBLE UREA RESINS

CATEGORY LABEL	CODE	ABSOLUTE FREQ	RELATIVE FREQ (PCT)	ADJUSTED FREQ (PCT)	CUM FREQ (PCT)
NO. PLANTS USING	A	215	15.6	100.0	100.0
		1159	84.4	MISSING	100.0
	TOTAL	1374	100.0	100.0	

VALID CASES 215 MISSING CASES 1159

RM95 NAPHTHA SOLUBLE MELAMINE RESINS

CATEGORY LABEL	CODE	ABSOLUTE FREQ	RELATIVE FREQ (PCT)	ADJUSTED FREQ (PCT)	CUM FREQ (PCT)
NO. PLANTS USING	B	188	13.7	100.0	100.0
		1186	86.3	MISSING	100.0
	TOTAL	1374	100.0	100.0	

VALID CASES 188 MISSING CASES 1186

RM96 VINYL CHLORIDE DERIVATIVES

CATEGORY LABEL	CODE	ABSOLUTE FREQ	RELATIVE FREQ (PCT)	ADJUSTED FREQ (PCT)	CUM FREQ (PCT)
NO. PLANTS USING	C	511	37.2	100.0	100.0
		863	62.8	MISSING	100.0
	TOTAL	1374	100.0	100.0	

VALID CASES 511 MISSING CASES 863

RM97 VINYL CHLORIDE DERIVED PVA

CATEGORY LABEL	CODE	ABSOLUTE FREQ	RELATIVE FREQ (PCT)	ADJUSTED FREQ (PCT)	CUM FREQ (PCT)
NO. PLANTS USING	D	104	7.6	100.0	100.0
		1270	92.4	MISSING	100.0
	TOTAL	1374	100.0	100.0	

VALID CASES 104 MISSING CASES 1270

RM98 PHENOL OR TOLUENE SOLUBLE PV ALCOHOL

CATEGORY LABEL	CODE	ABSOLUTE FREQ	RELATIVE FREQ (PCT)	ADJUSTED FREQ (PCT)	CUM FREQ (PCT)
NO. PLANTS USING	E	247	18.0	100.0	100.0
		1127	82.0	MISSING	100.0
	TOTAL	1374	100.0	100.0	

VALID CASES 247 MISSING CASES 1127

RM99 VINYL CHLORIDE VINYLIDENE CHLORIDE

CATEGORY LABEL	CODE	ABSOLUTE FREQ	RELATIVE FREQ (PCT)	ADJUSTED FREQ (PCT)	CUM FREQ (PCT)
NO. PLANTS USING	F	44	3.2	100.0	100.0
		1330	96.8	MISSING	100.0
	TOTAL	1374	100.0	100.0	

VALID CASES 44 MISSING CASES 1330

RM100 TOLUENE SOLUBLE ACRYLIC SOLIDS

CATEGORY LABEL	CODE	ABSOLUTE FREQ	RELATIVE FREQ (PCT)	ADJUSTED FREQ (PCT)	CUM FREQ (PCT)
NO. PLANTS USING	G	506	36.8	100.0	100.0
		868	63.2	MISSING	100.0
	TOTAL	1374	100.0	100.0	

VALID CASES 506 MISSING CASES 868

03/23/78 FILE - PAINT - CREATED 03/23/78

RM101 TOLUENE SOLUBLE ACRYLIC SOLUTIONS

CATEGORY LABEL	CODE	ABSOLUTE FREQ	RELATIVE FREQ (PCT)	ADJUSTED FREQ (PCT)	CUM FREQ (PCT)
NO. PLANTS USING	H	451	32.8	100.0	100.0
		923	67.2	MISSING	100.0
	TOTAL	1374	100.0	100.0	

VALID CASES 451 MISSING CASES 923

RM102 TOLUENE SOLUBLE STYRENE AND VINYL TOLUEN

CATEGORY LABEL	CODE	ABSOLUTE FREQ	RELATIVE FREQ (PCT)	ADJUSTED FREQ (PCT)	CUM FREQ (PCT)
NO. PLANTS USING	I	150	10.9	100.0	100.0
		1224	89.1	MISSING	100.0
	TOTAL	1374	100.0	100.0	

VALID CASES 150 MISSING CASES 1224

RM103 PHENOL OR ETHYLBENZENE SOLUBLE OLEORESIN

CATEGORY LABEL	CODE	ABSOLUTE FREQ	RELATIVE FREQ (PCT)	ADJUSTED FREQ (PCT)	CUM FREQ (PCT)
NO. PLANTS USING	J	167	12.2	100.0	100.0
		1207	87.8	MISSING	100.0
	TOTAL	1374	100.0	100.0	

VALID CASES 167 MISSING CASES 1207

RM104 TOLUENE OR NAPHTHA SOLUBLE SILICONES

CATEGORY LABEL	CODE	ABSOLUTE FREQ	RELATIVE FREQ (PCT)	ADJUSTED FREQ (PCT)	CUM FREQ (PCT)
NO. PLANTS USING	K	223	16.2	100.0	100.0
		1151	83.8	MISSING	100.0
	TOTAL	1374	100.0	100.0	

VALID CASES 223 MISSING CASES 1151

RM105 TOLUENE SOLUBLE MALEIC SOLUTIONS

CATEGORY LABEL	CODE	ABSOLUTE FREQ	RELATIVE FREQ (PCT)	ADJUSTED FREQ (PCT)	CUM FREQ (PCT)
NO. OF PLANTS USING	L	122	8.9	100.0	100.0
		1252	91.1	MISSING	100.0
	TOTAL	1374	100.0	100.0	

VALID CASES 122 MISSING CASES 1252

RM106 PHENOLIC RESINS

CATEGORY LABEL	CODE	ABSOLUTE FREQ	RELATIVE FREQ (PCT)	ADJUSTED FREQ (PCT)	CUM FREQ (PCT)
NO. PLANTS USING	M	377	27.4	100.0	100.0
		997	72.6	MISSING	100.0
	TOTAL	1374	100.0	100.0	

VALID CASES 377 MISSING CASES 997

RM107 METHYL CHLORIDE OR TOLUENE SOLUBLE CEL

CATEGORY LABEL	CODE	ABSOLUTE FREQ	RELATIVE FREQ (PCT)	ADJUSTED FREQ (PCT)	CUM FREQ (PCT)
NO. PLANTS USING	N	273	19.9	100.0	100.0
		1101	80.1	MISSING	100.0
	TOTAL	1374	100.0	100.0	

VALID CASES 273 MISSING CASES 1101

RM108 TOLUENE SOLUBLE URETHANE RESINS

CATEGORY LABEL	CODE	ABSOLUTE FREQ	RELATIVE FREQ (PCT)	ADJUSTED FREQ (PCT)	CUM FREQ (PCT)
NO. PLANTS USING	O	284	20.7	100.0	100.0
		1090	79.3	MISSING	100.0
	TOTAL	1374	100.0	100.0	

VALID CASES 284 MISSING CASES 1090

RM109 MISC RESINS

CATEGORY LABEL	CODE	ABSOLUTE FREQ	RELATIVE FREQ (PCT)	ADJUSTED FREQ (PCT)	CUM FREQ (PCT)
NO. PLANTS USING	P	143	10.4	100.0	100.0
		1231	89.6	MISSING	100.0
	TOTAL	1374	100.0	100.0	

VALID CASES 143 MISSING CASES 1231

03/23/78 FILE - PAINT - CREATED 03/23/78

RM110 BENZENE

CATEGORY LABEL	CODE	ABSOLUTE FREQ	RELATIVE FREQ (PCT)	ADJUSTED FREQ (PCT)	CUM FREQ (PCT)
NO. PLANTS USING	A	43	3.1	100.0	100.0
		1331	96.9	MISSING	100.0
	TOTAL	1374	100.0	100.0	

VALID CASES 43 MISSING CASES 1331

RM111 BENZENE TOLUENE MIXTURES

CATEGORY LABEL	CODE	ABSOLUTE FREQ	RELATIVE FREQ (PCT)	ADJUSTED FREQ (PCT)	CUM FREQ (PCT)
NO. PLANTS USING	B	27	2.0	100.0	100.0
		1347	98.0	MISSING	100.0
	TOTAL	1374	100.0	100.0	

VALID CASES 27 MISSING CASES 1347

RM112 TOLUENE

CATEGORY LABEL	CODE	ABSOLUTE FREQ	RELATIVE FREQ (PCT)	ADJUSTED FREQ (PCT)	CUM FREQ (PCT)
NO. PLANTS USING	C	825	60.0	100.0	100.0
		549	40.0	MISSING	100.0
	TOTAL	1374	100.0	100.0	

VALID CASES 825 MISSING CASES 549

03/23/78 FILE - PAINT - CREATED 03/23/78

RM113 TOLUENE ETHYLBENZENE MIXTURES

CATEGORY LABEL	CODE	ABSOLUTE FREQ	RELATIVE FREQ (PCT)	ADJUSTED FREQ (PCT)	CUM FREQ (PCT)
NO. PLANTS USING	D	57	4.1	100.0	100.0
		1317	95.9	MISSING	100.0
	TOTAL	1374	100.0	100.0	

VALID CASES 57 MISSING CASES 1317

RM114 ETHYLBENZENE

CATEGORY LABEL	CODE	ABSOLUTE FREQ	RELATIVE FREQ (PCT)	ADJUSTED FREQ (PCT)	CUM FREQ (PCT)
NO. PLANTS USING	E	161	11.7	100.0	100.0
		1213	88.3	MISSING	100.0
	TOTAL	1374	100.0	100.0	

VALID CASES 161 MISSING CASES 1213

RM115 ISOPHORONE

CATEGORY LABEL	CODE	ABSOLUTE FREQ	RELATIVE FREQ (PCT)	ADJUSTED FREQ (PCT)	CUM FREQ (PCT)
NO. PLANTS USING	F	175	12.7	100.0	100.0
		1199	87.3	MISSING	100.0
	TOTAL	1374	100.0	100.0	

VALID CASES 175 MISSING CASES 1199

RM116 CARBON TETRACHLORIDE

CATEGORY LABEL	CODE	ABSOLUTE FREQ	RELATIVE FREQ (PCT)	ADJUSTED FREQ (PCT)	CUM FREQ (PCT)
NO. PLANTS USING	G	8	0.6	100.0	100.0
		1366	99.4	MISSING	100.0
	TOTAL	1374	100.0	100.0	

VALID CASES 8 MISSING CASES 1366

RM117 CHLOROBENZENE

CATEGORY LABEL	CODE	ABSOLUTE FREQ	RELATIVE FREQ (PCT)	ADJUSTED FREQ (PCT)	CUM FREQ (PCT)
NO. PLANTS USING	H	9	0.7	100.0	100.0
		1365	99.3	MISSING	100.0
	TOTAL	1374	100.0	100.0	

VALID CASES 9 MISSING CASES 1365

RM118 1 2 4 TRICHLOROBENZENE

CATEGORY LABEL	CODE	ABSOLUTE FREQ	RELATIVE FREQ (PCT)	ADJUSTED FREQ (PCT)	CUM FREQ (PCT)
NO. PLANTS USING	I	3	0.2	100.0	100.0
		1371	99.8	MISSING	100.0
	TOTAL	1374	100.0	100.0	

VALID CASES 3 MISSING CASES 1371

RM119 1-2-DICHLOROETHANE

CATEGORY LABEL	CODE	ABSOLUTE FREQ	RELATIVE FREQ (PCT)	ADJUSTED FREQ (PCT)	CUM FREQ (PCT)
NO. PLANTS USING	J	5	0.4	100.0	100.0
		1369	99.6	MISSING	100.0
	TOTAL	1374	100.0	100.0	

VALID CASES 5 MISSING CASES 1369

RM120 1,1,1 TRICHLOROETHANE

CATEGORY LABEL	CODE	ABSOLUTE FREQ	RELATIVE FREQ (PCT)	ADJUSTED FREQ (PCT)	CUM FREQ (PCT)
NO. PLANTS USING	K	140	10.2	100.0	100.0
		1234	89.8	MISSING	100.0
	TOTAL	1374	100.0	100.0	

VALID CASES 140 MISSING CASES 1234

RM121 1,1,2 TRICHLOROETHANE

CATEGORY LABEL	CODE	ABSOLUTE FREQ	RELATIVE FREQ (PCT)	ADJUSTED FREQ (PCT)	CUM FREQ (PCT)
NO. OF PLANTS USING	L	10	0.7	100.0	100.0
		1364	99.3	MISSING	100.0
	TOTAL	1374	100.0	100.0	

VALID CASES 10 MISSING CASES 1364

RM122 BIS 2 CHLOROETHYL ETHER

CATEGORY LABEL	CODE	ABSOLUTE FREQ	RELATIVE FREQ (PCT)	ADJUSTED FREQ (PCT)	CUM FREQ (PCT)
NO. PLANTS USING	A	1	0.1	100.0	100.0
		1373	99.9	MISSING	100.0
	TOTAL	1374	100.0	100.0	

VALID CASES 1 MISSING CASES 1373

RM123 CHLOROFORM

CATEGORY LABEL	CODE	ABSOLUTE FREQ	RELATIVE FREQ (PCT)	ADJUSTED FREQ (PCT)	CUM FREQ (PCT)
NO. PLANTS USING	B	3	0.2	100.0	100.0
		1371	99.8	MISSING	100.0
	TOTAL	1374	100.0	100.0	

VALID CASES 3 MISSING CASES 1371

RM124 1,2 DICHLOROBENZENE

CATEGORY LABEL	CODE	ABSOLUTE FREQ	RELATIVE FREQ (PCT)	ADJUSTED FREQ (PCT)	CUM FREQ (PCT)
NO. PLANTS USING	C	8	0.6	100.0	100.0
		1366	99.4	MISSING	100.0
	TOTAL	1374	100.0	100.0	

VALID CASES 8 MISSING CASES 1366

RM125 1,3 DICHLOROPROPYLENE

CATEGORY LABEL	CODE	ABSOLUTE FREQ	RELATIVE FREQ (PCT)	ADJUSTED FREQ (PCT)	CUM FREQ (PCT)
NO. PLANTS USING	D	6	0.4	100.0	100.0
		1368	99.6	MISSING	100.0
	TOTAL	1374	100.0	100.0	

VALID CASES 6 MISSING CASES 1368

RM126 METHYLENE CHLORIDE

CATEGORY LABEL	CODE	ABSOLUTE FREQ	RELATIVE FREQ (PCT)	ADJUSTED FREQ (PCT)	CUM FREQ (PCT)
NO. PLANTS USING	E	305	22.2	100.0	100.0
		1069	77.8	MISSING	100.0
	TOTAL	1374	100.0	100.0	

VALID CASES 305 MISSING CASES 1069

RM127 THICHLOROETHYLENE

CATEGORY LABEL	CODE	ABSOLUTE FREQ	RELATIVE FREQ (PCT)	ADJUSTED FREQ (PCT)	CUM FREQ (PCT)
NO. PLANTS USING	F	77	5.6	100.0	100.0
		1297	94.4	MISSING	100.0
	TOTAL	1374	100.0	100.0	

VALID CASES 77 MISSING CASES 1297

☆ U. S. GOVERNMENT PRINTING OFFICE : 1979 O - 307-248