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National Dioxin Study Tier 4 — Combustion Sources

Draft

Literature Review And Testing Options

PRELIMINARY

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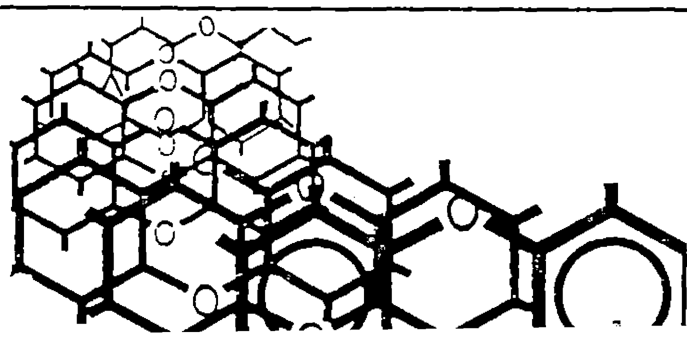

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DRAFT

National Dioxin Study Tier 4 — Combustion Sources

Literature Review And Testing Options

PRELIMINARY

By
Radian Corporation
Research Triangle, NC 27709

DRAFT: DO NOT QUOTE OR CITE

Contract No. 68-02-3513
EPA Project Officer: William H. Lamason

U.S. ENVIRONMENTAL PROTECTION AGENCY
Office Of Air And Radiation
Office Of Air Quality Planning And Standards
Research Triangle Park, NC 27711

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This document is a preliminary draft. It has not been subjected to the Agency's required peer and policy review and therefore does not reflect the views of the Agency, and official endorsement should not be inferred.

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EXECUTIVE SUMMARY

The purpose of Tier 4 of the National Dioxin Study is to assess combustion source emissions of primarily 2,3,7,8-Tetrachlorodibenzo-p-dioxin (2,3,7,8-TCDD) and, secondarily, other chlorinated dioxin and furan homologs. Radian Corporation has been contracted by EPA to review and evaluate dioxin emissions data from the literature and propose a test plan for the Tier 4 program. This report summarizes the results of the review and evaluation and presents a proposed test plan.

Radian conducted a literature review on dioxin emissions from combustion processed early in 1984. In addition, contacts were made with key individuals to identify recently performed or ongoing studies that could be used to supplement the data base. Based on the available information, a preliminary list of source categories with the potential to emit dioxins was developed. The preliminary list was then ranked based on potential to emit dioxins, number of previous dioxin tests in a source category, and potential human exposure. Highly ranked source categories will be stack tested early in the Tier 4 program. The Tier 4 budget will allow for 10 source stack tests. A relatively inexpensive ash screening procedure will be used to supplement the stack testing program. The lower ranked source categories will be screened first using a polychlorinated dibenzo-p-dioxin (PCDD) scan on ash samples. The screening will help in determining which of the lower ranked categories warrant stack tests and will help classify categories that will not be stack tested.

Table 1 presents the ranked list. Rank A sources will be tested initially. Ash screening will be conducted on Rank B and C sources, along with sources requested by State and regional offices. Results of the ash screening will be used to select other sources for stack testing.

TABLE 1. RANKED SOURCE CATEGORY LIST

Rank A Source Categories

- Sewage Sludge Incinerators
- Black Liquor Boilers
- Commercial Boilers

Rank B Source Categories

- PCP Sludge Incinerators
- Carbon Regeneration (Industrial)
- Charcoal Manufacturing
- Wire Reclamation

Rank C Source Categories

- Wood Stoves
- Wood Boilers (PCP Treated)
- Mobile Sources
- Small Spreader Stoker Coal Boiler
- Hazardous Waste Incinerators
- Lime/Cement Kilns Cofired with Hazardous Wastes

Rank D Source Categories

- MSW Incineration
- Industrial Boilers Cofiring Wastes

Rank A - Large source categories (greater than 1 million tons of fuel and/or waste burned annually) with elevated dioxin precursor contamination of feed/fuel. These categories have the potential to emit TCDD and require further testing.

Rank B - Small source categories (less than 1 million tons of fuel and/or waste burned annually) or source categories with limited dioxin precursor contamination of feed/fuel. These categories have the potential to emit TCDD and require further testing.

Rank C - Source categories less likely to emit TCDD.

Rank D - Source categories that have already been tested three or more times.

1.0 INTRODUCTION

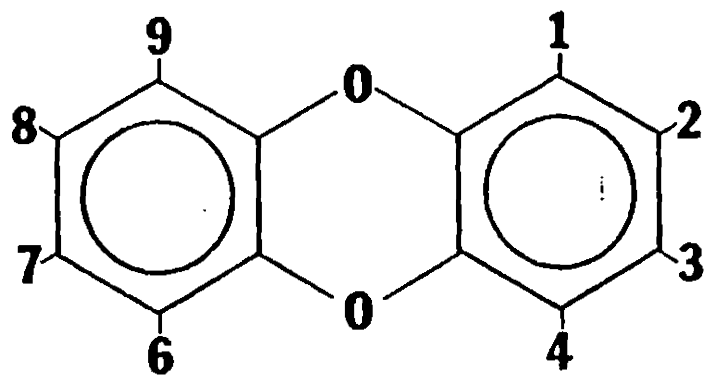
1.1 BACKGROUND

The Air Management Technology Branch within the U. S. Environmental Protection Agency's (EPA) Office of Air Quality Planning and Standards (OAQPS) is responsible for the development and implementation of a source testing program for Tier 4 of the National Dioxin Study. The purpose of Tier 4 is to assess combustion source emissions of polychlorinated dibenzo-p-dioxin (PCDD), with a focus on the most toxic isomer - 2,3,7,8-tetrachlorodibenzo-p-dioxin (2,3,7,8-TCDD). Combustion source emissions of polychlorinated dibenzofuran (PCDF) will also be addressed in this study.

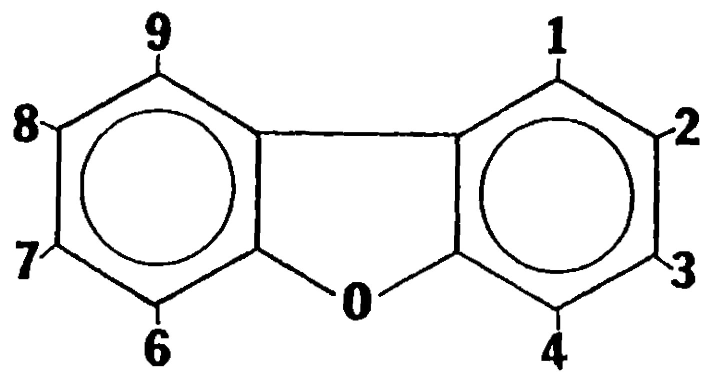
Radian Corporation, under task order contract, is providing support to the Air Management Technology Branch by collecting and reviewing available literature data on combustion related emissions sources of PCDD's and PCDF's. Based on information available in the literature and the Tier 4 budget, Radian has also developed a source test plan that will address the following questions:

1. Which combustion source categories emit PCDD's (and PCDF's) to the atmosphere?
2. What range of concentrations of PCDD's (and PCDF's) are emitted from these source categories?

Dioxins are members of a family of organic compounds known chemically as dibenzo-p-dioxins. The common aspect of all dioxin compounds is that they have a three ring nucleus containing two benzene rings interconnected through a pair of oxygen atoms. The structural formula of the dioxin nucleus and the convention used in numbering its substituent positions are shown in Figure 1-1a. Theoretically, one to eight chlorine atoms can occur at dioxin substituent positions such that 75 different chlorinated dioxin isomers are possible. Each isomer has its own physical and chemical properties and differs from others in the number and relative position of its chlorine atoms. The schedule of potential chlorinated dioxin isomers



a. Dioxin configuration.



b. Furan configuration.

Figure 1-1. Dioxin and furan configurations showing the dioxin and furan nuclei and conventional substituent numbering system.

is given in Table 1-1. The abbreviations given in this table for chlorinated dioxin homologs are used throughout this report.

Furans are a group of organic compounds chemically known as dibenzofurans. They have a similar structure to the dibenzo-p-dioxins except that the two benzene rings in the nucleus are interconnected with a five member ring containing only one oxygen atom. The structural formula of the furan nucleus and the convention used in numbering its substituent positions are shown in Figure 1-1b. Theoretically, the chlorinated furan group can contain up to 135 different structural isomers, each with varying physical and chemical properties. The schedule of potential chlorinated furan isomers is given in Table 1-2. The abbreviations given in this table for chlorinated furan homologs are used throughout this report.

1.2 APPROACH AND LIMITATIONS TO THIS STUDY

This study was accomplished in three general tasks. The first task was to obtain and review the available literature on PCDD emissions from combustion sources. Approximately 119 published and unpublished reports were obtained. In addition, contacts were made with key individuals to identify recently performed or ongoing studies that could be used to supplement the data base. The second task was to develop a ranked list of source categories with potential to emit PCDD's. The criteria used to develop the ranked list was based on information obtained from the literature review. The final task was to develop a testing program to assess PCDD (and PCDF) emissions from combustion sources. Again, the results of this task were largely based on the outputs of the first two tasks.

During the development of the source test plan, it became apparent that 7
the Tier 4 budget would allow for only 10 stack tests. Obviously, this number of tests will be inadequate to characterize all the source categories being considered. The source ranking procedure is an attempt to predict which categories are most likely to emit PCDD's and, therefore, should be stack tested. However, the ranking procedure is largely subjective, since no realistic assignment of weighing factors could be made for each of the

TABLE 1-1. SCHEDULE OF THEORETICAL CHLORINATED DIOXIN ISOMERS

Chlorinated Dioxin Compound	Number of Isomers
Monochlorodibenzo-p-dioxin (MCDD)	2
Dichlorodibenzo-p-dioxin (DCDD)	10
Trichlorodibenzo-p-dioxin (T_3CDD)	14
Tetrachlorodibenzo-p-dioxin (TCDD)	22
Pentachlorodibenzo-p-dioxin (P_5CDD)	14
Hexachlorodibenzo-p-dioxin (H_6CDD)	10
Heptachlorodibenzo-p-dioxin (H_7CDD)	2
Octachlorodibenzo-p-dioxin (OCDD)	1
TOTAL	75

TABLE 1-2. SCHEDULE OF THEORETICAL CHLORINATED FURAN ISOMERS

Chlorinated Furan Compound	Number of Isomers
Monochlorodibenzofuran (MCDF)	4
Dichlorodibenzofuran (DCDF)	16
Trichlorodibenzofuran (T_3CDF	28
Tetrachlorodibenzofuran (TCDF)	38
Pentachlorodibenzofuran (P_5CDF)	28
Hexachlorodibenzofuran (H_6CDF)	16
Heptachlorodibenzofuran (H_7CDF)	4
Octachlorodibenzofuran (OCDF)	1
TOTAL	135

ranking criteria. The development of a ranked list would change depending on the relative importance given to the ranking criteria. A screening tool would be beneficial to prevent wasting of limited resources.

Because of the tight schedule, limited budget, and large number of source categories, a PCDD scan of ash samples was selected as a quick and inexpensive screening tool. Although the ash screening cannot be used as an absolute ranking tool, this method can provide a relative indication of which source categories warrant further study. Source categories identified by OAQPS along with sources suggested by State and regional offices will be screened. The results of the screening procedure will help verify the ranked list developed in this text and will help characterize source categories that will not be stack tested.

1.3 CONTENTS OF THIS REPORT

Section 2.0 presents a summary of the literature review. Tetrachlorodibenzo-p-dioxin (TCDD) emissions data are presented along with qualitative information on source characteristics. A complete listing of the emissions information along with sampling and analytical methodology used to obtain the data is presented in Appendix A. Ongoing research is also identified in Section 2.0

The source category characteristics and emission rates summarized in Section 2.0 are used in Section 3.0 to identify factors that affect TCDD emissions. These factors include both fuel and combustion characteristics. The factors identified are based on experimental studies, source tests, and theoretical chemistry. No attempt was made to assign a relative importance to these factors.

In Section 4.0, a ranked list of source categories is developed. The ranking procedure is largely based on the factors affecting TCDD emissions identified in Section 3.0. In addition, the size of the source category, the number of previous PCDD studies, and the potential for human exposure are considered during the ranking. As discussed earlier, the ranking procedure is largely subjective, and the final ranked list may be modified following the ash screening program.

Section 5.0 presents a testing program based on the ranked list of source categories. The testing program will include initial screening of all sources identified, followed by stack testing of the top ranked sources. Section 5.0 also discusses the costs of stack testing, the number of sources that should be tested in each source category, and the types of samples that should be analyzed at each source.

Section 6.0 presents a short discussion on two proposed modeling tasks. The advantages and disadvantages of dispersion modeling 2,3,7,8-TCDD emissions from combustion sources for the purposes of assessing exposure, and development of an empirical or a mechanistic model describing 2,3,7,8-TCDD emissions from specific source categories are discussed.

2.0 SUMMARY OF AVAILABLE DATA

A literature review for sources of PCDD and PCDF air emissions was made in 1983 by the Pollutant Assessment Branch (OAQPS/PAB).[14] This review was used as a starting point for a more specific literature search concerning PCDD emissions from combustion sources in early 1984. In addition, contacts were made with key individuals to identify recently performed, ongoing, or planned studies that could be used to supplement the data base. Contacts included personnel from the Canadian Government, EPA personnel, and researchers from industry and universities. Primarily, members of the EPA's Chlorinated Dioxin Working Group and authors of key references were contacted.

This chapter summarizes the updated literature review and provides the data base upon which the Tier 4 testing program was developed. Confirmed and potential sources of PCDD and PCDF air emissions are identified. Industrial, commercial, and residential combustion sources are identified by testing. Experimental studies suggest additional potential sources of emissions. Quantitative data are presented on TCDD emission rates, along with qualitative information on the source characteristics and feed composition. Theories are also presented on dioxin formation mechanisms and conditions that promote formation.

2.1 COMBUSTION SOURCES TESTED

A review of the literature has produced a list of 12 broadly defined source categories that have been tested for dioxin emissions:

- Municipal Waste Combustors,
- Hazardous Waste Incinerators,
- Sewage Sludge Incinerators,
- Coal Fired Utility Boiler,
- Commercial Boilers Firing Waste Oil,
- Industrial Boilers Cofiring Wastes,
- Carbon Regeneration,
- Residential Wood Combustion,

- Mobile Sources,
- Wire Reclamation,
- Lime/Cement Kilns Cofiring Hazardous Wastes,
- Accidental PCB Fires.

Table 2-1 lists tested sources and the TCDD concentrations detected. Although the National Dioxin Study is focusing on 2,3,7,8-TCDD, most of the data found in the literature addressed TCDD and PCDD. TCDD has been used during the evaluation of the data base as the best representative of 2,3,7,8-TCDD emissions. Whenever possible, stack test results were recorded. Much of the literature is focused on analysis of ash samples due to the ease of collection. However, these samples may not always be representative of stack emissions. The possibilities of PCDD partitioning in the ash and PCDD enrichment on the fine particulate are discussed in greater detail on Section 5.0.

General source characteristics are summarized in Table 2-2. Source characteristics are used to identify factors that affect PCDD emissions. Based on these factors, other potential sources of PCDD emissions are identified for the testing program. In several cases, PCDD studies have not been cleared for public use. For these studies, the sources are described, but no emissions data are provided. Appendix A provides a complete listing of the dioxin data bases. The data base lists levels of PCDD detected, source characteristics, precursors, and sampling/analytical methodology. Based on the information provided, the data are rated as good (G), poor (P), or incomplete (I). The rating is a function of sampling/analytical procedures, detection limits, and completeness. The following discussion summarizes the data available on source categories identified in the literature review.

2.1.1 Municipal Waste Incineration

In 1978, TCDD's were detected in the emissions of the Hempstead municipal waste combustor (MWC) on Long Island. Since that date, this source category has received considerable attention in the United States. The Canadian Government has identified MWC's as one of the major combustion

TABLE 2-1. COMBUSTION SOURCES TESTED FOR TCDD

Source Category	Number of Facilities Tested	Sample	Mean	Range	References
Municipal Waste Combustors					
USA	7	Stack	45.4 ng/m^3	ND-240 ng/m^3	43, 44, 49, 114
European	13	Stack	25.6 ng/m^3	ND-128 ng/m^3	23, 24, 41, 53, 86
Hazardous Waste Incinerators					
Incinerator Ship	2	Stack	ND[a]	ND	2, 3
Land Based Incinerators	10(7)[b]	Stack	0.56 ng/m^3	ND-2.5 ng/m^3	116, 98, 99, 81
Sewage Sludge Incinerators	1	Stack	C	C	117
Utility Coal Boilers	7	Stack	ND	ND	44
Commercial Boilers (Waste Fired)	6(6)[b]	Stack	D	D	39
Industrial Boilers (Waste Fired)	6(1)[b]	Stack	10.13 ng/m^3	ND-40.5 ng/m^3	22, 28, 31, 45
Activated Carbon Regeneration	1	Stack	$1.25x10^{-5}$ ppb	ND-$5x10^{-5}$ ppb	50
Residential Wood Combustion	4	Scraping	0.329 ppb	ND-.777 ppb	31, 83
Mobile Sources	9(4)[b]	Exhaust	$4x10^{-3}$ ppb	ND-$2x10^{-2}$ ppb	31, 105
Wire Reclamation Incinerators	1	Scraping	.234 ppb	.058-.410 ppb	51
Lime/Cement Kilns (Waste Fired)	1	Stack	ND	ND	90
Accidental PCB Fires	2	Scraping	44,000 ppb	ND-195,000 ppb	48, 79

[a]ND = None detected.
[b]Number of tests that have been performed, but the results have not been officially reported.
C - PCDD scan only. PCDD concentrations ranged from 483 ng/m^3 to 1,140 ng/m^3 with a mean of 739 ng/m^3.
D - Results have not yet been officially reported.

TABLE 2-2. CHARACTERISTICS OF SOURCES TESTED FOR DIOXINS

Source	Precursors	Furnace Type	Temperature	Available Air[a]
Municipal Waste Combustors				
Conventional	Cl-aromatics	Waterwall	500-1000°C	Low
Refuse Derived Fuel boilers	Cl-aromatics	Spreader stoker	1000°C	Excess
Hazardous Waste Incinerators				
Land Based	PCBs, PCPs	Rotary kiln	1200°C	Excess
Incinerator Ships	PCBs, PCPs	Dual chamber	1600°C	Excess
Sewage Sludge Incinerators	PCBs, Cl-aromatics	Multiple hearth	450-950°C	Excess
Utility Coal Boilers	Coal, low chlorine	Pulverized coal	1200°C	Excess
Commercial Boilers (Waste Fired)	TCP	Small fire tube	1000°C	Excess
Industrial Boilers (Waste Fired)	PCP, Cl-aromatics	Liquid injection/stoker	1300°C	Excess
Activated Carbon Regeneration	PCBs	Fluidized bed	750-1000°C	Limited
Residential Wood Combustion	Low chlorine	Woodstove/fireplace	<500°C	Low
Mobile Sources	Low chlorine	Internal combustion engine		Excess
Wire Reclamation Incinerators	PCBs, PVCs	Batch/conveyor	500°C	Limited
Lime/Cement Kilns (Waste Fired)	Cl-organics	Rotary kiln	1400°C	Excess
Accidental Transformer Fire	PCBs	Uncontrolled PCB Oil Fire	NA[b]	NA

[a]Excess: High air/fuel ratio with efficient mixing.
Low : High air/fuel ratio with inefficient mixing.

sources of PCDD's in the Canadian environment.[202] Numerous tests have also been conducted in Europe and Japan.[23, 24, 41, 53, 86]

MWC's can be classified as either large mass burn units, refuse derived fuel (RDF) units, or small modular units. Large mass burn units comprise the largest portion of this source category. These units are characterized by low combustion temperatures (500-1000°C) and poor air/fuel mixing. Of the seven MWC's tested in the United States, three are large mass burn units, three units are RDF fired, and one unit is modular. The TCDD emission rates measured at these sources ranged from none detected (ND) to 240 ng/m^3 (Table 1-1).

The only study with no PCDD's detected was a spreader stoker boiler that cofired RDF with coal.[44] The furnace temperature was 1200°C. Two other facilities with low levels of TCDD's detected are another incinerator boiler (3.15 ng/m^3) and a small modular unit (1.2 ng/m^3)[49] Both facilities were equipped with secondary chambers for combustion of offgases. The remaining units, both mass burn units and RDF units, emitted higher levels of TCDD's (6.3-240 ng/m^3)[49, 44, 114, 43] These sources were characterized by no supplemental fuel, no secondary combustion chambers, and, in some cases, poor air/fuel mixing. One unit added a chlorinated biocide to the RDF.[114]

Many of these units are equipped with electrostatic precipitators or cyclones to remove the large particulate from stack emissions. However, Karasek et al has shown that in some cases PCDD's enrich on the smaller particulate.[57] A large portion of these may not be removed by the above control devices.

Limited: Designed for low air/fuel ratio.

2.1.2 Hazardous Waste Incineration

The incineration of hazardous wastes can be divided into four categories:

(1) Land Based Incinerators,
(2) Incineration Ships,
(3) Boilers Cofiring Hazardous Wastes,
(4) Lime/Cement Kilns Cofiring Hazardous Wastes.

In each case, the feed material may contain elevated levels of chlorinated aromatics or PCDD's. Based on fuel composition, the potential for PCDD emissions is high. Fuel characteristics are discussed further in Section 3.0. In spite of the fuel composition, well controlled source design allows for high efficiency destruction of these wastes.

2.1.2.1 Land Based Incinerators. Four studies have been conducted in the U. S. with data from ten land based incinerators.[116, 98, 99, 81] In tests on two rotary kilns incinerating polychlorinated biphenyl (PCB's), TCDD emissions were low (ND-2.48 ng/m^3).[116] These incinerators were equipped with afterburners (1200°C). In both bases, the addition of supplemental fuel resulted in no PCDD's detected. Tests on a controlled air incinerator firing polychlorinated phenol treated wood also showed no PCDD's detected.[109] This incinerator was also equipped with an afterburner (1370°C) and used supplemental fuel.

2.1.2.2 Incinerator Ships. Two studies were conducted with M/T Vulcanus incinerator ship.[2, 3] The first study was conducted during the incineration of Herbicide Orange. TCDD levels in the feed ranged from ND-2.4 μg/g. No PCDD's were detected in the stack emissions. The second study was conducted during a PCB burn. PCDD's were not found in the feed or stack emissions. However, PCDF's were found in the feed. This incinerator ship uses a dual chamber configuration. Furnace temperatures reach 1600°C with a residence time of 1.35 seconds.

2.1.2.3 Boilers Cofiring Wastes. A review of the literature has produced five studies describing dioxin emissions from 13 boilers cofiring wastes. The Industrial Environmental Research Laboratory (IERL) in Cincinnati conducted studies on eight industrial boilers cofiring waste products.[22] Four boilers were cofiring chlorinated wastes and were tested for dioxin. A steam boiler firing waste wood contaminated with pentachlorophenol (PCP) and PCDD's emitted TCDD's at a level of 38-43 ng/m^3. PCDD's in the feed were highly chlorinated isomers. PCDD's formed from PCP should also be highly chlorinated isomers.[32] The predominance of TCDD's in stack emissions indicates that dechlorination had occurred. Further analysis of the results indicate that the lower chlorinated isomers (TCDD's) escaped with the small particulates and flue gas, while the higher chlorinated isomers are trapped with large particulates in the ESP. The three boilers remaining were tested for PCDD's at a detection limit of 1,000 ng/m^3. No PCDD's were detected. At present, more sensitive tests are being conducted on archived samples from these three boilers.

Two unrelated studies detected dioxins in ash samples from boilers cofiring PCP wastes.[28, 94] In one study, stack emissions were tested.[28] No PCDD's were detected. However the detection limits were high (10 μg/m^3). A final study found no PCDD's or PCDF's in the emissions of a high efficiency industrial boiler firing PCB contaminated oil.[45] The detection limits in this study were again high.

Dow Chemical tested two industrial waste incinerators; a 72 million Btu/hour stationary tar burner and a 70 million Btu/hour rotary kiln.[31] In both cases, PCDD's were detected in the fly ash taken from the stacks. When supplemental fuel was added to the rotary kiln, no TCDD's were detected at a 2.0 ppb detection limit.

2.1.2.4 Lime/Cement Kilns Cofiring Wastes. One study has addressed PCDD emissions from cement kilns cofiring wastes.[90] This study tested emissions from the San Juan cement kiln while cofiring pharmaceutical wastes (21 percent Cl). No PCDD's or PCDF's were detected at a detection limit of 14.9 ng/m^3. The combustion temperature of this process is 1260°C, with a residence time of 1.5 seconds. The State of California is planning to test a dry cement kiln cofiring wastes. Details on this study are not yet available.

2.1.3 Sewage Sludge Incineration

Very little data is available on PCDD emissions from sewage sludge incinerators. A Canadian study detected PCDD and PCDF emissions from a sewage sludge incinerator at concentrations of 0.739 μg/m^3 and 1.213 μg/m^3, respectively.[117] The incineration was a multiple hearth unit with a combustion temperature of 1000°C. Currently, there are no U. S. studies available. However, the New Bedford Incinerator in Massachusetts has been tested. The results will be available before the Tier 4 final report is completed.

2.1.4 Coal Boilers

The EPA conducted a national survey of organic emissions, including PCDD's and PCDF's, from coal fired utility boilers.[44] Seven large utility boilers were tested. No PCDD's were detected in the emissions. The boilers were large pulverized coal units operating at temperatures above 1000°C. Several smaller studies recorded similar results.[62, 29, 47] The only study that detected PCDD's in coal fired boilers was a Dow Chemical Study.[31] TCDD's were detected in fly ash at a level of 38 ppb. In an experimental study, Dow Chemical detected PCDD emissions from coal combustion, but only when chlorine was added to the feed.[78] A small spreader stoker coal boiler test will be tested in the near future by IERL. This testing effort will be expanded to include stack sampling for the Tier 4 program.

2.1.5 Activated Carbon Regeneration

The regeneration of activated carbon has been studied in Cincinnati, Ohio.[50] This carbon serviced the Cincinnati water supply for approximately 1 year. PCB's were detected in the feed. Parts per trillion (ppt) levels of TCDD were detected in the fly ash and flue gas samples. This facility operated a rotary kiln at 800°C. The air supply was limited to prevent combustion of the carbon.

2.1.6 Wire Reclamation

One PCDD study has been conducted on a wire reclamation incinerator.[51] TCDD and tetrachlorodibenzofurans (TCDF) concentrations in ash scrapings were 410 ppt and 11,600 ppt, respectively. Wire insulation incinerated during this process often contains PCB's and polyvinyl chloride. To prevent oxidation of the copper wire, both combustion temperatures and oxygen levels are kept low.

2.1.7 PCB Transformer Fires

Ash samples from two PCB fires have been analyzed for PCDD;s.[48, 79] In both cases, PCDD's were detected at elevated levels. At a third fired, PCDF's were detected in both the uncombusted PCB oil and ash samples.[54] In experimental work, Buser et al demonstrates the formation of PCDF's by pyrolysis of PCB's.[19] Buser postulates an intramolecular cyclization mechanism.

2.1.8 Residential Wood Combustion

Dow Chemical conducted two series of tests on wood stoves.[31, 83] The levels of TCDD's detected in ash samples ranged from ND-370 ppt. The feed material was untreated wood and residential wastes. Both combustion temperature and local oxygen availability are expected to be low.

2.1.9 Mobile Sources

Two series of tests have been conducted on auto emissions.[31, 105] In a test series by Dow Chemical, TCDD levels in muffler scrapings ranged from ND to 20 ppt. This test series included regular and unleaded cars and diesel trucks. Currently, the Environmental Science Research Laboratory in Research Triangle Park is conducting emissions tests on gasoline and diesel vehicles. This work will be available in the Tier 4 final report.

2.1.10 Experimental Studies

Extensive experimental studies have been conducted on PCDD and PCDF formation from combustion of chlorinated aromatics. Three categories of organics have been tested: PCB's, chlorobenzenes, and chlorophenols. The effect of inorganic chlorine on PCDD emissions has also been studied.

The major focus of the experimental work identified is the formation of PCDD's from the combustion of chlorinated phenols. Experiments by Rappe[92], Jansson[55], and Ahling[5, 4] demonstrate the formation of PCDD's at combustion temperatures of 500-800°C. Above this temperature, PCDD's are destroyed. Formation mechanisms postulated are (1) dimerization of chlorophenates, (2) cyclization of predioxin, and (3) dechlorination of higher chlorinated dioxins.

Buser investigated the formation of PCDD's and PCDF's from the pyrolysis of chlorobenzenes.[17] Both PCDD's and PCDF's were detected in pyrolyzed samples. The formation mechanism proposed included a chlorophenol intermediate.

Buser also investigated the formation of PCDF's from the pyrolysis of PCBs.[18, 19, 20] The yields of PCDF's were estimated to range from 0.1 percent to several percent. The proposed formation mechanism is an intramolecular cyclization. No experimental work has been identified on PCDD formation from PCB's. However, PCDD formation from PCB combustion has been demonstrated in two transformer fires.[48, 95] Elevated levels of PCDD's were found in ash samples from both fires. During two series of PCB destruction tests, PCDD emissions from rotary kilns increased when PCB wastes were added to the feed.[116]

Three recent reports have dealt with PCDD formation from combustion processes in the presence of inorganic chlorine.[78, 113, 73] Tierman found no detectable PCDD's or PCDF's emitted from the combustion of virgin pine.[113] However, in the presence of HCl, significant quantities of TCDD's were detected. Mahle presents similar results when burning coal in the presence of Cl_2, HCl, and NaCl.[78] Liberati studied the combustion of vegetables.[73] When inorganic chlorine or PVC is added, PCDD's and PCDF's were detected in the emissions.

2.2 POSSIBLE, PLANNED, OR ONGOING WORK

Table 2-3 lists PCDD studies that are either ongoing or being considered. Results from many of these tests will be available in the Tier 4 final report.

The Industrial Environmental Research Laboratory (IERL) in Cincinnati, Ohio is conducting a series of tests. These include a batch asphalt plant in Maryland, a steel blast furnace cofiring hazardous wastes in Pennsylvania, and a spreader stoker coal boiler cofiring hazardous wastes.

Two sewage sludge incinerators are listed. The New Bedford incinerator has recently been tested. Results are due in the near future. Testing of the Norfolk incinerator will start this summer. PCDD tests may be conducted at this site.

Several regions have expressed interest in testing MWC's. Two studies that should be noted are the retesting of Hampton which is currently underway, and the retesting of Hempstead. The Hempstead study may not be complete during the Tier 4 program.

Two important foreign studies are currently ongoing. The University of Waterloo in Canada is conducting a study on a Paris MWC. This study is attempting to correlate operating conditions with levels of PCDD emissions.

TABLE 2-3. POSSIBLE, PLANNED, OR ONGOING WORK

Organization	Source Type	Number of Tests
DOE	Coal/Waste Boiler	1
ORD, EPA	Steel Blast Furnace	1
	Asphalt Plant	1
	Stoker Coal Boiler	1
	Mobile Sources	1
EPA Regional Offices	Municipal Waste Combustors	11
	Sewage Sludge Incinerators	2
	Pathological Incinerators	2
	Hazardous Waste Incinerators	2
State Offices	Municipal Waste Combustors	1
	Dry Cement Kiln	1
Environment, Canada	Municipal Waste Combustors	3

A current Japanese study is looking at the effect of control devices on PCDD emissions.

2.3 SUMMARY AND PURPOSE OF LITERATURE REVIEW

The literature review has produced a list of twelve source categories that have been tested for PCDD's. Ten of the 12 source categories tested have been shown to emit PCDD's at detectable levels. Likewise, theories proposed for PCDD formation mechanisms and experimental studies which support these theories have been identified. By evaluating the proposed formation mechanisms and characteristics of the tested sources, a list of factors that may affect PCDD emissions have been developed. Based on these factors, source categories with suitable operational and fuel characteristics are identified for the Tier 4 testing program. The next section presents a more detailed discussion on the factors that are believed to affect PCDD emissions.

3.0 FACTORS AFFECTING DIOXIN EMISSIONS

There are several unproven hypotheses concerning PCDD emissions from combustion processes. Dow Chemical's "Chemistries of Fire" theory proposes that PCDD's are a natural byproduct of fire and will be formed at some quantities in all combustion processes.[31]. However, experimental results by Buser and Rappe and an evaluation of data from the literature suggests that PCDD's are emitted only under limited conditions. The most prevalent theories, including Esposito's formation mechanism, involve the incomplete combustion of PCDD's or PCDD precursors. Although there is some disagreement on the definition of precursors, PCDD precursors are defined in this paper as chlorinated aromatics that can produce PCDD's through bimolecular reactions and thermal rearrangements. Examples include chlorinated phenols and chlorinated benzenes. When PCDD's are in the feed of a combustion source, they can escape with the fine particulate if thermal destruction efficiency is low. Additionally, PCDD precursors may be thermally rearranged during incomplete combustion to form PCDD's.

Neither the Dow hypothesis or the precursor hypothesis have been conclusively supported or refuted. Recent studies involving pyrolysis of wood with and without chlorination, in conjunction with the studies of pyrolysis of chlorinated coal, suggest that inorganic chlorine at high levels with any organic material may very well lead to PCDD formation (see Section 2.1.10).

This section discusses the various factors identified in the literature that may effect PCDD emissions. These are listed below.

Based on the literature review, the following factors are believed to affect dioxin emissions:

- PCDD in feed,
- Precursors in feed,
- Chlorine in feed,
- Combustion temperature,
- Residence time,
- Oxygen availability,

- Feed processing,
- Supplemental fuel.

How these factors interact during the formation of PCDD's is not well defined. Therefore, each of the factors will be discussed separately below. Once the results of the source test program and ash screening studies are available and have been analyzed, an assessment of the relative importance of each of these factors can be made. In addition, now Dow's hypothesis and the precursor hypothesis can be tested with the additional information.

3.1 PCDD IN FEED

2,3,7,8-TCDD is an impurity that results from the manufacture of trichlorophenol, which is used to make the herbicide 2,4,5-trichlorophenoxy acetic acid (245-T). Pentachlorophenol (PCP) production will also result in a PCDD contaminant, primarily octachlorodibenzo-p-dioxin (OCDD). The primary end use for PCP is as a wood preservative. It is anticipated that limited PCDD contamination will also occur during the manufacturing of other similar chlorinated aromatics, particularly if the manufacturing process is inefficient or not well controlled. Therefore, PCDD's are expected to enter the environment as a contaminant of commercial products, such as wood preservatives and pesticides.

The widespread use of these products increases the possibility of finding PCDD's in the feed of a combustion process. For example, PCP treated wood may be used to fire boilers. Runoff may carry pesticides to water treatment facilities where the organics are incorporated into a sludge. The sludge may then be incinerated. Likewise, contaminated waste streams from manufacturing processes may be incinerated as an energy recovery procedure. Two examples are PCP sludge incinerators used at wood preserving facilities and black liquor recovery boilers used at paper mills.

The IERL industrial boiler study discussed in Section 2.1.2.3 demonstrates that PCDD's have been detected in combustion source emissions with PCDD's in the feed.[22] If PCDD's are found in the feed of an inefficient or poorly controlled combustion process, it is very likely that they will be released to the atmosphere.

3.2 PRECURSORS IN FEED

Although the Dow "Chemistry of Fire" theory has some backing, much of the experiments reviewed focused on the formation of PCDD's and PCDF's from precursors. Experiments by Buser, Rappe, and others are described in more detail in Section 2.1.10. Esposito et al presented detailed descriptions of the formation mechanisms of chlorinated dioxins from precursors.[37] This work organizes dioxin precursors into three classes:

Class I - Polyhalogenated phenols, primarily with a halogen ortho to the hydroxyl group, with a high probability of dioxin formation.

Class II- Ortho-halophenols and ortho-halophenyl esters where the substituted groups are a mixture of halogens and nonhalogens.

Class III - Other chemicals having the possibility, but less likelihood, of dioxin formation. These include chlorinated aromatic compounds.

The majority of experimental work to date has centered on three classes of precursors: chlorinated phenols, chlorinated benzenes, and PCB's. Table 3-1 lists the uses and annual production rates for these three classes of chemicals.

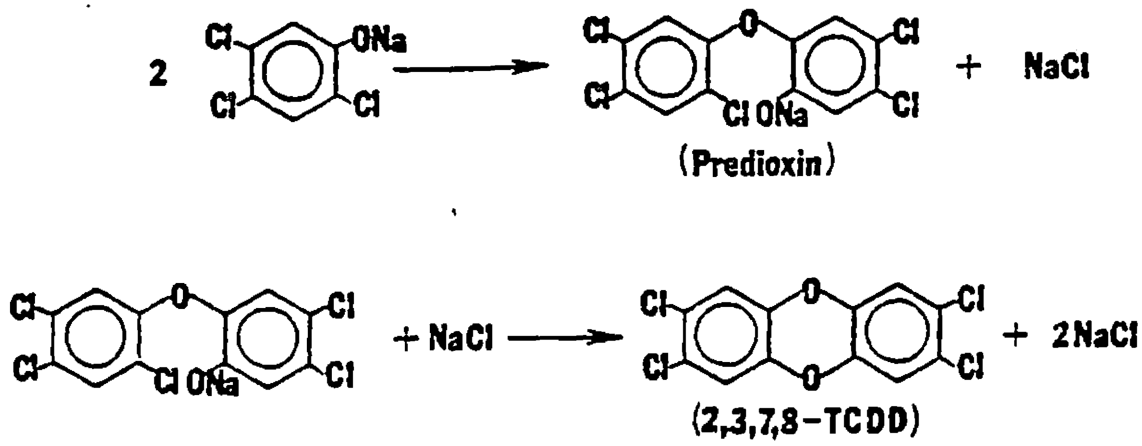
PCDD formation from the combustion of chlorinated phenols has been tested extensively by Rappe[92], Jansson[55], and Ahling[5, 4]. The formation of 2,3,7,8-TCDD from 2,4,5-trichlorophenol is illustrated in Figure 3-1a. Figure 3-1b illustrates the formation of OCDD from PCP. Dechlorination of the highly chlorinated homologs can result in the more toxic TCDD isomers.

Chlorinated phenols are used as wood preservatives, herbicides, and sap stain control. Wood or vegetation sprayed with chlorophenols may be disposed of by incineration or used as a supplemental fuel in boilers. In addition, chlorophenol wastes are often disposed of in sludge incinerators and industrial boilers. The identified experimental references indicate that these combustion sources should be considered in the Tier 4 testing program.

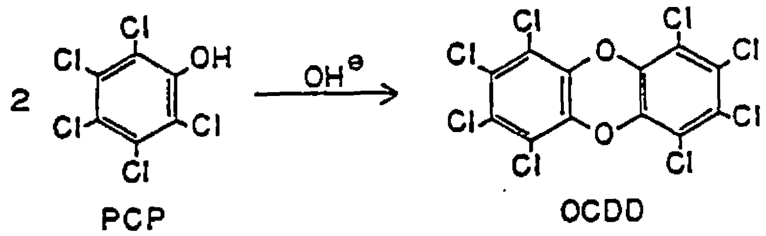
Buser investigated the formation of PCDD's and PCDF's from the pyrolysis of chlorobenzenes.[17] The formation mechanism included a

TABLE 3-1. PCDD PRECURSORS

Precursor	Use	Quantity
Chlorophenols	Herbicides Fungicides Wood Preservatives Sap Stain Control	63,000 kkg/y
Chlorobenzenes	Manufacturing Intermediates Inert Solvents Rubber Production Pesticides Lubricants Pharmaceuticals Dyes Wood Preservatives	215,000 kkg/
PCBs	Transformers Capacitators Insulation Hydraulic Fluid Plasticizers Dyes	570×10^6 kkg (1930-1975)



A: 2378-TCDD Formation from 245-trichlorophenol



B: OCDD Formation from PCP

Figure 3-1. PCDD formation from chlorophenols.

chlorophenol and a polychlorinated diphenyl ester (PCDPE) intermediate. Figure 3-2 illustrates the possible formation mechanisms.

Chlorobenzenes are used in solvents, dyes, pharmaceuticals, and rubber production. These products make up much of the organic chlorine found in MWC feed. The associated waste product may also be disposed of in an incinerator or boiler.

Buser also investigated the formation of PCDF's from the pyrolysis of PCB's.[18, 19, 20] The proposed formation mechanism is an intramolecular cyclization as shown in Figure 3-3. No experimental work has been identified on PCDD formation from PCB's. However, several studies have been identified that found PCDD's emitted from PCB fires.[48, 95, 116] In addition, PCB's are often in solution with hexachlorobenzenes which have been shown to form PCDD's.

Up until 1975, PCB's were used as dielectric fluids in transformers and capacitors. PCB's have also been used in hydraulic fluids, plasticizers, and dyes. The incineration of PCB's at waste disposal facilities or in boilers may result in PCDD and PCDF emissions.

3.3 CHLORINE IN FEED

The chlorine content of fuel is obviously an important parameter affecting the formation of PCDD's or PCDF's. Shih *et al* developed a ranked priority list of conventional combustion systems emitting polycyclic organic matter including PCDD's and PCDF's.[104] The rationale presented for source ranking is based on fuel characteristics and combustion conditions. Shih's work places great emphasis on both the chlorine content of the feed and the concentration of aromatics in the feed. Table 3-2 lists the chlorine content of several fuels.

Other authors have demonstrated the effect of chlorine on dioxin emissions. Mahle *et al* demonstrated that PCDD's were emitted from coal combustion only when chlorine was added.[55] Tierman *et al* found PCDD formation during the combustion of pine in the presence of HCl, but no PCDD's were detected during the combustion of pine alone.[113] Liberti

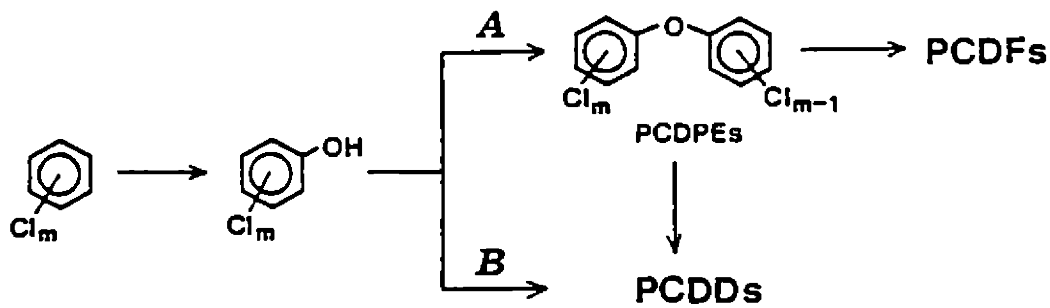


Figure 3-2. PCDD and PCDF formation from chlorobenzenes[17]

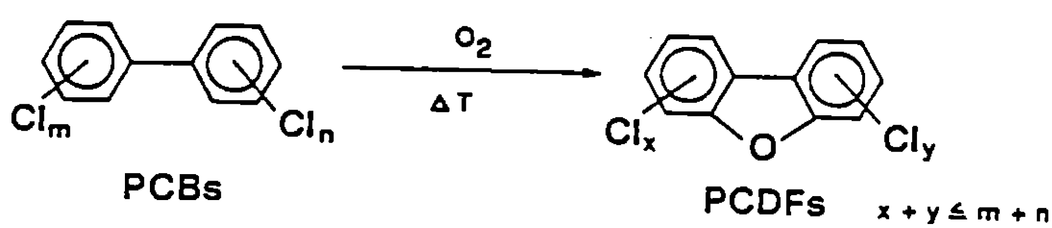


Figure 3-3. PCDF formation from PCB's[20]

TABLE 3-2. FUEL CHLORINE CONTENT

Fuel Type	Chlorine Content (ppm)
Refuse Derived Fuel	1,400 - 9,500
Paper	300 - 1,600
Wood	11 - 84
Coal	10 - 3,700
Residual Oil	1 - 200
Crude Oil	1.6 - 74
Distillate Oil	50 - 100
Natural Gas	---
PCP/PCB Wastes	Several Percent

Source: Reference No. 104

studied the combustion of vegetables.[73] When inorganic chlorine or PVC is added, PCDD's and PCDF's were detected in the feed.

While the precursor theory has received widespread acceptance,these inorganic chlorine studies demonstrate that the specific mechanisms involved in PCDD formation are complex and not well understood. However, it can be generally stated that chlorine must be present for the formation of PCDD, and general trends indicate that increased chlorine concentrations in the feed improve the possibilities of PCDD emissions.

3.4 COMBUSTION CONDITIONS

The remaining factors that affect PCDD emissions are combustion conditions. These are combustion temperature, residence time, supplemental fuel, and fuel processing. The combustion efficiency is a function of all of these factors. In order to destroy PCDD's or prevent their formation, the combustion efficiency must be high. This requires a combination of high temperatures, available oxygen, high Btu fuel, and long residence times. Each factor is discussed separately below.

3.4.1 Combustion Temperature

Experimental evidence suggests that temperatures of 500-800°C promote PCDD formation, while temperatures greater than 800°C destroy PCDD's.[5,20,31] Buser et al showed that PCB pyrolysis at 550-650°C forms PCDF.[20] However, pyrolysis at temperature greater than 700°C cause 99 percent destruction of PCB's and no PCDF formation. Ahling et al produced similar results for both PCDD's and PCDF's during the combustion of chlorophenols.

Combustion temperature is a function of the Btu content of the fuel or supplemental fuel, the available air, and the degree of fuel processing. MWC's are considered a major combustion source of PCDD's.[114] The large mass burn units are characterized by low combustion temperatures. This is due in part to the high moisture, low BTU fuel; poor air/feed mixing due to the lack of feed processing; and lack of supplemental fuel. In comparison, many hazardous waste incinerators and high efficiency boilers are designed for efficient combustion. These units burn high BTU fuels or add high BTU supplemental fuels; and, even if the air/fuel ratio is low, the air/fuel missing is efficient. The fuels are processed to decrease moisture and improve mixing. In many cases, high temperature afterburners are used for the combustion of offgases. Several studies have been identified that demonstrate the effects of high combustion temperatures on PCDD's and PCDD precursors.[116, 90, 3] For example, no PCDD's were detected in the emissions of the Vulcanus incinerator ship during the combustion of PCDD contaminated Herbicide Orange.[3] The combustion temperature during this project was 1600°C.

When selecting sources for the Tier 4 testing program, combustion temperatures will be considered. Source categories characterized by low combustion temperatures are considered potential sources of PCDD emissions.

3.4.2 Residence Time

The residence time necessary to destroy PCDD's and the combustion temperature are inversely related. The higher the combustion temperature, the shorter the required residence time for PCDD destruction. Likewise, a low temperature source will require a long residence time for destruction of PCDD's. Sachter et al showed that an increase in both temperature and residence time decreased the formation of PCDD's from chlorophenol combustion.[100] Similar results have been found at hazardous waste incinerators that run with 1.5-2.0 second residence times. Combustion sources with longer residence times and high temperatures are less likely to form products of incomplete combustion, such as PCDD's.

3.4.3 Oxygen Availability

Oxygen availability is a function of both the air/fuel ratio and air/fuel mixing efficiency, both of which are of concern when burning solid fuels. Solid fuels and high viscosity liquid fuels (waste tars, etc.) burn as particulates or large droplets, and therefore portions of the fuel are burned in low oxygen or pyrolysis conditions. A low air/fuel ratio or poor air/fuel mixing will promote poor combustion conditions and the formation of PCDD's. Jansson demonstrates that an insufficient air supply increases PCDD emissions from chlorophenol combustion.[55] MWC are usually fired with excess air. However, large mass burn units have poor air/fuel mixing due to the lack of fuel processing. Activated carbon regeneration and wire reclamation incinerators are both designed with limited air. All of these cases have been shown to emit dioxins.[49, 51, 50] Available oxygen will be considered during the source ranking. Sources with a low air/fuel ratio or poor air/fuel mixing will be considered potential sources of PCDD emissions.

3.4.4 Feed Processing

The feed material for a combustion source may be a liquid, a solid, or a gas. Both liquid and gas fuels can be easily mixed with air resulting in a high combustion efficiency; solid feeds usually require some processing to improve combustion. Often solid feeds require drying, shredding, or separation to improve combustion. Similarly, high viscosity fuels, for example waste tars, require some preparations including preheating and atomization prior to combustion.

Feed processing will determine in part both oxygen availability and residence time. Fine, homogeneous feed particles will improve air/fuel mixing and combustion. Larger particles will require longer residence times and may result in local oxygen deficiencies due to poor mixing. High moisture will also decrease combustion efficiency. Therefore, highly processed homogeneous feeds are less likely to emit products of incomplete combustion, such as PCDD's.

3.4.5 Supplemental Fuel

When burning a low Btu fuel, the addition of supplemental fuel will increase the combustion temperature and improve combustion. Haile et al tested a boiler cofiring RDF with coal. The boiler temperature was 1200°C, and no PCDD's were detected. Dow Chemical tested an industrial incinerator burning waste tars without supplemental fuel and found ppb levels of TCDD's in the fly ash. After the addition of a supplemental fuel, no TCDD's were detected.

When selecting sources for the Tier 4 testing program, sources fired with high Btu supplemental fuel will be considered less likely to emit PCDD's. Sources burning low Btu wastes without supplemental fuels are likely candidates for testing.

4.0 DEVELOPMENT OF THE RANKED SOURCE LIST

Based on the results of the literature review, a sampling plan has been developed that will provide data to allow a better definition of the nature of the dioxin emissions problem. Due to Tier 4 budget restraints, not all source categories identified by the literature search will be tested. In order to facilitate the source selection process, source categories will first be ranked based on factors identified in Sections 2.0 and 3.0. Source categories with the highest ranking will be stack tested first, and source categories ranked with a low potential to emit dioxins will be screened early in the test program. Source screening will involve collecting ash samples and analyzing these samples for PCDD's. Screening results help select which of the lower ranked categories should be stack tested and will help characterize source categories that will not be stack tested. The following chapter describes the rationale used to select and rank broad source categories for the Tier 4 testing program.

During the development of the ranked source list, very broad source category definitions were used. All of the source categories can be subdivided further and, in many instances, it is anticipated that some subcategories will have a higher potential for PCDD emissions than others. For example, municipal waste combustion can occur in large field erected units designed for energy recovery or in smaller package units. The waste can be burned as is or can be classified in a number of ways including by air or by wet processing. In addition, refuse derived fuel can be cofired in boilers. As discussed earlier, each of these differences in subcategories can effect dioxin emissions. Due to the limited amount of information available, and the subjective nature of the ranking process, the authors felt that subcategorization was not justified for the development of the preliminary source list.

As site selection for ash screening and stack testing proceeds, consideration should be given to the representativeness of the facilities selected. Subcategories of the major categories may well be justified especially during ash screening.

4.1 DEVELOPMENT OF PRELIMINARY SOURCE LIST

The first step in the ranking process is to develop a fairly extensive list of the major combustion source categories. Table 4-1 lists the approximately 50 combustion sources considered. The sources listed can be categorized in one of the following groups:

(1) Fossil fuel boilers, process heaters, oil engines;
(2) Manufacturing processes;
(3) Waste Disposal; and
(4) Accidental fires.

Source category size and precursor concentration in the feed are key criteria in the selection of these categories. Based on precursor content described by Esposito[37] and chlorine content, many waste disposal categories and manufacturing processes were selected. A review of AP-42 and the 1981 NED's Fuel Use Report suggested several fossil fuel and wood fired source categories. These sources were selected based on size and emissions data.

From this list of potential source categories, a preliminary source list has been developed. These sources are most likely to pose a dioxin emissions problem. Source categories on the preliminary source list will eventually be ranked and considered for stack testing. Selection of source categories for the preliminary source list is based on the following criteria:

(1) PCDD's detected in previous studies;
(2) Elevated levels of chlorine, PCDD precursors, or PCDD's in feed;
(3) Experimental studies that suggest the source is a potential PCDD emitter; and
(4) Favorable combustion conditions for PCDD formation based on operational parameters described in Section 2.0.

For example, wood stoves have been shown to produce dioxins.[31] Based on this work and the possibility of PCP contamination, wood fired boilers and wood stoves warrant further research. Municipal waste combustors, sewage sludge incinerators, and hazardous waste incinerators have all been previously tested, and PCDD's were detected. Precursor and chlorine levels in the feed indicate that both black liquor boilers and other waste fired

TABLE 4-1. COMBUSTION SOURCES

Fossil Fuel Boilers, Process Heaters, or Engines

Boilers
- Coal Fired
- Oil Fired
- Natural Gas Fired
- Liquified Petroleum Gas

Process Heaters
- Oil
- Natural Gas
- Refinery Gas

Turbines
- Oil
- Natural Gas

Internal Combustion Engines
- Stationary
- Mobile

Home Heating
- Oil
- Natural gas
- Coal
- Kerosene

Industrial Processes

Catalytic Cracking
Charcoal Manufacturing
Carbon Black Manufacturing
Coke Manufacturing
Coal Gasification
Asphalt Manufacturing
Coffee Roasting
Meat Smoke Houses

Waste Disposal Operations

Wood Boilers
Refuse Derived Fuel Boilers
Municipal Waste Incinerators
Hazardous Waste Incinerators
- land based
- incinerator ship

Sewage Sludge Incinerators
Boilers Fired with
- contaminated waste oils
- off spec products
- distillation bottoms
- tars

Cement/Lime Kilns (Waste Fired)
Resource Recovery (Metals)
Carbon Reactivation
Pathological Incinerators
Black Liquor Boilers
Open Burning
Wood Stoves
Agricultural Burning

Accidental Fires

PCB Transformers
Structural Fires
Forest Fires
Subway Fires

boilers should be considered. Based on combustion conditions, activated carbon regeneration, charcoal manufacturing, and wire reclamation will also be considered. In each of these processes, both the combustion temperature and the air/fuel ratio are limited by design.[208, 205, 209]

Some source categories will be excluded from the preliminary list. Based on an evaluation of available data, these source categories are not expected to present a health risk. Therefore, these source categories will not be considered for stack testing during the initial ranking procedure. At the request of State or regional offices, these sources and others not listed will be screened using ash samples. Exclusion of source categories from consideration for stack testing was based on the following criteria:

(1) Low chlorine fuel (natural gas, clear oil);

(2) Low precursor level (less than 1 ppm);

(3) Small source category (low annual tonnage); and

(4) Intermittent source category.

Based on previous studies and chlorine content, fossil fuel boilers, process heaters, and turbines have been excluded from the preliminary list.[44] In addition, processes using clean fossil fuels, such as carbon black manufacturing and coal gasification, have been excluded. Two exceptions are small spreader stoker coal boilers and mobile sources. Due to combustion conditions (poor air/fuel mixing and lower temperatures), small spreader stoker coal boilers will be included in the test plan. Dioxins have been detected in two previous studies on mobile sources.[31, 105]

Sources burning low annual tonnage such as coffee roasting, meat smoke houses, or open burning have also been excluded from the preliminary list. Similarly, intermittent sources such as accidental fires or incinerator ships have been excluded. While on an individual basis, many of these sources may emit dioxins, these source categories do not pose the potential exposure problem that would be expected with large continuous sources. Table 4-2 lists the major exclusions from the preliminary source list.

Table 4-3 presents the preliminary list of combustion source categories and rationale for selection. In the next section, the rationale for ranking the preliminary source list will be presented.

TABLE 4-2. COMBUSTION SOURCE CATEGORIES EXCLUDED FROM PRELIMINARY SOURCE LIST

- Coal: Tested extensively by EPA
  No PCDD detected
- Natural Gas: Clean burning
  Low chlorine
- Clean oil: Low chlorine
- Processes using low chlorine petroleum products
  - Carbon Black Manufacturing
  - Catalytic Cracking
  - Coke Manufacturing
  - Coal Gasification
  - Asphalt Manufacturing
- Intermittent Sources/Low National Fuel/Feed Use
  - Pathological Incinerators
  - Incineration Ships
  - Coffee Roasting
  - Meat Smoke Houses
  - Bagasse Boilers
  - Open Refuse Burning
  - Accidental fires
  - Apartment House Incinerators

TABLE 4-3. PRELIMINARY SOURCE LIST OF COMBUSTION SOURCE CATEGORIES BELIEVED TO HAVE THE GREATEST POTENTIAL TO EMIT DIOXINS

Source	Rationale
Hazardous Waste Incinerators	TCDD Detected
Municipal Waste Incinerators	TCDD Detected
RDF Boilers	TCDD Detected
Commercial Waste Oil Boilers	TCDD Detected
Industrial Boilers Cofiring Wastes	TCDD Detected
Wire Reclamation Incinerators	TCDD Detected
Activated Carbon Regeneration	TCDD Detected
PCP Sludge Incinerators	TCDD Detected
Sewage Sludge Incinerators	PCDD Detected
Mobile Sources	TCDD Detected
Wood Stoves/Fireplaces	TCDD Detected
Wood/Bark Boilers	Experimental results with PCP treated wood
Charcoal Manufacturing	Experimental results with PCP treated wood, combustion conditions
Black Liquor Boilers	PCBs in effluent, PCP's in feed
Cement/Lime Kilns Cofiring Wastes	Precursors present
Small Spreader-Stoker Coal Boilers	Favorable combustion conditions for dioxin formation

4.2 DEVELOPMENT OF RANKING CRITERIA AND THE RANKED SOURCE LIST

Shih et al developed a ranked priority list of conventional combustion systems emitting polycyclic organic matter.[104] The emphasis of this work was on PCDD's, PCDF's, and PCB's. The rationale presented for source ranking was based on fuel characteristics and combustion process characteristics. Table 4-4 presents Shih's ranked list.

Radian's efforts to rank combustion sources with the potential to emit TCDD is based on Shih's work, with the following exceptions:

(1) A greater emphasis is placed on combustion of wastes as fuels and on dioxin precursors in the feed.

(2) Coverage has been expanded to include nonconventional combustion sources, such as waste fired boilers and black liquor boilers which are considered due to the potential for elevated concentrations of chlorinated aromatics in the feed.

(2) Source category size (annual tonnage) is considered during ranking.

(3) The number of valid tests previously conducted on a source category is also considered a ranking criteria.

The following discussion presents supporting data, ranking rationale, and key references using during the development of the ranked source list. Figure 4-1 summarizes these procedures by means of a flow chart. Source categories from the preliminary source list are ranked into one of four groups. Rank descriptions are listed in Table 4-5.

The ranking process was highly subjective since no realistic assignment of weighing factors could be made for each of the ranking criteria. The development of a ranked list would change depending on the relative importance given to the ranking criteria. The criteria used to rank the preliminary source list are based on factors affecting dioxin emissions identified in the literature review. In addition, the size of the source category, the location of the sources, the number of previous tests, and the results of previous tests are considered. Table 4-6 lists the ranking criteria. Table 4-7 summarizes source characteristics used in the ranking procedure.

TABLE 4-4. RANKED PRIORITY LIST OF COMBUSTION SYSTEMS FOR SOURCE TESTING

Priority List for Chlorinated POM Compounds*	Corresponding Priority Ranking for Brominated POM Compounds+	Corresponding Priority Ranking for PAH Compounds
1. Coal-refuse spreader stoker	1	10
2. Municipal refuse incineration	2	12
3. Coal-refuse suspension-firing	3	16
4. Wood combustion - dutch oven	4	7
5. Wood combustion - overfeed stoker	5	8
6. Wood combustion - spreader stoker	7	11
7. Waste oil combustion	6	19
8. Bituminous coal - hand-fired units	8	1
9. Bituminous coal - overfeed stoker	9	3
9. Bituminous coal - underfeed stoker	9	3
11. Bituminous coal - spreader stoker	11	5
12. Wood combustion - hand-fired units	13	2
13. Lignite - other stokers	12	6
14. Lignite - spreader stoker	14	9
15. Bituminous coal - cyclone	15	13
16. Bituminous coal - pulverized dry-bottom	16	14
17. Bituminous coal - pulverized wet-bottom	17	16
18. Lignite - cyclone	18	18
19. Lignite - pulverized dry-bottom	19	19
20. Distillate oil - home heating units	20	15
21. Residual oil - packaged boilers	21	21
22. Residual oil - field-erected boilers	22	22
23. Distillate oil - packaged boilers	23	23

* Chlorinated POM compounds include PCDDs, PCDFs, and PCBs.

+ Brominated POM compounds include PBDDs, PBDFs, and PBBs.

Reference Number 104

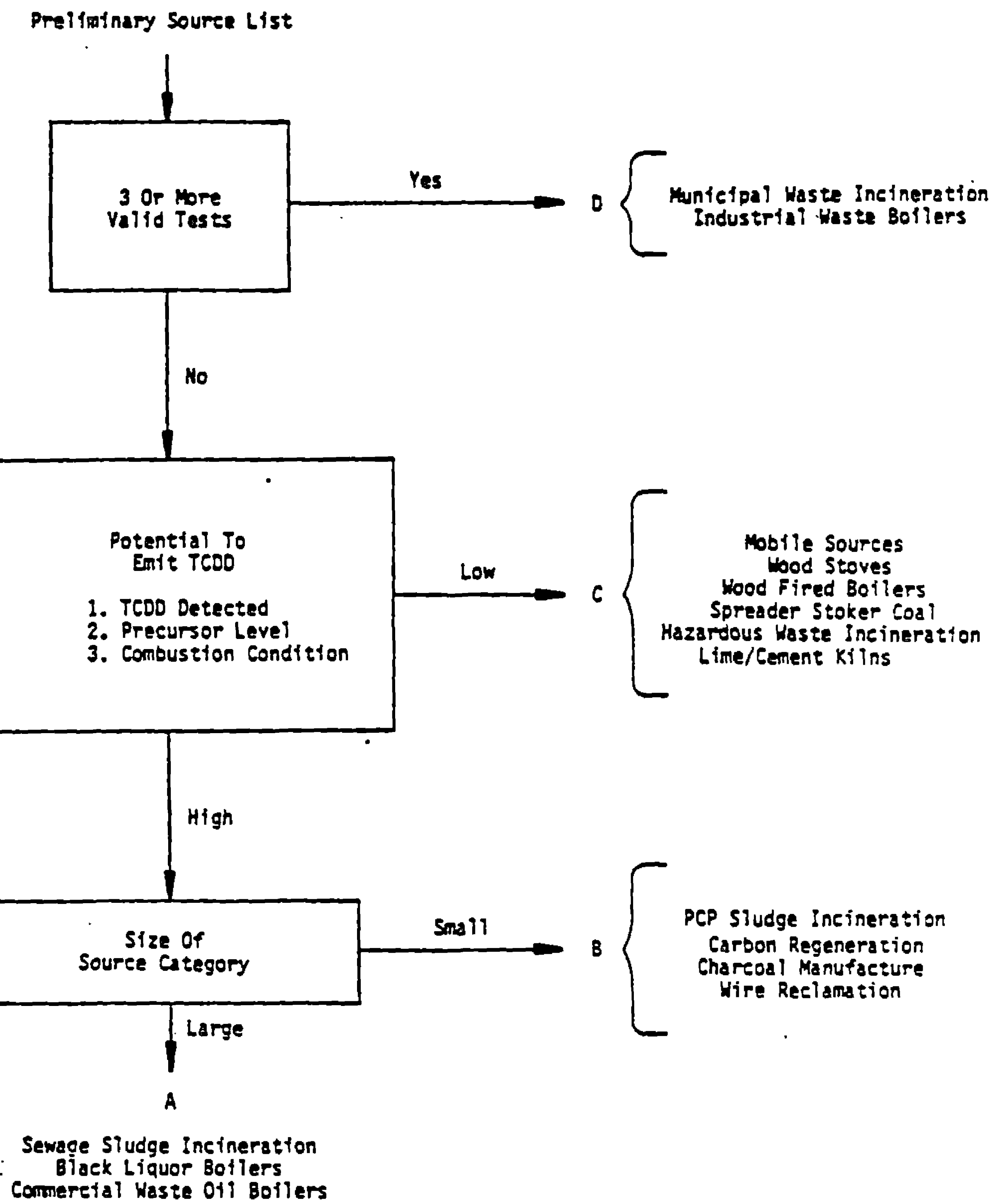


Figure 4-1. Ranking flow chart.

TABLE 4-5. RANKING CATEGORIES

Rank	Description
A	Large source categories (greater than 1 million tons of fuel and/or waste burned annually) with elevated dioxin precursor contamination of feed/fuel. These categories have the potential to emit TCDD and require further testing.
B	Small source categories (less than 1 million tons of fuel and/or waste burned annually) or source categories with limited dioxin precursor contamination of feed/fuel. These categories have the potential to emit TCDD and require further testing.
C	Source categories less likely to emit TCDD.
D	Source categories that have already been tested three or more times.

TABLE 4-6. CRITERIA FOR RANKING COMBUSTION SOURCE CATEGORIES

- Number of previous dioxin stack tests

- Estimated potential to emit TCDD

  - Measured TCDD levels
  - Presence of dioxin precursors in feed
    - chlorinated phenols
    - chlorinated benzenes
    - PCB's
  - Chlorine content of feed
  - Combustion conditions
    - temperature
    - local air availability
    - supplemental fuel
    - residence time
    - fuel processing

- Size of source category

  - Number of facilities
  - Quantity of fuel burned
  - Location of sources in category
  - Potential for human exposure

TABLE 4-7. SOURCE CHARACTERISTICS

Source	Size (Tons/Year)	Number of U.S. Facilities	Fuel Composition	Combustion Temperature	Air/Fuel Ratio	Air/Fuel Mixing	Number of Previous Tests	TCDD Detected
Waste Fired Boilers	$20x10^6$	-						
Industrial	---	-	PCBs, Cl-phenols	1000°C	Excess	Good	6(1)	ND-40.5 ng/m^3
Commercial	---	-	PCBs, Cl-phenols	<1000°C	Excess	Good	6(6)	
MWCs								
Conventional	$10x10^6$	40	Cl-organics	500-1000°C	Excess	Poor	3	3.15-240 ng/m^3
Modular	$0.23x10^6$	90	Cl-organics	500-1000°C	Excess	Poor	1	1.2 ng/m^3
RDF Boiler	$4.5x10^6$	11	Cl-organics	1000°C	Excess	Good	3	ND-29.7 ng/m^3
Black Liquor Boilers	$42x10^6$	274	PCBs, PCPs	1000°C	Excess	Good	0	
Sewage Incinerators	$1.5x10^6$	200	Cl-organics	1000°C	Excess	Poor	2	483-1140 ng/m^3
							(PCDD Scan)	
PCP Sludge Incinerators			PCPs	1000°C	Excess	Good	1	0.8-3.4 ppb
Carbon Regeneration		73	PCBs	800°C	Limited	Good	1	ND-$5x10^{-4}$ ppb
Wire Reclamation			PCBs, PVC	550°C	Limited	Poor	1	ND-.41 ppb
Charcoal Manufacturing	$3.7x10^6$	106	PCP	500°C	Limited	Poor	0	
Wood Boilers	$60x10^6$		PCPs	1000°C	Excess	Poor	4	.329 ppb
Woodstoves	$48x10^6$			<500°C	Low	Poor	0	
Spreader Stoker Coal				1000°C	Excess	Poor	0	
Mobile Sources					Excess	Good	9(4)	ND-.02 ppb
HW Incineration	$1x10^6$	219	PCBs, Cl-phenols	1200°C	Excess	Good	10(7)	ND-2.5 ng/m^3
Lime/Cement Kilns		2-3	PCBs, Cl-phenols	1400°C	Excess	Good	1	ND

Based on these ranking criteria, source categories in the preliminary source list will be ranked into one of the groups listed in Table 4-5. The Rank A group is expected to emit dioxins with the greatest potential human exposure. Rank B and C sources are expected to be less of a problem. Rank D sources are considered to be adequately tested for the purposes of the Tier 4 testing program. The implications of these rankings will be discussed in greater detail in the next section.

Source categories with three or more valid dioxin tests, using modified Method 5 train sampling and GC/MS analysis for 2,3,7,8-TCDD, are considered adequately tested for the purposes of Tier 4. Results of three or more valid tests are considered sufficient to indicate the potential range of 2,3,7,8-TCDD emissions from a source category. Source categories meeting these criteria are assigned a rank of D. These include municipal waste combustors (reference 49, 56, 9, 44, 114, 43) and industrial boilers cofiring wastes (reference 94, 46, 22). Seven MWC's have been tested in the United States. Several fly ash and stack tests have also been conducted in Canada and Europe. After reanalyzing archived samples from the IERL industrial boiler tests, a total of six waste fired industrial boiler tests will be completed.

The remaining source categories are ranked according to potential to emit TCDD's. Rank C source categories are categories that have been judged less likely to emit TCDD's, when compared to other source categories under consideration. The judgments made considered many of the ranking criteria including the level of TCDD's detected in previous tests, the anticipated level of precursors, and the combustion conditions. Rank C source categories include mobile sources, woodstoves, wood boilers, small spreader stoker coal boilers, hazardous waste incinerators, and lime/cement kilns.

Mobile sources have been tested in two earlier studies.[31, 105] In both cases, TCDD's were detected at the ppt level. Chlorine content of the gasoline and diesel fuels are also low (0-100 ppm). The only case where significant quantities of chlorine may be found in gasoline is the use of ethylene dichloride (EDC) as an antiknock agent in leaded gasoline. However, with the increasing concern over atmospheric lead pollution, the use of leaded gasoline and EDC is on the decline. Based on earlier tests and chlorine content, mobile sources have been ranked C.

Dow Chemical conducted two series of tests on woodstoves.[31, 83] TCDD's detected ranged from ND-370 ppt. The chlorine content of wood is less than 100 ppm. Although the combustion conditions found in wood stoves favor the formation of PCDD's, the low chlorine concentrations and the low levels of PCDD's detected in earlier studies indicate that this category is less likely to emit PCDD's. However, 48 million tons of wood is burned each year in residential woodstoves. This source category is characterized by low stacks and high particulate emissions. Woodstoves will be considered during the ash screening. Likewise, wood fired boilers, which are more efficient combustion systems with higher stacks, will be ranked C. Boilers fired with PCP treated wood are considered under the waste fired boilers category.

Small spreader stoker coal boilers have been placed in the Rank C category. This source category was originally considered because of combustion conditions that favor PCDD formation. These include lower combustion temperatures than the larger boilers previously tested,[44] and poor air/fuel mixing due to large feed size. However, the earlier tests on utility boilers did not detect PCDD in stack emissions[44], and experimental studies demonstrate that PCDD's are emitted from coal combustions at 600°C only when chlorine is added.[78]

Both hazardous waste incinerators and lime/cement kilns cofiring wastes have been ranked C. Elevated levels of PCDD precursors can be expected in the feed of these source categories. However, previous tests have shown only low levels of PCDD's emitted.[116, 90, 81] This is due to combustion conditions. Generally, combustion temperatures for these sources are greater than 1000°C, and the residence time for fuel ranges from 1 to 2 seconds. The use of high Btu supplemental fuel and afterburners also decrease the likelihood of PCDD emissions from these sources.

Sources with high potential to emit are ranked A or B. Rank B source categories are smaller source categories (less than 1 million tons/year) or categories with lower concentrations of precursors in the feed. These include PCP sludge incineration, carbon regeneration, charcoal manufacturing, and wire reclamation.

Two studies have looked at PCP waste incineration.[28, 94] In both cases, PCDD's were detected in fly ash samples. Through experimental studies, PCP's have been shown to form octachlorodibenzo-p-dioxins (OCDD) during combustion.[55] Dechlorination of OCDD can result in TCDD's.[22] Annually, 19,000 tons of PCP is used to preserve wood.[213] Only a small percentage of this is incorporated in sludge which must be disposed. Typically, the sludge is incinerated at the wood preserving plant along with scrap wood. The lack of feed processing and the high moisture content of the sludge can result in poor combustion conditions. Therefore, while PCP sludge incineration is a potential source of PCDD's, the size of this category does not warrant the highest ranking for the Tier 4 program.

Activated carbon regeneration has also been placed in the Rank B category. The thermal regeneration of activated carbon has been studied in Cincinnati, Ohio. ppt levels of TCDD's were detected in the fly ash. However, the spent carbon had been used to treat the Cincinnati water supply. Precursor levels in the carbon were low in comparison to what might be expected in carbon used to treat an industrial waste stream. In order to prevent the combustion of the carbon, the air/fuel ratio and the combustion temperature (~800°C) are kept low.[209] These conditions promote the formation of products of incomplete combustion, such as PCDD's. There are approximately 73 carbon regeneration facilities in the United States. The actual amount of carbon thermally regenerated annually is currently not available.

Charcoal manufacturing is another source category with combustion conditions that favor dioxin formation. Furnace temperatures are kept low (500°C), and both air/fuel ratio and air/fuel mixing are poor.[206] Source category surveys indicate that charcoal manufacturers are now using scrap wood from saw mills. Much of this wood has been treated with PCP products for sap stain control. The combustion conditions, along with the potential use of PCP treated wood, indicate that this source category has a high potential to emit dioxins. Approximately 3-4 million tons of wood is used annually in the production of charcoal. However, not all of this wood is PCP treated. Tierman has demonstrated that the combustion of clean wood (pine) does not form PCDD's.[113] In addition, the majority of charcoal manufacturing facilities are located in rural settings. This source category has been placed in the Rank B category.

The final Rank B source category is wire reclamation incinerators. In previous tests, ppt levels of TCDD's were detected in stack scrapings. As with carbon regeneration and charcoal manufacturing, both the combustion temperature and available oxygen are kept low in this process.[210] Wire insulation incinerated during this process often contains PCB's and polyvinyl chloride. The size of this source category is not known. However, there are 11 of these facilities in the Chicago area.[212] New York State has also cited this source as a potential problem.

The remaining source categories are Ranked A. These are sewage sludge incinerators, black liquor boilers, and commercial boilers cofiring chlorinated wastes. Of the sources that have not been adequately tested, these sources are considered to have the highest potential to emit dioxins.

Approximately 1.5 million ton of sewage sludge is incinerated annually.[201] The high moisture content of the feed can result in poor combustion conditions. Many of these incinerators have odor and particulate problems. In addition, sewage from an industrial district may contain elevated levels of PCB's and other chlorinated aromatics. In an earlier Canadian study, PCDD's were detected in stack emissions. Many newer units are operated on a fuel efficient system. In order to save energy, both the combustion temperature and the available oxygen are held low.

Black liquor boilers are also Rank A sources. Approximately 13 percent of all fuel used in large industrial boilers is pulping liquor.[215] Some 42 million tons of this pulping liquor is disposed of in boilers.[216] Due to wood treatment at saw mills and pulp wood storage areas, and biocides used in the pulping operation, the potential for chlorophenol contamination is high. In addition, earlier studies have detected PCB's in the emissions from these boilers.[217] One subcategory of particular concern is black liquor recovery boilers. These boilers recover smelt from the liquor. The black liquor is sprayed on the inner walls of the boiler. Smelt is collected at the base of the boiler while organics are incinerated. The temperature is kept low in these boilers to prevent oxidation of the smelt.

The final Rank A source category is commercial boiler firing waste oil containing chlorinated solvents. Approximately 20 million tons of RCRA wastes are disposed of in boilers annually.[205] Many of these wastes are chlorinated aromatics. Commercial size boilers account for about one third of this waste disposal. These boilers are less efficient that the larger industrial boilers and are more likely to produce products of incomplete combustion such as dioxins. The low stack heights and urban settings of these boilers also increase the human exposure risk.

Table 4-8 presents the ranked source list. As discussed earlier, this ranking procedure is highly subjective. In order to help validate the ranked source list, ash screening tests will be conducted on Rank B and C source categories. The final ranking of B and C source categories may change depending on the results of the screening tests. The following section presents the development of the testing program which is based on the ranked source list.

TABLE 4-8. RANKED SOURCE CATEGORY LIST

Rank A Source Categories
Sewage Sludge Incinerators
Black Liquor Boilers
Commercial Boilers
Rank B Source Categories
PCP Sludge Incinerators
Carbon Regeneration (Industrial)
Charcoal Manufacturing
Wire Reclamation
Rank C Source Categories
Wood Stoves
Wood Boilers (PCP Treated)
Mobile Sources
Small Spreader Stoker Coal Boiler
Hazardous Waste Incinerators
Lime/Cement Kilns Cofired with Hazardous Wastes
Rank D Source Categories
MSW Incineration
Industrial Boilers Cofiring Wastes

Rank A - Large source categories (greater than 1 million tons of fuel and/or waste burned annually) with elevated dioxin precursor contamination of feed/fuel. These categories have the potential to emit TCDD and require further testing.

Rank B - Small source categories (less than 1 million tons of fuel and/or waste burned annually) or source categories with limited dioxin precursor contamination of feed/fuel. These categories have the potential to emit TCDD and require further testing.

Rank C - Source categories less likely to emit TCDD.

Rank D - Source categories that have already been tested three or more times.

5.0 SAMPLING PLAN DEVELOPMENT

The objective of this chapter is to develop a sampling plan that will provide data to better define the nature of the PCDD emissions problem. Prior to the development of a sampling plan, some decision regarding the scope of study had to be reached.

Data obtained from the literature review has shown that PCDD emissions from combustion sources have been studied for some time on a piecemeal basis. Various hypotheses have been advanced concerning dioxin emissions including the theory that PCDD's are a widespread contaminant from combustion processes. The Canadian Government has taken the position that MWC's and forest fires are the major combustion sources emitting PCDD's.

With this diversity of opinions, there are several alternative options that could be pursued to fulfill the Tier 4 objectives. Each option has a different focus and attempts to address different aspects of the dioxin emissions issue. Four such options are considered during the sampling plan development.

<u>Option 1</u>: Take the Canadian position to be definitive and focus the Tier 4 efforts on MWC's and forest fires. Address the two prime questions: (1) Do 2,3,7,8-TCDD emissions at the concentration measured from MWC's pose an unreasonable risk to the public? (2) If so, what can be done to minimize the risk?

The work would involve several items including reviewing the previous risk assessment methodology, testing additional MWC's, and sampling forest fires. Forest fires could be sampled by perhaps sampling the plume from an aircraft or by taking ash samples. In addition, if the risk was significant, a detailed evaluation of an incinerator would have to be conducted. This would include determining the effects of various furnace operating parameters and fine-tuning the control devices.

<u>Option 2</u>: Test the trace chemistry of fire hypothesis for all combustion source categories. This option would involve testing as many combustion source categories as possible. The main question to be addressed would be: Which combustion sources emit 2,3,7,8-TCDD to the atmosphere?

A reliable and relatively cheap technique would have to be developed to allow a representative number of the hundred's of different combustion source categories and subcategories to be tested. Analysis of ash samples may be a viable technique.

Option 3: Develop a theoretical or empirical model of the combustion processes that lead to dioxin formation.

The modeling results will be used to address the question: Which combustion sources have the potential to emit 2,3,7,8-TCDD? It is unlikely that the model could address the follow-up question: At what concentrations?

Any modeling effort would have to be validated by some source tests which covered the range of expected types and conditions of combustion sources.

Option 4: Select a reasonable number of source categories to source test based upon the available data provided by the literature review. Attempt to select the combustion source categories with the highest potential to emit TCDD's and concentrate the available resources on these.

This option would attempt to address the questions: (1) Which combustion source categories emit significant 2,3,7,8-TCDD? (2) What range of concentration of 2,3,7,8-TCDD are emitted from the source categories? (3) What source characteristics (fuel type, combustion temperature, chlorine level, etc.) have the greatest effect on 2,3,7,8-TCDD emissions?

Recommended Option: Option four (4) has been selected by OAQPS for the Tier 4 study because it has the potential to provide the most information to the dioxin task force. In addition, the Tier 4 Working Group has decided to collect and analyze ash samples for PCDD's. This information will be used to help select sources for stack testing and will help characterize sources that will not be stack tested. Maximum use will be made of the available emissions information and, in addition, a broad range of combustion source categories will be covered. With judicial source category selection based on the literature review and ash analysis, sufficient information should be available from the test program to determine which source characteristics have the most effect on PCDD emissions. Even though insufficient information would be available to develop empirical models, the available results could then be extrapolated to other untested combustion source categories to estimate the relative magnitude of PCDD emissions from these.

Option 1 was not selected because it was felt that this option was too narrow in scope. The literature review indicated that only 15 or so source categories had been tested out of the potentially hundreds of combustion source categories and subcategories. One of the objectives of the Tier 4 study was to better define the nature of the problem. In addition, a detailed study of several incinerators has been or is being conducted to ascertain how PCDD emissions from these sources can be minimized. Instead of duplicating this ongoing effort, the Tier 4 resources could be better allocated.

Option 2 was not selected because it was too broad in scope. Option 3 was not selected because insufficient emissions information and source information are currently available to develop a model. The available data in the literature are very scanty and, in addition, the data were taken with various methods and at various levels of accuracy. Development of an empirical model that covered the range of combustion sources would require extensive sampling and data gathering at multiple sources and would require more resources that are currently available.

5.1 SELECTION OF NUMBER AND TYPE OF SAMPLES TO BE COLLECTED

5.1.1 Stack Testing

The Tier 4 stack testing program will use the EPA/ASME protocol developed last January. This protocol is based on a modified Method 5 train and includes continuous monitoring of various stack parameters. A summary of the EPA/ASME protocol is shown in Table 5-1. This has been used to develop a preliminary cost estimate for sampling at a particulate site. Depending on the number of sampling trains used and the complexity of the test site, the cost per source tested will range between $70,000 and $130,000. The following documents the costs and assumptions required for five sampling scenarios.

Assumptions

1. Three samples will be collected during a 1-week test period (on-site).

TABLE 5-1. SUMMARY OF DRAFT EPA/ASME PROTOCOL AND COST ESTIMATES FOR SAMPLE COLLECTION

- Sampling procedures will be based on the draft EPA/ASME protocol requirements.
  - Three separate test runs
  - Sample quantities will allow for initial analysis and archived samples
  - Each source will be tested and includes the following samples:
    - total gaseous and particulate stack emissions
    - inlet/outlet of control devices
    - grab samples of feed/fuel
    - bottom ash grab samples
    - ash or slurry from control devices
    - Precombustion air
    - Quench water effluent
    - Soil
- Standard EPA Method 5 train, modified to incorporate a sorbent module containing XAD-2.
- Emissions characterization.
  - Stack temperature
  - Moisture content
  - CO_2, CO
  - O_2, NO_x, TYHC, SO_x, Opacity
  - Total particulates

  (CO_2, CO; O_2, NO_x, TYHC, SO_x, Opacity): Continuous monitoring
- Estimated Costs
  - Estimated sampling costs: $70,000 - $130,000

2. Three weeks are required for each test site. The full crew will not be on-site the entire 3 weeks.
3. The site is "test ready", with sample ports, power, and scaffolding present.
4. There will be two categories of sites (Table 5-2):
   Simple - no control devices;
   Complex - control devices present.
5. Three tests will be run per site. These will be approximately 8-hour tests. If the site is complex, that will include six actual modified method 5 trains (3 inlet, 3 outlet).
6. The testing must be limited to 8 hours. Since there is no guarantee that PCDD's will be present, bounds must be established in the testing.
7. There will be one or two audits over the complete testing period. The cost is amortized over the complete program.
8. Van cleanup is amortized over the complete program.
9. There are two types of reports costed: only a listing of test data with discussion, or a complete report including the analytical results.
10. The resin trays, filters, and filter holder used in the Method 5 train will have to be sent to the appropriate analytical laboratory. Their return during the program for reuse is unlikely. The cost of replacement trays are included as part of the testing costs.
11. If furan samples are to be archived, two trains must be run simultaneously at each sampling point.
12. Cost scenarios include:
    a. labor;
    b. travel;
    c. per diem;
    d. supplies;
    e. shipping; and
    f. miscellaneous (extra glassware, etc.).

Based on these assumptions, five cost scenarios have been developed. Table 5-3 presents the costs and descriptions of the scenarios. Given the testing budget, 10 sources can be tested. Obviously, this number of tests

TABLE 5-2. COMPLEX/SIMPLE SITE COMPARISON

	Complex	Simple
Modified Method 5 trains	3 inlet 3 outlet	3 outlet
Personnel on-site	7	5

TABLE 5-3. COST SCENARIOS

Scenario	Cost	Remarks
1	70,000	Simple site, report is listing of data
2	77,000	Complex site, report is listing of data
3	85,000	Simple site, complete report including sampling and analytical results.
4	90,000	Complex site, complete report including sampling and analytical results.
5	130,000	Complex site, double trains, complete report including sampling and analytical results.

would be inadequate to characterize all of the combustion source categories on the ranked listed. In addition, there is marked uncertainty with the absolute ranking results discussed earlier since the ranking procedures are largely subjective.

5.1.2 Ash Screening

A tool to screen source categories during the Tier 4 program would be very beneficial to prevent wasting of limited resources. Because of the tight schedule, limited budget, and large number of combustion source categories and subcategories, any screening technique would need to be quick to perform, inexpensive, applicable to many sources, and would need to be a responsible indicator of TCDD emissions from a source category.

Unfortunately, there are no proven screening techniques that can be used to estimate TCDD emissions from combustion sources. Two screening methods have been considered. These are (1) a PCDD precursor scan and PCDD scan of the fuel, and (2) a PCDD scan of ash samples. The fuel analysis method has several problems. Although fuel analysis is considered during ranking of source categories and is discussed at length in the literature review, this method does not consider the combustion conditions of the source. In addition, fuels are often heterogeneous and difficult to handle. On the other hand, ash analysis may have some merit as a screening tool and as an indicator of those source categories which should be stack tested using the EPA/ASME protocol. The following paragraphs discuss the validity of using ash screening instead of the stack testing.

Use of ash samples for screening of combustion sources has several advantages. These include:

(1) There is usually a significant quantity of easily accessible ash in the hoppers of the control devices on combustion sources.

(2) The ash is usually homogeneous and can be readily extracted without a lot of preparation work.

(3) Taking of ash samples does not require a lot of sampling equipment.

(4) Ash supplies can be shipped easily.

(5) An ash sample can be screened for PCDD's for $500-1,000.

There are several disadvantages to using ash samples. These include:

(1) The dioxin in the ash is not a true indicator of the dioxin emitted in the flue gas. One study has shown that PCDD's can be enriched on smaller particles.[57] A large portion of the small particles is not captured by the control device but are emitted from the source. Another study showed that there was selective partitioning of homologs between the flue gas and the particulate matter (fly ash and bottom ash).[22] In particular, TCDD's concentrated in the flue gas while the higher chlorinated homologs concentrated in the ash particulates.

(2) Absence of TCDD's in the ash samples does not indicate absence of TCDD's in the flue gas. Table 5-4 shows flue gas and fly ash analyses for several MWC's where both types of samples were taken. The data do indicate that PCDD ash analysis could be used as an relative indicator of the presence of TCDD emissions. However, the data trends show that the PCDD data could not be used for estimating TCDD emission rates from the sources screened.

Despite the above mentioned disadvantages, ash sampling and analysis will be useful in the ranking process for combustion sources. However, to get maximum utility from the ash sampling and analysis, some additional source data should be obtained at the same time as the ash sample is collected. For example, source characteristics that should be collected include fuel type and degree of processing, the combustion conditions, and control device specifications including inlet and outlet temperatures so that a thermal history of the ash can be ascertained.

5.2 NUMBER OF SOURCES TO BE TESTED IN A PARTICULAR CATEGORY

The number of sources to be tested within a source category should depend upon several factors including the intent of the testing, the number of sources previously tested, and the budget. Preliminary calculations were made to estimate how many sources within a source category would be needed to statistically characterize the average emissions from the source category within a given confidence interval.

TABLE 5-4. COMPARISONS OF FLUE GAS AND ESP ASH DIOXIN CONTENTS

Reference	Stack (ng/m^3)		ESP Ash(ppb)	
	TCDD	PCDD	TCDD	PCDD
43 (U.S.A.)	240	2,300	170	800
24 (Italy #2)	189.2	48,997	0.25	599.8
24 (Italy #4)	70.9	4,409	46.4	3,535
86 (9 facilities)	57	1,540	93	2,056
49 (U.S.A.)	20.14	-	7.3	-
24 (Italy #3)	19	7,509	ND	7.32
24 (Italy #6)	19	587.8	ND	5.9
24 (Italy #5)	9.9	1,030	0.7	0.9
44 (Chicago)	6.3	45.4	ND	ND
114 (Ames)	ND	ND	ND	ND

* Furnace Ash

ND= None detected

The MWC source category was chosen as an example since there are a number of source tests for this category, and something is known about the population characteristics. Appendix B illustrates the calculations made. The calculations show that to statistically characterize the MWC source category with a 95 percent confidence interval, 14-39 tests would be required. Thirty-nine tests are required if all six previous tests are used in the calculations. Fourteen tests are required if the high and low valves are dropped from the calculations. The MWC with the high valve (240 ng/m^3) has undergone modifications and is being retested. The MWC with the low valve (ND) was fired with refused derived fuel and coal. Assuming $100,000 per source test, the entire Tier 4 budget would be used up on one source category.

A reasonable number of source tests and screens should be performed with each source category to enable an estimate of the mean emissions to be made. The confidence intervals around these mean emissions should be fairly narrow to allow comparison between source categories. The confidence interval around a mean is given by:

$$\bar{x} \pm t\left(1-\frac{\alpha}{2}\right)\frac{S}{\sqrt{n}}$$

The size of the confidence interval, therefore, varies with the size of the sample (n) and the value of the t statistic. The size of the t value varies with the degrees of freedom (number of samples -1) and the confidence level chosen. Some example values of the t statistic are shown below.

	t Statistic	
Number of Samples	95% C.I.	90% C.I.
2	12.706	6.314
3	4.303	2.920
4	3.182	2.353
5	1.96	2.645

Inspection of this table shows that beyond three samples, there are diminishing returns. Similarly, the effects of $1/\sqrt{n}$ diminish beyond n=3. For these reasons, a sample size of three was suggested as optimal for the purpose of this study. Based on the Tier 4 budget and the number of source categories considered, three source tests per source category is considered practical.

5.3 SELECTION OF THE SOURCE TEST PLAN

Several options were initially considered for the source test plan. These are shown in Table 5-5. These include (1) complete coverage (3 tests) of all listed sources, (2) broad coverage of all listed source categories, and (3) a recommended plan. Option 1 is not acceptable due to budget restraints. Option 2 does not provide any statistical significance for the results. Following review by the Tier 4 Working Group and after considering comments by the various regions, Option 3 was recommended along with ash screening.

The recommended test plan including ash screening is shown in Table 5-6. The testing would be phased. Complete stack tests would be initiated in 1984 for sewage sludge incinerators, black liquor boilers, and commercial boilers cofiring wastes. A portion of the testing budget would be set aside for screening of the remaining B and C ranked sources and other source categories recommended by the regions.

Three screening samples would be taken from each source under consideration, and a total of three sources within a source category would be sampled. Analysis of the samples (PCDD scan) could be conducted for $500-1,000 each, and therefore 10-20 source categories (9 samples each) could be screened for the cost of one complete stack test.

Early in the testing program, State and regional offices will be asked to collect ash samples and source information from facilities selected for screening. Results of the screening test will be used to determine which of the Rank B or C sources warrant stack testing. Other sources suggested by State or regional offices with high PCDD levels in the ash will also be considered for stack testing.

TABLE 5-5. SOURCE TEST PLAN OPTIONS FOR STACK EMISSIONS

Source	Number of Recommended Tests Option 1	Option 2	Option 3
Rank A Sources			
Sewage Sludge Incinerator	2	1	2
Black Liquor Boilers	3	1	3
Commercial Boilers	3	1	2
Rank B Sources			
PCP Sludge Incinerator	2	1	
Carbon Regeneration (Industrial)	2	1	
Charcoal Manufacturing	3	1	
Wire Reclamation	2	1	
Rank C Sources			
Mobile Sources*	2	1	2
Wood Stoves	3	1	
Wood Boilers (PCP Treated)	3	0	
Small Spreader Stoker Coal Boiler	3	0	
Hazardous Waste Incineration	1	0	-
Lime/Cement Kilns (HW)	2	0	
Rank D Sources			
MSW Incineration**	1	1	1
Industrial Boilers Cofiring Wastes	0	0	0
TOTAL	32	10	10

Option 1: Three test coverage of potential source categories.

Option 2: Single source coverage of potential source categories.

Option 3: Recommended stack test plan, focused on source categories with greatest potential.

* $10K - allocated to EPA Environmental Science Research Laboratory in Research Triangle Park for emissions testing.

** Retest Hempstead.

TABLE 5-6. PHASED SOURCE TEST PLAN FOR STACK EMISSIONS INCLUDING ASH SCREENING

Source	Number of Recommended Tests 1984	1985	Number Screened
Rank A Sources			
Sewage Sludge Incinerator	2		
Black Liquor Boilers	3		
Commercial Boilers	2		
Rank B Sources			
PCP Sludge Incinerator			3
Carbon Regeneration (Industrial)			3
Charcoal Manufacturing			3
Wire Reclamation			3
Rank C Sources			
Mobile Sources	a		
Wood Stoves			3
Wood Boilers (PCP Treated)			3
Small Spreader Stoker Coal Boiler	1[c]		
Hazardous Waste Incineration			3
Lime/Cement Kilns (HW)			3
Rank D Sources			
MSW Incineration[b]		1	3
Industrial Boilers Cofiring Wastes			3
Other Categories[d]		2-3	30

[a] 10K - allocated to EPA Environmental Research Laboratory for emissions testing.
[b] Retest Hempstead.
[c] Expand sampling and analysis of IERL Cincinnati spreader stoker test.
[d] Identified by screening, these could include categories listed in the table, or categories chosen by the States having the highest PCDD ash screening values.

A small spreader stoker is being tested in the near future by IERL. This test effort could be readily expanded to include PCDD sampling and analysis. This source category is included in the recommended plan. In addition, approximately $10,000 has been allocated to EPA Environmental Science Laboratory in Research Triangle Park to obtain samples for PCDD analysis of mobile sources.

5.4 SELECTION OF TYPES OF SAMPLES AND ANALYSIS

The intent of the source testing is not only to provide an estimate of the amount of 2,3,7,8-TCDD emissions from a given source, but is also to gather additional data about the source to determine if PCDD emitted from the source has contaminated its surroundings. In addition to stack samples, water and soil samples will be collected. Ash samples will also be collected and used to determine the levels of TCDD's in the solid wastes. Comparison of the ash analyses to the flue gas analyses will allow the validity of the ash screening tool to be checked. Table 5-7 summarizes the types of samples and analyses recommended for each source test.

The analyses of these samples will include the tetra and above dioxin homologs as well as 2,3,7,8-TCDD. Analysis for furans homologs is also included. Sufficient sample will be taken to allow archiving of samples for future PCDF analysis when additional resources become available. The fuel/feed samples will also be analyzed for PCB's, total organic chlorine, chlorinated phenols, and chlorinated benzenes, since these compounds may be precursors of PCDD's.

WHY ONLY ORGANIC?

<u>Input Samples</u>. Precombustion air will be sampled at sources where air contamination may be a factor in stack emissions. Heavily industrialized areas may have high concentrations of precursors or dioxin in the background air. For example, when testing a PCP sludge incinerator located at a wood preserving facility, precombustion air should be analyzed for chlorinated phenols. The decision to test precombustion air will be made during a pretest survey. If collected, precombustion air samples will be analyzed for PCDD's, PCB's, chlorinated phenols, chlorinated benzenes, and total organic chlorine (TOCl).

TABLE 5-7. RECOMMENDED SAMPLING AND ANALYSES

Sample	Method	Recommended (Samples/Day)	Recommended Analyses	Total Samples[a] for Analysis
Inputs				
Precombustion Air	XAD-2	0-1[b]	2,3,7,8-TCDD, Homologs, PCBs, TOCL, Cl-phenols, Cl-Benzenes	1[b]
Feed/Fuel	Grab (every 4 hours)	Daily Composite	PCDD Scan, Cl-phenols, Cl-benzenes PCBs, TOCL	3[c]
Outputs				
Stack (before control)	MM5T	2 trains -Back half daily composite -Condenser rinse -Adsorbent resin -Front half daily composite -cyclone catch -filter -probe rinse	2,3,7,8-TCDD, Homologs	6
Stack (after control)	MM5T	2 trains -Back half daily composite -Condenser rinse -Adsorbent resin -Front half daily composite -filter catch -probe rinse	2,3,7,8-TCDD, Homologs	6
Bottom Ash	Grab (every 4 hours)	Daily Composite	2,3,7,8-TCDD, Homologs	3
Ash from Control Device	Grab (every 4 hours)	Daily Composite	2,3,7,8-TCDD, Homologs	3
Quench Water Effluent	Grab (every 4 hours)	Daily Composite	2,3,7,8-TCDD, Homologs	3
Other				
Soil	Boring	1 Composite	2,3,7,8-TCDD, Homologs	1
			TOTAL	26

[a]Based on 3 sampling days.
[b]Sample to be collected if there is a source of precursors in area.
[c]Analysis by contractor.

During stack testing, fuel/feed samples will be collected every four hours and composited daily. These samples will be analyzed for total PCDD's, chlorinated phenols, chlorinated benzenes, PCB's, and TOCl. The sampling contractor will be responsible for analyzing the sample.

Output Samples. Stack samples will be taken before and after control devices. The stacks will be sampled using the EPA/ASME sampling protocol with an EPA modified Method 5 train. Daily gaseous and particulate samples will be composited separately. Grab samples of control device ash, bottom ash, and quench water will be collected every 4 hours and composited daily. All output samples will be sent to a centralized laboratory and analyzed for 2,3,7,8-TCDD, dioxin homologs (and furan homologs).

Environmental Samples. Soil borings will be collected at the source facility around ash handling and fuel storage areas. Composite samples will be sent to a centralized laboratory and analyzed for 2,3,7,8-TCDD, dioxin homologs, and furan homologs. This data will provide some historic information on PCDD deposition at the facility.

When a facility has been located that emits high levels of TCDD's, ambient air samples will be taken around the facility and at the point of maximum plume impact. These samples will be analyzed for 2,3,7,8-TCDD, dioxin homologs, and fural homologs. This data will be useful in determining the extent of dioxin contamination and in risk assessments.

5.5 TIER 4 FINAL REPORT

At the conclusion of the Tier 4 testing program, OAQPS will submit a final report to the Dioxin Task Force and to Congress. Table 5-8 presents a recommended outline for the Tier 4 final report. This report will summarize the literature review and results of the testing program and recommend options to reduce the emissions of PCDD's from combustion sources.

TABLE 5-8. TIER 4 FINAL REPORT OUTLINE

I. Executive Summary

II. Recommendations

III. Introduction

- A. Background
- B. Objectives
- C. Methodology

IV. Literature Survey

- A. Summary of Available Data
- B. Postulated Formation Mechanisms
- C. Factors Effecting Dioxin Emissions
- D. Risk Assessments
- E. Planned or Ongoing Work

V. Tier 4 Testing Program

- A. Source Test Plan
- B. Screening Test Results
- C. Stack Test Results
- D. Data Evaluation
  - 1. New ranked list
  - 2. Factors effecting dioxin emissions
  - 3. Validity of screening tests

VI. Risk Assessment

- A. Review of Sampling and Analysis Methodology
- B. Worse Case Risk Assessment

VII. Minimizing Risk

- A. Evaluation of Control Devices
- B. Operation and Maintenance Procedures

VIII. Data Gaps

6.0 MODELING PCDD EMISSIONS FROM COMBUSTION SOURCES

During the development of the Tier 4 testing program, two modeling tasks were proposed. The first task was to use a standard gaussian dispersion model to determine the relative impact of generic source groups. The second proposed task was to develop a mechanistic model to determine operational parameters that affect dioxin emissions and to predict worse case sources. The following two sections present discussions relevant to these tasks.

6.1 DISPERSION MODELING OF GENERIC SOURCE GROUPS

The original proposed task involved the use of a standard gaussian dispersion model to calculate maximum ambient 2,3,7,8-TCDD hourly concentrations resulting from combustion source emissions. These models were to be run with "constructed" source strengths and generic source groups. This analysis would be for the purpose of establishing relative source impacts and priority determinations relative to some sensitivity level. This task was to be done only if sufficient data was available.

Several problems arise when extrapolating results from generic source group modeling to specific combustion sources. First of all, generic groups would be based on source characteristics such as stack height, gas flow rate, gas temperature, source density, and source geometry. Characteristics used to group sources identified in the literature include combustion conditions and fuel composition. The variability in modeling parameters of sources identified in Section 4.0 would produce vague modeling results.

In addition, "constructed" source strengths would have to show the variability within a source category and the variability within a single source. For example, the levels of TCDD's detected in six MWCs in the U. S. range from ND to 240 ng/m^3. Other tested sources do not have enough data to provide an accurate range of emissions. Variability from day to day at a single source would depend on several factors including fuel composition and operation conditions and would be expected to be large. There is insufficient data to provide statistically sound emissions data base for a modeling effort.

Finally, results of dispersion modeling are very sensitive to modeling parameters. Gschwandtner et al discuss the sensitivity of three models (PAL, RAM, and ISC-ST) to variations in receptor grid spacing, emissions release height, area source size, and source type.[204] Each of these parameters was varied, while other modeling parameters were held constant.

Figure 6-1 illustrates the affects stack height. Changes of 20-30 feet will change the location of the point of maximum impact and will change the TCDD concentration at this point. Differences between models depends on how each model calculates wind speed as a function of height and whether or not the stack is above the wind speed measurement height.

Figure 6-2a shows the effect of area source size or maximum concentrations using PAL. Point source emissions produce the maximum plume impact. Figure 6-2b shows significantly different results for the RAM model. In this case, the area source produces the greatest impact. This is because the RAM model assumes no pollution dispersion in the crosswind direction. This model should never be used to model an area source as a point source.

As shown in the previous discussion, generic grouping and constructed source strengths would produce unreliable modeling results. Extrapolating these results to specific sources would prove to be useless when attempting to establish relative source impacts.

6.2 EMPIRICAL MECHANISTIC MODELING OF PCDD EMISSIONS

[To be provided later]

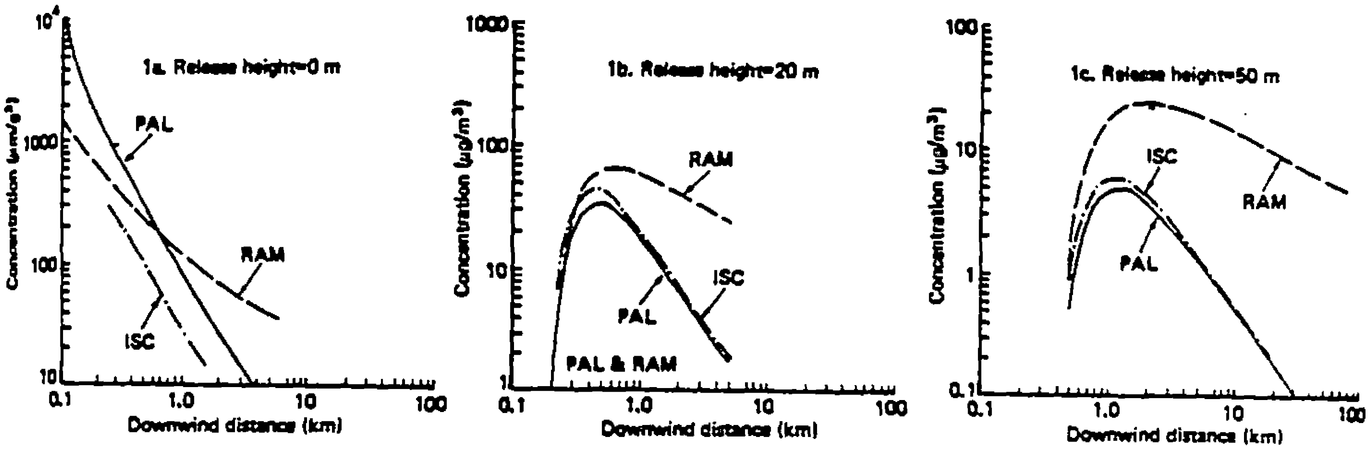
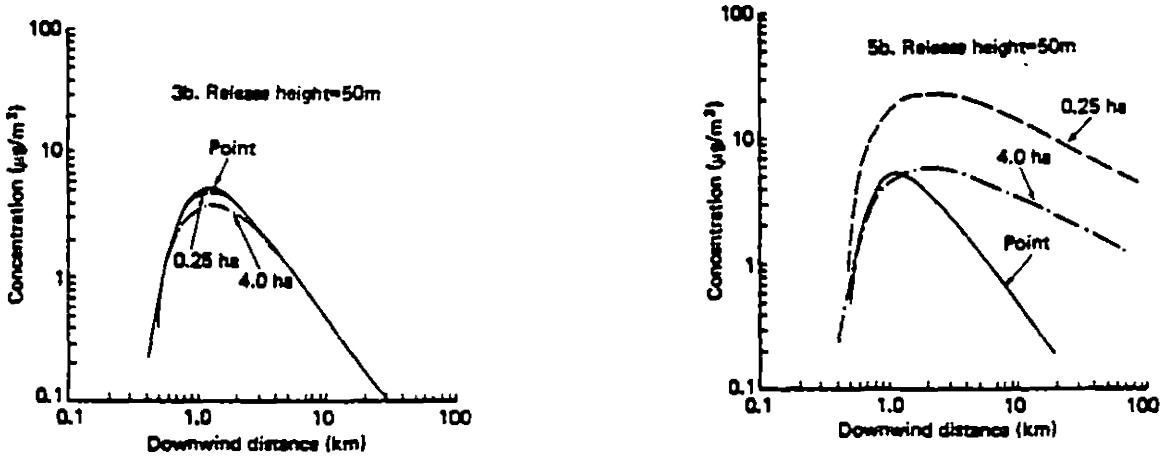


Figure 6-1. Effects of stack height on plume dispersion[204]



a: PAL Model

b: RAM Model

Figure 6-2. Effects of source size on plume dispersion.

APPENDIX A: DIOXIN DATA BASE

KEY TO ABBREVIATIONS

References listed with "*" are not cleared for public use.

dscm	=	Dry Standard Cubic Meter
ESP	=	Electrostatic Precipitator
FA	=	Fly Ash
FG	=	Flue Gas
g	=	Gram
GC	=	Gas Chromatography
GS	=	Grab Sample
HRGC	=	High Resolution Gas Chromatography
HRMS	=	High Resolution Mass Spectrophotometry
M^3	=	Cubic Meter
MM5T	=	Modified Method 5 Train
MS	=	Mass Spectrophotomer
N/A	=	Not Available
ND	=	None Detected
ng	=	Nanogram
NM3	=	Normal Cubic Meter
ppb	=	Parts Per Billion
ppm	=	Parts Per Million
ppr	=	Parts per Trillion
Mg	=	Micrograms

Data Rating:

Good (G): FG Sampling by MM5T (or similar train), and analysis by GC/MS, and complete data.

Poor (P): Inappropriate sampling or analysis methodology.

Incomplete (I): Incomplete data on methodology. Lack of detection limits when ND is recorded.

HAZARDOUS WASTE INCINERATORS

REF #	SOURCE TYPE	FACILITY	SOURCE CHARACT.
2	CEMENT KILNS	San Juan Cement, Puerto Rico	1260 C. RT = 1.5 sec
[illegible]	HW INCINERATORS	M/T Vulcanus	Incinerator Ship (7/77 - 9/77)
[illegible]	HW INCINERATORS	M/T Vulcanus	Incinerator Ship (7/77 - 9/77)
69	HW INCINERATORS	JM Huber Corp.	PCB Pyrolysis (2000 C)
#81	HW INCINERATORS	Ross, OH	Rotary Kiln
#81	HW INCINERATORS	Ross, OH	Rotary Kiln
#81	HW INCINERATORS	Ross, OH	Rotary Kiln
#81	HW INCINERATORS	Ross, OH	Rotary Kiln
#81	HW INCINERATORS	Abco, SC	2 Stage Boiler
#81	HW INCINERATORS	Abco, SC	2 Stage Boiler
#81	HW INCINERATORS	Abco, SC	2 Stage Boiler
#81	HW INCINERATORS	Abco, SC	2 Stage Boiler
#81	HW INCINERATORS	Upjohn, TX	Horiz. Cyl. Thermal Oxidizer
#81	HW INCINERATORS	Upjohn, TX	Horiz. Cyl. Thermal Oxidizer
#81	HW INCINERATORS	Upjohn, TX	Horiz. Cyl. Thermal Oxidizer
#81	HW INCINERATORS	Upjohn, TX	Horiz. Cyl. Thermal Oxidizer
#81	HW INCINERATORS	Am.Cyanamid, WV	2 Chambers
#81	HW INCINERATORS	Am.Cyanamid, WV	2 Chambers
#81	HW INCINERATORS	Am.Cyanamid, WV	2 Chambers
#81	HW INCINERATORS	Am.Cyanamid, WV	2 Chambers
#81	HW INCINERATORS	Mitchell, NC	Liquid Injection
#81	HW INCINERATORS	Mitchell, NC	Liquid Injection
#81	HW INCINERATORS	Mitchell, NC	Liquid Injection
#81	HW INCINERATORS	Mitchell, NC	Liquid Injection
#81	HW INCINERATORS	DuPont, LA	Rotary Kiln/Liquid Injection
#81	HW INCINERATORS	DuPont, LA	Rotary Kiln/Liquid Injection
#81	HW INCINERATORS	DuPont, LA	Rotary Kiln/Liquid Injection
#81	HW INCINERATORS	DuPont, LA	Rotary Kiln/Liquid Injection
90	HW INCINERATORS	M/T Vulcanus	1600C, RT=1.35, (8/82)
90	HW INCINERATORS	M/T Vulcanus	1600C, RT=1.35, (8/82)
90	HW INCINERATORS	M/T Vulcanus	1600C, RT=1.35, (8/82)
90	HW INCINERATORS	M/T Vulcanus	1600C, RT=1.35, (8/82)
#99	HW INCINERATORS	NJ	Rotary Kiln (1200C)
#99	HW INCINERATORS	NJ	Rotary Kiln (1200C)
109	HW INCINERATORS	Los Alamos Pilot Study	Controlled Air Incineration (1370C)
109	HW INCINERATORS	Los Alamos Pilot Study	Controlled Air Incineration (1370C)
109	HW INCINERATORS	Los Alamos Pilot Study	Controlled Air Incineration (1370C)
116	HW INCINERATORS	Ensco, El Dorado, ARK	Rotary Kiln with Afterburner (1200 C)
116	HW INCINERATORS	Ensco, El Dorado, ARK	Rotary Kiln with Afterburner (1200 C)
116	HW INCINERATORS	Ensco, El Dorado, ARK	Rotary Kiln with Afterburner (1200 C)
116	HW INCINERATORS	Ensco, El Dorado, ARK	Rotary Kiln with Afterburner (1200 C)
116	HW INCINERATORS	Ensco, El Dorado, ARK	Rotary Kiln with Afterburner (1200 C)
116	HW INCINERATORS	Rollins, Dear Park, TX	Rotary Kiln with Afterburner (1200 C)
116	HW INCINERATORS	Rollins, Dear Park, TX	Rotary Kiln with Afterburner (1200 C)
116	HW INCINERATORS	Rollins, Dear Park, TX	Rotary Kiln with Afterburner (1200 C)
116	HW INCINERATORS	Rollins, Dear Park, TX	Rotary Kiln with Afterburner (1200 C)
116	HW INCINERATORS	Rollins, Dear Park, TX	Rotary Kiln with Afterburner (1200 C)
116	HW INCINERATORS	Rollins, Dear Park, TX	Rotary Kiln with Afterburner (1200 C)

REF #	PROCESS	SAMPLE	METHOD	SAMPLE NUM.	EXTRACTION	ANALYSIS
1	Stack	FG	MST	4 Samples	Soxhlet/Benzene	GC/MS
3	stack	FA/FG	BIT	13 days / 6 weeks	Basic Extraction	GC/MS
3	feed		GS	13 days / 6 weeks	Basic Extraction	GC/MS
69	Stack	FG/FA	MM5T	4 tests	N/A	GC/MS
#81	-----	Feed	GS	N/A	Soxhlet/Methylene Chloride	GC/MS
#81	-----	Feed	GS	N/A	Soxhlet/Methylene Chloride	GC/MS
#81	Stack	FG/FA	MM5T	N/A	Soxhlet/methylene Chloride	GC/MS
#81	Stack	FG/FA	MM5T	N/A	Soxhlet/Methylene Chloride	GC/MS
#81	-----	Feed	GS	N/A	Soxhlet/Methylene Chloride	GC/MS
#81	-----	Feed	GS	N/A	Soxhlet/Methylene Chloride	GC/MS
#81	Stack	FG/FA	MM5T	N/A	Soxhlet/Methylene Chloride	GC/MS
#81	Stack	FG/FA	MM5T	N/A	Soxhlet/Methylene Chloride	GC/MS
#81	-----	Feed	GS	N/A	Soxhlet/Methylene Chloride	GC/MS
#81	-----	Feed	GS	N/A	Soxhlet/Methylene Chloride	GC/MS
#81	Stack	FG/FA	MM5T	N/A	Soxhlet/Methylene Chloride	GC/MS
#81	Stack	FG/FA	MM5T	N/A	Soxhlet/Methylene Chloride	GC/MS
#81	-----	Feed	GS	N/A	Soxhlet/Methylene Chloride	GC/MS
#81	-----	Feed	GS	N/A	Soxhlet/Methylene Chloride	GC/MS
#81	Stack	FG/FA	MM5T	N/A	Soxhlet/Methylene Chloride	GC/MS
#81	Stack	FG/FA	MM5T	N/A	Soxhlet/Methylene Chloride	GC/MS
#81	-----	Feed	GS	N/A	Soxhlet/Methylene Chloride	GC/MS
#81	-----	Feed	GS	N/A	Soxhlet/Methylene Chloride	GC/MS
#81	Stack	FG/FA	MM5T	N/A	Soxhlet/Methylene Chloride	GC/MS
#81	Stack	FG/FA	MM5T	N/A	Soxhlet/Methylene Chloride	GC/MS
#81	-----	Feed	GS	N/A	Soxhlet/Methylene Chloride	GC/MS
#81	-----	Feed	GS	N/A	Soxhlet/Methylene Chloride	GC/MS
#81	Stack	FG/FA	MM5T	N/A	Soxhlet/Methylene Chloride	GC/MS
#81	Stack	FG/FA	MM5T	N/A	Soxhlet/Methylene Chloride	GC/MS
90	Stack	FG	MM5T	10 Tests/13 Days	Soxhlet/Hexane	GC/HRMS
90	Stack	FG	MM5T	10 Tests/13 Days	Soxhlet/Hexane	GC/HRMS
90	-----	Feed	GS	10 Tests/13 Days	Soxhlet/Hexane	GC/HRMS
90	-----	Feed	GS	10 Tests/13 Days	Soxhlet/Hexane	GC/HRMS
#99	Stack	FA/FG	MM5T	3 Runs	N/A	GC/MS
#99	Stack	FA/FG	MM5T	3 Runs	N/A	GC/MS
109	Stack	FG/FA	MM5T	N/A	Soxhlet/Toluene	GC/MS
109	Scrubber	Liquid	GS	N/A	Soxhlet/Toluene	GC/MS
109	Furnace	Ash	GS	N/A	Soxhlet/Toluene	GC/MS
116	Stack	FG	MM5T	4 Hours	Soxhlet/Benzene	GC/HRMS
116	Stack	FG	MM5T	4 Hours	Soxhlet/Benzene	GC/HRMS
116	Stack	FG	MM5T	4 Hours	Soxhlet/Benzene	GC/HRMS
116	Stack	FG	MM5T	4 Hours	Soxhlet/Benzene	GC/HRMS
116	Stack	FG	MM5T	4 Hours	Soxhlet/Benzene	GC/HRMS
116	Stack	FG	MM5T	4 Hours	Soxhlet/Benzene	GC/HRMS
116	Stack	FG	MM5T	4 Hours	Soxhlet/Benzene	GC/HRMS
116	Stack	FG	MM5T	4 Hours	Soxhlet/Benzene	GC/HRMS
116	Stack	FG	MM5T	4 Hours	Soxhlet/Benzene	GC/HRMS
116	Stack	FG	MM5T	4 Hours	Soxhlet/Benzene	GC/HRMS
116	Stack	FG	MM5T	4 Hours	Soxhlet/Benzene	GC/HRMS

REF #	DETECTION LIMITS	ISOMER	ISOMER CONC.	DATA VARIABILITY	PRECURSORS
2	14.9 ng/m3	PCDD/PCDF	ND	N/A	Pharm.Wastes(21%Cl)
5	N/A	TCDD	ND	N/A	Herbicide Orange
7	0.2 ppm	TCDD	0.98 ppb	ND - 2.4 ppb	Herbicide Orange
59	0.5 ug/m3	PCDD/PCDF	ND	N/A	PCBs
#81	N/A	TCDD	ND	N/A	Liq Org (.02-6.2%Cl)
#81	N/A	TCDF	ND	N/A	Liq Org (.02-6.2%Cl)
#81	N/A	TCDD	ND	N/A	Liq Org (.02-6.2%Cl)
#81	N/A	TCDF	ND	N/A	Liq Org (.02-6.2%Cl)
#81	N/A	TCDD	Detected	N/A	Liq Org (.4-6.6%Cl)
#81	N/A	TCDF	Detected	N/A	Liq Org (.4-6.6%Cl)
#81	N/A	TCDD	15 ng/m3	N/A	Liq Org (.4-6.6%Cl)
#81	N/A	TCDF	40 ng/m3	N/A	Liq Org (.4-6.6%Cl)
#81	N/A	TCDD	ND	N/A	Liq/Gaseous (21%Cl)
#81	N/A	TCDF	Detected	N/A	Liq/Gaseous (21%Cl)
#81	N/A	TCDD	ND	N/A	Liq/Gaseous (21%Cl
#81	N/A	TCDF	6.9 ng/m3	N/A	Liq/Gaseous (21%Cl
#81	N/A	TCDD	ND	N/A	Analine Wast(0.15%Cl)
#81	N/A	TCDF	ND	N/A	Analine Wast(0.15%Cl)
#81	N/A	TCDD	ND	N/A	Analine Wast(0.15%Cl)
#81	N/A	TCDF	ND	N/A	Analine Wast(0.15%Cl)
#81	N/A	TCDD	ND	N/A	Liq Org(.4-1%Cl)
#81	N/A	TCDF	Detected	N/A	Liq Org(.4-1%Cl)
#81	N/A	TCDD	ND	N/A	Liq Org(.4-1%Cl)
#81	N/A	TCDF	0.7 ng/m3	N/A	Liq Org(.4-1%Cl)
#81	N/A	TCDD	ND	N/A	Liq/Sol(.05-16%Cl)
#81	N/A	TCDF	ND	N/A	Liq/Sol(.05-16%Cl)
#81	N/A	TCDD	ND	N/A	Liq/Sol(.05-16%Cl)
#81	N/A	TCDF	ND	N/A	Liq/Sol(.05-16%Cl)
90	N/A	TCDD	ND	N/A	PCB-Cont. waste
90	N/A	TCDF	47.5 ng/g	25 - 80 ng/g	PCB-Cont. Waste
90	N/A	TCDD	ND	N/A	PCB-Cont. waste
90	N/A	TCDF	N/A	0.3 - 3 ng/m3	PCB-Cont. Waste
#99	N/A	2,3,7,8 TCDD	ND	N/A	Silvex Herbicide
#99	N/A	PCDD	ND - 365 ng	N/A	Silvex Herbicide
109	N/A	PCDD/PCDF	ND	N/A	PCP Treated Wood
109	N/A	PCDD/PCDF	ND	N/A	PCP Treated Wood
109	N/A	PCDD/PCDF	ND	N/A	PCP Treated Wood
116	.07 ng	TCDD	.072 ng/Nm3	N/A	Waste Chemicals
116	.2 ng	TCDF	0.56 ng/Nm3	N/A	Waste Chemicals
116	.66 ng	TCDD	0.171 ng/Nm3	N/A	Waste Chem Plus PCBs
116	0.5 ng	TCDF	2.14 ng/Nm3	N/A	Waste Chem Plus PCBs
116	0.45 ng	TCDD	ND	N/A	PCBs Plus Fuel Oil
116	0.4 ng	TCDD	2.48 ng/Nm3	N/A	Waste Chemicals
116	0.3 ng	TCDF	4.92 ng/Nm3	N/A	Waste Chemicals
116	(0.48) ng	TCDD	0.645 ng/Nm3	N/A	Waste Chem Plus PCBs
116	(0.9) ng	TCDF	10 ng/Nm3	N/A	Waste Chem Plus PCBs
116	.9 ng	TCDD	ND	N/A	PCBs Plus Fuel Oil
116	0.5 ng^	TCDD	0.741 ng/Nm3	N/A	PCBs Plus Fuel Oil

HAZARDOUS WASTE INCINERATORS

REF #	SAMPLING ORGANIZATION	RATING
2	Monsanto Research Corp.	G
3	TRW, Inc.	I
3	TRW, Inc.	G
69	Radian Corp.	G
*81	MRI	I
*81	MRI	I
*81	MRI	I
*81	MRI	I
*81	MRI	I
*81	MRI	I
*81	MRI	I
*81	MRI	I
*81	MRI	I
*81	MRI	I
*81	MRI	I
*81	MRI	I
*81	MRI	I
*81	MRI	I
*81	MRI	I
*81	MRI	I
*81	MRI	I
*81	MRI	I
*81	MRI	I
*81	MRI	I
*81	MRI	I
*81	MRI	I
*81	MRI	I
*81	MRI	I
90	TRW	I
90	TRW	G
90	TRW	I
90	TRW	G
*99	Roy F. Weston	I
*99	Roy F. Weston	I
109	Los Alamos Nat. Lab.	I
109	Los Alamos Nat. Lab.	I
109	Los Alamos Nat. Lab.	I
116	TRW/Wright St. U.	G
116	TRW/Wright St. U.	G
116	TRW/Wright St. U.	G
116	TRW/Wright St. U.	G
116	TRW/Wright St. U.	G
116	TRW/Wright St. U.	G
116	TRW/Wright St. U.	G
116	TRW/Wright St. U.	G
116	TRW/Wright St. U.	G
116	TRW/Wright St. U.	G
116	TRW/Wright St. U.	G

ACCIDENTAL PCB FIRES

REF #	SOURCE TYPE	FACILITY	SOURCE CHARACT.
49	ACCIDENTAL FIRE	N.Y. State Transformer	N/A
49	ACCIDENTAL FIRE	N.Y. State Transformer	N/A
49	ACCIDENTAL FIRE	N.Y. State Transformer	N/A
54	ACCIDENTAL FIRE	Stockholm, Sweden	Transformer Station (1978)
54	ACCIDENTAL FIRE	Stockholm, Sweden	Transformer Station (1978)
54	ACCIDENTAL FIRE	Stockholm, Sweden	Transformer Station (1978)
54	ACCIDENTAL FIRE	Stockholm, Sweden	Transformer Station (1978)
54	ACCIDENTAL FIRE	Stockholm, Sweden	Transformer Station (1978)
79	ACCIDENTAL FIRE	San Fransisco	PCB Transformer
79	ACCIDENTAL FIRE	San Fransisco	PCB Transformer
79	ACCIDENTAL FIRE	San Fransisco	PCB Transformer
79	ACCIDENTAL FIRE	San Fransisco	PCB Transformer
79	ACCIDENTAL FIRE	San Fransisco	PCB Transformer
79	ACCIDENTAL FIRE	Chicago	PCB Transformer
95	ACCIDENTAL FIRE	Skoude, Sweden	Capacitor Battery Fire
95	ACCIDENTAL FIRE	Skoude, Sweden	Capacitor Battery Fire
95	ACCIDENTAL FIRE	Skoude, Sweden	Capacitor Battery Fire
95	ACCIDENTAL FIRE	Skoude, Sweden	Capacitor Battery Fire
95	ACCIDENTAL FIRE	Skoude, Sweden	Capacitor Battery Fire
95	ACCIDENTAL FIRE	Skoude, Sweden	Capacitor Battery Fire
95	ACCIDENTAL FIRE	Skoude, Sweden	Capacitor Battery Fire
95	ACCIDENTAL FIRE	Skoude, Sweden	Capacitor Battery Fire
107	ACCIDENTAL FIRE	Binghamton, NY	Office Building (Feb. 1981)
107	ACCIDENTAL FIRE	Binghamton, NY	Office Building (Feb. 1981)

ACCIDENTAL PCB FIRES

REF #	PROCESSES	SAMPLE	METHOD	SAMPLE NUM.	EXTRACTION	ANALYSIS
48	Capac/Wall	Liquid	Wipe	N/A	N/A	N/A
48	Capacitor	Soot	SS	N/A	N/A	N/A
48	Capac/Wall	Liquid	Wipe	N/A	N/A	N/A
54	Intact Cap	Liquid	SS	N/A	Hexane	GC/MS
54	In Exp Cap	Liquid	SS	N/A	Hexane	GC/MS
54	On Exp Cap	Liquid	Scraping	N/A	Hexane	GC/MS
54	Fence	Ash	Scraping	N/A	Hexane	GC/MS
54	Pine Need.	Ash	SS	N/A	Hexane	GC/MS
79	N/A	Liquid	SS	N/A	N/A	N/A
79	N/A	Liquid	SS	N/A	N/A	N/A
79	N/A	Soot	wipe	N/A	N/A	N/A
79	N/A	Soot	wipe	N/A	N/A	N/A
79	N/A	Soot	wipe	N/A	N/A	N/A
79	N/A	Soot	wipe	N/A	N/A	N/A
95	In Fire	Soot	Wipe Tests	N/A	N/A	HRGC/MS
95	In Fire	Soot	Wipe Tests	N/A	N/A	HRGC/MS
95	In Fire	Soot	Wipe Tests	N/A	N/A	HRGC/MS
95	Near Fire	Soot	Wipe Tests	N/A	N/A	HRGC/MS
95	Near Fire	Soot	Wipe Tests	N/A	N/A	HRGC/MS
95	Near Fire	Soot	Wipe Tests	N/A	N/A	HRGC/MS
95	Wall(2m)	Soot	Wipe Tests	N/A	N/A	HRGC/MS
95	Bench(10m)	Soot	Wipe Tests	N/A	N/A	HRGC/MS
107	Transform.	Soot	Scraping	2 floors, 2 repli.	Soxhlet/Benzene	GC/MS
107	Transform.	Soot	Scraping	2 floors, 2 repli.	Soxhlet/Benzene	GC/MS

ACCIDENTAL PCB FIRES

REF #	DETECTION LIMITS	ISOMER	ISOMER CONC.	DATA VARIABILITY	PRECURSORS
48	N/A	TCDD	N/A	30 - 500 pg	PCBs
48	N/A	2,3,7,8 TCDD	1.2 ng	N/A	PCBs
48	N/A	TCDF	N/A	20 - 400 ng	PCBs
54	N/A	PCDF	N/A	0.9 - 1.1 ppm	PCBs
54	N/A	PCDF	75 ppm	N/A	PCBs
54	N/A	PCDF	N/A	27 - 52 ppm	PCBs
54	N/A	PCDF	ND	N/A	PCBs
54	N/A	PCDF	ND	N/A	PCBs
79	N/A	TCDF	0.127 ppm	N/A	PCBs
79	N/A	TCDD	ND	N/A	PCBs
79	N/A	TCDF	28.9 ppm	N/A	PCBs
79	N/A	TCDD	0.324 ppm	N/A	PCBs
79	N/A	2,3,7,8 TCDD	0.059 ppm	N/A	PCBs
79	N/A	PCDD/PCDF	ND	N/A	PCBs
95	N/A	2,3,7,8 TCDD	20 ng/m2	N/A	PCBs
95	N/A	TCDD	100 ng/m2	N/A	PCBs
95	N/A	PCDD	213 ng/m2	N/A	PCBs
95	N/A	2,3,7,8 TCDD	100 ng/m2	N/A	PCBs
95	N/A	TCDD	600 ng/m2	N/A	PCBs
95	N/A	PCDD	873 ng/m2	N/A	PCBs
95	N/A	PCDD	ND	N/A	PCBs
95	N/A	PCDD	ND	N/A	PCBs
107	N/A	2,3,7,8 TCDD	2.85 ppm	N/A	PCBs, Chlor. Benzenes
107	N/A	2,3,7,8 TCDF	195 ppm	120 - 270 ppm	PCBs, Chlor. Benzenes

ACCIDENTAL PCB FIRES

REF #	SAMPLING ORGANIZATION	RATING
48	N.Y. State Dept. of Health	I
48	N.Y. State Dept. of Health	I
48	N.Y. State Dept. of Health	I
54	Nat. Swedish Env. Prot. Board	I
54	Nat. Swedish Env. Prot. Board	I
54	Nat. Swedish Env. Prot. Board	I
54	Nat. Swedish Env. Prot. Board	I
54	Nat. Swedish Env. Prot. Board	I
79	N/A	I
79	N/A	I
79	N/A	I
79	N/A	I
79	N/A	I
79	N/A	I
95	Univ. of Umea, Sweden	G
95	Univ. of Umea, Sweden	G
95	Univ. of Umea, Sweden	G
95	Univ. of Umea, Sweden	G
95	Univ. of Umea, Sweden	G
95	Univ. of Umea, Sweden	G
95	Univ. of Umea, Sweden	I
95	Univ. of Umea, Sweden	I
107	NY State	G
107	NY State	G

DOMESTIC SOURCES

REF #	SOURCE TYPE	FACILITY	SOURCE CHARACT.
31	DOMESTIC	N/A	25 yr old Fireplace
31	DOMESTIC	N/A	25 yr old Fireplace
31	DOMESTIC	N/A	25 yr old Fireplace
31	DOMESTIC	N/A	25 yr old Fireplace
31	DOMESTIC	N/A	25 yr old Fireplace
31	DOMESTIC	N/A	12 yr old Fireplace
31	DOMESTIC	N/A	12 yr old Fireplace
31	DOMESTIC	N/A	12 yr old Fireplace
31	DOMESTIC	N/A	12 yr old Fireplace
31	DOMESTIC	N/A	Natural Gas Furnace
31	DOMESTIC	N/A	Natural Gas Furnace
31	DOMESTIC	N/A	Natural Gas Furnace
31	DOMESTIC	N/A	Natural Gas Furnace
31	DOMESTIC	N/A	Natural Gas Furnace
83	DOMESTIC	Cape Cod, MA	N/A
83	DOMESTIC	Cape Cod, MA	N/A
83	DOMESTIC	Cape Cod, MA	N/A
83	DOMESTIC	Cape Cod, MA	N/A
83	DOMESTIC	Cape Cod, MA	N/A
83	DOMESTIC	Cape Cod, MA	N/A
83	DOMESTIC	Cape Cod, MA	N/A
83	DOMESTIC	Cape Cod, MA	N/A
83	DOMESTIC	Midland, Mich.	N/A
83	DOMESTIC	Midland, Mich.	N/A
83	DOMESTIC	Midland, Mich.	N/A
83	DOMESTIC	Midland, Mich.	N/A
83	DOMESTIC	Midland, Mich.	N/A

DOMESTIC SOURCES

REF #PROCESSES	SAMPLE	METHOD	SAMPLE NUM.	EXTRACTION	ANALYSIS
31 CHIMNEY	ASH	SCRAPING	N/A	N/A	GC/MS
31 CHIMNEY	ASH	SCRAPING	N/A	N/A	GC/MS
31 CHIMNEY	ASH	SCRAPING	N/A	N/A	GC/MS
31 CHIMNEY	ASH	SCRAPING	N/A	N/A	GC/MS
31 CHIMNEY	ASH	SCRAPING	N/A	N/A	GC/MS
31 CHIMNEY	ASH	SCRAPING	N/A	N/A	GC/MS
31 CHIMNEY	ASH	SCRAPING	N/A	N/A	GC/EC
31 CHIMNEY	ASH	SCRAPING	N/A	N/A	GC/EC
31 CHIMNEY	ASH	SCRAPING	N/A	N/A	GC/EC
31 ESP	FA	GS	N/A	N/A	GC/MS
31 ESP	FA	GS	N/A	N/A	GC/MS
31 ESP	FA	GS	N/A	N/A	GC/MS
31 ESP	FA	GS	N/A	N/A	GC/MS
31 ESP	FA	GS	N/A	N/A	GC/MS
83 Flue Pipe	FA	GS	N/A	N/A	GC/MS
83 Flue Pipe	FA	GS	N/A	N/A	GC/MS
83 Flue Pipe	FA	GS	N/A	N/A	GC/MS
83 Flue Pipe	FA	GS	N/A	N/A	GC/MS
83 Flue Pipe	FA	GS	N/A	N/A	GC/MS
83 Flue Pipe	FA	GS	N/A	N/A	GC/MS
83 Flue Pipe	FA	GS	N/A	N/A	GC/MS
83 Flue Pipe	FA	GS	N/A	N/A	GC/MS
83 Chimney	FA	GS	N/A	N/A	GC/MS
83 Chimney	FA	GS	N/A	N/A	GC/MS
83 Chimney	FA	GS	N/A	N/A	GC/MS
83 Chimney	FA	GS	N/A	N/A	GC/MS
83 Chimney	FA	GS	N/A	N/A	GC/MS

FOSSIL FUEL COMBUSTION

REF #	SOURCE TYPE	FACILITY	SOURCE CHARACT.
29	FOSSIL FUEL	N/A	One Plant
31	FOSSIL FUEL	Midland Mich.	Power house
31	FOSSIL FUEL	Midland Mich.	Power house
31	FOSSIL FUEL	Midland Mich.	Power house
31	FOSSIL FUEL	Midland Mich.	Power house
31	FOSSIL FUEL	Midland Mich.	Power house
44	FOSSIL FUEL	(7) Coal-fired Utility Plants	Large PC Boiler
44	FOSSIL FUEL	(7) Coal-fired Utility Plants	Large PC Boiler
44	FOSSIL FUEL	(7) Coal-fired Utility Plants	Large PC Boiler
44	FOSSIL FUEL	(7) Coal-fired Utility Plants	Large PC Boiler
44	FOSSIL FUEL	(7) Coal-fired Utility Plants	Large PC Boiler
44	FOSSIL FUEL	(7) Coal-fired Utility Plants	Large PC Boiler
44	FOSSIL FUEL	(7) Coal-fired Utility Plants	Large PC Boiler
44	FOSSIL FUEL	(7) Coal-fired Utility Plants	Large PC Boiler
44	FOSSIL FUEL	(7) Coal-fired Utility Plants	Large PC Boiler
44	FOSSIL FUEL	(7) Coal-fired Utility Plants	Large PC Boiler
44	FOSSIL FUEL	(7) Coal-fired Utility Plants	Large PC Boiler
44	FOSSIL FUEL	(7) Coal-fired Utility Plants	Large PC Boiler
47	FOSSIL FUEL	U.S.	N/A
62	FOSSIL FUEL	N/A	One Plant

DOMESTIC SOURCES

REF #	SAMPLING ORGANIZATION	RATING
31	Dow Chemical	6
31	Dow Chemical	6
31	Dow Chemical	6
31	Dow Chemical	6
31	Dow Chemical	6
31	Dow Chemical	6
31	Dow Chemical	6
31	Dow Chemical	6
31	Dow Chemical	6
31	Dow Chemical	6
31	Dow Chemical	6
31	Dow Chemical	6
31	Dow Chemical	6
31	Dow Chemical	6
83	Dow Chemical	6
83	Dow Chemical	6
83	Dow Chemical	6
83	Dow Chemical	6
83	Dow Chemical	6
83	Dow Chemical	6
83	Dow Chemical	6
83	Dow Chemical	6
83	Dow Chemical	6
83	Dow Chemical	6
83	Dow Chemical	6
83	Dow Chemical	6
83	Dow Chemical	6

DOMESTIC SOURCES

REF #	DETECTION LIMITS	ISOMER	ISOMER CONC.	DATA VARIABILITY	PRECURSORS
31	0.04 ppb	2,3,7,8 TCDD	0.1 ppb	N/A	Wood
31	N/A	TCDD	0.37 ppb	N/A	Wood
31	N/A	H6CDD	3.4 ppb	N/A	Wood
31	N/A	H7CDD	16 ppb	N/A	Wood
31	N/A	OCDD	25 ppb	N/A	Wood
31	0.04 ppb	TCDD	ND	N/A	Wood
31	N/A	H6CDD	0.23 ppb	N/A	Wood
31	N/A	H7CDD	0.67 ppb	N/A	Wood
31	N/A	OCDD	0.89 ppb	N/A	Wood
31	0.2 ppb	2,3,7,8 TCDD	0.6 ppb	N/A	Natural Gas
31	0.40 ppb	TCDD	1.0 ppb	N/A	Natural Gas
31	N/A	H6CDD	34 ppb	N/A	Natural Gas
31	N/A	H7CDD	430 ppb	N/A	Natural Gas
31	N/A	OCDD	1300 ppb	N/A	Natural Gas
83	1 ppt	TCDD	ND	N/A	Oil
83	N/A	TCDD	170 ppt	N/A	Wood
83	3 ppt	H6CDD	ND	N/A	Oil
83	N/A	H6CDD	260 ppt	N/A	Wood
83	2 ppt	H7CDD	ND	N/A	Oil
83	N/A	H7CDD	330 ppt	N/A	Wood
83	14 ppt	OCDD	ND	N/A	Oil
83	N/A	OCDD	210 ppt	N/A	Wood
83	N/A	2,3,7,8 TCDD	26 ppt	N/A	Oil, Wood
83	N/A	TCDD	777 ppt	N/A	Oil, Wood
83	N/A	H6CDD	3100 ppt	N/A	Oil, Wood
83	N/A	H7CDD	7200 ppt	N/A	Oil, Wood
83	N/A	OCDD	10500 ppt	N/A	Oil, Wood

FOSSIL FUEL COMBUSTION

REF #	SOURCE TYPE	FACILITY	SOURCE CHARACT.
29	FOSSIL FUEL	N/A	One Plant
31	FOSSIL FUEL	Midland Mich.	Power house
31	FOSSIL FUEL	Midland Mich.	Power house
31	FOSSIL FUEL	Midland Mich.	Power house
31	FOSSIL FUEL	Midland Mich.	Power house
31	FOSSIL FUEL	Midland Mich.	Power house
44	FOSSIL FUEL	(7) Coal-fired Utility Plants	Large PC Boiler
44	FOSSIL FUEL	(7) Coal-fired Utility Plants	Large PC Boiler
44	FOSSIL FUEL	(7) Coal-fired Utility Plants	Large PC Boiler
44	FOSSIL FUEL	(7) Coal-fired Utility Plants	Large PC Boiler
44	FOSSIL FUEL	(7) Coal-fired Utility Plants	Large PC Boiler
44	FOSSIL FUEL	(7) Coal-fired Utility Plants	Large PC Boiler
44	FOSSIL FUEL	(7) Coal-fired Utility Plants	Large PC Boiler
44	FOSSIL FUEL	(7) Coal-fired Utility Plants	Large PC Boiler
44	FOSSIL FUEL	(7) Coal-fired Utility Plants	Large PC Boiler
44	FOSSIL FUEL	(7) Coal-fired Utility Plants	Large PC Boiler
44	FOSSIL FUEL	(7) Coal-fired Utility Plants	Large PC Boiler
44	FOSSIL FUEL	(7) Coal-fired Utility Plants	Large PC Boiler
47	FOSSIL FUEL	U.S.	N/A
62	FOSSIL FUEL	N/A	One Plant

REF #	PROCESSES	SAMPLE	METHOD	SAMPLE NUM.	EXTRACTION	ANALYSIS
[illegible]	N/A	FA	GS	1 Sample	Basic Extraction	GC/MS
31	Stack	FA	GS	N/A	N/A	GC/MS
31	Stack	FA	GS	N/A	N/A	GC/MS
31	Stack	FA	GS	N/A	N/A	GC
31	Stack	FA	GS	N/A	N/A	GC
31	Stack	FA	GS	N/A	N/A	GC
44	Stack	FB	MMET	5 Days	Soxhlet/Benzene	HRGC/MS
44	Stack	FB	MMET	5 Days	Soxhlet/Benzene	HRGC/MS
44	Feed	FB	MMET	5 Days	Soxhlet/Benzene	HRGC/MS
44	Feed	FB	MMET	5 Days	Soxhlet/Benzene	HRGC/MS
44	ESP	FB	MMET	5 Days	Soxhlet/Benzene	HRGC/MS
44	ESP	FB	MMET	5 Days	Soxhlet/Benzene	HRGC/MS
44	Stack	FA	GS	5 Days	Soxhlet/Benzene	HRGC/MS
44	Stack	FA	GS	5 Days	Soxhlet/Benzene	HRGC/MS
44	Feed	FA	GS	5 Days	Soxhlet/Benzene	HRGC/MS
44	Feed	FA	GS	5 Days	Soxhlet/Benzene	HRGC/MS
44	ESP	FA	GS	5 Days	Soxhlet/Benzene	HRGC/MS
44	ESP	FA	GS	5 Days	Soxhlet/Benzene	HRGC/MS
47	N/A	FA	GS	7 samples	Soxhlet/Benzene(24 hr)	GC/MS
62	Stack	FA	N/A	N/A	Hexane/Acetone	GC/MS

FOSSIL FUEL COMBUSTION

REF #	DETECTION LIMITS	ISOMER	ISOMER CONC.	DATA VARIABILITY	PRECURSORS
29	N/A	TCDD	ND	N/A	Coal
31	10 ppb	2,3,7,8 TCDD	ND	N/A	coal and oil
31	20 ppb	TCDD	38 ppb	N/A	coal and oil
31	N/A	H6CDD	2 ppb	N/A	coal and oil
31	N/A	H7CDD	4 ppb	N/A	coal and oil
31	N/A	OCDD	24 ppb	N/A	coal and oil
44	PPT	PCDD	ND	N/A	Coal
44	PPT	PCDF	ND	N/A	Coal
44	PPT	PCDD	ND	N/A	Coal
44	PPT	PCDF	ND	N/A	Coal
44	PPT	PCDD	ND	N/A	Coal
44	PPT	PCDF	ND	N/A	Coal
44	PPT	PCDD	ND	N/A	Coal
44	PPT	PCDF	ND	N/A	Coal
44	PPT	PCDD	ND	N/A	Coal
44	PPT	PCDF	ND	N/A	Coal
44	PPT	PCDD	ND	N/A	Coal
44	PPT	PCDF	ND	N/A	Coal
47	2 ppt	TCDD	ND	N/A	Coal
62	1.2 ppt	TCDD	ND	N/A	Low Sulfur Coal

SAMPLING ORGANIZATION	RATINGS
Batelle, Columbus Lab	I
Dow Chemical	G
Dow Chemical	G
Dow Chemical	G
Dow Chemical	G
Dow Chemical	G
MRI	G
MRI	G
MRI	G
MRI	G
MRI	G
MRI	G
MRI	G
MRI	G
MRI	G
MRI	G
MRI	G
MRI	G
U.S. EPA	G
Univ. of Calif. at Davis	G

AUTOMOBILE EMISSIONS

REF #	SOURCE TYPE	FACILITY	SOURCE CHARACT.
31	AUTO MUFFLERS	Pontiac Mich.	Reg gas / no Catalytic Converter
31	AUTO MUFFLERS	Pontiac Mich.	Reg gas / no Catalytic Converter
31	AUTO MUFFLERS	Pontiac Mich.	Reg gas / no Catalytic Converter
31	AUTO MUFFLERS	Pontiac Mich.	Reg gas / no Catalytic Converter
31	AUTO MUFFLERS	Pontiac Mich.	Reg gas / no Catalytic Converter
31	AUTO MUFFLERS	Detroit Mich.	Unleaded / Catalytic Converter
31	AUTO MUFFLERS	Detroit Mich.	Unleaded / Catalytic Converter
31	AUTO MUFFLERS	Detroit Mich.	Unleaded / Catalytic Converter
31	AUTO MUFFLERS	Detroit Mich.	Unleaded / Catalytic Converter
31	AUTO MUFFLERS	Detroit Mich.	Unleaded / Catalytic Converter / Low mileage
31	AUTO MUFFLERS	Detroit Mich.	Unleaded / Catalytic Converter / Low mileage
31	AUTO MUFFLERS	Detroit Mich.	Unleaded / Catalytic Converter / Low mileage
31	AUTO MUFFLERS	Detroit Mich.	Unleaded / Catalytic Converter / Low mileage
31	AUTO MUFFLERS	Auburn Mich.	Diesel Truck
31	AUTO MUFFLERS	Auburn Mich.	Diesel Truck
31	AUTO MUFFLERS	Auburn Mich.	Diesel Truck
31	AUTO MUFFLERS	Auburn Mich.	Diesel Truck
31	AUTO MUFFLERS	Saginaw Mich.	Diesel Truck
31	AUTO MUFFLERS	Saginaw Mich.	Diesel Truck
31	AUTO MUFFLERS	Saginaw Mich.	Diesel Truck
31	AUTO MUFFLERS	Saginaw Mich.	Diesel Truck
31	AUTO MUFFLERS	Saginaw Mich.	Diesel Truck
#105	AUTO MUFFLERS	N/A	Diesel
#105	AUTO MUFFLERS	N/A	Diesel
#105	AUTO MUFFLERS	N/A	Unleaded
#105	AUTO MUFFLERS	N/A	Unleaded
#105	AUTO MUFFLERS	N/A	Leaded
#105	AUTO MUFFLERS	N/A	Leaded
#105	AUTO MUFFLERS	N/A	Chevette-Broken Ring
#105	AUTO MUFFLERS	N/A	Chevette-Broken Ring

AUTOMOBILE EMISSIONS

REF #PROCESSED	SAMPLE	METHOD	SAMPLE NUM.	EXTRACTION	ANALYSIS
31 MUFFLER	ASH	SCRAPING	N/A	N/A	GC/MS
31 MUFFLER	ASH	SCRAPING	N/A	N/A	GC/MS
31 MUFFLER	ASH	SCRAPING	N/A	N/A	GC/MS
31 MUFFLER	ASH	SCRAPING	N/A	N/A	GC/MS
31 MUFFLER	ASH	SCRAPING	N/A	N/A	GC/MS
31 MUFFLER	ASH	SCRAPING	N/A	N/A	GC/MS
31 MUFFLER	ASH	SCRAPING	N/A	N/A	GC/MS
31 MUFFLER	ASH	SCRAPING	N/A	N/A	GC/MS
31 MUFFLER	ASH	SCRAPING	N/A	N/A	GC/MS
31 MUFFLER	ASH	SCRAPING	N/A	N/A	GC/MS
31 MUFFLER	ASH	SCRAPING	N/A	N/A	EC/GC
31 MUFFLER	ASH	SCRAPING	N/A	N/A	EC/GC
31 MUFFLER	ASH	SCRAPING	N/A	N/A	EC/GC
31 MUFFLER	ASH	SCRAPING	N/A	N/A	GC/MS
31 MUFFLER	ASH	SCRAPING	N/A	N/A	GC/MS
31 MUFFLER	ASH	SCRAPING	N/A	N/A	GC/MS
31 MUFFLER	ASH	SCRAPING	N/A	N/A	GC/MS
31 MUFFLER	ASH	SCRAPING	N/A	N/A	GC/MS
31 MUFFLER	ASH	SCRAPING	N/A	N/A	GC/MS
31 MUFFLER	ASH	SCRAPING	N/A	N/A	GC/MS
31 MUFFLER	ASH	SCRAPING	N/A	N/A	GC/MS
31 MUFFLER	ASH	SCRAPING	N/A	N/A	GC/MS
#105 Muffler	Ash	SCRAPING	2 Cars	Methylene Chloride/Hexane	HRGC/HRMS
#105 Muffler	Ash	SCRAPING	2 Cars	Methylene Chloride/Hexane	HRGC/HRMS
#105 Muffler	Ash	SCRAPING	10 cars	Methylene Chloride/Hexane	HRGC/HRMS
#105 Muffler	Ash	SCRAPING	10 cars	Methylene Chloride/Hexane	HRGC/HRMS
#105 Muffler	Ash	SCRAPING	3 Cars	Methylene Chloride/Hexane	HRGC/HRMS
#105 Muffler	Ash	SCRAPING	3 Cars	Methylene Chloride/hexane	HRGC/HRMS
#105 Muffler	Ash	SCRAPING	1 car	Methylene Chloride/hexane	HRGC/HRMS
#105 Muffler	Ash	SCRAPING	1 car	Methylene Chloride/Hexane	HRGC/HRMS

AUTOMOBILE EMISSIONS

REF #	DETECTION LIMITS	ISOMER	ISOMER CONC.	DATA VARIABILITY	PRECURSORS
31	1.0 ppt	2,3,7,8 TCDD	ND	N/A	Regular Gas
31	2.0 ppt	TCDD	4.0 ppt	N/A	Regular Gas
31	14 ppt	H6CDD	ND	N/A	Regular Gas
31	6 ppt	H7CDD	ND	N/A	Regular Gas
31	9 ppt	OCDD	16 ppt	N/A	Regular Gas
31	2.0 ppt	TCDD	ND	N/A	Unleaded Gas
31	10 ppt	H6CDD	ND	N/A	Unleaded Gas
31	8 ppt	H7CDD	14 ppt	N/A	Unleaded Gas
31	N/A	OCDD	68 ppt	N/A	Unleaded Gas
31	0.1 ppt	TCDD	0.1 ppt	N/A	Unleaded Gas
31	0.1 ppt	H6CDD	0.5 ppt	N/A	Unleaded Gas
31	0.2 ppt	H7CDD	2 ppt	N/A	Unleaded Gas
31	0.5 ppt	OCDD	8 ppt	N/A	Unleaded Gas
31	3.0 ppt	TCDD	ND	N/A	Diesel Fuel
31	25 ppt	H6CDD	ND	N/A	Diesel Fuel
31	30 ppt	H7CDD	110 ppt	N/A	Diesel Fuel
31	N/A	OCDD	280 ppt	N/A	Diesel Fuel
31	1.0 ppt	2,3,7,8 TCDD	3.0 ppt	N/A	Diesel Fuel
31	N/A	TCDD	20 ppt	N/A	Diesel Fuel
31	15 ppt	H6CDD	20 ppt	N/A	Diesel Fuel
31	15 ppt	H7CDD	100 ppt	N/A	Diesel Fuel
31	N/A	OCDD	260 ppt	N/A	Diesel Fuel
*105	40 pg	2,3,7,8 TCDD	ND	N/A	Diesel Fuel
*105	40 pg	TCDD	ND	N/A	Diesel Fuel
*105	40 pg	2,3,7,8 TCDD	0.23 ng	N/A	Unleaded Gas
*105	40 pg	TCDD	6.5 ng	N/A	Unleaded Gas
*105	40 pg	2,3,7,8 TCDD	2 ng	N/A	Leaded Gas
*105	40 pg	TCDD	36 ng	N/A	Leaded Gas
*105	40 pg	2,3,7,8 TCDD	0.15 ng	N/A	Unleaded Gas
*105	40 pg	TCDD	4.3 ng	N/A	Unleaded Gas

AUTOMOBILE EMISSIONS

REF #	SAMPLING ORGANIZATION	RATING
31	Dow Chemical	G
31	Dow Chemical	G
31	Dow Chemical	G
31	Dow Chemical	G
31	Dow Chemical	G
31	Dow Chemical	G
31	Dow Chemical	G
31	Dow Chemical	G
31	Dow Chemical	G
31	Dow Chemical	G
31	Dow Chemical	G
31	Dow Chemical	G
31	Dow Chemical	G
31	Dow Chemical	G
31	Dow Chemical	G
31	Dow Chemical	G
31	Dow Chemical	G
31	Dow Chemical	G
31	Dow Chemical	G
31	Dow Chemical	G
31	Dow Chemical	G
31	Dow Chemical	G
#105	U.S. EPA	G
#105	U.S. EPA	G
#105	U.S. EPA	G
#105	U.S. EPA	G
#105	U.S. EPA	G
#105	U.S. EPA	G
#105	U.S. EPA	G
#105	U.S. EPA	G

WIRE RECLAMATION INCINERATOR

REF #	SOURCE TYPE	FACILITY	SOURCE CHARACT.
51	WIRE RECLAMATION INCINERATOR	Midwestern USA (1)	3 Incinerators
51	WIRE RECLAMATION INCINERATOR	Midwestern USA (1)	3 Incinerators
51	WIRE RECLAMATION INCINERATOR	Midwestern USA (1)	3 Incinerators
51	WIRE RECLAMATION INCINERATOR	Midwestern USA (1)	3 Incinerators

WIRE RECLAMATION INCINERATOR

REF #	PROCESSES	SAMPLE	METHOD	SAMPLE NUM.	EXTRACTION	ANALYSIS
51	Stack	FA	GS	N/A	Hexane/Acetone	GC/MS
51	Stack	FA	GS	N/A	Hexane/Acetone	GC/MS
51	Furnace	FA	GS	N/A	Hexane/Acetone	GC/MS
51	Furnace	FA	GS	N/A	Hexane/Acetone	GC/MS

WIRE RECLAMATION INCINERATOR

REF #	DETECTION LIMITS	ISOMER	ISOMER CONC.	DATA VARIABILITY	PRECURSORS
51	N/A	TCDD	410 ppt	N/A	Wire Insul&Con.
51	N/A	TCDF	11600 ppt	N/A	Wire Insul&Con.
51	N/A	TCDD	58 ppt	N/A	Wire Insul&Con.
51	N/A	TCDF	730 ppt	N/A	Wire Insul&Con.

WIRE RECLAMATION INCINERATOR

REF #	SAMPLING ORGANIZATION	RATING
51	EPA	B
51	EPA	B
51	EPA	B
51	EPA	B

THERMAL ACTIVATED CARBON REGENERATION

REF #	SOURCE TYPE	FACILITY	SOURCE CHARACT.
50	CARBON REGENERATION	Cincinnati, Ohio	Fluidized Bed System
50	CARBON REGENERATION	Cincinnati, Ohio	Fluidized Bed System
50	CARBON REGENERATION	Cincinnati, Ohio	Fluidized Bed System
50	CARBON REGENERATION	Cincinnati, Ohio	Fluidized Bed System
50	CARBON REGENERATION	Cincinnati, Ohio	Fluidized Bed System
50	CARBON REGENERATION	Cincinnati, Ohio	Fluidized Bed System
50	CARBON REGENERATION	Cincinnati, Ohio	Fluidized Bed System
50	CARBON REGENERATION	Cincinnati, Ohio	Fluidized Bed System
50	CARBON REGENERATION	Cincinnati, Ohio	Fluidized Bed System
50	CARBON REGENERATION	Cincinnati, Ohio	Fluidized Bed System
50	CARBON REGENERATION	Cincinnati, Ohio	Fluidized Bed System
50	CARBON REGENERATION	Cincinnati, Ohio	Fluidized Bed System

THERMAL ACTIVATED CARBON REGENERATION

REF	#PROCESSES	SAMPLE	METHOD	SAMPLE NUM.	EXTRACTION	ANALYSIS
50	-----	Feed	GS	4 Tests/3 Days	Soxhlet/Methylene Chloride	HRGC/HRMS
50	-----	Feed	GS	4 Tests/3 Days	Soxhlet/Methylene Chloride	HRGC/HRMS
50	Cyclone	Ash	GS	4 Tests/3 Days	Soxhlet/Methylene Chloride	HRGC/HRMS
50	Cyclone	Ash	GS	4 Tests/3 Days	Soxhlet/Methylene Chloride	HRGC/HRMS
50	Scrubber	Water	GS	4 Tests/3 Days	Soxhlet/Methylene Chloride	HRGC/HRMS
50	Scrubber	Water	GS	4 Tests/3 Days	Soxhlet/Methylene Chloride	HRGC/HRMS
50	Quench	Water	GS	4 Tests/3 Days	Soxhlet/Methylene Chloride	HRGC/HRMS
50	Quench	Water	GS	4 Tests/3 Days	Soxhlet/Methylene Chloride	HRGC/HRMS
50	Stack	FA	MM5T	4 Tests/3 Days	Soxhlet/Methylene Chloride	HRGC/HRMS
50	Stack	FA	MM5T	4 Tests/3 Days	Soxhlet/Methylene Chloride	HRGC/HRMS
50	Stack	FG	MM5T	4 Tests/3 Days	Soxhlet/Methylene Chloride	HRGC/HRMS
50	Stack	FG	MM5T	4 Tests/3 Days	Soxhlet/Methylene Chloride	HRGC/HRMS

THERMAL ACTIVATED CARBON REGENERATION

REF #	DETECTION LIMITS	ISOMER	ISOMER CONC.	DATA VARIABILITY	PRECURSORS
50	N/A	2,3,7,8 TCDD	ND	N/A	Spent Activated Carbon
50	N/A	TCDD	ND	N/A	Spent Activated Carbon
50	N/A	2,3,7,8 TCDD	ND	N/A	Spent Activated Carbon
50	N/A	TCDD	1.11 ppt	0.3 - 4.1 ppt	Spent Activated Carbon
50	N/A	2,3,7,8 TCDD	.03 ppt	ND - .07 ppt	Spent Activated Carbon
50	N/A	TCDD	.075 ppt	ND - .2 ppt	Spent Activated Carbon
50	N/A	2,3,7,8 TCDD	ND	N/A	Spent Activated Carbon
50	N/A	TCDD	ND	N/A	Spent Activated Carbon
50	N/A	2,3,7,8 TCDD	.083 ppt	.01 - .2 ppt	Spent Activated Carbon
50	N/A	TCDD	.138 ppt	.05 - .2 ppt	Spent Activated Carbon
50	N/A	2,3,7,8 TCDD	.0025 ppt	ND - .01 ppt	Spent Activated Carbon
50	.04 - 2.0 mg/Kg	TCDD	.0125 ppt	ND - .05 ppt	Spent Activated Carbon

THERMAL ACTIVATED CARBON REGENERATION

REF #	SAMPLING ORGANIZATION	RATING
50	Batelle Labs	I
50	Batelle Labs	I
50	Batelle Labs	I
50	Batelle Labs	I
50	Batelle Labs	I
50	Batelle Labs	I
50	Batelle Labs	I
50	Batelle Labs	I
50	Batelle Labs	I
50	Batelle Labs	I
50	Batelle Labs	I
50	Batelle Labs	I

REF #	SOURCE TYPE	FACILITY	SOURCE CHARACT.
117	SEWAGE SLUDGE INCINERATORS	Ontario	Multiple Hearth Inc. (1000 C)
117	SEWAGE SLUDGE INCINERATORS	Ontario	Multiple Hearth Inc. (1000 C)

SEWAGE SLUDGE INCINERATORS

REF #	PROCESSES	SAMPLE	METHOD	SAMPLE NUM.	EXTRACTION	ANALYSIS
117	Stack	N/A	N/A	3 Sample Periods	N/A	N/A
117	Stack	N/A	N/A	3 Sample Periods	N/A	N/A

SEWAGE SLUDGE INCINERATORS

REF #	DETECTION LIMITS	ISOMER	ISOMER CONC.	DATA VARIABILITY	PRECURSORS
117	N/A	PCDD	0.739 ug/m3	.483 - 1.14 ug/m3	Sewage Sludge
117	N/A	PCDF	1.213 ug/m3	.501 - 2.248 ug/m3	Sewage Sludge

SEWAGE SLUDGE INCINERATORS

REF #	SAMPLING ORGANIZATION	RATING
117	Ont. Ministry of Env.	I
117	Ont. Ministry of Env.	I

BOILERS COFIRING WASTES

REF #	SOURCE TYPE	FACILITY	SOURCE CHARACT.
16	WASTE OIL BOILER	Aarau, Switzerland	N/A
16	WASTE OIL BOILER	Aarau, Switzerland	N/A
22	IND WASTE BOILERS	Site A	Keeler CP Steam Generator
22	IND WASTE BOILERS	Site A	Keeler CP Steam Generator
22	IND WASTE BOILERS	Site A	Keeler CP Steam Generator
22	IND WASTE BOILERS	Site A	Keeler CP Steam Generator
22	IND WASTE BOILERS	Site A	Keeler CP Steam Generator
22	IND WASTE BOILERS	Site A	Keeler CP Steam Generator
22	IND WASTE BOILERS	Site A	Keeler CP Steam Generator
22	IND WASTE BOILERS	SITE D	B&W Wall-Fired Boiler
22	IND WASTE BOILERS	SITE E	Water Tube Boiler
22	IND WASTE BOILERS	SITE G	Fire Tube Boiler
28	IND WASTE BOILERS	N/A	Industrial Boiler (pile burner)
28	IND WASTE BOILERS	N/A	Industrial Boiler (pile burner)
28	IND WASTE BOILERS	N/A	Industrial Boiler (pile burner)
28	IND WASTE BOILERS	N/A	Industrial Boiler (pile burner)
28	IND WASTE BOILERS	N/A	Industrial Boiler (pile burner)
28	IND WASTE BOILERS	N/A	Industrial Boiler (pile burner)
28	IND WASTE BOILERS	N/A	Industrial Boiler (pile burner)
28	IND WASTE BOILERS	N/A	Industrial Boiler (pile burner)
28	IND WASTE BOILERS	N/A	Industrial Boiler (pile burner)
31	TAR BURNER	Midland Mich.	72 million BTU/hr with supplemental fuel (gas)
31	TAR BURNER	Midland Mich.	72 million BTU/hr with supplemental fuel (gas)
31	TAR BURNER	Midland Mich.	72 million BTU/hr with supplemental fuel (gas)
31	TAR BURNER	Midland Mich.	72 million BTU/hr with supplemental fuel (gas)
31	INDUSTRIAL SW INCINERATION	Midland Mich.	Rotary kiln without suppl. fuel
31	INDUSTRIAL SW INCINERATION	Midland Mich.	Rotary kiln without suppl. fuel
31	INDUSTRIAL SW INCINERATION	Midland Mich.	Rotary kiln without suppl. fuel
31	INDUSTRIAL SW INCINERATION	Midland Mich.	Rotary kiln without suppl. fuel
31	INDUSTRIAL SW INCINERATION	Midland Mich.	Rotary kiln without suppl. fuel
31	INDUSTRIAL SW INCINERATION	Midland Mich.	Rotary kiln with suppl. fuel
31	INDUSTRIAL SW INCINERATION	Midland Mich.	Rotary kiln with suppl. fuel
31	INDUSTRIAL SW INCINERATION	Midland Mich.	Rotary kiln with suppl. fuel
31	INDUSTRIAL SW INCINERATION	Midland Mich.	Rotary kiln with suppl. fuel
31	INDUSTRIAL SW INCINERATION	Midland Mich.	Rotary kiln with suppl. fuel
31	INDUSTRIAL SW INCINERATION	Midland Mich.	Rotary kiln without suppl. fuel
31	INDUSTRIAL SW INCINERATION	Midland Mich.	Rotary kiln without suppl. fuel
31	INDUSTRIAL SW INCINERATION	Midland Mich.	Rotary kiln without suppl. fuel
31	INDUSTRIAL SW INCINERATION	Midland Mich.	Rotary kiln without suppl. fuel
31	INDUSTRIAL SW INCINERATION	Midland Mich.	Rotary kiln with suppl. fuel
31	INDUSTRIAL SW INCINERATION	Midland Mich.	Rotary kiln with suppl. fuel
31	INDUSTRIAL SW INCINERATION	Midland Mich.	Rotary kiln with suppl. fuel
31	INDUSTRIAL SW INCINERATION	Midland Mich.	Rotary kiln with suppl. fuel
#39	WASTE OIL BOILER	Office Building	Cast Iron Boiler
#39	WASTE OIL BOILER	Office Building	Cast Iron Boiler
#39	WASTE OIL BOILER	Office Building	Cast Iron Boiler
#39	WASTE OIL BOILER	Office Building	Cast Iron Boiler
#39	WASTE OIL BOILER	Greenhouse Complex	Horizontal Return Tube Boiler
#39	WASTE OIL BOILER	Greenhouse Complex	Horizontal Return Tube Boiler
#39	WASTE OIL BOILER	Greenhouse Complex	Horizontal Return Tube Boiler
#39	WASTE OIL BOILER	Greenhouse Complex	Horizontal Return Tube Boiler
#39	WASTE OIL BOILER	Greenhouse Complex	Horizontal Return Tube Boiler
#39	WASTE OIL BOILER	Greenhouse	Four Pass Fire Tube
#39	WASTE OIL BOILER	Greenhouse	Four Pass Fire Tube

BOILERS COFIRING WASTES

REF #PROCESSES		SAMPLE	METHOD	SAMPLE NUM.	EXTRACTION	ANALYSIS
16	Stack/ESP	FA	N/A	N/A	Methylene Chloride	GC/MS
16	Stack/ESP	FA	N/A	N/A	Methylene Chloride	GC/MS
22	-----	Feed	GS	4 Tests	Soxhlet/Methylene Chloride	HRGC/HRMS
22	-----	Feed	GS	4 Tests	Soxhlet/Methylene Chloride	HRGC/HRMS
22	Stack	FG/FA	MM5T	4 Tests	Soxhlet/Methylene Chloride	HRGC/HRMS
22	Stack	FG/FA	MM5T	4 Tests	Soxhlet/Methylene Chloride	HRGC/HRMS
22	Stack	FG/FA	MM5T	4 Tests	Soxhlet/Methylene Chloride	HRGC/HRMS
22	Furnace	Ash	GS	4 Tests	Soxhlet/Methylene Chloride	HRGC/HRMS
22	Furnace	Ash	GS	4 Tests	Soxhlet/Methylene Chloride	HRGC/HRMS
22	Stack	FG/FA	MM5T	N/A	Soxhlet/Methylene Chloride	HRGC/HRMS
22	Stack	FG/FA	MM5T	N/A	Soxhlet/Methylene Chloride	HRGC/HRMS
22	Stack	FG/FA	MM5T	N/A	Soxhlet/Methylene Chloride	HRGC/HRMS
28	Stack	FG	Train	5 Days	N/A	GC/MS
28	Feed	Sludge	GS	5 Days	N/A	GC/MS
28	Feed	Sludge	GS	5 Days	N/A	GC/MS
28	Feed	Sludge	GS	5 Days	N/A	GC/MS
28	Feed	Sludge	GS	5 Days	N/A	GC/MS
28	Composit	Ash	GS	5 Days	N/A	GC/MS
28	Composit	Ash	GS	5 Days	N/A	GC/MS
28	Composit	Ash	GS	5 Days	N/A	GC/MS
28	Composit	Ash	GS	5 Days	N/A	GC/MS
31	Stack	FA	GS	5 samples	N/A	GC/MS
31	Stack	FA	GS	5 samples	N/A	GC/MS
31	Stack	FA	GS	5 samples	N/A	GC/MS
31	Stack	FA	GS	5 samples	N/A	GC/MS
31	Stack	FA	GS	4 samples	N/A	GC/MS
31	Stack	FA	GS	4 samples	N/A	GC/MS
31	Stack	FA	GS	4 samples	N/A	GC/MS
31	Stack	FA	GS	4 samples	N/A	GC/MS
31	Stack	FA	GS	4 samples	N/A	GC/MS
31	Stack	FA	GS	5 samples	N/A	GC/MS
31	Stack	FA	GS	5 samples	N/A	GC/MS
31	Stack	FA	GS	5 samples	N/A	GC/MS
31	Stack	FA	GS	5 samples	N/A	GC/MS
31	Stack	FA	GS	5 samples	N/A	GC/MS
31	Scrubber	FA	FILTERED	N/A	N/A	GC/MS
31	Scrubber	FA	FILTERED	N/A	N/A	GC/MS
31	Scrubber	FA	FILTERED	N/A	N/A	GC/MS
31	Scrubber	FA	FILTERED	N/A	N/A	GC/MS
31	Scrubber	FA	FILTERED	N/A	N/A	GC/MS
31	Scrubber	FA	FILTERED	N/A	N/A	GC/MS
31	Scrubber	FA	FILTERED	N/A	N/A	GC/MS
31	Scrubber	FA	FILTERED	N/A	N/A	GC/MS
#39	-----	Feed	GS	6 Trials	Soxhlet/Methylene Chloride	GC/MS
#39	Stack	FG	MM5T	6 Trials	Soxhlet/Methylene Chloride	GC/MS
#39	Stack	FG	MM5T	6 Trials	Soxhlet/Methylene Chloride	GC/MS
#39	Stack	FG	MM5T	6 Trials	Soxhlet/Methylene Chloride	GC/MS
#39	-----	Feed	GS	2 Trials	Soxhlet/Methylene Chloride	GC/MS
#39	Stack	FG	MM5T	2 Trials	Soxhlet/Methylene Chloride	GC/MS
#39	Stack	FG	MM5T	2 Trials	Soxhlet/Methylene Chloride	GC/MS
#39	Stack	FG	MM5T	2 Trials	Soxhlet/Methylene Chloride	GC/MS
#39	Stack	FG	MM5T	2 Trials	Soxhlet/Methylene Chloride	GC/MS
#39	-----	Feed	GS	6 Trials	Soxhlet/Methylene Chloride	GC/MS
#39	Stack	FG	MM5T	6 Trials	Soxhlet/Methylene Chloride	GC/MS

BOILERS COFIRING WASTES

REF #	DETECTION LIMITS	ISOMER	ISOMER CONC.	DATA VARIABILITY	PRECURSORS
16	N/A	PCDD	0.6 ppm	N/A	Used Ind. Oil
16	N/A	PCDF	0.3 ppm	N/A	Used Ind. Oil
22	0.6 ppb	PCDD	5.55 ppb	N/A	Waste Wood
22	0.6 ppb	TCDD	ND	N/A	Waste Wood
22	0.4 ng/m3	2,3,7,8 TCDD	ND	N/A	Waste Wood
22	0.4 ng/m3	TCDD	40.5 ng/m3	38 - 43 ng/m3	Waste Wood
22	0.4 ng/m3	PCDD	75.5 ng/m3	75 - 76 ng/m3	Waste Wood
22	0.02 ppb	2,3,7,8 TCDD	ND	N/A	Waste Wood
22	0.02 ppb	PCDD	51.5 ppb	38 - 65 ppb	Waste Wood
22	1000 ng/m3	PCDD	ND	N/A	CL-Solvents
22	1000 ng/m3	PCDD	ND	N/A	CL-Waste Oil
22	1000 ng/m3	PCDD	ND	N/A	CL-Wastes
28	10 ng/m3	PCDD/PCDF	ND	N/A	PCP / scrap wood
28	0.9 ng.g	TCDD	ND	N/A	PCP / scrap wood
28	0.65 ng/g	TCDF	ND	N/A	PCP / scrap wood
28	6.4 ng/g	PCDD	306 ng/g	N/A	PCP / scrap wood
28	5.75 ng/g	PCDF	18.2 ng/g	N/A	PCP / scrap wood
28	0.2 ng/g	TCDD	2.5 ng/g	0.8 - 3.4 ng/g	PCP / scrap wood
28	0.5 ng/g	TCDF	3.7 ng/g	1.2 - 7 ng/g	PCP / scrap wood
28	5.2 ng/g	PCDD	209 ng/g	30.5 - 439.4 ng/g	PCP / scrap wood
28	5.5 ng/g	PCDF	92.1 ng/g	37.8 - 124.4 ng/g	PCP / scrap wood
31	1.5 ppb	TCDD	ND	ND	gas and tars
31	N/A	H6CDD	7.6 ppb	1 - 20 ppb	gas and tars
31	N/A	H7CDD	91 ppb	27 - 160 ppb	gas and tars
31	N/A	OCDD	306 ppb	190 - 440 ppb	gas and tars
31	N/A	2,3,7,8 TCDD	55 ppb	ND - 110 ppb	tars, SW, gas
31	N/A	TCDD	7705 ppb	3410 - 12000 ppb	tars, SW, gas
31	N/A	H6CDD	21225 ppb	1300 - 65000 ppb	tars, SW, gas
31	N/A	H7CDD	164750 ppb	2000 - 510000 ppb	tars, SW, gas
31	N/A	OCDD	263000 ppb	3000 - 810000 ppb	tars, SW, gas
31	2.0 ppb	2,3,7,8 TCDD	ND	N/A	tars, SW, gas
31	2.0 ppb	TCDD	ND	N/A	tars, SW, gas
31	0.5 ppb	H6CDD	2.1 ppb	ND - 5.0 ppb	tars, SW, gas
31	N/A	H7CDD	32 ppb	4.0 - 110.0 ppb	tars, SW, gas
31	N/A	OCDD	234.8 ppb	9.0 - 950.0 ppb	tars, SW, gas
31	N/A	TCDD	2500 ppb	N/A	tars, SW, gas
31	N/A	H6CDD	3400 ppb	N/A	tars, SW, gas
31	N/A	H7CDD	26000 ppb	N/A	tars, SW, gas
31	N/A	OCDD	42000 ppb	N/A	tars, SW, gas
31	N/A	TCDD	46 ppb	N/A	tars, SW, gas
31	N/A	H6CDD	200 ppb	N/A	tars, SW, gas
31	N/A	H7CDD	970 ppb	N/A	tars, SW, gas
31	N/A	OCDD	1200 ppb	N/A	tars, SW, gas
*39	.04 - 2.0 mg/kg	PCDD/PCDF	ND	N/A	Spiked Waste Oil
*39	.05 - 3.1 ug/m3	PCDD	ND	N/A	Spiked Waste Oil
*39	0.10 ug/m3	TCDF	ND	N/A	Spiked Waste Oil
*39	0.5 - 3.1 ug/m3	PCDF	1.3 ug/m3	N/A	Spiked Waste Oil
*39	.04 - 2.0 mg/kg	PCDD/PCDF	ND	N/A	Spiked Waste Oil
*39	.05 - 4.5 ug/m3	PCDD	2.48 ug/m3	0.45 - 4.5 ug/m3	Spiked Waste Oil
*39	0.06 ug/m3	TCDD	ND	N/A	Spiked Waste Oil
*39	0.05 - 2.0 ug/m3	PCDF	0.78 ug/m3	0.69 - 0.86 ug/m3	Spiked Waste Oil
*39	0.06 ug/m3	TCDF	ND	N/A	Spiked Waste Oil
*39	.04 - 2.0 mg/kg	PCDD/PCDF	ND	N/A	Spiked Waste Oil
*39	.05 - 3.1 ug/m3	PCDD	0.32 ug/m3	ND - 1.6 ug/m3	Spiked Waste Oil

BOILERS COFIRING WASTES

REF #	SAMPLING ORGANIZATION	RATING
16	Swiss Fed. Res. Station	I
16	Swiss Fed. Res. Station	I
22	Acurex	G
22	Acurex	G
22	Acurex	G
22	Acurex	G
22	Acurex	G
22	Acurex	G
22	Acurex	G
22	Acurex	G
22	Acurex	G
22	Acurex	G
28	Acurex Corp.	G
28	Acurex Corp.	G
28	Acurex Corp.	G
28	Acurex Corp.	G
28	Acurex Corp.	G
28	Acurex Corp.	G
28	Acurex Corp.	G
28	Acurex Corp.	G
28	Acurex Corp.	G
31	Dow Chemical	G
31	Dow Chemical	G
31	Dow Chemical	G
31	Dow Chemical	G
31	Dow Chemical	G
31	Dow Chemical	G
31	Dow Chemical	G
31	Dow Chemical	G
31	Dow Chemical	G
31	Dow Chemical	G
31	Dow Chemical	G
31	Dow Chemical	G
31	Dow Chemical	G
31	Dow Chemical	G
31	Dow Chemical	G
31	Dow Chemical	G
31	Dow Chemical	G
31	Dow Chemical	G
31	Dow Chemical	G
31	Dow Chemical	G
31	Dow Chemical	G
31	Dow Chemical	G
#39	EPA/GCA Corp	P
#39	EPA/GCA Corp	P
#39	EPA/GCA Corp	P
#39	EPA/GCA Corp	P
#39	EPA/GCA Corp	P
#39	EPA/GCA Corp	P
#39	EPA/GCA Corp	P
#39	EPA/GCA Corp	P
#39	EPA/GCA Corp	P
#39	EPA/GCA Corp	P
#39	EPA/GCA Corp	P

BOILERS COFIRING WASTES

REF #	SOURCE TYPE	FACILITY	SOURCE CHARACT.
#39	WASTE OIL BOILER	Greenhouse	Four Pass Fire Tube
#39	WASTE OIL BOILER	Greenhouse	Four Pass Fire Tube
#39	WASTE OIL BOILER	Greenhouse	Four Pass Fire Tube
#39	WASTE OIL BOILER	Office Building	Three Pass Scotch Fire Tube
#39	WASTE OIL BOILER	Office Building	Three Pass Scotch Fire Tube
#39	WASTE OIL BOILER	Office Building	Three Pass Scotch Fire Tube
#39	WASTE OIL BOILER	Office Building	Three Pass Scotch Fire Tube
#39	WASTE OIL BOILER	Office Building	Three Pass Scotch Fire Tube
#39	WASTE OIL BOILER	Office Building	Three Pass Scotch Fire Tube
#39	WASTE OIL BOILER	Office Building	Three Pass Scotch Fire Tube
#39	WASTE OIL BOILER	Office Building	Three Pass Scotch Fire Tube
#39	WASTE OIL BOILER	Greenhouse	Three Pass Fire Tube
#39	WASTE OIL BOILER	Greenhouse	Three Pass Fire Tube
#39	WASTE OIL BOILER	Greenhouse	Three Pass Fire Tube
#39	WASTE OIL BOILER	Greenhouse	Three Pass Fire Tube
#39	WASTE OIL BOILER	Greenhouse	Four Pass Scotch Fire Tube
#39	WASTE OIL BOILER	Greenhouse	Four Pass Scotch Fire Tube
#39	WASTE OIL BOILER	Greenhouse	Four Pass Scotch Fire Tube
45	IND WASTE BOILER	Bay City, Mich.	High Eff. Ind. Boiler
94	IND WASTE BOILER	European	Ind BOILER (PCP WASTES)
94	IND WASTE BOILER	European	Ind BOILER (PCP WASTES)
94	IND WASTE BOILER	European	Ind BOILER (PCP WASTES)
94	IND WASTE BOILER	European	Ind BOILER (PCP WASTES)
94	IND WASTE BOILER	European	Ind BOILER (PCP WASTES)
94	IND WASTE BOILER	European	Ind BOILER (PCP WASTES)
94	IND WASTE BOILER	European	Ind BOILER (PCP WASTES)
94	IND WASTE BOILER	European	Ind BOILER (PCP WASTES)

BOILERS COFIRING WASTES

REF #PROCESSES		SAMPLE	METHOD	SAMPLE NUM.	EXTRACTION	ANALYSIS
#39	Stack	FG	MM5T	6 Trials	Soxhlet/Methylene Chloride	GC/MS
#39	Stack	FG	MM5T	6 Trials	Soxhlet Methylene Chloride	GC/MS
#39	Stack	FG	MM5T	6 Trials	Soxhlet Methylene Chloride	GC/MS
#39	-----	Feed	GS	N/A	Soxhlet/Methylene Chloride	GC/MS
#39	Stack	FG	MM5T	6 Trials	Soxhlet/Methylene Chloride	GC/MS
#39	Stack	FG	MM5T	6 Trials	Soxhlet/Methylene Chloride	GC/MS
#39	Stack	FG	MM5T	6 Trials	Soxhlet/Methylene Chloride	GC/MS
#39	Fire Tube	FA	GS	3 Trials	Soxhlet/Methylene Chloride	GC/MS
#39	Fire Tube	FA	GS	3 Trials	Soxhlet/Methylene Chloride	GC/MS
#39	Fire Tube	FA	GS	3 Trials	Soxhlet/Methylene Chloride	GC/MS
#39	Fire Tube	FA	GS	3 Trials	Soxhlet/Methylene Chloride	GC/MS
#39	-----	Feed	GS	6 Trials	Soxhlet/Methylene Chloride	GC/MS
#39	Stack	FG	MM5T	6 Trials	Soxhlet/Methylene Chloride	GC/MS
#39	Stack	FG	MM5T	6 Trials	Soxhlet/Methylene Chloride	GC/MS
#39	Stack	FG	MM5T	6 Trials	Soxhlet/Methylene Chloride	GC/MS
#39	-----	Feed	GS	4 Trials	Soxhlet/Methylene Chloride	GC/MS
#39	Stack	FG	MM5T	4 Trials	Soxhlet/Methylene Chloride	GC/MS
#39	Stack	FG	MM5T	4 Trials	Soxhlet/Methylene Chloride	GC/MS
45	Stack	FG/FA	MM5T	3	Soxhlet/Methylene Chloride	GC/MS
94	Baghouse	Ash	GS	N/A	Soxhlet/Toluene	GC/MS
94	Baghouse	Ash	GS	N/A	Soxhlet/Toluene	GC/MS
94	Baghouse	Ash	GS	N/A	Soxhlet/Toluene	GC/MS
94	Baghouse	Ash	GS	N/A	Soxhlet/Toluene	GC/MS
94	Furnace	Ash	GS	N/A	Soxhlet/Toluene	GC/MS
94	Furnace	Ash	GS	N/A	Soxhlet/Toluene	GC/MS
94	Furnace	Ash	GS	N/A	Soxhlet/Toluene	GC/MS
94	Furnace	Ash	GS	N/A	Soxhlet/Toluene	GC/MS

BOILERS COFIRING WASTES

REF #	DETECTION LIMITS	ISOMER	ISOMER CONC.	DATA VARIABILITY	PRECURSORS
#39	.09 ug/m3	TCDD	ND	N/A	Spiked Waste Oil
#39	.05 - 3.1 ug/m3	PCDF	.232 ug/m3	ND - .73 ug/m3	Spiked Waste Oil
#39	0.09 ug/m3	TCDF	0.034 ug/m3	ND - .17 ug/m3	Spiked Waste Oil
#39	0.04 - 2.0 mg/kg	PCDD/PCDF	ND	N/A	Spiked Waste Oil
#39	0.05 - 4.0 ug/m3	PCDD	ND	N/A	Spiked Waste Oil
#39	0.05 - 4.0 ug/m3	PCDF	0.416 ug/m3	ND - .75 ug/m3	Spiked Waste Oil
#39	0.12 ug/m3	TCDF	ND	N/A	Spiked Waste Oil
#39	0.5 - 10.0 ug/kg	PCDD	337 ug/kg	ND - 593 ug/kg	Spiked Waste Oil
#39	0.5 ug/kg	TCDD	ND	N/A	Spiked Waste Oil
#39	0.5 - 10 ug/kg	PCDF	1267 ug/kg	71 - 2,200 ug/kg	Spiked Waste Oil
#39	0.5 ug/kg	TCDF	177 ug/kg	11 - 350 ug/kg	Spiked Waste Oil
#39	.04 - 2.0 mg/kg	PCDD/PCDF	ND	N/A	Spiked Waste Oil
#39	.05 - 3.0 ug/m3	PCDD	-----	ND - 17 ug/m3	Spiked Waste Oil
#39	0.10 ug/m3	TCDD	ND	N/A	Spiked Waste Oil
#39	.05 - 3.0 ug/m3	PCDF	0.42 ug/m3	ND - 2.1 ug/m3	Spiked Waste Oil
#39	.04 - 2.0 mg/kg	PCDD/PCDF	ND	N/A	Spiked Waste Oil
#39	0.04 - 3.0 ug/m3	PCDD	0.35 ug/m3	ND - 1.4 ug/m3	Spiked Waste Oil
#39	0.04 - 3.0 ug/m3	PCDF	ND	N/A	Spiked Waste Oil
45	N/A	PCDD/PCDF	ND	N/A	PCBs (500 ppm)
94	N/A	TCDD	0.96 ug/g	N/A	PCP
94	N/A	PCDD	5.2 ug/g	N/A	PCP
94	N/A	TCDF	0.90 ug/g	N/A	PCP
94	N/A	PCDF	2.6 ug/g	N/A	PCP
94	N/A	TCDD	0.31 ug/g	N/A	PCP
94	N/A	PCDD	0.01 ug/g	N/A	PCP
94	N/A	TCDF	ND	N/A	PCP
94	N/A	PCDF	ND	N/A	PCP

BOILERS COFIRING WASTES

REF #	SAMPLING ORGANIZATION	RATING
#39	EPA/GCA Corp	P
#39	EPA/GCA Corp	P
#39	EPA/GCA Corp	P
#39	EPA/GCA Corp	P
#39	EPA/GCA Corp	P
#39	EPA/GCA Corp	P
#39	EPA/GCA Corp	P
#39	EPA/GCA Corp	P
#39	EPA/GCA Corp	P
#39	EPA/GCA Corp	P
#39	EPA/GCA Corp	P
#39	EPA/GCA Corp	P
#39	EPA/GCA Corp	P
#39	EPA/GCA Corp	P
#39	EPA/GCA Corp	P
#39	EPA/GCA Corp	P
#39	EPA/GCA Corp	P
#39	EPA/GCA Corp	P
45	GCA	I
94	Univ. of Umea, Sweden	G
94	Univ. of Umea, Sweden	G
94	Univ. of Umea, Sweden	G
94	Univ. of Umea, Sweden	G
94	Univ. of Umea, Sweden	G
94	Univ. of Umea, Sweden	G
94	Univ. of Umea, Sweden	I
94	Univ. of Umea, Sweden	I

EXPERIMENTAL STUDIES

REF #	SOURCE TYPE	FACILITY	SOURCE CHARACT.
4	EXPERIMENTAL	Pilot Scale Incinerator	Treated Wood
4	EXPERIMENTAL	Pilot Scale Incinerator	Treated Wood
4	EXPERIMENTAL	Pilot Scale Incinerator	Treated Wood
4	EXPERIMENTAL	Pilot Scale Incinerator	Treated Wood
4	EXPERIMENTAL	Pilot Scale Incinerator	Treated Wood
4	EXPERIMENTAL	Pilot Scale Incinerator	Treated Wood
4	EXPERIMENTAL	Pilot Scale Incinerator	Treated Wood
4	EXPERIMENTAL	Pilot Scale Incinerator	Treated Wood
4	EXPERIMENTAL	Pilot Scale Incinerator	Treated Wood
4	EXPERIMENTAL	Pilot Scale Incinerator	Treated Wood
5	EXPERIMENTAL	N/A	Open Fire/Treated Wood
5	EXPERIMENTAL	N/A	Open Fire/Treated Wood
5	EXPERIMENTAL	N/A	Open Fire/Treated Wood
5	EXPERIMENTAL	N/A	Open Fire/Treated Wood
5	EXPERIMENTAL	N/A	Open Fire/Treated Wood
5	EXPERIMENTAL	N/A	Open Fire/Treated Wood
5	EXPERIMENTAL	N/A	Open Fire/Treated Wood
5	EXPERIMENTAL	N/A	Open Fire/Treated Wood
5	EXPERIMENTAL	N/A	Open Fire/Treated Wood
5	EXPERIMENTAL	N/A	Open Fire/Treated Wood
17	EXPERIMENTAL	Quartz Mini Ampoules	Trichlorobenzene pyrolysis
17	EXPERIMENTAL	Quartz Mini Ampoules	Trichlorobenzene pyrolysis
17	EXPERIMENTAL	Quartz Mini Ampoules	Trichlorobenzene pyrolysis
17	EXPERIMENTAL	Quartz Mini Ampoules	Trichlorobenzene pyrolysis
17	EXPERIMENTAL	Quartz Mini Ampoules	Trichlorobenzene pyrolysis
17	EXPERIMENTAL	Quartz Mini Ampoules	Trichlorobenzene pyrolysis
17	EXPERIMENTAL	Quartz Mini Ampoules	Trichlorobenzene pyrolysis
17	EXPERIMENTAL	Quartz Mini Ampoules	Trichlorobenzene pyrolysis
17	EXPERIMENTAL	Quartz Mini Ampoules	Trichlorobenzene pyrolysis
17	EXPERIMENTAL	Quartz Mini Ampoules	Trichlorobenzene pyrolysis
19	EXPERIMENTAL	Quartz Mini Ampoules	PCB Pyrolysis (550 degrees C)
19	EXPERIMENTAL	Quartz Mini Ampoules	PCB Pyrolysis (600 degrees C)
19	EXPERIMENTAL	Quartz Mini Ampoules	PCB Pyrolysis (650 degrees C)
19	EXPERIMENTAL	Quartz Mini Ampoules	PCB Pyrolysis (700 degrees C)
19	EXPERIMENTAL	Quartz Mini Ampoules	PCB Pyrolysis (850 degrees C)
19	EXPERIMENTAL	Quartz Mini Ampoules	PCB Pyrolysis (550 degrees C)
19	EXPERIMENTAL	Quartz Mini Ampoules	PCB Pyrolysis (600 degrees C)
19	EXPERIMENTAL	Quartz Mini Ampoules	PCB Pyrolysis (650 degrees C)
19	EXPERIMENTAL	Quartz Mini Ampoules	PCB Pyrolysis (700 degrees C)
19	EXPERIMENTAL	Quartz Mini Ampoules	PCB Pyrolysis (850 degrees C)
19	EXPERIMENTAL	Quartz Mini Ampoules	PCB Pyrolysis (550 degrees C)
19	EXPERIMENTAL	Quartz Mini Ampoules	PCB Pyrolysis (600 degrees C)
19	EXPERIMENTAL	Quartz Mini Ampoules	PCB Pyrolysis (650 degrees C)
19	EXPERIMENTAL	Quartz Mini Ampoules	PCB Pyrolysis (700 degrees C)
19	EXPERIMENTAL	Quartz Mini Ampoules	PCB Pyrolysis (850 degrees C)
20	EXPERIMENTAL	Quartz Mini Ampoules	PCB Pyrolysis
31	EXPERIMENTAL	N/A	Cigarette Smoke
31	EXPERIMENTAL	N/A	Cigarette Smoke
31	EXPERIMENTAL	N/A	Cigarette Smoke
31	EXPERIMENTAL	N/A	Cigarette Smoke
55	EXPERIMENTAL	Pilot Incineration	Chlorophenol Treated Wood
55	EXPERIMENTAL	Pilot Incineration	Chlorophenol Treated Wood
55	EXPERIMENTAL	Pilot Incineration	Chlorophenol Treated Wood
55	EXPERIMENTAL	Pilot Incineration	Chlorophenol Treated Wood

REF #	PROCESSES	SAMPLE	METHOD	SAMPLE NUM.	EXTRACTION	ANALYSIS
4	N/A	FG	N/A	5 Trials	N/A	N/A
4	N/A	FG	N/A	5 Trials	N/A	N/A
4	N/A	FG	N/A	5 Trials	N/A	N/A
4	N/A	FG	N/A	5 Trials	N/A	N/A
4	N/A	FG	N/A	5 Trials	N/A	N/A
4	N/A	FG	N/A	5 Trials	N/A	N/A
4	N/A	FG	N/A	5 Trials	N/A	N/A
4	N/A	FG	N/A	5 Trials	N/A	N/A
4	N/A	FG	N/A	5 Trials	N/A	N/A
4	N/A	FG	N/A	5 Trials	N/A	N/A
5	Open Fire	Smoke	Filter	8 Experiments	Basic Extraction	GC/MS
5	Open Fire	Smoke	Filter	8 Experiments	Basic Extraction	GC/MS
5	Open Fire	Smoke	Filter	8 Experiments	Basic Extraction	GC/MS
5	Open Fire	Smoke	Filter	8 Experiments	Basic Extraction	GC/MS
5	Open Fire	Smoke	Filter	8 Experiments	Basic Extraction	GC/MS
5	Open Fire	Smoke	Filter	8 Experiments	Basic Extraction	GC/MS
5	Open Fire	Smoke	Filter	8 Experiments	Basic Extraction	GC/MS
5	Open Fire	Smoke	Filter	8 Experiments	Basic Extraction	GC/MS
5	Open Fire	Smoke	Filter	8 Experiments	Basic Extraction	GC/MS
5	Open Fire	Smoke	Filter	8 Experiments	Basic Extraction	GC/MS
17	N/A	FG	N/A	N/A	Benzene	GC/MS
17	N/A	FG	N/A	N/A	Benzene	GC/MS
17	N/A	FG	N/A	N/A	Benzene	GC/MS
17	N/A	FG	N/A	N/A	Benzene	GC/MS
17	N/A	FG	N/A	N/A	Benzene	GC/MS
17	N/A	FG	N/A	N/A	Benzene	GC/MS
17	N/A	FG	N/A	N/A	Benzene	GC/MS
17	N/A	FG	N/A	N/A	Benzene	GC/MS
17	N/A	FG	N/A	N/A	Benzene	GC/MS
17	N/A	FG	N/A	N/A	Benzene	GC/MS
19	N/A	FG	N/A	N/A	Benzene/Hexane	GC/MS
19	N/A	FG	N/A	N/A	Benzene/Hexane	GC/MS
19	N/A	FG	N/A	N/A	Benzene/Hexane	GC/MS
19	N/A	FG	N/A	N/A	Benzene/Hexane	GC/MS
19	N/A	FG	N/A	N/A	Benzene/Hexane	GC/MS
19	N/A	FG	N/A	N/A	Benzene/Hexane	GC/MS
19	N/A	FG	N/A	N/A	Benzene/Hexane	GC/MS
19	N/A	FG	N/A	N/A	Benzene/Hexane	GC/MS
19	N/A	FG	N/A	N/A	Benzene/Hexane	GC/MS
19	N/A	FG	N/A	N/A	Benzene/Hexane	GC/MS
19	N/A	FG	N/A	N/A	Benzene/Hexane	GC/MS
19	N/A	FG	N/A	N/A	Benzene/Hexane	GC/MS
19	N/A	FG	N/A	N/A	Benzene/Hexane	GC/MS
19	N/A	FG	N/A	N/A	Benzene/Hexane	GC/MS
19	N/A	FG	N/A	N/A	Benzene/Hexane	GC/MS
20	N/A	FG	N/A	N/A	Benzene	GC/MS
31	N/A	SMOKE	FILTER	2 Tests	Hexane	GC/MS
31	N/A	SMOKE	FILTER	2 Tests	Hexane	GC/MS
31	N/A	SMOKE	FILTER	2 Tests	Hexane	GC/MS
31	N/A	SMOKE	FILTER	2 Tests	Hexane	GC/MS
55	-----	Feed	GS	5 Tests	Soxhlet/Benzene	Mass Frag.
55	-----	Feed	GS	5 Tests	Soxhlet/Benzene	Mass Frag.
55	N/A	FG	Glass Wool	5 Tests	Soxhlet/Benzene	Mass Frag.
55	N/A	FG	Glass Wool	5 Tests	Soxhlet/Benzene	Mass Frag.

EXPERIMENTAL STUDIES

REF #	DETECTION LIMITS	ISOMER	ISOMER CONC.	DATA VARIABILITY	PRECURSORS
4	N/A	TCDD	69.62 ug/g feed	2.4 - 230 ug/g feed	Trichlorophenolate
4	N/A	P5CDD	34.72 ug/g feed	1.2 - 91 ug/g feed	Trichlorophenolate
4	N/A	H6CDD	3.92 ug/g feed	ND - 9 ug/g feed	Trichlorophenolate
4	N/A	H7CDD	1.72 ug/g feed	ND - 8 ug/g feed	Trichlorophenolate
4	N/A	OCDD	1.32 ug/g feed	ND - 6 ug/g feed	Trichlorophenolate
4	N/A	TCDD	52.5 ug/g feed	10 - 140 ug/g feed	Tetrachlorophenolate
4	N/A	P5CDD	97.8 ug/g feed	14 - 240 ug/g feed	Tetrachlorophenolate
4	N/A	H6CDD	154.4 ug/g feed	17 - 360 ug/g feed	Tetrachlorophenolate
4	N/A	H7CDD	45.5 ug/g feed	10 - 95 ug/g feed	Tetrachlorophenolate
4	N/A	OCDD	ND	N/A	Tetrachlorophenolate
5	N/A	TCDD	1.4 mg/kg feed	ND - 3.0 ppm	2,4,5 T
5	N/A	P5CDD	ND	N/A	2,4,5 T
5	N/A	H6CDD	ND	N/A	2,4,5 T
5	N/A	H7CDD	ND	N/A	2,4,5 T
5	N/A	OCDD	ND	N/A	2,4,5 T
5	N/A	T4CDF	2.72 mg/kg feed	ND - 8.0 mg/kg feed	2,4,5 T
5	N/A	P5CDF	2.95 mg/kg feed	ND - 7.1 mg/kg feed	2,4,5 T
5	N/A	H6CDF	1.56 mg/kg feed	ND - 4.9 mg/kg feed	2,4,5 T
5	N/A	H7CDF	0.89 mg/kg feed	ND - 3.4 mg/kg feed	2,4,5 T
5	N/A	OCDF	ND	N/A	2,4,5 T
17	0.3-0.1 mg/inject.	TCDF	800 ug/g feed	N/A	Trichlorobenzene
17	0.3-0.1 mg/inject.	P5CDF	2200 ug/g feed	N/A	Trichlorobenzene
17	0.3-0.1 mg/inject.	H6CDF	1100 ug/g feed	N/A	Trichlorobenzene
17	0.3-0.1 mg/inject.	H6CDF	100 ug/g feed	N/A	Trichlorobenzene
17	0.3-0.1 mg/inject.	OCDF	ND	N/A	Trichlorobenzene
17	0.3-0.1 mg/inject.	TCDD	60 ug/g feed	N/A	Trichlorobenzene
17	0.3-0.1 mg/inject.	P5CDD	40 ug/g feed	N/A	Trichlorobenzene
17	0.3-0.1 mg/inject.	H6CDD	ND	N/A	Trichlorobenzene
17	0.3-0.1 mg/inject.	H7CDD	ND	N/A	Trichlorobenzene
17	0.3-0.1 mg/inject.	OCDD	ND	N/A	Trichlorobenzene
19	N/A	TCDF	1.6 %	N/A	2452'4'5'Hexachlorobiphenyl
19	N/A	TCDF	0.3%	N/A	2452'4'5'Hexachlorobiphenyl
19	N/A	TCDF	0.2%	N/A	2452'4'5'Hexachlorobiphenyl
19	N/A	TCDF	<0.1%	N/A	2452'4'5'Hexachlorobiphenyl
19	N/A	TCDF	<0.1%	N/A	2452'4'5'Hexachlorobiphenyl
19	N/A	TCDF	0.75%	N/A	Aroclor 1254
19	N/A	TCDF	0.60 %	N/A	Aroclor 1254
19	N/A	TCDF	0.25%	N/A	Aroclor 1254
19	N/A	TCDF	<0.02 %	N/A	Aroclor 1254
19	N/A	TCDF	<0.02 %	N/A	Aroclor 1254
19	N/A	TCDF	0.5%	N/A	2462'4'5'Hexachlorobiphenyl
19	N/A	TCDF	0.5%	N/A	2462'4'5'Hexachlorobiphenyl
19	N/A	TCDF	0.35 %	N/A	2462'4'5'Hexachlorobiphenyl
19	N/A	TCDF	<0.01%	N/A	2462'4'5'Hexachlorobiphenyl
19	N/A	TCDF	<0.01 %	N/A	2462'4'5'Hexachlorobiphenyl
20	N/A	PCDF	0.1% - several %	N/A	18 PCB Isomers
31	10 pg/cigarette	TCDD	ND	N/A	Tobacco
31	N/A	H6CDD	8.0, 4.2 pg/cigarett	N/A	Tobacco
31	N/A	H7CDD	8.5, 9.0 pg/cigarett	N/A	Tobacco
31	N/A	OCDD	50, 18 pg/cigarette	N/A	Tobacco
55	N/A	TCDD	0.7 ug/g feed	N/A	K trichlorophenolate
55	N/A	PCDD	11 ug/g feed	N/A	K trichlorophenolate
55	N/A	TCDD	69.9 ug/g feed	1.8 - 230 ug/g feed	K trichlorophenolate
55	N/A	PCDD	131.2 ug/g feed	6.2 - 385 ug/g feed	K trichlorophenolate

EXPERIMENTAL STUDIES

REF #	SAMPLING ORGANIZATION	RATING
4	Swed. W & A Poll. Res. Inst.	I
4	Swed. W & A Poll. Res. Inst.	I
4	Swed. W & A Poll. Res. Inst.	I
4	Swed. W & A Poll. Res. Inst.	I
4	Swed. W & A Poll. Res. Inst.	I
4	Swed. W & A Poll. Res. Inst.	I
4	Swed. W & A Poll. Res. Inst.	I
4	Swed. W & A Poll. Res. Inst.	I
4	Swed. W & A Poll. Res. Inst.	I
4	Swed. W & A Poll. Res. Inst.	I
5	Swed. W&A Pollution Res. Lab	G
5	Swed. W&A Pollution Res. Lab	I
5	Swed. W&A Pollution Res. Lab	I
5	Swed. W&A Pollution Res. Lab	I
5	Swed. W&A Pollution Res. Lab	I
5	Swed. W&A Pollution Res. Lab	G
5	Swed. W&A Pollution Res. Lab	G
5	Swed. W&A Pollution Res. Lab	G
5	Swed. W&A Pollution Res. Lab	G
5	Swed. W&A Pollution Res. Lab	I
17	Swiss Fed. Res. Station	G
17	Swiss Fed. Res. Station	G
17	Swiss Fed. Res. Station	G
17	Swiss Fed. Res. Station	G
17	Swiss Fed. Res. Station	G
17	Swiss Fed. Res. Station	G
17	Swiss Fed. Res. Station	G
17	Swiss Fed. Res. Station	G
17	Swiss Fed. Res. Station	G
17	Swiss Fed. Res. Station	G
19	Swiss Fed. Res.Station	G
19	Swiss Fed. Res.Station	G
19	Swiss Fed. Res.Station	G
19	Swiss Fed. Res.Station	G
19	Swiss Fed. Res.Station	G
19	Swiss Fed. Res.Station	G
19	Swiss Fed. Res.Station	G
19	Swiss Fed. Res.Station	G
19	Swiss Fed. Res.Station	G
19	Swiss Fed. Res.Station	G
19	Swiss Fed. Res.Station	G
19	Swiss Fed. Res.Station	G
19	Swiss Fed. Res.Station	G
19	Swiss Fed. Res.Station	G
19	Swiss Fed. Res.Station	G
20	Swiss Fed. Res. Station	G
31	Dow Chemical	G
31	Dow Chemical	G
31	Dow Chemical	G
31	Dow Chemical	G
55	Univ. of Stockholm	G
55	Univ. of Stockholm	G
55	Univ. of Stockholm	G
55	Univ. of Stockholm	G

EXPERIMENTAL STUDIES

REF #	SOURCE TYPE	FACILITY	SOURCE CHARACT.
55	EXPERIMENTAL	Pilot Incineration	Chlorophenol Treated Wood
55	EXPERIMENTAL	Pilot Incineration	Chlorophenol Treated Wood
55	EXPERIMENTAL	Pilot Incineration	Chlorophenol Treated Wood
55	EXPERIMENTAL	Pilot Incineration	Chlorophenol Treated Wood
55	EXPERIMENTAL	Pilot Incineration	Chlorophenol Treated Wood
55	EXPERIMENTAL	Pilot Incineration	Chlorophenol Treated Wood
55	EXPERIMENTAL	Pilot Incineration	Chlorophenol Treated Wood
55	EXPERIMENTAL	Pilot Incineration	Chlorophenol Treated Wood
55	EXPERIMENTAL	Pilot Incineration	Chlorophenol Treated Wood
55	EXPERIMENTAL	Pilot Incineration	Chlorophenol Treated Wood
55	EXPERIMENTAL	Pilot Incineration	Chlorophenol Treated Wood
73	EXPERIMENTAL	Vegetable Combustion	Chestnuts
73	EXPERIMENTAL	Vegetable Combustion	Chestnuts
73	EXPERIMENTAL	Vegetable Combustion	Chestnuts
73	EXPERIMENTAL	Vegetable Combustion	Chestnuts
73	EXPERIMENTAL	Vegetable Combustion	Mimosa
73	EXPERIMENTAL	Vegetable Combustion	Mimosa
73	EXPERIMENTAL	Vegetable Combustion	Mimosa
73	EXPERIMENTAL	Vegetable Combustion	Mimosa
73	EXPERIMENTAL	Vegetable Combustion	Fruit/Vegetables
73	EXPERIMENTAL	Vegetable Combustion	Fruit/Vegetables
73	EXPERIMENTAL	Vegetable Combustion	Fruit/Vegetables
73	EXPERIMENTAL	Vegetable Combustion	Fruit/Vegetables
73	EXPERIMENTAL	Vegetable Combustion	All Vegetables Tested
78	EXPERIMENTAL	quartz mini ampoules	500 - 600 C
78	EXPERIMENTAL	N/A	quartz tube (600 C)
78	EXPERIMENTAL	N/A	quartz tube (600 C)
78	EXPERIMENTAL	N/A	quartz tube (600 C)
78	EXPERIMENTAL	N/A	quartz tube (600 C)
78	EXPERIMENTAL	N/A	quartz tube (600 C)
78	EXPERIMENTAL	N/A	quartz tube (600 C)
78	EXPERIMENTAL	N/A	quartz tube (600 C)
78	EXPERIMENTAL	N/A	quartz tube (600 C)
78	EXPERIMENTAL	N/A	quartz tube (600 C)
78	EXPERIMENTAL	N/A	quartz tube (600 C)
78	EXPERIMENTAL	N/A	quartz tube (600 C)
78	EXPERIMENTAL	N/A	quartz tube (600 C)
78	EXPERIMENTAL	N/A	quartz tube (600 C)
78	EXPERIMENTAL	N/A	quartz tube (600 C)
78	EXPERIMENTAL	N/A	quartz tube (600 C)
78	EXPERIMENTAL	N/A	quartz tube (600 C)
78	EXPERIMENTAL	N/A	quartz tube (600 C)
78	EXPERIMENTAL	N/A	quartz tube (600 C)
78	EXPERIMENTAL	N/A	quartz tube (600 C)
78	EXPERIMENTAL	N/A	quartz tube (600 C)
78	EXPERIMENTAL	N/A	quartz tube (600 C)
78	EXPERIMENTAL	N/A	quartz tube (600 C)
78	EXPERIMENTAL	N/A	quartz tube (600 C)
78	EXPERIMENTAL	N/A	quartz tube (600 C)
78	EXPERIMENTAL	N/A	quartz tube (600 C)
78	EXPERIMENTAL	N/A	quartz tube (600 C)
78	EXPERIMENTAL	N/A	quartz tube (600 C)
78	EXPERIMENTAL	N/A	quartz tube (600 C)
87	EXPERIMENTAL	Fluidized Bed Oven	Painted Wood

EXPERIMENTAL STUDIES

REF #	PROCESSES	SAMPLE	METHOD	SAMPLE NUM.	EXTRACTION	ANALYSIS
55	-----	Feed	GS	5 Tests	Soxhlet/Benzene	Mass Frag.
55	-----	Feed	GS	5 Tests	Soxhlet/Benzene	Mass Frag.
55	N/A	FG	Glass Wool	5 Tests	Soxhlet/Benzene	Mass Frag.
55	N/A	FG	Glass Wool	5 Tests	Soxhlet/Benzene	Mass Frag.
55	-----	Feed	GS	5 Tests	Soxhlet/Benzene	Mass Frag.
55	-----	Feed	GS	5 Tests	Soxhlet/Benzene	Mass Frag.
55	N/A	FG	Glass Wool	5 Tests	Soxhlet/Benzene	Mass Frag.
55	N/A	FG	Glass Wool	5 Tests	Soxhlet/Benzene	Mass Frag.
55	-----	Feed	GS	5 Tests	Soxhlet/Benzene	Mass Frag.
55	N/A	FG	Glass Wool	5 Tests	Soxhlet/Benzene	Mass Frag.
55	N/A	FG	Glass Wool	5 Tests	Soxhlet/Benzene	Mass Frag.
73	N/A	FG	N/A	N/A	N/A	GC/MS
73	N/A	FG	N/A	N/A	N/A	GC/MS
73	N/A	FG	N/A	N/A	N/A	GC/MS
73	N/A	FG	N/A	N/A	N/A	GC/MS
73	N/A	FG	N/A	N/A	N/A	GC/MS
73	N/A	FG	N/A	N/A	N/A	GC/MS
73	N/A	FG	N/A	N/A	N/A	GC/MS
73	N/A	FG	N/A	N/A	N/A	GC/MS
73	N/A	FG	N/A	N/A	N/A	GC/MS
73	N/A	FG	N/A	N/A	N/A	GC/MS
73	N/A	FG	N/A	N/A	N/A	GC/MS
73	N/A	FG	N/A	N/A	N/A	GC/MS
73	N/A	FG	N/A	N/A	N/A	GC/MS
73	N/A	FG	N/A	N/A	N/A	GC/MS
78	N/A	Feed	Wool Trap	N/A	Soxhlet/Benzene	GC/MS
78	N/A	Feed	Wool Trap	N/A	Soxhlet/Benzene	GC/MS
78	N/A	Feed	Wool Trap	N/A	Soxhlet/Benzene	GC/MS
78	N/A	Feed	Wool Trap	N/A	Soxhlet/Benzene	GC/MS
78	N/A	Feed	Wool Trap	N/A	Soxhlet/Benzene	GC/MS
78	N/A	Feed	Wool Trap	N/A	Soxhlet/Benzene	GC/MS
78	N/A	Feed	Wool Trap	N/A	Soxhlet/Benzene	GC/MS
78	N/A	Feed	Wool Trap	N/A	Soxhlet/Benzene	GC/MS
78	N/A	FG	Wool Trap	N/A	Soxhlet/Benzene	GC/MS
78	N/A	FG	Wool Trap	N/A	Soxhlet/Benzene	GC/MS
78	N/A	FG	Wool Trap	N/A	Soxhlet/Benzene	GC/MS
78	N/A	FG	Wool Trap	N/A	Soxhlet/Benzene	GC/MS
78	N/A	FG	Wool Trap	N/A	Soxhlet/Benzene	GC/MS
78	N/A	FG	Wool Trap	N/A	Soxhlet/Benzene	GC/MS
78	N/A	FG	Wool Trap	N/A	Soxhlet/Benzene	GC/MS
78	N/A	FG	Wool Trap	N/A	Soxhlet/Benzene	GC/MS
78	N/A	FG	Wool Trap	N/A	Soxhlet/Benzene	GC/MS
78	N/A	FG	Wool Trap	N/A	Soxhlet/Benzene	GC/MS
78	N/A	FG	Wool Trap	N/A	Soxhlet/Benzene	GC/MS
78	N/A	FG	Wool Trap	N/A	Soxhlet/Benzene	GC/MS
78	N/A	FG	Wool Trap	N/A	Soxhlet/Benzene	GC/MS
78	N/A	FG	Wool Trap	N/A	Soxhlet/Benzene	GC/MS
78	N/A	FG	Wool Trap	N/A	Soxhlet/Benzene	GC/MS
78	N/A	FG	Wool Trap	N/A	Soxhlet/Benzene	GC/MS
78	N/A	FG	Wool Trap	N/A	Soxhlet/Benzene	GC/MS
78	N/A	FG	Wool Trap	N/A	Soxhlet/Benzene	GC/MS
78	N/A	FG	Wool Trap	N/A	Soxhlet/Benzene	GC/MS
78	N/A	FG	Wool Trap	N/A	Soxhlet/Benzene	GC/MS
67	N/A	FA	GS	N/A	N/A	GC/MS

EXPERIMENTAL STUDIES

REF #	DETECTION LIMITS	ISOMER	ISOMER CONC.	DATA VARIABILITY	PRECURSORS
55	N/A	TCDD	0.4 ug/g feed	N/A	Na Tetrachlorophenol
55	N/A	PCDD	6.4 ug/g feed	N/A	Na Tetrachlorophenol
55	N/A	TCDD	52.5 ug/g feed	10-140 ug/g feed	Na Tetrachlorophenol
55	N/A	PCDD	346 ug/g feed	31-854 ug/g feed	Na Tetrachlorophenol
55	N/A	TCDD	0.2 ug/g feed	N/A	Tetrachlorophenolate(CUsalts)
55	N/A	PCDD	2.4 ug/g feed	N/A	Tetrachlorophenolate(CUsalts)
55	N/A	TCDD	ND	N/A	Tetrachlorophenolate(CUsalts)
55	N/A	PCDD	0.296 ug/g feed	ND - 0.8 ug/g feed	Tetrachlorophenolate(CUsalts)
55	N/A	PCDD	12.3 ug/g feed	N/A	Pentachlorophenol
55	N/A	TCDD	0.44 ug/g feed	ND - 2 ug/g feed	Pentachlorophenol
55	N/A	PCDD	15.44 ug/g feed	.9 - 41 ug/g feed	Pentachlorophenol
73	N/A	TCDD	Trace	N/A	Vegetables plus Cl
73	N/A	PCDD	66 ug/g feed	N/A	Vegetables plus Cl
73	N/A	TCDF	Trace	N/A	Vegetables plus Cl
73	N/A	PCDF	299 ug/g feed	N/A	Vegetables plus Cl
73	N/A	TCDD	Trace	N/A	Vegetables plus Cl
73	N/A	PCDD	16 ug/g feed	N/A	Vegetables plus Cl
73	N/A	TCDF	Trace	N/A	Vegetables plus Cl
73	N/A	PCDF	95 ug/g feed	N/A	Vegetables plus Cl
73	N/A	TCDD	35 ug/g feed	N/A	Vegetables plus Cl
73	N/A	PCDD	202 ug/g feed	N/A	Vegetables plus Cl
73	N/A	TCDF	21 ug/g feed	N/A	Vegetables plus Cl
73	N/A	PCDF	167 ug/g feed	N/A	Vegetables plus Cl
73	N/A	PCDD/PCDF	ND	N/A	Vegetables only
76	N/A	PCDD/PCDF	N/A	0.1 - 4.5 %	PCDPEs
78	0.07 ppb	TCDD	ND	N/A	Feed/Coal
78	0.03 ppb	H6CDD	ND	N/A	Feed/Coal
78	0.1 ppb	H7CDD	ND	N/A	Feed/Coal
78	0.3 ppb	OCDD	ND	N/A	Feed/Coal
78	0.003	TCDD	ND	N/A	Feed/HCl
78	0.01 ppb	H6CDD	ND	N/A	Feed/HCl
78	0.03 ppb	H7CDD	ND	N/A	Feed/HCl
78	0.03 ppb	OCDD	ND	N/A	Feed/HCl
78	0.07 ppb	TCDD	ND	N/A	Cl2 + Air
78	0.1 ppb	H6CDD	ND	N/A	Cl2 + Air
78	0.3 ppb	H7CDD	ND	N/A	Cl2 + Air
78	0.5 ppb	OCDD	ND	N/A	Cl2 + Air
78	0.08 ppb	TCDD	ND	N/A	Coal + Air
78	0.1 ppb	H6CDD	ND	N/A	Coal + Air
78	0.3 ppb	H7CDD	0.6 ng/g feed	N/A	Coal + Air
78	0.7 ppb	OCDD	1.3 ng/g feed	N/A	Coal + Air
78	0.07 ppb	TCDD	ND	N/A	Coal + Air + NaCl
78	0.2 ppb	H6CDD	ND	N/A	Coal + Air + NaCl
78	0.2 ppb	H7CDD	0.5 ng/g feed	N/A	Coal + Air + NaCl
78	0.5 ppb	OCDD	2.7 ng/g feed	N/A	Coal + Air + NaCl
78	0.06 ppb	TCDD	1.4 ng/g feed	N/A	Coal + Air + HCl
78	0.1 ppb	H6CDD	8.4 ng/g feed	N/A	Coal + Air + HCl
78	0.3 ppb	H7CDD	25 ng/g feed	N/A	Coal + Air + HCl
78	0.6 ppb	OCDD	64 ng/g geed	N/A	Coal + Air + HCl
78	0.3 ppb	TCDD	1.2 ng/g feed	N/A	Coal + Air + Cl2
78	0.4 ppb	H6CDD	29 ng/g feed	N/A	Coal + Air + Cl2
78	2 ppb	H7CDD	91 ng/g feed	N/A	Coal + Air + Cl2
78	3 ppb	OCDD	290 ng/g feed	N/A	Coal + Air + Cl2
87	N/A	TCDD	29 ppb	N/A	PCP/Hypochlorite

REF #	SAMPLING ORGANIZATION	RATING
55	Univ. of Stockholm	G
55	Univ. of Stockholm	G
55	Univ. of Stockholm	G
55	Univ. of Stockholm	G
55	Univ. of Stockholm	G
55	Univ. of Stockholm	G
55	Univ. of Stockholm	I
55	Univ. of Stockholm	G
55	Univ. of Stockholm	G
55	Univ. of Stockholm	G
55	Univ. of Stockholm	G
73	Universita Roma	I
73	Universita Roma	I
73	Universita Roma	I
73	Universita Roma	I
73	Universita Roma	I
73	Universita Roma	I
73	Universita Roma	I
73	Universita Roma	I
73	Universita Roma	I
73	Universita Roma	I
73	Universita Roma	I
73	Universita Roma	I
73	Universita Roma	I
76	Univ of Umea	I
78	Dow Chemical	G
78	Dow Chemical	G
78	Dow Chemical	G
78	Dow Chemical	G
78	Dow Chemical	G
78	Dow Chemical	G
78	Dow Chemical	G
78	Dow Chemical	G
78	Dow Chemical	G
78	Dow Chemical	G
78	Dow Chemical	G
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78	Dow Chemical	G
78	Dow Chemical	G
78	Dow Chemical	G
78	Dow Chemical	G
78	Dow Chemical	G
78	Dow Chemical	G
78	Dow Chemical	G
87	Wright State University	G

EXPERIMENTAL STUDIES

REF #	SOURCE TYPE	FACILITY	SOURCE CHARACT.
87	EXPERIMENTAL	Fluidized Bed Oven	Painted Wood
87	EXPERIMENTAL	Fluidized Bed Oven	Painted Wood
87	EXPERIMENTAL	Fluidized Bed Oven	Painted Wood
87	EXPERIMENTAL	Fluidized Bed Oven	PCP Wood
87	EXPERIMENTAL	Fluidized Bed Oven	PCP Wood
87	EXPERIMENTAL	Fluidized Bed Oven	PCP Wood
87	EXPERIMENTAL	Fluidized Bed Oven	PCP Wood
87	EXPERIMENTAL	Fluidized Bed Oven	Paper (Hypochlorite)
87	EXPERIMENTAL	Fluidized Bed Oven	Paper (Hypochlorite)
87	EXPERIMENTAL	Fluidized Bed Oven	Paper (Hypochlorite)
87	EXPERIMENTAL	Fluidized Bed Oven	Paper (Hypochlorite)
92	EXPERIMENTAL	Open Fire	Chlorophenate Pyrolysis
92	EXPERIMENTAL	Open Fire	Chlorophenate Pyrolysis
92	EXPERIMENTAL	Open Fire	Chlorophenate Pyrolysis
92	EXPERIMENTAL	Open Fire	Chlorophenate Pyrolysis
92	EXPERIMENTAL	Open Fire	Chlorophenate Pyrolysis
92	EXPERIMENTAL	Open Fire	Chlorophenate Pyrolysis
92	EXPERIMENTAL	Open Fire	Chlorophenate Pyrolysis
92	EXPERIMENTAL	Open Fire	Chlorophenate Pyrolysis
92	EXPERIMENTAL	Open Fire	Chlorophenate Pyrolysis
92	EXPERIMENTAL	Open Fire	Chlorophenate Pyrolysis
92	EXPERIMENTAL	Open Fire	Chlorophenate Pyrolysis
92	EXPERIMENTAL	Open Fire	Chlorophenate Pyrolysis
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92	EXPERIMENTAL	Open Fire	Chlorophenate Pyrolysis
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92	EXPERIMENTAL	Open Fire	Chlorophenate Pyrolysis
92	EXPERIMENTAL	Open Fire	Chlorophenate Pyrolysis
92	EXPERIMENTAL	Open Fire	Chlorophenate Pyrolysis
92	EXPERIMENTAL	Open Fire	Chlorophenate Pyrolysis
92	EXPERIMENTAL	Open Fire	Chlorophenate Pyrolysis
92	EXPERIMENTAL	Open Fire	Chlorophenate Pyrolysis
92	EXPERIMENTAL	Open Fire	Chlorophenate Pyrolysis
92	EXPERIMENTAL	Open Fire	Chlorophenate Pyrolysis
92	EXPERIMENTAL	Open Fire	Chlorophenate Pyrolysis
92	EXPERIMENTAL	Open Fire	Chlorophenate Pyrolysis
92	EXPERIMENTAL	Open Fire	Chlorophenate Pyrolysis
92	EXPERIMENTAL	Open Fire	Chlorophenate Pyrolysis
92	EXPERIMENTAL	Open Fire	Chlorophenate Pyrolysis
92	EXPERIMENTAL	Open Fire	Chlorophenate Pyrolysis
92	EXPERIMENTAL	Open Fire	Chlorophenate Pyrolysis
92	EXPERIMENTAL	Open Fire	Chlorophenate Pyrolysis

REF	#PROCESSES	SAMPLE	METHOD	SAMPLE NUM.	EXTRACTION	ANALYSIS
87	N/A	FA	SS	N/A	N/A	GC/MS
87	N/A	FA	SS	N/A	N/A	GC/MS
87	N/A	FA	SS	N/A	N/A	GC/MS
87	N/A	FA	SS	N/A	N/A	GC/MS
87	N/A	FA	SS	N/A	N/A	GC/MS
87	N/A	FA	SS	N/A	N/A	GC/MS
87	N/A	FA	SS	N/A	N/A	GC/MS
87	N/A	FA	SS	N/A	N/A	GC/MS
87	N/A	FA	SS	N/A	N/A	GC/MS
87	N/A	FA	SS	N/A	N/A	GC/MS
87	N/A	FA	SS	N/A	N/A	GC/MS
92	N/A	Feed	SS	N/A	Soxhlet/Methylene Chloride	GC/MS
92	N/A	Feed	SS	N/A	Soxhlet/Methylene Chloride	GC/MS
92	N/A	Feed	SS	N/A	Soxhlet/Methylene Chloride	GC/MS
92	N/A	Feed	SS	N/A	Soxhlet/Methylene Chloride	GC/MS
92	N/A	Feed	SS	N/A	Soxhlet/Methylene Chloride	GC/MS
92	N/A	FG	Char. Filt	N/A	Soxhlet/Methylene Chloride	GC/MS
92	N/A	FG	Char. Filt	N/A	Soxhlet/Methylene Chloride	GC/MS
92	N/A	FG	Char. Filt	N/A	Soxhlet/Methylene Chloride	GC/MS
92	N/A	FG	Char. Filt	N/A	Soxhlet/Methylene Chloride	GC/MS
92	N/A	FG	Char. Filt	N/A	Soxhlet/Methylene Chloride	GC/MS
92	N/A	Ash	SS	N/A	Soxhlet/Methylene Chloride	GC/MS
92	N/A	Ash	SS	N/A	Soxhlet/Methylene Chloride	GC/MS
92	N/A	Ash	SS	N/A	Soxhlet/Methylene Chloride	GC/MS
92	N/A	Ash	SS	N/A	Soxhlet/Methylene Chloride	GC/MS
92	N/A	Ash	SS	N/A	Soxhlet/Methylene Chloride	GC/MS
92	N/A	FG	XAD-2 Filt	N/A	Soxhlet/Methylene Chloride	GC/MS
92	N/A	FG	XAD-2 Filt	N/A	Soxhlet/Methylene Chloride	GC/MS
92	N/A	FG	XAD-2 Filt	N/A	Soxhlet/Methylene Chloride	GC/MS
92	N/A	FG	XAD-2 Filt	N/A	Soxhlet/Methylene Chloride	GC/MS
92	N/A	FG	XAD-2 Filt	N/A	Soxhlet/Methylene Chloride	GC/MS
92	N/A	FG	Char. Filt	N/A	Soxhlet/Methylene Chloride	GC/MS
92	N/A	FG	Char. Filt	N/A	Soxhlet/Methylene Chloride	GC/MS
92	N/A	FG	Char. Filt	N/A	Soxhlet/Methylene Chloride	GC/MS
92	N/A	FG	Char. Filt	N/A	Soxhlet/Methylene Chloride	GC/MS
92	N/A	FG	Char. Filt	N/A	Soxhlet/Methylene Chloride	GC/MS
92	N/A	FG	XAD-2 Filt	N/A	Soxhlet/Methylene Chloride	GC/MS
92	N/A	FG	XAD-2 Filt	N/A	Soxhlet/Methylene Chloride	GC/MS
92	N/A	FG	XAD-2 Filt	N/A	Soxhlet/Methylene Chloride	GC/MS
92	N/A	FG	XAD-2 Filt	N/A	Soxhlet/Methylene Chloride	GC/MS
92	N/A	FG	XAD-2 Filt	N/A	Soxhlet/Methylene Chloride	GC/MS
92	N/A	Feed	SS	N/A	Soxhlet/Methylene Chloride	GC/MS
92	N/A	Feed	SS	N/A	Soxhlet/Methylene Chloride	GC/MS
92	N/A	Feed	SS	N/A	Soxhlet/Methylene Chloride	GC/MS
92	N/A	Feed	SS	N/A	Soxhlet/Methylene Chloride	GC/MS
92	N/A	Feed	SS	N/A	Soxhlet/Methylene Chloride	GC/MS
92	N/A	FG	Char. Filt	N/A	Soxhlet/Methylene Chloride	GC/MS
92	N/A	FG	Char. Filt	N/A	Soxhlet/Methylene Chloride	GC/MS
92	N/A	FG	Char. Filt	N/A	Soxhlet/Methylene Chloride	GC/MS
92	N/A	FG	Char. Filt	N/A	Soxhlet/Methylene Chloride	GC/MS
92	N/A	FG	Char. Filt	N/A	Soxhlet/Methylene Chloride	GC/MS
92	N/A	Feed	SS	N/A	Soxhlet/Methylene Chloride	GC/MS
92	N/A	FG	Char. Filt	N/A	Soxhlet/Methylene Chloride	GC/MS
92	N/A	FG	Char. Filt	N/A	Soxhlet/Methylene Chloride	GC/MS

REF #	DETECTION LIMITS	ISOMER	ISOMER CONC.	DATA VARIABILITY	PRECURSORS
87	N/A	PCDD	177 ppb	N/A	PCP/Hypochlorite
87	N/A	TCDF	105 ppb	N/A	PCP/Hypochlorite
87	N/A	PCDF	217 ppb	N/A	PCP/Hypochlorite
87	N/A	TCDD	47 ppb	N/A	PCP/Hypochlorite
87	N/A	PCDD	324 ppb	N/A	PCP/Hypochlorite
87	N/A	TCDF	97 ppb	N/A	PCP/Hypochlorite
87	N/A	PCDF	241 ppb	N/A	PCP/Hypochlorite
87	N/A	TCDD	1 ppb	N/A	PCP/Hypochlorite
87	N/A	PCDD	24 ppb	N/A	PCP/Hypochlorite
87	N/A	TCDF	4 ppb	N/A	PCP/Hypochlorite
87	N/A	PCDF	12 ppb	N/A	PCP/Hypochlorite
92	0.01 - 0.20 ug/g	TCDD	0.7 ug/g feed	N/A	SERVAREX
92	0.01 - 0.20 ug/g	P5CDD	5.2 ug/g feed	N/A	SERVAREX
92	0.01 - 0.20 ug/g	H6CDD	9.5 ug/g feed	N/A	SERVAREX
92	0.01 - 0.20 ug/g	H7CDD	5.6 ug/g feed	N/A	SERVAREX
92	0.01 - 0.20 ug/g	OCDD	0.7 ug/g feed	N/A	SERVAREX
92	0.01 - 0.20 ug/g	TCDD	35 ug/g feed	N/A	SERVAREX/Birch
92	0.01 - 0.20 ug/g	P5CDD	90 ug/g feed	N/A	SERVAREX/Birch
92	0.01 - 0.20 ug/g	H6CDD	80 ug/g feed	N/A	SERVAREX/Birch
92	0.01 - 0.20 ug/g	H7CDD	8 ug/g feed	N/A	SERVAREX/Birch
92	0.01 - 0.20 ug/g	OCDD	0.3 ug/g feed	N/A	SERVAREX/Birch
92	0.01 - 0.20 ug/g	TCDD	17 ug/g feed	N/A	SERVAREX/Birch
92	0.01 - 0.20 ug/g	P5CDD	52 ug/g feed	N/A	SERVAREX/Birch
92	0.01 - 0.20 ug/g	H6CDD	74 ug/g feed	N/A	SERVAREX/Birch
92	0.01 - 0.20 ug/g	H7CDD	16 ug/g feed	N/A	SERVAREX/Birch
92	0.01 - 0.20 ug/g	OCDD	6.4 ug/g feed	N/A	SERVAREX/Birch
92	0.01 - 0.20 ug/g	TCDD	26 ug/g feed	N/A	SERVAREX/Birch
92	0.01 - 0.20 ug/g	P5CDD	59 ug/g feed	N/A	SERVAREX/Birch
92	0.01 - 0.20 ug/g	H6CDD	57 ug/g feed	N/A	SERVAREX/Birch
92	0.01 - 0.20 ug/g	H7CDD	8 ug/g feed	N/A	SERVAREX/Birch
92	0.01 - 0.20 ug/g	OCDD	0.2 ug/g feed	N/A	SERVAREX/Birch
92	0.01 - 0.20 ug/g	TCDD	96 ug/g feed	N/A	SERVAREX/Wood Wool
92	0.01 - 0.20 ug/g	P5CDD	120 ug/g feed	N/A	SERVAREX/Wood Wool
92	0.01 - 0.20 ug/g	H6CDD	110 ug/g feed	N/A	SERVAREX/Wood Wool
92	0.01 - 0.20 ug/g	H7CDD	65 ug/g feed	N/A	SERVAREX/Wood Wool
92	0.01 - 0.20 ug/g	OCDD	1.2 ug/g feed	N/A	SERVAREX/Wood Wool
92	0.01 - 0.20 ug/g	TCDD	210 ug/g feed	N/A	SERVAREX/Wood Wool
92	0.01 - 0.20 ug/g	P5CDD	357 ug/g feed	N/A	SERVAREX/Wood Wool
92	0.01 - 0.20 ug/g	H6CDD	347 ug/g feed	N/A	SERVAREX/Wood Wool
92	0.01 - 0.20 ug/g	H7CDD	29 ug/g feed	N/A	SERVAREX/Wood Wool
92	0.01 - 0.20 ug/g	OCDD	1.2 ug/g feed	N/A	SERVAREX/Wood Wool
92	0.01 - 0.20 ug/g	TCDD	0.4 ug/g feed	N/A	KY - 5
92	0.01 - 0.20 ug/g	P5CDD	3.5 ug/g feed	N/A	KY - 5
92	0.01 - 0.20 ug/g	H6CDD	5.3 ug/g feed	N/A	KY - 5
92	0.01 - 0.20 ug/g	H7CDD	2.1 ug/g feed	N/A	KY - 5
92	0.01 - 0.20 ug/g	OCDD	0.3 ug/g feed	N/A	KY - 5
92	0.01 - 0.20 ug/g	TCDD	30 ug/g feed	N/A	KY - 5/Birch
92	0.01 - 0.20 ug/g	P5CDD	84 ug/g feed	N/A	KY - 5/Birch
92	0.01 - 0.20 ug/g	H6CDD	82 ug/g feed	N/A	KY - 5/Birch
92	0.01 - 0.20 ug/g	H7CDD	8.2 ug/g feed	N/A	KY - 5/Birch
92	0.01 - 0.20 ug/g	OCDD	0.4 ug/g feed	N/A	KY - 5/Birch
92	0.01 - 0.20 ug/g	PCDD	ND	N/A	2,4,6-Tri-Cl-Phenate
92	0.01 - 0.20 ug/g	TCDD	2100 ug/g feed	N/A	2,4,6-Tri-Cl-Phenate
92	0.01 - 0.20 ug/g	P5CDD	5.0 ug/g feed	N/A	2,4,6-Tri-Cl-Phenate

EXPERIMENTAL STUDIES

REF #	SAMPLING ORGANIZATION	RATING
87	Wright State University	6
87	Wright State University	6
87	Wright State University	6
87	Wright State University	6
87	Wright State University	6
87	Wright State University	6
87	Wright State University	6
87	Wright State University	6
87	Wright State University	6
87	Wright State University	6
87	Wright State University	6
92	Univ. of Umea, Sweden	6
92	Univ. of Umea, Sweden	6
92	Univ. of Umea, Sweden	6
92	Univ. of Umea, Sweden	6
92	Univ. of Umea, Sweden	6
92	Univ. of Umea, Sweden	6
92	Univ. of Umea, Sweden	6
92	Univ. of Umea, Sweden	6
92	Univ. of Umea, Sweden	6
92	Univ. of Umea, Sweden	6
92	Univ. of Umea, Sweden	6
92	Univ. of Umea, Sweden	6
92	Univ. of Umea, Sweden	6
92	Univ. of Umea, Sweden	6
92	Univ. of Umea, Sweden	6
92	Univ. of Umea, Sweden	6
92	Univ. of Umea, Sweden	6
92	Univ. of Umea, Sweden	6
92	Univ. of Umea, Sweden	6
92	Univ. of Umea, Sweden	6
92	Univ. of Umea, Sweden	6
92	Univ. of Umea, Sweden	6
92	Univ. of Umea, Sweden	6
92	Univ. of Umea, Sweden	6
92	Univ. of Umea, Sweden	6
92	Univ. of Umea, Sweden	6
92	Univ. of Umea, Sweden	6
92	Univ. of Umea, Sweden	6
92	Univ. of Umea, Sweden	6
92	Univ. of Umea, Sweden	6
92	Univ. of Umea, Sweden	6
92	Univ. of Umea, Sweden	6
92	Univ. of Umea, Sweden	6
92	Univ. of Umea, Sweden	6
92	Univ. of Umea, Sweden	6
92	Univ. of Umea, Sweden	6
92	Univ. of Umea, Sweden	6
92	Univ. of Umea, Sweden	6
92	Univ. of Umea, Sweden	6
92	Univ. of Umea, Sweden	6
92	Univ. of Umea, Sweden	6
92	Univ. of Umea, Sweden	6
92	Univ. of Umea, Sweden	6

EXPERIMENTAL STUDIES

REF #	SOURCE TYPE	FACILITY	SOURCE CHARACT.
92	EXPERIMENTAL	Open Fire	Chlorophenate Pyrolysis
92	EXPERIMENTAL	Open Fire	Chlorophenate Pyrolysis
92	EXPERIMENTAL	Open Fire	Chlorophenate Pyrolysis
92	EXPERIMENTAL	Open Fire	Chlorophenate Pyrolysis
92	EXPERIMENTAL	Open Fire	Chlorophenate Pyrolysis
92	EXPERIMENTAL	Open Fire	Chlorophenate Pyrolysis
92	EXPERIMENTAL	Open Fire	Chlorophenate Pyrolysis
92	EXPERIMENTAL	Open Fire	Chlorophenate Pyrolysis
92	EXPERIMENTAL	Open Fire	Chlorophenate Pyrolysis
100	EXPERIMENTAL	Chlorophenol Combustion	N/A
100	EXPERIMENTAL	Chlorophenol Combustion	700 C, 15
100	EXPERIMENTAL	Chlorophenol Combustion	700 C, 15
100	EXPERIMENTAL	Chlorophenol Combustion	900 C, 35
100	EXPERIMENTAL	Chlorophenol Combustion	N/A
100	EXPERIMENTAL	Chlorophenol Combustion	N/A
100	EXPERIMENTAL	Chlorophenol Combustion	700 C, 0.7 sec
100	EXPERIMENTAL	Chlorophenol Combustion	900 C, 3.4 sec
100	EXPERIMENTAL	Chlorophenol Combustion	700 C, 0.7 sec
100	EXPERIMENTAL	Chlorophenol Combustion	900 C, 3.4 sec
100	EXPERIMENTAL	Chlorophenol Combustion	N/A
100	EXPERIMENTAL	Chlorophenol Combustion	N/A
100	EXPERIMENTAL	Chlorophenol Combustion	700 C, 0.5 sec
100	EXPERIMENTAL	Chlorophenol Combustion	900 C, 1.6 sec
100	EXPERIMENTAL	Chlorophenol Combustion	700 C, 0.5 sec
100	EXPERIMENTAL	Chlorophenol Combustion	900 C, 1.6 sec
100	EXPERIMENTAL	Chlorophenol Combustion	N/A
100	EXPERIMENTAL	Chlorophenol Combustion	N/A
100	EXPERIMENTAL	Chlorophenol Combustion	250 C
100	EXPERIMENTAL	Chlorophenol Combustion	900 C, 0.67 sec
100	EXPERIMENTAL	Chlorophenol Combustion	250 C
100	EXPERIMENTAL	Chlorophenol Combustion	900 C, 0.67 sec
103	EXPERIMENTAL	N/A	Treated Paper and Grass
113	EXPERIMENTAL	Quartz Tube	Virgin Pine
113	EXPERIMENTAL	Quartz Tube	Pine and HCl
113	EXPERIMENTAL	Quartz Tube	Pine and HCl

REF #	PROCESSES	SAMPLE	METHOD	SAMPLE NUM.	EXTRACTION	ANALYSIS
92	N/A	FG	Char. Filt	N/A	Soxhlet/Methylene Chloride	GC/MS
92	N/A	FG	Char. Filt	N/A	Soxhlet/Methylene Chloride	GC/MS
92	N/A	FG	Char. Filt	N/A	Soxhlet/Methylene Chloride	GC/MS
92	N/A	Feed	GS	N/A	Soxhlet/Methylene Chloride	GC/MS
92	N/A	FG	Char. Filt	N/A	Soxhlet/Methylene Chloride	GC/MS
92	N/A	FG	Char. Filt	N/A	Soxhlet/Methylene Chloride	GC/MS
92	N/A	FG	Char. Filt	N/A	Soxhlet/Methylene Chloride	GC/MS
92	N/A	FG	Char. Filt	N/A	Soxhlet/Methylene Chloride	GC/MS
92	N/A	FG	Char. Filt	N/A	Soxhlet/Methylene Chloride	GC/MS
100	Lab Furn	Feed	GS	N/A	Trisodium Phosphate	GC/MS
100	Lab Furn	FG	Meth Trap	N/A	Trisodium Phosphate	GC/MS
100	Lab Furn	FG	Meth Trap	N/A	Trisodium Phosphate	GC/MS
100	Lab Furn	FG	Meth Trap	N/A	Trisodium Phosphate	GC/MS
100	Lab Furn	Feed	GS	N/A	Trisodium Phosphate	GC/MS
100	Lab Furn	Feed	GS	N/A	Trisodium Phosphate	GC/MS
100	Lab Furn	FG	Meth Trap	N/A	Trisodium Phosphate	GC/MS
100	Lab Furn	FG	Meth Trap	N/A	Trisodium Phosphate	GC/MS
100	Lab Furn	FG	Meth Trap	N/A	Trisodium Phosphate	GC/MS
100	Lab Furn	FG	Meth Trap	N/A	Trisodium Phosphate	GC/MS
100	Lab Furn	Feed	GS	N/A	Trisodium Phosphate	GC/MS
100	Lab Furn	Feed	GS	N/A	Trisodium Phosphate	GC/MS
100	Lab Furn	FG	Meth Trap	N/A	Trisodium Phosphate	GC/MS
100	Lab Furn	FG	Meth Trap	N/A	Trisodium Phosphate	GC/MS
100	Lab Furn	FG	Meth Trap	N/A	Trisodium Phosphate	GC/MS
100	Lab Furn	FG	Meth Trap	N/A	Trisodium Phosphate	GC/MS
100	Lab Furn	Feed	GS	N/A	Trisodium Phosphate	GC/MS
100	Lab Furn	Feed	GS	N/A	Trisodium Phosphate	GC/MS
100	Lab Furn	FG	Meth Trap	N/A	Trisodium Phosphate	GC/MS
100	Lab Furn	FG	Meth Trap	N/A	Trisodium Phosphate	GC/MS
100	Lab Furn	FG	Meth Trap	N/A	Trisodium Phosphate	GC/MS
100	Lab Furn	FG	Meth Trap	N/A	Trisodium Phosphate	GC/MS
108	N/A	FG	Gas Adsorp	6 Trials	Benzene/Methanol	GC/MS
113	N/A	FG	XAD-2 Trap	N/A	N/A	GC/MS
113	N/A	FG	XAD-2 Trap	N/A	N/A	GC/MS
113	N/A	FG	XAD-2 Trap	N/A	N/A	GC/MS

REF #	DETECTION LIMITS	ISOMER	ISOMER CONC.	DATA VARIABILITY	PRECURSORS
92	0.01 - 0.20 ug/g	H6CDD	1.0 ug/g feed	N/A	2,4,6-Tri-Cl-Phenate
92	0.01 - 0.20 ug/g	H7CDD	3.0 ug/g feed	N/A	2,4,6-Tri-Cl-Phenate
92	0.01 - 0.20 ug/g	OCDD	6.0 ug/g feed	N/A	2,4,6-Tri-Cl-Phenate
92	0.01 - 0.20 ug/g	PCDD	ND	ND - 0.9 ug/g feed	Pentachlorophenate
92	0.01 - 0.20 ug/g	TCDD	5.2 ug/g feed	N/A	Pentachlorophenate
92	0.01 - 0.20 ug/g	PECDD	14 ug/g feed	N/A	Pentachlorophenate
92	0.01 - 0.20 ug/g	H6CDD	56 ug/g feed	N/A	Pentachlorophenate
92	0.01 - 0.20 ug/g	H7CDD	172 ug/g feed	N/A	Pentachlorophenate
92	0.01 - 0.20 ug/g	OCDD	710 ug/g feed	N/A	Pentachlorophenate
100	N/A	PCDD/PCDF	0.13 mg/kg feed	N/A	2 4 5 TCP
100	N/A	TCDD/TCDF	95 mg/kg feed	N/A	2 4 5 TCP
100	N/A	PCDD/PCDF	415 mg/kg fedd	N/A	2 4 5 TCP
100	N/A	PCDD/PCDF	319 mg/kg feed	N/A	2 4 5 TCP
100	N/A	TCDD/TCDF	16 mg/kg feed	N/A	Wood Brite 24
100	N/A	PCDD/PCDF	126 mg/kg feed	N/A	Wood Brite 24
100	N/A	TCDD/TCDF	39 mg/kg feed	N/A	Wood Brite 24
100	N/A	TCDD/TCDF	2 mg/kg feed	N/A	Wood Brite 24
100	N/A	PCDD/PCDF	771 mg/kg feed	N/A	Wood Brite 24
100	N/A	PCDD/PCDF	309 mg/kg feed	N/A	Wood Brite 24
100	N/A	TCDD/TCDF	26 mg/kg feed	N/A	Alchem 4135
100	N/A	PCDD/PCDF	292 mg/kg feed	N/A	Alchem 4135
100	N/A	TCDD/TCDF	4 mg/kg feed	N/A	Alchem 4135
100	N/A	TCDD/TCDF	0.6 mg/kg feed	N/A	Alchem 4135
100	N/A	PCDD/PCDF	247 mg/kg feed	N/A	Alchem 4135
100	N/A	PCDD/PCDF	134 mg/kg feed	N/A	Alchem 4135
100	N/A	TCDD/TCDF	6.8 mg/kg feed	N/A	Diptork Sludge
100	N/A	TCDD/TCDF	70.4 mg/kg feed	N/A	Diptork Sludge
100	N/A	TCDD/TCDF	50 mg/kg feed	N/A	Diptork Sludge
100	N/A	TCDD/TCDF	1.4 mg/kg feed	N/A	Diptork Sludge
100	N/A	PCDD/PCDF	630 mg/kg feed	N/A	Diptork Sludge
100	N/A	PCDD/PCDF	47.4 mg/kg feed	N/A	Diptork Sludge
108	N/A	2,3,7,8 TCDD	0.375 ug/g TCP	0.12 - 0.63 ug/g	2.4.5 Trichlorophenoxy
113	N/A	PCDD/PCDF	ND	N/A	Pine and HCl
113	N/A	TCDD	21 ng/g wood	N/A	Pine and HCl
113	N/A	2,3,7,8 TCDD	0.6 ng/g wood	N/A	Pine and HCl

EXPERIMENTAL STUDIES

REF #	SAMPLING ORGANIZATION	RATING
92	Univ. of Umea, Sweden	G
92	Univ. of Umea, Sweden	G
92	Univ. of Umea, Sweden	G
92	Univ. of Umea, Sweden	G
92	Univ. of Umea, Sweden	G
92	Univ. of Umea, Sweden	G
92	Univ. of Umea, Sweden	G
92	Univ. of Umea, Sweden	G
92	Univ. of Umea, Sweden	G
100	Env. Canada/Deanborn Env. Ser.	G
100	Env. Canada/Deanborn Env. Ser.	G
100	Env. Canada/Deanborn Env. Ser.	G
100	Env. Canada/Deanborn Env. Ser.	G
100	Env. Canada/Deanborn Env. Ser.	G
100	Env. Canada/Deanborn Env. Ser.	G
100	Env. Canada/Deanborn Env. Ser.	G
100	Env. Canada/Deanborn Env. Ser.	G
100	Env. Canada/Deanborn Env. Ser.	G
100	Env. Canada/Deanborn Env. Ser.	G
100	Env. Canada/Deanborn Env. Ser.	G
100	Env. Canada/Deanborn Env. Ser.	G
100	Env. Canada/Deanborn Env. Ser.	G
100	Env. Canada/Deanborn Env. Ser.	G
100	Env. Canada/Deanborn Env. Ser.	G
100	Env. Canada/Deanborn Env. Ser.	G
100	Env. Canada/Deanborn Env. Ser.	G
100	Env. Canada/Deanborn Env. Ser.	G
100	Env. Canada/Deanborn Env. Ser.	G
100	Env. Canada/Deanborn Env. Ser.	G
100	Env. Canada/Deanborn Env. Ser.	G
100	Env. Canada/Deanborn Env. Ser.	G
105	Dow Chemical	G
113	Wright State University	I
113	Wright State University	G
113	Wright State University	G

MUNICIPAL WASTE COMBUSTORS

REF #	SOURCE TYPE	FACILITY	SOURCE CHARACT.
8	MUNICIPAL WASTE COMBUSTORS	W. Germany, MIP (SM 03.81)	N/A
8	MUNICIPAL WASTE COMBUSTORS	W. Germany MIP (SM 293)	N/A
8	MUNICIPAL WASTE COMBUSTORS	W. Germany MIP (SM 294)	N/A
8	MUNICIPAL WASTE COMBUSTORS	W. Germany MIP (MA-LfU)	N/A
8	MUNICIPAL WASTE COMBUSTORS	W. Germany MIP (S-LfU)	N/A
8	MUNICIPAL WASTE COMBUSTORS	W. Germany MIP (LFI-NW)	N/A
8	MUNICIPAL WASTE COMBUSTORS	W. Germany, Power Plant (coal)	N/A
13	MUNICIPAL WASTE COMBUSTORS	European	Inc. without any treatment
13	MUNICIPAL WASTE COMBUSTORS	European	Inc. without any treatment
13	MUNICIPAL WASTE COMBUSTORS	European	Inc. without any treatment
13	MUNICIPAL WASTE COMBUSTORS	European	Inc. without any treatment
13	MUNICIPAL WASTE COMBUSTORS	European	Inc. without any treatment
13	MUNICIPAL WASTE COMBUSTORS	European	Inc. after recycling
13	MUNICIPAL WASTE COMBUSTORS	European	Inc. after recycling
13	MUNICIPAL WASTE COMBUSTORS	European	Inc. after recycling
13	MUNICIPAL WASTE COMBUSTORS	European	Inc. after recycling
13	MUNICIPAL WASTE COMBUSTORS	European	Inc. after recycling
13	MUNICIPAL WASTE COMBUSTORS	European	Inc. after compost production
13	MUNICIPAL WASTE COMBUSTORS	European	Inc. after compost production
13	MUNICIPAL WASTE COMBUSTORS	European	Inc. after compost production
13	MUNICIPAL WASTE COMBUSTORS	European	Inc. after compost production
13	MUNICIPAL WASTE COMBUSTORS	European	Inc. after compost production
16	MUNICIPAL WASTE COMBUSTORS	Zurich, Switzerland	N/A
16	MUNICIPAL WASTE COMBUSTORS	Zurich, Switzerland	N/A
24	MUNICIPAL WASTE COMBUSTORS	Italy #1	N/A
24	MUNICIPAL WASTE COMBUSTORS	Italy #1	N/A
24	MUNICIPAL WASTE COMBUSTORS	Italy #1	N/A
24	MUNICIPAL WASTE COMBUSTORS	Italy #1	N/A
24	MUNICIPAL WASTE COMBUSTORS	Italy #1	N/A
24	MUNICIPAL WASTE COMBUSTORS	Italy #1	N/A
24	MUNICIPAL WASTE COMBUSTORS	Italy #1	N/A
24	MUNICIPAL WASTE COMBUSTORS	Italy #1	N/A
24	MUNICIPAL WASTE COMBUSTORS	Italy #1	N/A
24	MUNICIPAL WASTE COMBUSTORS	Italy #1	N/A
24	MUNICIPAL WASTE COMBUSTORS	Italy #1	N/A
24	MUNICIPAL WASTE COMBUSTORS	Italy #1	N/A
24	MUNICIPAL WASTE COMBUSTORS	Italy #1	N/A
24	MUNICIPAL WASTE COMBUSTORS	Italy #1	N/A
24	MUNICIPAL WASTE COMBUSTORS	Italy #2	N/A
24	MUNICIPAL WASTE COMBUSTORS	Italy #2	N/A
24	MUNICIPAL WASTE COMBUSTORS	Italy #2	N/A
24	MUNICIPAL WASTE COMBUSTORS	Italy #2	N/A
24	MUNICIPAL WASTE COMBUSTORS	Italy #2	N/A
24	MUNICIPAL WASTE COMBUSTORS	Italy #2	N/A
24	MUNICIPAL WASTE COMBUSTORS	Italy #2	N/A
24	MUNICIPAL WASTE COMBUSTORS	Italy #2	N/A
24	MUNICIPAL WASTE COMBUSTORS	Italy #2	N/A
24	MUNICIPAL WASTE COMBUSTORS	Italy #2	N/A
24	MUNICIPAL WASTE COMBUSTORS	Italy #2	N/A
24	MUNICIPAL WASTE COMBUSTORS	Italy #2	N/A
24	MUNICIPAL WASTE COMBUSTORS	Italy #2	N/A
24	MUNICIPAL WASTE COMBUSTORS	Italy #2	N/A
24	MUNICIPAL WASTE COMBUSTORS	Italy #2	N/A
24	MUNICIPAL WASTE COMBUSTORS	Italy #2	N/A

REF	#PROCESSES	SAMPLE	METHOD	SAMPLE NUM.	EXTRACTION	ANALYSIS
9	N/A	FA	GS	N/A	Toluene/Methanol	GC/MS
9	N/A	FA	GS	N/A	Toluene/Methanol	GC/MS
9	N/A	FA	GS	N/A	Toluene/Methanol	GC/MS
9	N/A	FA	GS	N/A	Toluene/Methanol	GC/MS
9	N/A	FA	GS	N/A	Toluene/Methanol	GC/MS
9	N/A	FA	GS	N/A	Toluene/Methanol	GC/MS
9	N/A	FA	GS	N/A	Toluene/Methanol	GC/MS
13	N/A	FA	GS	N/A	Soxhlet/Toluene	GC/MS
13	N/A	FA	GS	N/A	Soxhlet/Toluene	GC/MS
13	N/A	FA	GS	N/A	Soxhlet/Toluene	GC/MS
13	N/A	FA	GS	N/A	Soxhlet/Toluene	GC/MS
13	N/A	FA	GS	N/A	Soxhlet/Toluene	GC/MS
13	N/A	FA	GS	N/A	Soxhlet/Toluene	GC/MS
13	N/A	FA	GS	N/A	Soxhlet/Toluene	GC/MS
13	N/A	FA	GS	N/A	Soxhlet/Toluene	GC/MS
13	N/A	FA	GS	N/A	Soxhlet/Toluene	GC/MS
13	N/A	FA	GS	N/A	Soxhlet/Toluene	GC/MS
13	N/A	FA	GS	N/A	Soxhlet/Toluene	GC/MS
13	N/A	FA	GS	N/A	Soxhlet/Toluene	GC/MS
13	N/A	FA	GS	N/A	Soxhlet/Toluene	GC/MS
13	N/A	FA	GS	N/A	Soxhlet/Toluene	GC/MS
13	N/A	FA	GS	N/A	Soxhlet/Toluene	GC/MS
16	Stack/ESP	FA	N/A	N/A	Methylene Chloride	GC/MS
16	Stack/ESP	FA	N/A	N/A	Methylene Chloride	GC/MS
24	Stack	FA	Train	N/A	Hexane	HRGC/MS
24	Stack	FA	Train	N/A	Hexane	HRGC/MS
24	Stack	FA	Train	N/A	Hexane	HRGC/MS
24	Stack	FA	Train	N/A	Hexane	HRGC/MS
24	Stack	FA	Train	N/A	Hexane	HRGC/MS
24	Stack	FA	Train	N/A	Hexane	HRGC/MS
24	Stack	FA	Train	N/A	Hexane	HRGC/MS
24	Stack	FG	Train	N/A	Hexane	HRGC/MS
24	Stack	FG	Train	N/A	Hexane	HRGC/MS
24	Stack	FG	Train	N/A	Hexane	HRGC/MS
24	Stack	FG	Train	N/A	Hexane	HRGC/MS
24	Stack	FG	Train	N/A	Hexane	HRGC/MS
24	Stack	FG	Train	N/A	Hexane	HRGC/MS
24	Stack	FG	Train	N/A	Hexane	HRGC/MS
24	Dust Col.	FA	GS	N/A	Hexane	HRGC/MS
24	Dust Col.	FA	GS	N/A	Hexane	HRGC/MS
24	Dust Col.	FA	GS	N/A	Hexane	HRGC/MS
24	Dust Col.	FA	GS	N/A	Hexane	HRGC/MS
24	Dust Col.	FA	GS	N/A	Hexane	HRGC/MS
24	Dust Col.	FA	GS	N/A	Hexane	HRGC/MS
24	Dust Col.	FA	GS	N/A	Hexane	HRGC/MS
24	Stack	FA	Train	N/A	Hexane	HRGC/MS
24	Stack	FA	Train	N/A	Hexane	HRGC/MS
24	Stack	FA	Train	N/A	Hexane	HRGC/MS
24	Stack	FA	Train	N/A	Hexane	HRGC/MS
24	Stack	FA	Train	N/A	Hexane	HRGC/MS
24	Stack	FA	Train	N/A	Hexane	HRGC/MS
24	Stack	FA	Train	N/A	Hexane	HRGC/MS
24	Stack	FG	Train	N/A	Hexane	HRGC/MS
24	Stack	FG	Train	N/A	Hexane	HRGC/MS

REF #	DETECTION LIMITS	ISOMER	ISOMER CONC.	DATA VARIABILITY	PRECURSORS
8	0.1 ppb	OCDD	<0.5 ug/kg	N/A	MSW
8	0.1 ppb	OCDD	1 ug/kg	N/A	MSW
8	0.1 ppb	OCDD	13 ug/kg	N/A	MSW
8	0.1 ppb	OCDD	15 ug/kg	N/A	MSW
8	0.1 ppb	OCDD	520 ug/kg	N/A	MSW
8	0.1 ppb	OCDD	800 ug/kg	N/A	MSW
8	0.1 ppb	OCDD	<0.5 ug/kg	N/A	MSW
13	N/A	H6CDF	89 ppb	39 - 135 ppb	MSW
13	N/A	H7CDF	49.3 ppb	30 - 68 ppb	MSW
13	N/A	H6CDD	90.6 ppb	42 - 145 ppb	MSW
13	N/A	OCDF	43.6 ppb	31 - 63 ppb	MSW
13	N/A	OCDD	120 ppb	90 - 152 ppb	MSW
13	N/A	H6CDF	ND	N/A	MSW
13	N/A	H7CDF	ND	N/A	MSW
13	N/A	H6CDD	6 ppb	N/A	MSW
13	N/A	OCDF	ND	N/A	MSW
13	N/A	OCDD	12 ppb	N/A	MSW
13	N/A	H6CDF	ND	N/A	MSW
13	N/A	H7CDF	ND	N/A	MSW
13	N/A	H6CDD	5 ppb	N/A	MSW
13	N/A	OCDF	ND	N/A	MSW
13	N/A	OCDD	5 ppb	N/A	MSW
16	N/A	PCDD	0.2 ppm	N/A	Mun.&Ind. S.W.
16	N/A	PCDF	0.1 ppm	N/A	Mun.&Ind. S.W.
24	N/A	T4CDD	1.1 ng/Nm3U	N/A	MSW
24	N/A	P5CDD	2.7 NG/nM3u	N/A	MSW
24	N/A	H6CDD	11.5 ng/Nm3U	N/A	MSW
24	N/A	H7CDD	1.03 ng/Nm3U	N/A	MSW
24	N/A	O8CDD	8.0 ng/Nm3U	N/A	MSW
24	N/A	T4CDF	ND	N/A	MSW
24	N/A	O8CDF	2.2 ng/Nm3U	N/A	MSW
24	N/A	T4CDD	19.6 ng/Nm3U	N/A	MSW
24	N/A	P5CDD	27.9 ng/Nm3U	N/A	MSW
24	N/A	H6CDD	178.2 ng/Nm3U	N/A	MSW
24	N/A	H7CDD	159.6 ng/Nm3U	N/A	MSW
24	N/A	O8CDD	63.9 ng/Nm3U	N/A	MSW
24	N/A	T4CDF	ND	N/A	MSW
24	N/A	O8CDF	59.3 ng/Nm3U	N/A	MSW
24	N/A	TCDD	0.25 ppb	N/A	MSW
24	N/A	P5CDD	1.7 ppb	N/A	MSW
24	N/A	H6CDD	294.0 ppb	N/A	MSW
24	N/A	H7CDD	8.9 ppb	N/A	MSW
24	N/A	OCDD	295.0 ppb	N/A	MSW
24	N/A	TCDF	0.46 ppb	N/A	MSW
24	N/A	OCDF	15.8 ppb	N/A	MSW
24	N/A	TCDD	172.2 ng/Nm3U	N/A	MSW
24	N/A	P5CDD	172.3 ng/Nm3U	N/A	MSW
24	N/A	H6CDD	12015.0 ng/Nm3U	N/A	MSW
24	N/A	H7CDD	575.0 ng/Nm3U	N/A	MSW
24	N/A	OCDD	7312.0 ng/Nm3U	N/A	MSW
24	N/A	TCDF	75.0 ng/Nm3U	N/A	MSW
24	N/A	OCDF	2883.0 ng/Nm3U	N/A	MSW
24	N/A	TCDD	17.0 ng/Nm3U	N/A	MSW
24	N/A	P5CDD	107.0 ng/Nm3U	N/A	MSW

MUNICIPAL WASTE COMBUSTORS

REF #	SAMPLING ORGANIZATION	RATING
8	Univ. of Ulm, Germany	G
8	Univ. of Ulm, Germany	G
8	Univ. of Ulm, Germany	G
8	Univ. of Ulm, Germany	G
8	Univ. of Ulm, Germany	G
8	Univ. of Ulm, Germany	G
8	Univ. of Ulm, Germany	G
13	Inst. Inquin. Atmos., CNR	I
13	Inst. Inquin. Atmos., CNR	I
13	Inst. Inquin. Atmos., CNR	I
13	Inst. Inquin. Atmos., CNR	I
13	Inst. Inquin. Atmos., CNR	I
13	Inst. Inquin. Atmos., CNR	I
13	Inst. Inquin. Atmos., CNR	I
13	Inst. Inquin. Atmos., CNR	I
13	Inst. Inquin. Atmos., CNR	I
13	Inst. Inquin. Atmos., CNR	I
13	Inst. Inquin. Atmos., CNR	I
13	Inst. Inquin. Atmos., CNR	I
13	Inst. Inquin. Atmos., CNR	I
13	Inst. Inquin. Atmos., CNR	I
13	Inst. Inquin. Atmos., CNR	I
16	Swiss Fed. Res. Station	I
16	Swiss Fed. Res. Station	I
24	Lab Prov di Igiene e Prof	G
24	Lab Prov di Igiene e Prof	G
24	Lab Prov di Igiene e Prof	G
24	Lab Prov di Igiene e Prof	G
24	Lab Prov di Igiene e Prof	G
24	Lab Prov di Igiene e Prof	I
24	Lab Prov di Igiene e Prof	G
24	Lab Prov di Igiene e Prof	G
24	Lab Prov di Igiene e Prof	G
24	Lab Prov di Igiene e Prof	G
24	Lab Prov di Igiene e Prof	G
24	Lab Prov di Igiene e Prof	G
24	Lab Prov di Igiene e Prof	I
24	Lab Prov di Igiene e Prof	G
24	Lab.Prov. di Igiene e Prof.	G
24	Lab.Prov. di Igiene e Prof.	G
24	Lab.Prov. di Igiene e Prof.	G
24	Lab.Prov. di Igiene e Prof.	G
24	Lab.Prov. di Igiene e Prof.	G
24	Lab.Prov. di Igiene e Prof.	G
24	Lab.Prov. di Igiene e Prof.	G
24	Lab.Prov. di Igiene e Prof.	G
24	Lab.Prov. di Igiene e Prof.	G
24	Lab.Prov. di Igiene e Prof.	G
24	Lab.Prov. di Igiene e Prof.	G
24	Lab.Prov. di Igiene e Prof.	G
24	Lab.Prov. di Igiene e Prof.	G
24	Lab.Prov. di Igiene e Prof.	G
24	Lab.Prov. di Igiene e Prof.	G
24	Lab.Prov. di Igiene e Prof.	G

REF #	SOURCE TYPE	FACILITY	SOURCE CHARACT.
24	MUNICIPAL WASTE COMBUSTORS	Italy #2	N/A
24	MUNICIPAL WASTE COMBUSTORS	Italy #2	N/A
24	MUNICIPAL WASTE COMBUSTORS	Italy #2	N/A
24	MUNICIPAL WASTE COMBUSTORS	Italy #2	N/A
24	MUNICIPAL WASTE COMBUSTORS	Italy #2	N/A
24	MUNICIPAL WASTE COMBUSTORS	Italy #3	N/A
24	MUNICIPAL WASTE COMBUSTORS	Italy #3	N/A
24	MUNICIPAL WASTE COMBUSTORS	Italy #3	N/A
24	MUNICIPAL WASTE COMBUSTORS	Italy #3	N/A
24	MUNICIPAL WASTE COMBUSTORS	Italy #3	N/A
24	MUNICIPAL WASTE COMBUSTORS	Italy #3	N/A
24	MUNICIPAL WASTE COMBUSTORS	Italy #3	N/A
24	MUNICIPAL WASTE COMBUSTORS	Italy #3	N/A
24	MUNICIPAL WASTE COMBUSTORS	Italy #3	N/A
24	MUNICIPAL WASTE COMBUSTORS	Italy #3	N/A
24	MUNICIPAL WASTE COMBUSTORS	Italy #3	N/A
24	MUNICIPAL WASTE COMBUSTORS	Italy #3	N/A
24	MUNICIPAL WASTE COMBUSTORS	Italy #3	N/A
24	MUNICIPAL WASTE COMBUSTORS	Italy #3	N/A
24	MUNICIPAL WASTE COMBUSTORS	Italy #3	N/A
24	MUNICIPAL WASTE COMBUSTORS	Italy #3	N/A
24	MUNICIPAL WASTE COMBUSTORS	Italy #3	N/A
24	MUNICIPAL WASTE COMBUSTORS	Italy #3	N/A
24	MUNICIPAL WASTE COMBUSTORS	Italy #3	N/A
24	MUNICIPAL WASTE COMBUSTORS	Italy #3	N/A
24	MUNICIPAL WASTE COMBUSTORS	Italy #3	N/A
24	MUNICIPAL WASTE COMBUSTORS	Italy #4	N/A
24	MUNICIPAL WASTE COMBUSTORS	Italy #4	N/A
24	MUNICIPAL WASTE COMBUSTORS	Italy #4	N/A
24	MUNICIPAL WASTE COMBUSTORS	Italy #4	N/A
24	MUNICIPAL WASTE COMBUSTORS	Italy #4	N/A
24	MUNICIPAL WASTE COMBUSTORS	Italy #4	N/A
24	MUNICIPAL WASTE COMBUSTORS	Italy #4	N/A
24	MUNICIPAL WASTE COMBUSTORS	Italy #4	N/A
24	MUNICIPAL WASTE COMBUSTORS	Italy #4	N/A
24	MUNICIPAL WASTE COMBUSTORS	Italy #4	N/A
24	MUNICIPAL WASTE COMBUSTORS	Italy #4	N/A
24	MUNICIPAL WASTE COMBUSTORS	Italy #4	N/A
24	MUNICIPAL WASTE COMBUSTORS	Italy #4	N/A
24	MUNICIPAL WASTE COMBUSTORS	Italy #4	N/A
24	MUNICIPAL WASTE COMBUSTORS	Italy #4	N/A
24	MUNICIPAL WASTE COMBUSTORS	Italy #4	N/A
24	MUNICIPAL WASTE COMBUSTORS	Italy #4	N/A
24	MUNICIPAL WASTE COMBUSTORS	Italy #4	N/A
24	MUNICIPAL WASTE COMBUSTORS	Italy #4	N/A
24	MUNICIPAL WASTE COMBUSTORS	Italy #4	N/A
24	MUNICIPAL WASTE COMBUSTORS	Italy #4	N/A
24	MUNICIPAL WASTE COMBUSTORS	Italy #5	N/A
24	MUNICIPAL WASTE COMBUSTORS	Italy #5	N/A
24	MUNICIPAL WASTE COMBUSTORS	Italy #5	N/A
24	MUNICIPAL WASTE COMBUSTORS	Italy #5	N/A
24	MUNICIPAL WASTE COMBUSTORS	Italy #5	N/A
24	MUNICIPAL WASTE COMBUSTORS	Italy #5	N/A
24	MUNICIPAL WASTE COMBUSTORS	Italy #5	N/A

REF #	PROCESSES	SAMPLE	METHOD	SAMPLE NUM.	EXTRACTION	ANALYSIS
24	Stack	FB	Train	N/A	Hexane	HRGC/MS
24	Stack	FB	Train	N/A	Hexane	HRGC/MS
24	Stack	FB	Train	N/A	Hexane	HRGC/MS
24	Stack	FB	Train	N/A	Hexane	HRGC/MS
24	Stack	FB	Train	N/A	Hexane	HRGC/MS
24	Dust Col.	FA	SS	N/A	Hexane	HRGC/MS
24	Dust Col.	FA	SS	N/A	Hexane	HRGC/MS
24	Dust Col.	FA	SS	N/A	Hexane	HRGC/MS
24	Dust Col.	FA	SS	N/A	Hexane	HRGC/MS
24	Dust Col.	FA	SS	N/A	Hexane	HRGC/MS
24	Dust Col.	FA	SS	N/A	Hexane	HRGC/MS
24	Dust Col.	FA	SS	N/A	Hexane	HRGC/MS
24	Stack	FA	Train	N/A	Hexane	HRGC/MS
24	Stack	FA	Train	N/A	Hexane	HRGC/MS
24	Stack	FA	Train	N/A	Hexane	HRGC/MS
24	Stack	FA	Train	N/A	Hexane	HRGC/MS
24	Stack	FA	Train	N/A	Hexane	HRGC/MS
24	Stack	FA	Train	N/A	Hexane	HRGC/MS
24	Stack	FA	Train	N/A	Hexane	HRGC/MS
24	Stack	FB	Train	N/A	Hexane	HRGC/MS
24	Stack	FB	Train	N/A	Hexane	HRGC/MS
24	Stack	FB	Train	N/A	Hexane	HRGC/MS
24	Stack	FB	Train	N/A	Hexane	HRGC/MS
24	Stack	FB	Train	N/A	Hexane	HRGC/MS
24	Stack	FB	Train	N/A	Hexane	HRGC/MS
24	Stack	FB	Train	N/A	Hexane	HRGC/MS
24	Dust Col.	FA	SS	N/A	Hexane	HRGC/MS
24	Dust Col.	FA	SS	N/A	Hexane	HRGC/MS
24	Dust Col.	FA	SS	N/A	Hexane	HRGC/MS
24	Dust Col.	FA	SS	N/A	Hexane	HRGC/MS
24	Dust Col.	FA	SS	N/A	Hexane	HRGC/MS
24	Dust Col.	FA	SS	N/A	Hexane	HRGC/MS
24	Dust Col.	FA	SS	N/A	Hexane	HRGC/MS
24	Stack	FA	Train	N/A	Hexane	HRGC/MS
24	Stack	FA	Train	N/A	Hexane	HRGC/MS
24	Stack	FA	Train	N/A	Hexane	HRGC/MS
24	Stack	FA	Train	N/A	Hexane	HRGC/MS
24	Stack	FA	Train	N/A	Hexane	HRGC/MS
24	Stack	FA	Train	N/A	Hexane	HRGC/MS
24	Stack	FA	Train	N/A	Hexane	HRGC/MS
24	Stack	FB	Train	N/A	Hexane	HRGC/MS
24	Stack	FB	Train	N/A	Hexane	HRGC/MS
24	Stack	FB	Train	N/A	Hexane	HRGC/MS
24	Stack	FB	Train	N/A	Hexane	HRGC/MS
24	Stack	FB	Train	N/A	Hexane	HRGC/MS
24	Stack	FB	Train	N/A	Hexane	HRGC/MS
24	Stack	FB	Train	N/A	Hexane	HRGC/MS
24	Dust. Col.	FA	SS	N/A	Hexane	HRGC/MS
24	Dust. Col.	FA	SS	N/A	Hexane	HRGC/MS
24	Dust. Col.	FA	SS	N/A	Hexane	HRGC/MS
24	Dust. Col.	FA	SS	N/A	Hexane	HRGC/MS
24	Dust. Col.	FA	SS	N/A	Hexane	HRGC/MS
24	Dust. Col.	FA	SS	N/A	Hexane	HRGC/MS
24	Dust. Col.	FA	SS	N/A	Hexane	HRGC/MS

REF #	DETECTION LIMITS	ISOMER	ISOMER CONC.	DATA VARIABILITY	PRECURSORS
24	N/A	H6CDD	25620.0 ng/Nm3U	N/A	MSW
24	N/A	H7CDD	923.0 ng/Nm3U	N/A	MSW
24	N/A	OCDD	1179.0 ng/Nm3U	N/A	MSW
24	N/A	TCDF	108.2 ng/Nm3U	N/A	MSW
24	N/A	OCDF	4390.0 ng/Nm3U	N/A	MSW
24	N/A	TCDD	ND	N/A	MSW
24	N/A	P5CDD	0.92 ppb	N/A	MSW
24	N/A	H6CDD	1.8 ppb	N/A	MSW
24	N/A	H7CDD	3.1 ppb	N/A	MSW
24	N/A	OCDD	1.5 ppb	N/A	MSW
24	N/A	TCDF	0.8 ppb	N/A	MSW
24	N/A	OCDF	3.3 ppb	N/A	MSW
24	N/A	TCDD	0.037 ng/Nm3U	N/A	MSW
24	N/A	P5CDD	0.3 ng/Nm3U	N/A	MSW
24	N/A	H6CDD	6.7 ng/Nm3U	N/A	MSW
24	N/A	H7CDD	0.2 ng/Nm3U	N/A	MSW
24	N/A	OCDD	1.7 ng/Nm3U	N/A	MSW
24	N/A	TCDF	2.57 ng/Nm3U	N/A	MSW
24	N/A	OCDF	0.08 ng/Nm3U	N/A	MSW
24	N/A	TCDD	0.08 ng/Nm3U	N/A	MSW
24	N/A	P5CDD	40.0 ng/Nm3U	N/A	MSW
24	N/A	H6CDD	6542.0 ng/Nm3U	N/A	MSW
24	N/A	H7CDD	124.0 ng/Nm3U	N/A	MSW
24	N/A	OCDD	776.0 ng/Nm3U	N/A	MSW
24	N/A	TCDF	429.0 ng/Nm3U	N/A	MSW
24	N/A	OCDF	1010.0 ng/Nm3U	N/A	MSW
24	N/A	TCDD	46.4 ppb	N/A	MSW
24	N/A	P5CDD	65.4 ppb	N/A	MSW
24	N/A	H6CDD	2496.0 ppb	N/A	MSW
24	N/A	H7CDD	87.9 ppb	N/A	MSW
24	N/A	OCDD	841.5 ppb	N/A	MSW
24	N/A	TCDF	61.7 ppb	N/A	MSW
24	N/A	OCDF	255.0 ppb	N/A	MSW
24	N/A	TCDD	10.9 ng/Nm3U	N/A	MSW
24	N/A	P5CDD	2.8 ng/Nm3U	N/A	MSW
24	N/A	H6CDD	0.54 ng/Nm3U	N/A	MSW
24	N/A	H7CDD	3.2 ng/Nm3U	N/A	MSW
24	N/A	OCDD	39.0 ng/Nm3U	N/A	MSW
24	N/A	TCDF	3.7 ng/Nm3U	N/A	MSW
24	N/A	OCDF	0.06 ng/Nm3U	N/A	MSW
24	N/A	TCDD	60.0 ng/Nm3U	N/A	MSW
24	N/A	P5CDD	33.0 ng/Nm3U	N/A	MSW
24	N/A	H6CDD	1390.0 ng/Nm3U	N/A	MSW
24	N/A	H7CDD	167.0 ng/Nm3U	N/A	MSW
24	N/A	OCDD	2703.0 ng/Nm3U	N/A	MSW
24	N/A	TCDF	1814.0 ng/Nm3U	N/A	MSW
24	N/A	OCDF	1760.0 ng/Nm3U	N/A	MSW
24	N/A	TCDD	0.7 ppb	N/A	MSW
24	N/A	P5CDD	0.05 ppb	N/A	MSW
24	N/A	H6CDD	0.021 ppb	N/A	MSW
24	N/A	H7CDD	0.007 ppb	N/A	MSW
24	N/A	OCDD	0.1 ppb	N/A	MSW
24	N/A	TCDF	1.18 ppb	N/A	MSW
24	N/A	OCDF	0.0015 ppb	N/A	MSW

REF #	SAMPLING ORGANIZATION	RATING
24	Lab.Prov. di Igiene e Prof.	6
24	Lab.Prov. di Igiene e Prof.	6
24	Lab.Prov. di Igiene e Prof.	6
24	Lab.Prov. di Igiene e Prof.	6
24	Lab.Prov. di Igiene e Prof.	6
24	Lab.Prov. di Igiene e Prof.	6
24	Lab.Prov. di Igiene e Prof.	6
24	Lab.Prov. di Igiene e Prof.	6
24	Lab.Prov. di Igiene e Prof.	6
24	Lab.Prov. di Igiene e Prof.	6
24	Lab.Prov. di Igiene e Prof.	6
24	Lab.Prov. di Igiene e Prof.	6
24	Lab.Prov. di Igiene e Prof.	6
24	Lab.Prov. di Igiene e Prof.	6
24	Lab.Prov. di Igiene e Prof.	6
24	Lab.Prov. di Igiene e Prof.	6
24	Lab.Prov. di Igiene e Prof.	6
24	Lab.Prov. di Igiene e Prof.	6
24	Lab.Prov. di Igiene e Prof.	6
24	Lab.Prov. di Igiene e Prof.	6
24	Lab.Prov. di Igiene e Prof.	6
24	Lab.Prov. di Igiene e Prof.	6
24	Lab.Prov. di Igiene e Prof.	6
24	Lab.Prov. di Igiene e Prof.	6
24	Lab.Prov. di Igiene e Prof.	6
24	Lab.Prov. di Igiene e Prof.	6
24	Lab.Prov. di Igiene e Prof.	6
24	Lab.Prov. di Igiene e Prof.	6
24	Lab.Prov. di Igiene e Prof.	6
24	Lab.Prov. di Igiene e Prof.	6
24	Lab.Prov. di Igiene e Prof.	6
24	Lab.Prov. di Igiene e Prof.	6
24	Lab.Prov. di Igiene e Prof.	6
24	Lab.Prov. di Igiene e Prof.	6
24	Lab.Prov. di Igiene e Prof.	6
24	Lab.Prov. di Igiene e Prof.	6
24	Lab.Prov. di Igiene e Prof.	6
24	Lab.Prov. di Igiene e Prof.	6
24	Lab.Prov. di Igiene e Prof.	6
24	Lab.Prov. di Igiene e Prof.	6
24	Lab.Prov. di Igiene e Prof.	6
24	Lab.Prov. di Igiene e Prof.	6
24	Lab.Prov. di Igiene e Prof.	6
24	Lab.Prov. di Igiene e Prof.	6
24	Lab.Prov. di Igiene e Prof.	6
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24	Lab.Prov. di Igiene e Prof.	6
24	Lab.Prov. di Igiene e Prof.	6
24	Lab.Prov. di Igiene e Prof.	6
24	Lab.Prov. di Igiene e Prof.	6
24	Lab.Prov. di Igiene e Prof.	6
24	Lab.Prov. di Igiene e Prof.	6
24	Lab.Prov. di Igiene e Prof.	6

REF #	SOURCE TYPE	FACILITY	SOURCE CHARACT.
24	MUNICIPAL WASTE COMBUSTORS	Italy #5	N/A
24	MUNICIPAL WASTE COMBUSTORS	Italy #5	N/A
24	MUNICIPAL WASTE COMBUSTORS	Italy #5	N/A
24	MUNICIPAL WASTE COMBUSTORS	Italy #5	N/A
24	MUNICIPAL WASTE COMBUSTORS	Italy #5	N/A
24	MUNICIPAL WASTE COMBUSTORS	Italy #5	N/A
24	MUNICIPAL WASTE COMBUSTORS	Italy #5	N/A
24	MUNICIPAL WASTE COMBUSTORS	Italy #5	N/A
24	MUNICIPAL WASTE COMBUSTORS	Italy #5	N/A
24	MUNICIPAL WASTE COMBUSTORS	Italy #5	N/A
24	MUNICIPAL WASTE COMBUSTORS	Italy #5	N/A
24	MUNICIPAL WASTE COMBUSTORS	Italy #5	N/A
24	MUNICIPAL WASTE COMBUSTORS	Italy #5	N/A
24	MUNICIPAL WASTE COMBUSTORS	Italy #5	N/A
24	MUNICIPAL WASTE COMBUSTORS	Italy #6	N/A
24	MUNICIPAL WASTE COMBUSTORS	Italy #6	N/A
24	MUNICIPAL WASTE COMBUSTORS	Italy #6	N/A
24	MUNICIPAL WASTE COMBUSTORS	Italy #6	N/A
24	MUNICIPAL WASTE COMBUSTORS	Italy #6	N/A
24	MUNICIPAL WASTE COMBUSTORS	Italy #6	N/A
24	MUNICIPAL WASTE COMBUSTORS	Italy #6	N/A
24	MUNICIPAL WASTE COMBUSTORS	Italy #6	N/A
24	MUNICIPAL WASTE COMBUSTORS	Italy #6	N/A
24	MUNICIPAL WASTE COMBUSTORS	Italy #6	N/A
24	MUNICIPAL WASTE COMBUSTORS	Italy #6	N/A
24	MUNICIPAL WASTE COMBUSTORS	Italy #6	N/A
24	MUNICIPAL WASTE COMBUSTORS	Italy #6	N/A
24	MUNICIPAL WASTE COMBUSTORS	Italy #6	N/A
24	MUNICIPAL WASTE COMBUSTORS	Italy #6	N/A
24	MUNICIPAL WASTE COMBUSTORS	Italy #6	N/A
24	MUNICIPAL WASTE COMBUSTORS	Italy #6	N/A
24	MUNICIPAL WASTE COMBUSTORS	Italy #6	N/A
24	MUNICIPAL WASTE COMBUSTORS	Italy #6	N/A
24	MUNICIPAL WASTE COMBUSTORS	Italy #6	N/A
24	MUNICIPAL WASTE COMBUSTORS	Italy #6	N/A
34	MUNICIPAL WASTE COMBUSTORS	Ontario, Canada (1)	N/A
34	MUNICIPAL WASTE COMBUSTORS	Ontario, Canada (1)	N/A
34	MUNICIPAL WASTE COMBUSTORS	Ontario, Canada (1)	N/A
34	MUNICIPAL WASTE COMBUSTORS	Ontario, Canada (1)	N/A
34	MUNICIPAL WASTE COMBUSTORS	Ontario, Canada (1)	N/A
35	MUNICIPAL WASTE COMBUSTORS	Ontario, Canada (2)	N/A
35	MUNICIPAL WASTE COMBUSTORS	Ontario, Canada (2)	N/A
35	MUNICIPAL WASTE COMBUSTORS	Ontario, Canada (2)	N/A
35	MUNICIPAL WASTE COMBUSTORS	Ontario, Canada (2)	N/A
35	MUNICIPAL WASTE COMBUSTORS	Ontario, Canada (2)	N/A
36	MUNICIPAL WASTE COMBUSTORS	Japan (#1)	N/A
36	MUNICIPAL WASTE COMBUSTORS	Japan (#2)	N/A
36	MUNICIPAL WASTE COMBUSTORS	Netherlands	N/A
36	MUNICIPAL WASTE COMBUSTORS	Ontario (#1)	N/A
36	MUNICIPAL WASTE COMBUSTORS	Ontario (#2)	N/A
41	MUNICIPAL WASTE COMBUSTORS	Como, Italy	> 500 degrees C
41	MUNICIPAL WASTE COMBUSTORS	Como, Italy	> 500 degrees C
41	MUNICIPAL WASTE COMBUSTORS	Como, Italy	> 500 degrees C
41	MUNICIPAL WASTE COMBUSTORS	Como, Italy	> 500 degrees C

MUNICIPAL WASTE COMBUSTORS

REF #	PROCESSES	SAMPLE	METHOD	SAMPLE NUM.	EXTRACTION	ANALYSIS
24	Stack	FA	Train	N/A	Hexane	HRGC/MS
24	Stack	FA	Train	N/A	Hexane	HRGC/MS
24	Stack	FA	Train	N/A	Hexane	HRGC/MS
24	Stack	FA	Train	N/A	Hexane	HRGC/MS
24	Stack	FA	Train	N/A	Hexane	HRGC/MS
24	Stack	FA	Train	N/A	Hexane	HRGC/MS
24	Stack	FA	Train	N/A	Hexane	HRGC/MS
24	Stack	FG	Train	N/A	Hexane	HRGC/MS
24	Stack	FG	Train	N/A	Hexane	HRGC/MS
24	Stack	FG	Train	N/A	Hexane	HRGC/MS
24	Stack	FG	Train	N/A	Hexane	HRGC/MS
24	Stack	FG	Train	N/A	Hexane	HRGC/MS
24	Stack	FG	Train	N/A	Hexane	HRGC/MS
24	Stack	FG	Train	N/A	Hexane	HRGC/MS
24	Dust Col.	FA	GS	N/A	Hexane	HRGC/MS
24	Dust Col.	FA	GS	N/A	Hexane	HRGC/MS
24	Dust Col.	FA	GS	N/A	Hexane	HRGC/MS
24	Dust Col.	FA	GS	N/A	Hexane	HRGC/MS
24	Dust Col.	FA	GS	N/A	Hexane	HRGC/MS
24	Dust Col.	FA	GS	N/A	Hexane	HRGC/MS
24	Dust Col.	FA	GS	N/A	Hexane	HRGC/MS
24	Stack	FA	Train	N/A	Hexane	HRGC/MS
24	Stack	FA	Train	N/A	Hexane	HRGC/MS
24	Stack	FA	Train	N/A	Hexane	HRGC/MS
24	Stack	FA	Train	N/A	Hexane	HRGC/MS
24	Stack	FA	Train	N/A	Hexane	HRGC/MS
24	Stack	FA	Train	N/A	Hexane	HRGC/MS
24	Stack	FA	Train	N/A	Hexane	HRGC/MS
24	Stack	FG	Train	N/A	Hexane	HRGC/MS
24	Stack	FG	Train	N/A	Hexane	HRGC/MS
24	Stack	FG	Train	N/A	Hexane	HRGC/MS
24	Stack	FG	Train	N/A	Hexane	HRGC/MS
24	Stack	FG	Train	N/A	Hexane	HRGC/MS
24	Stack	FG	Train	N/A	Hexane	HRGC/MS
24	Stack	FG	Train	N/A	Hexane	HRGC/MS
34	ESP	FA	WEEKLY GS	8 weeks / 3 rep.	Soxhlet/Benzene(16 hr)	GC/MS
34	ESP	FA	WEEKLY GS	8 weeks / 3 rep.	Soxhlet/Benzene(16 hr)	GC/MS
34	ESP	FA	WEEKLY GS	8 weeks / 3 rep.	Soxhlet/Benzene(16 hr)	GC/MS
34	ESP	FA	WEEKLY GS	8 weeks / 3 rep.	Soxhlet/Benzene(16 hr)	GC/MS
34	ESP	FA	WEEKLY GS	8 weeks / 3 rep.	Soxhlet/Benzene(16 hr)	GC/MS
35	ESP	FA	GS	5 replications	Ultrasonic/Benzene(1 hr)	GC/MS
35	ESP	FA	GS	5 replications	Ultrasonic/Benzene(1 hr)	GC/MS
35	ESP	FA	GS	5 replications	Ultrasonic/Benzene(1 hr)	GC/MS
35	ESP	FA	GS	5 replications	Ultrasonic/Benzene(1 hr)	GC/MS
35	ESP	FA	GS	5 replications	Ultrasonic/Benzene(1 hr)	GC/MS
36	ESP	FA	GS	1 Sample	Soxhlet/Benzene	GC/MS
36	ESP	FA	GS	1 Sample	Soxhlet/Benzene	GC/MS
36	ESP	FA	GS	1 Sample	Soxhlet/Benzene	GC/MS
36	ESP	FA	GS	1 Sample	Soxhlet/Benzene	GC/MS
36	ESP	FA	GS	1 Sample	Soxhlet/Benzene	GC/MS
41	Stack	FG	MM5T	17 Samples/9 Months	Hexane	GC/MS
41	Stack	FG	MM5T	17 Samples/9 Months	Hexane	GC/MS
41	Stack	FG	MM5T	17 Samples/9 Months	Hexane	GC/MS
41	Stack	FG	MM5T	17 Samples/9 Months	Hexane	GC/MS

REF #	PROCESSES	SAMPLE	METHOD	SAMPLE NUM.	EXTRACTION	ANALYSIS
41	Stack	FS	MM5T	17 Samples/9 Months	Hexane	GC/MS
41	Stack	FS	MM5T	17 Samples/9 Months	Hexane	GC/MS
41	Stack	FS	MM5T	17 Samples/9 Months	Hexane	GC/MS
41	Stack	FS	MM5T	17 Samples/9 Months	Hexane	GC/MS
41	Stack	FS	MM5T	17 Samples/9 Months	Hexane	GC/MS
41	Stack	FS	MM5T	17 Samples/9 Months	Hexane	GC/MS
42	Stack	FA	GS	1 Sample	N/A	GC/HRMS
42	Stack	FA	GS	1 Sample	N/A	GC/HRMS
42	Furnace	Ash	GS	1 Sample	N/A	GC/HRMS
42	Furnace	Ash	GS	1 Sample	N/A	GC/HRMS
43	Stack	FS/FA	MM5T	N/A	N/A	GC/MS
43	Stack	FS/FA	MM5T	N/A	N/A	GC/MS
47	Stack	FS	MM5T	5 Samples	N/A	GC/MS
47	Stack	FS	MM5T	5 Samples	N/A	GC/MS
47	Stack	FS	MM5T	5 Samples	N/A	GC/MS
47	Stack	FS	MM5T	5 Samples	N/A	GC/MS
47	Stack	FS	MM5T	5 Samples	N/A	GC/MS
49	Stack	FS	MM5T	2-4 Days	Hexane/KOH	GC/HRMS
49	Stack	FS	MM5T	2-4 Days	Hexane/KOH	GC/HRMS
49	Stack	FS	MM5T	2-4 Days	Hexane/KOH	GC/HRMS
49	Stack	FS	MM5T	2-4 Days	Hexane/KOH	GC/HRMS
49	Stack	FS	MM5T	2-4 Days	Hexane/KOH	GC/HRMS
49	Stack	FS	MM5T	2-4 Days	Hexane/KOH	GC/HRMS
49	Stack	FS	MM5T	2-4 Days	Hexane/KOH	GC/HRMS
49	Stack	FS	MM5T	2-4 Days	Hexane/KOH	GC/HRMS
49	-----	Feed	GS	2-4 Days	Hexane/KOH	GC/HRMS
49	-----	Feed	GS	2-4 Days	Hexane/KOH	GC/HRMS
49	Stack	FS	MM5T	2-4 Days	Hexane/KOH	GC/HRMS
49	Stack	FS	MM5T	2-4 Days	Hexane/KOH	GC/HRMS
49	Stack	FS	MM5T	2-4 Days	Hexane/KOH	GC/HRMS
49	Stack	FS	MM5T	2-4 Days	Hexane/KOH	GC/HRMS
53	stack	FS/FA	Train	12 test	N/A	GC/MS
53	stack	FS/FA	Train	12 test	N/A	GC/MS
53	stack	FS/FA	Train	12 test	N/A	GC/MS
53	stack	FS/FA	Train	12 test	N/A	GC/MS
56	Grate	ASH	GS	3 - 8 Samples	Soxhlet/Methylene Chloride	GC/MS
56	ESP	FA	GS	3 - 8 Samples	Soxhlet/Methylene Chloride	GC/MS
56	Stack	FS	SSAS	3 - 8 Samples	Soxhlet/Methylene Chloride	GC/MS
57	ESP	FA	GS	1 Sample	Ultrasonic/Benzene	GC/MS
57	ESP	FA	GS	1 Sample	Ultrasonic/Benzene	GC/MS
57	ESP	FA	GS	1 Sample	Ultrasonic/Benzene	GC/MS
57	ESP	FA	GS	1 Sample	Ultrasonic/Benzene	GC/MS
57	ESP	FA	GS	1 Sample	Ultrasonic/Benzene	GC/MS
72	Furnace	Ash	GS	1 Sample	Soxhlet/Benzene	GC/MS
72	Furnace	Ash	GS	1 Sample	Soxhlet/Benzene	GC/MS
72	Furnace	Ash	GS	1 Sample	Soxhlet/Benzene	GC/MS
72	Furnace	Ash	GS	1 Sample	Soxhlet/Benzene	GC/MS
72	Furnace	Ash	GS	1 Sample	Soxhlet/Benzene	GC/MS
72	ESP	FA	GS	1 Sample	Soxhlet/Benzene	GC/MS
72	ESP	FA	GS	1 Sample	Soxhlet/Benzene	GC/MS
72	ESP	FA	GS	1 Sample	Soxhlet/Benzene	GC/MS
72	ESP	FA	GS	1 Sample	Soxhlet/Benzene	GC/MS
72	ESP	FA	GS	1 Sample	Soxhlet/Benzene	GC/MS
72	Stack	FA	GS	1 Sample	Soxhlet/Benzene	GC/MS

MUNICIPAL WASTE COMBUSTORS

REF #	DETECTION LIMITS	ISOMER	ISOMER CONC.	DATA VARIABILITY	PRECURSORS
24	N/A	TCDD	0.34 ng/Nm3U	N/A	MSW
24	N/A	P5CDD	2.4 ng/Nm3U	N/A	MSW
24	N/A	H6CDD	196.0 ng/Nm3U	N/A	MSW
24	N/A	H7CDD	9.9 ng/Nm3U	N/A	MSW
24	N/A	OCDD	173.0 ng/Nm3U	N/A	MSW
24	N/A	TCDF	75.3 ng/Nm3U	N/A	MSW
24	N/A	OCDF	3.2 ng/Nm3U	N/A	MSW
24	N/A	TCDD	9.6 ng/Nm3U	N/A	MSW
24	N/A	P5CDD	21.0 ng/Nm3U	N/A	MSW
24	N/A	H6CDD	325.0 ng/Nm3U	N/A	MSW
24	N/A	H7CDD	46.0 ng/Nm3U	N/A	MSW
24	N/A	OCDD	244.0 ng/Nm3U	N/A	MSW
24	N/A	TCDF	305.0 ng/Nm3U	N/A	MSW
24	N/A	OCDF	39.0 Ng/Nm3U	N/A	MSW
24	N/A	TCDD	ND	N/A	MSW
24	N/A	P5CDD	ND	N/A	MSW
24	N/A	H6CDD	ND	N/A	MSW
24	N/A	H7CDD	0.0012 ppb	N/A	MSW
24	N/A	OCDD	5.86 ppb	N/A	MSW
24	N/A	TCDF	ND	N/A	MSW
24	N/A	OCDF	1.93 ppb	N/A	MSW
24	N/A	TCDD	ND	N/A	MSW
24	N/A	P5CDD	0.010 ng/Nm3U	N/A	MSW
24	N/A	H6CDD	0.28 ng/Nm3U	N/A	MSW
24	N/A	H7CDD	ND	N/A	MSW
24	N/A	OCDD	0.51 ng/Nm3U	N/A	MSW
24	N/A	TCDF	ND	N/A	MSW
24	N/A	OCDF	ND	N/A	MSW
24	N/A	TCDD	19.0 ng/Nm3U	N/A	MSW
24	N/A	P5CDD	11.0 ng/Nm3U	N/A	MSW
24	N/A	H6CDD	480.0 ng/Nm3U	N/A	MSW
24	N/A	H7CDD	6.0 ng/Nm3U	N/A	MSW
24	N/A	OCDD	71.0 ng/Nm3U	N/A	MSW
24	N/A	TCDF	27.0 ng/Nm3U	N/A	MSW
24	N/A	OCDF	24.0 ng/Nm3U	N/A	MSW
34	N/A	TCDD	13.5 ppb	3.2 - 27 ppb	MSW
34	N/A	P5CDD	23.2 ppb	3.4 - 45 ppb	MSW
34	N/A	H6CDD	25.8 ppb	2.2 - 53 ppb	MSW
34	N/A	H7CDD	14.9 ppb	1.1 - 43 ppb	MSW
34	N/A	OCDD	6.3 ppb	0.4 - 26 ppb	MSW
35	N/A	TCDD	8.6 ppb	6.7 - 11.0 ppb	MSW
35	N/A	P5CDD	15.0 ppb	12.0 - 20.0 ppb	MSW
35	N/A	H6CDD	13.0 ppb	11.0 - 17.0 ppb	MSW
35	N/A	H7CDD	3.2 ppb	2.3 - 4.3 ppb	MSW
35	N/A	OCDD	0.4 ppb	0.28 - 0.53 ppb	MSW
36	N/A	TCDD	4.8 ng/g	N/A	MSW
36	N/A	TCDD	8.5 ng/g	N/A	MSW
36	N/A	TCDD	2.4 ng/g	N/A	MSW
36	N/A	TCDD	10 ng/g	N/A	MSW
36	N/A	TCDD	9.3 ng/g	N/A	MSW
41	N/A	TCDD	128.4 ng/Ncm	7 - 1127 ng/Ncm	MSW
41	N/A	P5CDD	ND	13 - 2080 ng/Ncm	MSW
41	N/A	H6CDD	366 ng/Ncm	15 - 3806 ng/Ncm	MSW
41	N/A	H7CDD	286.3 ng/Ncm	13 - 2884 ng/Ncm	MSW

REF #	SAMPLING ORGANIZATION	RATING
24	Lab.Prov. di Igiene e Prof.	G
24	Lab.Prov. di Igiene e Prof.	G
24	Lab.Prov. di Igiene e Prof.	G
24	Lab.Prov. di Igiene e Prof.	G
24	Lab.Prov. di Igiene e Prof.	G
24	Lab.Prov. di Igiene e Prof.	G
24	Lab.Prov. di Igiene e Prof.	G
24	Lab.Prov. di Igiene e Prof.	G
24	Lab.Prov. di Igiene e Prof.	G
24	Lab.Prov. di Igiene e Prof.	G
24	Lab.Prov. di Igiene e Prof.	G
24	Lab.Prov. di Igiene e Prof.	G
24	Lab.Prov. di Igiene e Prof.	G
24	Lab.Prov. di Igiene e Prof.	G
24	Lab.Prov. di Igiene e Prof.	I
24	Lab.Prov. di Igiene e Prof.	I
24	Lab.Prov. di Igiene e Prof.	I
24	Lab.Prov. di Igiene e Prof.	G
24	Lab.Prov. di Igiene e Prof.	G
24	Lab.Prov. di Igiene e Prof.	I
24	Lab.Prov. di Igiene e Prof.	G
24	Lab.Prov. di Igiene e Prof.	I
24	Lab.Prov. di Igiene e Prof.	G
24	Lab.Prov. di Igiene e Prof.	G
24	Lab.Prov. di Igiene e Prof.	I
24	Lab.Prov. di Igiene e Prof.	G
24	Lab.Prov. di Igiene e Prof.	I
24	Lab.Prov. di Igiene e Prof.	I
24	Lab.Prov. di Igiene e Prof.	G
24	Lab.Prov. di Igiene e Prof.	G
24	Lab.Prov. di Igiene e Prof.	G
24	Lab.Prov. di Igiene e Prof.	G
24	Lab.Prov. di Igiene e Prof.	G
24	Lab.Prov. di Igiene e Prof.	G
24	Lab.Prov. di Igiene e Prof.	G
34	Ont. Min. of the Env.	G
34	Ont. Min. of the Env.	G
34	Ont. Min. of the Env.	G
34	Ont. Min. of the Env.	G
34	Ont. Min. of the Env.	G
35	Ont. Min. of the Env.	G
35	Ont. Min. of the Env.	G
35	Ont. Min. of the Env.	G
35	Ont. Min. of the Env.	G
35	Ont. Min. of the Env.	G
36	Univ. of Kyoto	G
36	Univ. of Kyoto	G
36	Univ. of Amsterdam	G
36	Ontario Ministry of Env.	G
36	Ontario Ministry of Env.	G
41	Inst. Pharm. Res.,Milan,Italy	G
41	Inst. Pharm. Res.,Milan,Italy	I
41	Inst. Pharm. Res.,Milan,Italy	G
41	Inst. Pharm. Res.,Milan,Italy	G

MUNICIPAL WASTE COMBUSTORS

REF #	SOURCE TYPE	FACILITY	SOURCE CHARACT.
41	MUNICIPAL WASTE COMBUSTORS	Como, Italy	> 500 degrees C
41	MUNICIPAL WASTE COMBUSTORS	Como, Italy	> 500 degrees C
41	MUNICIPAL WASTE COMBUSTORS	Como, Italy	> 500 degrees C
41	MUNICIPAL WASTE COMBUSTORS	Como, Italy	> 500 degrees C
41	MUNICIPAL WASTE COMBUSTORS	Como, Italy	> 500 degrees C
41	MUNICIPAL WASTE COMBUSTORS	Como, Italy	> 500 degrees C
42	MUNICIPAL WASTE COMBUSTORS	Municipal Incinerator (USA)	N/A
42	MUNICIPAL WASTE COMBUSTORS	Municipal Incinerator (USA)	N/A
42	MUNICIPAL WASTE COMBUSTORS	Municipal Incinerator (USA)	N/A
42	MUNICIPAL WASTE COMBUSTORS	Municipal Incinerator (USA)	N/A
43	MUNICIPAL WASTE COMBUSTORS	U.S.	N/A
43	MUNICIPAL WASTE COMBUSTORS	U.S.	N/A
47	MUNICIPAL WASTE COMBUSTORS	U.S.	N/A
47	MUNICIPAL WASTE COMBUSTORS	U.S.	N/A
47	MUNICIPAL WASTE COMBUSTORS	U.S.	N/A
47	MUNICIPAL WASTE COMBUSTORS	U.S.	N/A
47	MUNICIPAL WASTE COMBUSTORS	U.S.	N/A
49	MUNICIPAL WASTE COMBUSTORS	U.S.A. Facilities	Small Modular
49	MUNICIPAL WASTE COMBUSTORS	U.S.A. Facilities	Small Modular
49	MUNICIPAL WASTE COMBUSTORS	U.S.A. Facilities	Small Modular
49	MUNICIPAL WASTE COMBUSTORS	U.S.A. Facilities	Small Modular
49	MUNICIPAL WASTE COMBUSTORS	U.S.A. Facilities	Incinerator/Boiler
49	MUNICIPAL WASTE COMBUSTORS	U.S.A. Facilities	Incinerator/Boiler
49	MUNICIPAL WASTE COMBUSTORS	U.S.A. Facilities	Incinerator/Boiler
49	MUNICIPAL WASTE COMBUSTORS	U.S.A. Facilities	Incinerator/Boiler
49	MUNICIPAL WASTE COMBUSTORS	U.S.A. Facilities	Incinerator/Boiler
49	MUNICIPAL WASTE COMBUSTORS	U.S.A. Facilities	Incinerator/Boiler
49	MUNICIPAL WASTE COMBUSTORS	U.S.A. Facilities	Industrial Spreader Stoker
49	MUNICIPAL WASTE COMBUSTORS	U.S.A. Facilities	Industrial Spreader Stoker
49	MUNICIPAL WASTE COMBUSTORS	U.S.A. Facilities	Industrial Spreader Stoker
49	MUNICIPAL WASTE COMBUSTORS	U.S.A. Facilities	Industrial Spreader Stoker
53	MUNICIPAL WASTE COMBUSTORS	Beveren, Belgium	Domestic/Industrial Wastes
53	MUNICIPAL WASTE COMBUSTORS	Beveren, Belgium	Domestic/Industrial Wastes
53	MUNICIPAL WASTE COMBUSTORS	Beveren, Belgium	Domestic/Industrial Wastes
53	MUNICIPAL WASTE COMBUSTORS	Beveren, Belgium	Domestic/Industrial Wastes
56	MUNICIPAL WASTE COMBUSTORS	N/A	One Plant
56	MUNICIPAL WASTE COMBUSTORS	N/A	One Plant
56	MUNICIPAL WASTE COMBUSTORS	N/A	One Plant
57	MUNICIPAL WASTE COMBUSTORS	France (1)	950 degrees C
57	MUNICIPAL WASTE COMBUSTORS	France (1)	950 degrees C
57	MUNICIPAL WASTE COMBUSTORS	France (1)	950 degrees C
57	MUNICIPAL WASTE COMBUSTORS	France (1)	950 degrees C
57	MUNICIPAL WASTE COMBUSTORS	France (1)	950 degrees C
72	MUNICIPAL WASTE COMBUSTORS	Urban Incinerator, Italy	N/A
72	MUNICIPAL WASTE COMBUSTORS	Urban Incinerator, Italy	N/A
72	MUNICIPAL WASTE COMBUSTORS	Urban Incinerator, Italy	N/A
72	MUNICIPAL WASTE COMBUSTORS	Urban Incinerator, Italy	N/A
72	MUNICIPAL WASTE COMBUSTORS	Urban Incinerator, Italy	N/A
72	MUNICIPAL WASTE COMBUSTORS	Urban Incinerator, Italy	N/A
72	MUNICIPAL WASTE COMBUSTORS	Urban Incinerator, Italy	N/A
72	MUNICIPAL WASTE COMBUSTORS	Urban Incinerator, Italy	N/A
72	MUNICIPAL WASTE COMBUSTORS	Urban Incinerator, Italy	N/A
72	MUNICIPAL WASTE COMBUSTORS	Urban Incinerator, Italy	N/A
72	MUNICIPAL WASTE COMBUSTORS	Urban Incinerator, Italy	N/A

REF #	DETECTION LIMITS	ISOMER	ISOMER CONC.	DATA VARIABILITY	PRECURSORS
41	N/A	OCDD	125.9 ng/Ncm	19 - 631 ng/Ncm	MSW
41	N/A	TCDF	309 ng/Ncm	17 - 2546 ng/Ncm	MSW
41	N/A	P5CDF	250.3 ng/Ncm	17 - 2261 ng/Ncm	MSW
41	N/A	H6CDF	314.2 ng/Ncm	22 - 2928 ng/Ncm	MSW
41	N/A	H7CDF	215.1 ng/Ncm	25 - 1414 ng/Ncm	MSW
41	N/A	OCDF	123.8 ng/Ncm	17 - 749 ng/Ncm	MSW
42	60 ppt	TCDD	10,000 ppt	N/A	MSW
42	65 ppt	TCDF	45,000 ppt	N/A	MSW
42	5 ppt	TCDD	45 ppt	N/A	MSW
42	10 ppt	TCDF	2000 ppt	N/A	MSW
43	N/A	TCDD	0.24 ug/m3	N/A	MSW
43	N/A	PCDD	2300 ng/m3	N/A	MSW
47	0.04 ng	TCDD	31.46 ng	8 - 42.2 ng	MSW
47	0.04 ng	2,3,7,8 TCDD	1.9 ng	0.5 - 2.9 ng	MSW
47	0.04 ng	H6CDD	42.0 ng	ND - 76 ng	MSW
47	0.04 ng	H7CDD	10 ng	ND - 25 ng	MSW
47	0.04 ng	OCDD	ND	N/A	MSW
49	25 pg/m3	2,3,7,8 TCDD	0.295 ng/m3	.29 - .30 ng/m3	Processed MSW
49	25 pg/m3	TCDD	1.2 ng/m3	1.1 - 1.3 ng/m3	Processed MSW
49	120 pg/m3	2,3,7,8 TCDF	5.4 ng/m3	2.8 - 7.9 ng/m3	Processed MSW
49	120 pg/m3	TCDF	11.1 ng/m3	8.3 - 14 ng/m3	Processed MSW
49	25 pg/m3	2,3,7,8 TCDD	1.05 ng/m3	1.1 - 1.2 ng/m3	MSW/Waste Oil
49	25 pg/m3	TCDD	3.15 ng/m3	2.5 - 3.8 ng/m3	MSW/Waste Oil
49	120 pg/m3	2,3,7,8 TCDF	10.3 ng/m3	1.9 - 24 ng/m3	MSW/Waste Oil
49	120 pg/m3	TCDF	21 ng/m3	4.5 - 47.7 ng/m3	MSW/Waste Oil
49	25 pg/m3	TCDD	ND	N/A	MSW/Waste Oil
49	120 pg/m3	TCDF	ND	N/A	MSW/Waste Oil
49	25 pg/m3	2,3,7,8 TCDD	9.1 ng/m3	9.6 - 9.6 ng/m3	RDF
49	25 pg/m3	TCDD	29.7 ng.m3	29.5 - 30 ng/m3	RDF
49	120 pg/me	2,3,7,8 TCDF	99.5 ng/m3	85 - 114 ng/m3	RDF
49	120 pg/me	TCDF	279.5 ng/m3	247 - 312 ng/m3	RDF
53	N/A	TCDD	N/A	0.1 - 7 ng/m3	PCBs, PCPs
53	N/A	PCDD	N/A	82.1 - 433 ng/m3	PCBs, PCPs
53	N/A	TCDF	N/A	2 - 30 ng/m3	PCBs, PCPs
53	N/A	PCDF	N/A	37 - 306 ng/m3	PCBs, PCPs
56	0.1ng/g	2,3,7,8 TCDD	ND	N/A	MSW/Coal
56	0.1 ng/g	2,3,7,8 TCDD	ND	N/A	MSW/Coal
56	0.0005 ng/l	2,3,7,8 TCDD	ND	N/A	MSW/Coal
57	100pg - 200 pg/g	TCDD	275 ng/g	N/A	MSW
57	100pg - 200 pg/g	P5CDD	7.8 ng/g	N/A	MSW
57	100pg - 200 pg/g	H6CDD	21.8 ng/g	N/A	MSW
57	100pg - 200 pg/g	H7CDD	62.4 ng/g	N/A	MSW
57	100pg - 200 pg/g	OCDD	185.8 ng/g	N/A	MSW
72	N/A	TCDD	Trac.	N/A	MSW/PCB
72	N/A	P5CDD	4 ng/g	N/A	MSW/PCB
72	N/A	H6CDD	16 ng/g	N/A	MSW/PCB
72	N/A	H7CDD	16 ng/g	N/A	MSW/PCB
72	N/A	OCDD	35 ng/g	N/A	MSW/PCB
72	N/A	TCDD	Trac.	N/A	MSW/PCB
72	N/A	P5CDD	6 ng/g	N/A	MSW/PCB
72	N/A	H6CDD	53 ng/g	N/A	MSW/PCB
72	N/A	H7CDD	55 ng/g	N/A	MSW/PCB
72	N/A	OCDD	50 ng/g	N/A	MSW/PCB
72	N/A	TCDD	40 ng/g	N/A	MSW/PCB

MUNICIPAL WASTE COMBUSTORS

REF #	SAMPLING ORGANIZATION	RATING
41	Inst. Pharm. Res., Milan, Italy	6
41	Inst. Pharm. Res., Milan, Italy	6
41	Inst. Pharm. Res., Milan, Italy	6
41	Inst. Pharm. Res., Milan, Italy	6
41	Inst. Pharm. Res., Milan, Italy	6
41	Inst. Pharm. Res., Milan, Italy	6
42	Univ. of Nebraska	6
42	Univ. of Nebraska	6
42	Univ. of Nebraska	6
42	Univ. of Nebraska	6
43	MRI	6
43	MRI	6
47	U.S. EPA	6
47	U.S. EPA	6
47	U.S. EPA	6
47	U.S. EPA	6
47	U.S. EPA	6
49	Systech Corp.	6
49	Systech Corp.	6
49	Systech Corp.	6
49	Systech Corp.	6
49	Systech Corp.	6
49	Systech Corp.	6
49	Systech Corp.	6
49	Systech Corp.	6
49	Systech Corp.	6
49	Systech Corp.	6
49	Systech Corp.	6
49	Systech Corp.	6
49	Systech Corp.	6
49	Systech Corp.	6
53	Univ of Antwerp	6
53	Univ of Antwerp	6
53	Univ of Antwerp	6
53	Univ of Antwerp	6
56	Ames Lab, Iowa St. Univ.	6
56	Ames Lab, Iowa St. Univ.	6
56	Ames Lab, Iowa St. Univ.	6
57	Univ. of Waterloo, Ontario	6
57	Univ. of Waterloo, Ontario	6
57	Univ. of Waterloo, Ontario	6
57	Univ. of Waterloo, Ontario	6
57	Univ. of Waterloo, Ontario	6
72	Lab. Inquin. Atmosferico, Rome	6
72	Lab. Inquin. Atmosferico, Rome	6
72	Lab. Inquin. Atmosferico, Rome	6
72	Lab. Inquin. Atmosferico, Rome	6
72	Lab. Inquin. Atmosferico, Rome	6
72	Lab. Inquin. Atmosferico, Rome	6
72	Lab. Inquin. Atmosferico, Rome	6
72	Lab. Inquin. Atmosferico, Rome	6
72	Lab. Inquin. Atmosferico, Rome	6
72	Lab. Inquin. Atmosferico, Rome	6
72	Lab. Inquin. Atmosferico, Rome	6

MUNICIPAL WASTE COMBUSTORS

REF #	SOURCE TYPE	FACILITY	SOURCE CHARACT.
73	MUNICIPAL WASTE COMBUSTORS	Urban Incinerator, Italy	N/A
73	MUNICIPAL WASTE COMBUSTORS	Urban Incinerator, Italy	N/A
73	MUNICIPAL WASTE COMBUSTORS	Urban Incinerator, Italy	N/A
73	MUNICIPAL WASTE COMBUSTORS	Urban Incinerator, Italy	N/A
74	MUNICIPAL WASTE COMBUSTORS	Bologna, Italy	Urban Incinerators
74	MUNICIPAL WASTE COMBUSTORS	Bologna, Italy	Urban Incinerators
74	MUNICIPAL WASTE COMBUSTORS	Bologna, Italy	Urban Incinerators
74	MUNICIPAL WASTE COMBUSTORS	Bologna, Italy	Urban Incinerators
74	MUNICIPAL WASTE COMBUSTORS	Bologna, Italy	Urban Incinerators
74	MUNICIPAL WASTE COMBUSTORS	Bologna, Italy	Urban Incinerators
74	MUNICIPAL WASTE COMBUSTORS	Bologna, Italy	Urban Incinerators
74	MUNICIPAL WASTE COMBUSTORS	Bologna, Italy	Urban Incinerators
74	MUNICIPAL WASTE COMBUSTORS	Bologna, Italy	Urban Incinerators
74	MUNICIPAL WASTE COMBUSTORS	Milano, Italy	Urban Incinerators
74	MUNICIPAL WASTE COMBUSTORS	Milano, Italy	Urban Incinerators
74	MUNICIPAL WASTE COMBUSTORS	Milano, Italy	Urban Incinerators
74	MUNICIPAL WASTE COMBUSTORS	Milano, Italy	Urban Incinerators
74	MUNICIPAL WASTE COMBUSTORS	Milano, Italy	Urban Incinerators
74	MUNICIPAL WASTE COMBUSTORS	Florence, Italy	Urban Incinerators
74	MUNICIPAL WASTE COMBUSTORS	Florence, Italy	Urban Incinerators
74	MUNICIPAL WASTE COMBUSTORS	Florence, Italy	Urban Incinerators
74	MUNICIPAL WASTE COMBUSTORS	Florence, Italy	Urban Incinerators
74	MUNICIPAL WASTE COMBUSTORS	Florence, Italy	Urban Incinerators
74	MUNICIPAL WASTE COMBUSTORS	Florence, Italy	Urban Incinerators
74	MUNICIPAL WASTE COMBUSTORS	Florence, Italy	Urban Incinerators
74	MUNICIPAL WASTE COMBUSTORS	Florence, Italy	Urban Incinerators
74	MUNICIPAL WASTE COMBUSTORS	Florence, Italy	Urban Incinerators
74	MUNICIPAL WASTE COMBUSTORS	Florence, Italy	Urban Incinerators
74	MUNICIPAL WASTE COMBUSTORS	N/A	Urban Incinerators
74	MUNICIPAL WASTE COMBUSTORS	N/A	Urban Incinerators
74	MUNICIPAL WASTE COMBUSTORS	N/A	Urban Incinerators
74	MUNICIPAL WASTE COMBUSTORS	N/A	Urban Incinerators
74	MUNICIPAL WASTE COMBUSTORS	N/A	Urban Incinerators
74	MUNICIPAL WASTE COMBUSTORS	N/A	Urban Incinerators
74	MUNICIPAL WASTE COMBUSTORS	N/A	Urban Incinerators
74	MUNICIPAL WASTE COMBUSTORS	N/A	Urban Incinerators
74	MUNICIPAL WASTE COMBUSTORS	N/A	Urban Incinerators
74	MUNICIPAL WASTE COMBUSTORS	N/A	Urban Incinerators
74	MUNICIPAL WASTE COMBUSTORS	N/A	Urban Incinerators
74	MUNICIPAL WASTE COMBUSTORS	N/A	Urban Incinerators
74	MUNICIPAL WASTE COMBUSTORS	N/A	Urban Incinerators
74	MUNICIPAL WASTE COMBUSTORS	N/A	Urban Incinerators
74	MUNICIPAL WASTE COMBUSTORS	N/A	Urban Incinerators
74	MUNICIPAL WASTE COMBUSTORS	N/A	Urban Incinerators
74	MUNICIPAL WASTE COMBUSTORS	N/A	Urban Incinerators
74	MUNICIPAL WASTE COMBUSTORS	N/A	Urban Incinerators
74	MUNICIPAL WASTE COMBUSTORS	N/A	Urban Incinerators
74	MUNICIPAL WASTE COMBUSTORS	N/A	Urban Incinerators
74	MUNICIPAL WASTE COMBUSTORS	N/A	Urban Incinerators
74	MUNICIPAL WASTE COMBUSTORS	N/A	Rural Incinerators
74	MUNICIPAL WASTE COMBUSTORS	N/A	Rural Incinerators
74	MUNICIPAL WASTE COMBUSTORS	N/A	Rural Incinerators
74	MUNICIPAL WASTE COMBUSTORS	N/A	Rural Incinerators
74	MUNICIPAL WASTE COMBUSTORS	N/A	Rural Incinerators

REF #	PROCESSES	SAMPLE	METHOD	SAMPLE NUM.	EXTRACTION	ANALYSIS
72	Stack	FA	GS	1 Sample	Soxhlet/Benzene	GC/MS
72	Stack	FA	GS	1 Sample	Soxhlet/Benzene	GC/MS
72	Stack	FA	GS	1 Sample	Soxhlet/Benzene	GC/MS
72	Stack	FA	GS	1 Sample	Soxhlet/Benzene	GC/MS
74	ESP	FA	GS	N/A	Soxhlet/Xylene	GC/MS
74	ESP	FA	GS	N/A	Soxhlet/Xylene	GC/MS
74	ESP	FA	GS	N/A	Soxhlet/Xylene	GC/MS
74	ESP	FA	GS	N/A	Soxhlet/Xylene	GC/MS
74	Furnace	Ash	GS	N/A	Soxhlet/Xylene	GC/MS
74	Furnace	Ash	GS	N/A	Soxhlet/Xylene	GC/MS
74	Furnace	Ash	GS	N/A	Soxhlet/Xylene	GC/MS
74	Furnace	Ash	GS	N/A	Soxhlet/Xylene	GC/MS
74	Furnace	Ash	GS	N/A	Soxhlet/Xylene	GC/MS
74	ESP	FA	GS	N/A	Soxhlet/Xylene	GC/MS
74	ESP	FA	GS	N/A	Soxhlet/Xylene	GC/MS
74	ESP	FA	GS	N/A	Soxhlet/Xylene	GC/MS
74	ESP	FA	GS	N/A	Soxhlet/Xylene	GC/MS
74	ESP	FA	GS	N/A	Soxhlet/Xylene	GC/MS
74	Stack	FA	MM5T	N/A	Soxhlet/Xylene	GC/MS
74	Stack	FA	MM5T	N/A	Soxhlet/Xylene	GC/MS
74	Stack	FA	MM5T	N/A	Soxhlet/Xylene	GC/MS
74	Stack	FA	MM5T	N/A	Soxhlet/Xylene	GC/MS
74	Stack	FA	MM5T	N/A	Soxhlet/Xylene	GC/MS
74	Stack	FB	MM5T	N/A	Soxhlet/Xylene	GC/MS
74	Stack	FB	MM5T	N/A	Soxhlet/Xylene	GC/MS
74	Stack	FB	MM5T	N/A	Soxhlet/Xylene	GC/MS
74	Stack	FB	MM5T	N/A	Soxhlet/Xylene	GC/MS
74	Stack	FB	MM5T	N/A	Soxhlet/Xylene	GC/MS
74	ESP	FA	GS	N/A	Soxhlet/Xylene	GC/MS
74	ESP	FA	GS	N/A	Soxhlet/Xylene	GC/MS
74	ESP	FA	GS	N/A	Soxhlet/Xylene	GC/MS
74	ESP	FA	GS	N/A	Soxhlet/Xylene	GC/MS
74	ESP	FA	GS	N/A	Soxhlet/Xylene	GC/MS
74	ESP	FA	GS	N/A	Soxhlet/Xylene	GC/MS
74	ESP	FA	GS	N/A	Soxhlet/Xylene	GC/MS
74	Furnace	Ash	GS	N/A	Soxhlet/Xylene	GC/MS
74	Furnace	Ash	GS	N/A	Soxhlet/Xylene	GC/MS
74	Furnace	Ash	GS	N/A	Soxhlet/Xylene	GC/MS
74	Furnace	Ash	GS	N/A	Soxhlet/Xylene	GC/MS
74	Furnace	Ash	GS	N/A	Soxhlet/Xylene	GC/MS
74	Furnace	Ash	GS	N/A	Soxhlet/Xylene	GC/MS
74	Furnace	Ash	GS	N/A	Soxhlet/Xylene	GC/MS
74	Stack	FA	Train	N/A	Soxhlet/Xylene	GC/MS
74	Stack	FA	Train	N/A	Soxhlet/Xylene	GC/MS
74	Stack	FA	Train	N/A	Soxhlet/Xylene	GC/MS
74	Stack	FA	Train	N/A	Soxhlet/Xylene	GC/MS
74	Stack	FA	Train	N/A	Soxhlet/Xylene	GC/MS
74	Stack	FA	Train	N/A	Soxhlet/Xylene	GC/MS
74	Stack	FA	Train	N/A	Soxhlet/Xylene	GC/MS
74	ESP	FA	GS	N/A	Soxhlet/Xylene	GC/MS
74	ESP	FA	GS	N/A	Soxhlet/Xylene	GC/MS
74	ESP	FA	GS	N/A	Soxhlet/Xylene	GC/MS
74	ESP	FA	GS	N/A	Soxhlet/Xylene	GC/MS
74	ESP	FA	GS	N/A	Soxhlet/Xylene	GC/MS

MUNICIPAL WASTE COMBUSTORS

REF #	DETECTION LIMITS	ISOMER	ISOMER CONC.	DATA VARIABILITY	PRECURSORS
72	N/A	P5CDD	110 ng/g	N/A	MSW/PCB
72	N/A	H6CDD	540 ng/g	N/A	MSW/PCB
72	N/A	H7CDD	900 ng/g	N/A	MSW/PCB
72	N/A	OCDD	900 ng/g	N/A	MSW/PCB
74	N/A	TCDD/TCDF	112 ppb	N/A	Untreated MSW
74	N/A	P5CDD/P5CDF	205 ppb	N/A	Untreated MSW
74	N/A	H6CDD/H6CDF	235 ppb	N/A	Untreated MSW
74	N/A	H7CDD/H7CDF	345 ppb	N/A	Untreated MSW
74	N/A	TCDD/TCDF	16 ppb	N/A	Untreated MSW
74	N/A	P5CDD/P5CDF	20 ppb	N/A	Untreated MSW
74	N/A	H6CDD/H6CDF	33 ppb	N/A	Untreated MSW
74	N/A	H7CDD/H7CDF	113 ppb	N/A	Untreated MSW
74	N/A	OCDD/OCDF	390 ppb	N/A	Untreated MSW
74	N/A	TCDD/TCDF	51 ppb	N/A	Untreated MSW
74	N/A	P5CDD/P5CDF	115 ppb	N/A	Untreated MSW
74	N/A	H6CDD/H6CDF	177 ppb	N/A	Untreated MSW
74	N/A	H7CDD/H7CDF	310 ppb	N/A	Untreated MSW
74	N/A	OCDD/OCDF	547 ppb	N/A	Untreated MSW
74	N/A	TCDD/TCDF	175 ppb	N/A	Untreated MSW
74	N/A	P5CDD/P5CDF	240 ppb	N/A	Untreated MSW
74	N/A	H6CDD/H6CDF	185 ppb	N/A	Untreated MSW
74	N/A	H7CDD/H7CDF	400 ppb	N/A	Untreated MSW
74	N/A	OCDD/OCDF	570 ppb	N/A	Untreated MSW
74	N/A	TCDD/TCDF	ND	N/A	Untreated MSW
74	N/A	P5CDD/P5CDF	ND	N/A	Untreated MSW
74	N/A	H6CDD/H6CDF	125 ppb	N/A	Untreated MSW
74	N/A	H7CDD/H7CDF	105 ppb	N/A	Untreated MSW
74	N/A	OCDD/OCDF	31 ppb	N/A	Untreated MSW
74	N/A	TCDD	20 ppb	N/A	Untreated MSW
74	N/A	P5CDD	100 ppb	N/A	Untreated MSW
74	N/A	H6CDD	160 ppb	N/A	Untreated MSW
74	N/A	H7CDD	230 ppb	N/A	Untreated MSW
74	N/A	OCDD	490 ppb	N/A	Untreated MSW
74	N/A	H7CDF	70 ppb	N/A	Untreated MSW
74	N/A	OCDF	50 ppb	N/A	Untreated MSW
74	N/A	TCDD	16 ppb	N/A	Untreated MSW
74	N/A	P5CDD	20 ppb	N/A	Untreated MSW
74	N/A	H6CDD	33 ppb	N/A	Untreated MSW
74	N/A	H7CDD	90 ppb	N/A	Untreated MSW
74	N/A	OCDD	340 ppb	N/A	Untreated MSW
74	N/A	H7CDF	25 ppb	N/A	Untreated MSW
74	N/A	OCDF	50 ppb	N/A	Untreated MSW
74	N/A	TCDD	N/A	N/A	Untreated MSW
74	N/A	P5CDD	80 ppb	N/A	Untreated MSW
74	N/A	H6CDD	180 ppb	N/A	Untreated MSW
74	N/A	H7CDD	290 ppb	N/A	Untreated MSW
74	N/A	OCDD	510 ppb	N/A	Untreated MSW
74	N/A	H7CDF	110 ppb	N/A	Untreated MSW
74	N/A	OCDF	60 ppb	N/A	Untreated MSW
74	N/A	TCDD	ND	N/A	Ag Products
74	N/A	P5CDD	ND	N/A	Ag Products
74	N/A	H6CDD	ND	N/A	Ag Products
74	N/A	H7CDD	30 ppb	N/A	Ag Products
74	N/A	OCDD	40 ppb	N/A	Ag Products

MUNICIPAL WASTE COMBUSTORS

REF #	SAMPLING ORGANIZATION	RATING
72	Lab. Inquin. Atmosferico, Rome	B
72	Lab. Inquin. Atmosferico, Rome	B
72	Lab. Inquin. Atmosferico, Rome	B
72	Lab. Inquin. Atmosferico, Rome	B
74	Inst. Sull Inquin Atmos. Rome	B
74	Inst. Sull Inquin Atmos. Rome	B
74	Inst. Sull Inquin Atmos. Rome	B
74	Inst. Sull Inquin Atmos. Rome	B
74	Inst. Sull Inquin Atmos. Rome	B
74	Inst. Sull Inquin Atmos. Rome	B
74	Inst. Sull Inquin Atmos. Rome	B
74	Inst. Sull Inquin Atmos. Rome	B
74	Inst. Sull Inquin Atmos. Rome	B
74	Inst. Sull Inquin Atmos. Rome	B
74	Inst. Sull Inquin Atmos. Rome	B
74	Inst. Sull Inquin Atmos. Rome	B
74	Inst. Sull Inquin Atmos. Rome	B
74	Inst. Sull Inquin Atmos. Rome	B
74	Inst. Sull Inquin Atmos. Rome	B
74	Inst. Sull Inquin Atmos. Rome	B
74	Inst. Sull Inquin Atmos. Rome	B
74	Inst. Sull Inquin Atmos. Rome	B
74	Inst. Sull Inquin Atmos. Rome	B
74	Inst. Sull Inquin Atmos. Rome	I
74	Inst. Sull Inquin Atmos. Rome	I
74	Inst. Sull Inquin Atmos. Rome	B
74	Inst. Sull Inquin Atmos. Rome	B
74	Inst. Sull Inquin Atmos. Rome	B
74	Inst. Sull Inquin Atmos. Rome	B
74	Inst. Sull Inquin Atmos. Rome	B
74	Inst. Sull Inquin Atmos. Rome	B
74	Inst. Sull Inquin Atmos. Rome	B
74	Inst. Sull Inquin Atmos. Rome	B
74	Inst. Sull Inquin Atmos. Rome	B
74	Inst. Sull Inquin Atmos. Rome	B
74	Inst. Sull Inquin Atmos. Rome	B
74	Inst. Sull Inquin Atmos. Rome	B
74	Inst. Sull Inquin Atmos. Rome	B
74	Inst. Sull Inquin Atmos. Rome	B
74	Inst. Sull Inquin Atmos. Rome	B
74	Inst. Sull Inquin Atmos. Rome	B
74	Inst. Sull Inquin Atmos. Rome	B
74	Inst. Sull Inquin Atmos. Rome	B
74	Inst. Sull Inquin Atmos. Rome	B
74	Inst. Sull Inquin Atmos. Rome	B
74	Inst. Sull Inquin Atmos. Rome	B
74	Inst. Sull Inquin Atmos. Rome	B
74	Inst. Sull Inquin Atmos. Rome	B
74	Inst. Sull Inquin Atmos. Rome	B
74	Inst. Sull Inquin Atmos. Rome	I
74	Inst. Sull Inquin Atmos. Rome	I
74	Inst. Sull Inquin Atmos. Rome	I
74	Inst. Sull Inquin Atmos. Rome	I
74	Inst. Sull Inquin Atmos. Rome	I

REF #	SOURCE TYPE	FACILITY	SOURCE CHARACT.
74	MUNICIPAL WASTE COMBUSTORS	N/A	Rural Incinerators
74	MUNICIPAL WASTE COMBUSTORS	N/A	Rural Incinerators
74	MUNICIPAL WASTE COMBUSTORS	N/A	Rural Incinerators
74	MUNICIPAL WASTE COMBUSTORS	N/A	Rural Incinerators
74	MUNICIPAL WASTE COMBUSTORS	N/A	Rural Incinerators
74	MUNICIPAL WASTE COMBUSTORS	N/A	Rural Incinerators
74	MUNICIPAL WASTE COMBUSTORS	N/A	Rural Incinerators
74	MUNICIPAL WASTE COMBUSTORS	N/A	Rural Incinerators
74	MUNICIPAL WASTE COMBUSTORS	N/A	Rural Incinerators
74	MUNICIPAL WASTE COMBUSTORS	N/A	N/A
74	MUNICIPAL WASTE COMBUSTORS	N/A	N/A
74	MUNICIPAL WASTE COMBUSTORS	N/A	N/A
74	MUNICIPAL WASTE COMBUSTORS	N/A	N/A
74	MUNICIPAL WASTE COMBUSTORS	N/A	N/A
74	MUNICIPAL WASTE COMBUSTORS	N/A	N/A
74	MUNICIPAL WASTE COMBUSTORS	N/A	N/A
74	MUNICIPAL WASTE COMBUSTORS	N/A	N/A
74	MUNICIPAL WASTE COMBUSTORS	N/A	N/A
74	MUNICIPAL WASTE COMBUSTORS	N/A	N/A
74	MUNICIPAL WASTE COMBUSTORS	N/A	N/A
74	MUNICIPAL WASTE COMBUSTORS	N/A	N/A
74	MUNICIPAL WASTE COMBUSTORS	N/A	N/A
74	MUNICIPAL WASTE COMBUSTORS	N/A	N/A
74	MUNICIPAL WASTE COMBUSTORS	N/A	N/A
74	MUNICIPAL WASTE COMBUSTORS	N/A	N/A
74	MUNICIPAL WASTE COMBUSTORS	N/A	N/A
74	MUNICIPAL WASTE COMBUSTORS	N/A	N/A
74	MUNICIPAL WASTE COMBUSTORS	N/A	N/A
74	MUNICIPAL WASTE COMBUSTORS	N/A	N/A
74	MUNICIPAL WASTE COMBUSTORS	N/A	N/A
75	MUNICIPAL WASTE COMBUSTORS	Italy (6)	N/A
75	MUNICIPAL WASTE COMBUSTORS	Italy (6)	N/A
75	MUNICIPAL WASTE COMBUSTORS	Italy (6)	N/A
75	MUNICIPAL WASTE COMBUSTORS	Italy (6)	N/A
75	MUNICIPAL WASTE COMBUSTORS	Italy (6)	N/A
75	MUNICIPAL WASTE COMBUSTORS	Italy (6)	N/A
75	MUNICIPAL WASTE COMBUSTORS	Italy (6)	N/A
75	MUNICIPAL WASTE COMBUSTORS	Italy (6)	N/A
75	MUNICIPAL WASTE COMBUSTORS	Italy (6)	N/A
75	MUNICIPAL WASTE COMBUSTORS	Italy (6)	N/A
75	MUNICIPAL WASTE COMBUSTORS	Italy (6)	N/A
75	MUNICIPAL WASTE COMBUSTORS	Italy (6)	N/A
75	MUNICIPAL WASTE COMBUSTORS	Italy (6)	N/A
75	MUNICIPAL WASTE COMBUSTORS	Italy (6)	N/A
75	MUNICIPAL WASTE COMBUSTORS	Italy (6)	N/A
75	MUNICIPAL WASTE COMBUSTORS	Italy (6)	N/A
75	MUNICIPAL WASTE COMBUSTORS	Italy (6)	N/A
75	MUNICIPAL WASTE COMBUSTORS	Italy (6)	N/A
75	MUNICIPAL WASTE COMBUSTORS	Italy (6)	N/A
75	MUNICIPAL WASTE COMBUSTORS	Italy (6)	N/A
75	MUNICIPAL WASTE COMBUSTORS	Italy (6)	N/A
75	MUNICIPAL WASTE COMBUSTORS	Italy (6)	N/A
75	MUNICIPAL WASTE COMBUSTORS	Italy (6)	N/A
75	MUNICIPAL WASTE COMBUSTORS	Italy (6)	N/A

MUNICIPAL WASTE COMBUSTORS

REF	#PROCESSES	SAMPLE	METHOD	SAMPLE NUM.	EXTRACTION	ANALYSIS
74	ESP	FA	GS	N/A	Soxhlet/Xylene	GC/MS
74	ESP	FA	GS	N/A	Soxhlet/Xylene	GC/MS
74	Furnace	Sludge	GS	N/A	Soxhlet/Xylene	GC/MS
74	Furnace	Sludge	GS	N/A	Soxhlet/Xylene	GC/MS
74	Furnace	Sludge	GS	N/A	Soxhlet/Xylene	GC/MS
74	Furnace	Sludge	GS	N/A	Soxhlet/Xylene	GC/MS
74	Furnace	Sludge	GS	N/A	Soxhlet/Xylene	GC/MS
74	Furnace	Sludge	GS	N/A	Soxhlet/Xylene	GC/MS
74	Furnace	Sludge	GS	N/A	Soxhlet/Xylene	GC/MS
74	Furnace	Sludge	GS	N/A	Soxhlet/Xylene	GC/MS
74	Furnace	Sludge	GS	N/A	Soxhlet/Xylene	GC/MS
74	Furnace	Sludge	GS	N/A	Soxhlet/Xylene	GC/MS
74	Furnace	Sludge	GS	N/A	Soxhlet/Xylene	GC/MS
74	Furnace	Sludge	GS	N/A	Soxhlet/Xylene	GC/MS
74	Furnace	Sludge	GS	N/A	Soxhlet/Xylene	GC/MS
74	Furnace	Sludge	GS	N/A	Soxhlet/Xylene	GC/MS
74	Stack	FA	Train	N/A	Soxhlet/Xylene	GC/MS
74	Stack	FA	Train	N/A	Soxhlet/Xylene	GC/MS
74	Stack	FA	Train	N/A	Soxhlet/Xylene	GC/MS
74	Stack	FA	Train	N/A	Soxhlet/Xylene	GC/MS
74	Stack	FA	Train	N/A	Soxhlet/Xylene	GC/MS
74	Stack	FA	Train	N/A	Soxhlet/Xylene	GC/MS
74	Stack	FA	Train	N/A	Soxhlet/Xylene	GC/MS
74	Furnace	Sludge	GS	N/A	Soxhlet/Xylene	GC/MS
74	Furnace	Sludge	GS	N/A	Soxhlet/Xylene	GC/MS
74	Furnace	Sludge	GS	N/A	Soxhlet/Xylene	GC/MS
74	Furnace	Sludge	GS	N/A	Soxhlet/Xylene	GC/MS
74	Furnace	Sludge	GS	N/A	Soxhlet/Xylene	GC/MS
74	Furnace	Sludge	GS	N/A	Soxhlet/Xylene	GC/MS
74	Furnace	Sludge	GS	N/A	Soxhlet/Xylene	GC/MS
75	Stack	FG/FA	MM5T	N/A	Xylene	GC
75	Stack	FG/FA	MM5T	N/A	Xylene	GC
75	Stack	FG/FA	MM5T	N/A	Xylene	GC
75	Stack	FG/FA	MM5T	N/A	Xylene	GC
75	Stack	FG/FA	MM5T	N/A	Xylene	GC
75	Stack	FG/FA	MM5T	N/A	Xylene	GC/MS
75	Stack	FG/FA	MM5T	N/A	Xylene	GC/MS
75	Stack	FG/FA	MM5T	N/A	Xylene	GC/MS
75	Stack	FG/FA	MM5T	N/A	Xylene	GC/MS
75	Stack	FG/FA	MM5T	N/A	Xylene	GC/MS
75	Cyclone	Sludge	GS	N/A	Xylene	GC
75	Cyclone	Sludge	GS	N/A	Xylene	GC
75	Cyclone	Sludge	GS	N/A	Xylene	GC
75	Cyclone	Sludge	GS	N/A	Xylene	GC
75	Cyclone	Sludge	GS	N/A	Xylene	GC
75	Cyclone	Sludge	GS	N/A	Xylene	GC/MS
75	Cyclone	Sludge	GS	N/A	Xylene	GC/MS
75	Cyclone	Sludge	GS	N/A	Xylene	GC/MS
75	Cyclone	Sludge	GS	N/A	Xylene	GC/MS
75	Cyclone	Sludge	GS	N/A	Xylene	GC/MS
75	Furnace	Ash	GS	N/A	Xylene	GC
75	Furnace	Ash	GS	N/A	Xylene	GC
75	Furnace	Ash	GS	N/A	Xylene	GC
75	Furnace	Ash	GS	N/A	Xylene	GC

REF #	DETECTION LIMITS	ISOMER	ISOMER CONC.	DATA VARIABILITY	PRECURSORS
74	N/A	H7CDF	ND	N/A	Ag Products
74	N/A	OCDF	ND	N/A	Ag Products
74	N/A	TCDD	ND	N/A	Ag Products
74	N/A	P5CDD	ND	N/A	Ag Products
74	N/A	H6CDD	ND	N/A	Ag Products
74	N/A	H7CDD	10 ppb	N/A	Ag Products
74	N/A	OCDD	15 ppb	N/A	Ag Products
74	N/A	H7CDF	ND	N/A	Ag Products
74	N/A	OCDF	ND	N/A	Ag Products
74	N/A	TCDD	ND	N/A	Proc. MSW (No Paper)
74	N/A	P5CDD	ND	N/A	Proc. MSW (No Paper)
74	N/A	H6CDD	ND	N/A	Proc. MSW (No Paper)
74	N/A	H7CDD	6 ppb	N/A	Proc. MSW (No Paper)
74	N/A	OCDD	12 ppb	N/A	Proc. MSW (No Paper)
74	N/A	H7CDF	ND	N/A	Proc. MSW (No Paper)
74	N/A	OCDF	ND	N/A	Proc. MSW (No Paper)
74	N/A	TCDD	ND	N/A	Homogenized MSW
74	N/A	P5CDD	ND	N/A	Homogenized MSW
74	N/A	H6CDD	ND	N/A	Homogenized MSW
74	N/A	H7CDD	5 ppb	N/A	Homogenized MSW
74	N/A	OCDD	5 ppb	N/A	Homogenized MSW
74	N/A	H7CDF	ND	N/A	Homogenized MSW
74	N/A	OCDF	ND	N/A	Homogenized MSW
74	N/A	TCDD	ND	N/A	Homogenized MSW
74	N/A	P5CDD	ND	N/A	Homogenized MSW
74	N/A	H6CDD	ND	N/A	Homogenized MSW
74	N/A	H7CDD	1 ppb	N/A	Homogenized MSW
74	N/A	OCDD	1 ppb	N/A	Homogenized MSW
74	N/A	H7CDF	ND	N/A	Homogenized MSW
74	N/A	OCDF	ND	N/A	Homogenized MSW
75	N/A	TCDD	175 ng/g	N/A	MSW
75	N/A	P5CDD	240 ng/g	N/A	MSW
75	N/A	H6CDD	185 ng/g	N/A	MSW
75	N/A	H7CDD	400 ng/g	N/A	MSW
75	N/A	OCDD	510 ng/g	N/A	MSW
75	N/A	TCDD	ND	N/A	MSW
75	N/A	P5CDD	80 ng/g	N/A	MSW
75	N/A	H6CDD	180 ng/g	N/A	MSW
75	N/A	H7CDD	290 ng/g	N/A	MSW
75	N/A	OCDD	510 ng/g	N/A	MSW
75	N/A	TCDD	50 ng/g	N/A	MSW
75	N/A	P5CDD	115 ng/g	N/A	MSW
75	N/A	H6CDD	175 ng/g	N/A	MSW
75	N/A	H6CDD	310 ng/g	N/A	MSW
75	N/A	OCDD	545 ng/g	N/A	MSW
75	N/A	TCDD	20 ng/g	N/A	MSW
75	N/A	P5CDD	100 ng/g	N/A	MSW
75	N/A	H6CDD	160 ng/g	N/A	MSW
75	N/A	H7CDD	230 ng/g	N/A	MSW
75	N/A	OCDD	490 ng/g	N/A	MSW
75	N/A	TCDD	16 ng/g	N/A	MSW
75	N/A	P5CDD	20 ng/g	N/A	MSW
75	N/A	H6CDD	33 ng/g	N/A	MSW
75	N/A	H7CDD	113 ng/g	N/A	MSW

REF #	SAMPLING ORGANIZATION	RATING
74	Inst. Sull Inquin Atmos. Rome	I
74	Inst. Sull Inquin Atmos. Rome	I
74	Inst. Sull Inquin Atmos. Rome	I
74	Inst. Sull Inquin Atmos. Rome	I
74	Inst. Sull Inquin Atmos. Rome	I
74	Inst. Sull Inquin Atmos. Rome	I
74	Inst. Sull Inquin Atmos. Rome	I
74	Inst. Sull Inquin Atmos. Rome	I
74	Inst. Sull Inquin Atmos. Rome	I
74	Inst. Sull Inquin Atmos. Rome	I
74	Inst. Sull Inquin Atmos. Rome	I
74	Inst. Sull Inquin Atmos. Rome	I
74	Inst. Sull Inquin Atmos. Rome	I
74	Inst. Sull Inquin Atmos. Rome	I
74	Inst. Sull Inquin Atmos. Rome	I
74	Inst. Sull Inquin Atmos. Rome	I
74	Inst. Sull Inquin Atmos. Rome	I
74	Inst. Sull Inquin Atmos. Rome	I
74	Inst. Sull Inquin Atmos. Rome	I
74	Inst. Sull Inquin Atmos. Rome	I
74	Inst. Sull Inquin Atmos. Rome	I
74	Inst. Sull Inquin Atmos. Rome	I
74	Inst. Sull Inquin Atmos. Rome	I
74	Inst. Sull Inquin Atmos. Rome	I
74	Inst. Sull Inquin Atmos. Rome	I
74	Inst. Sull Inquin Atmos. Rome	I
74	Inst. Sull Inquin Atmos. Rome	I
74	Inst. Sull Inquin Atmos. Rome	I
74	Inst. Sull Inquin Atmos. Rome	I
74	Inst. Sull Inquin Atmos. Rome	I
75	Inst Chim Anali, Univ di Roma	B
75	Inst Chim Anali, Univ di Roma	B
75	Inst Chim Anali, Univ di Roma	B
75	Inst Chim Anali, Univ di Roma	B
75	Inst Chim Anali, Univ di Roma	B
75	Inst Chim Anali, Univ di Roma	I
75	Inst Chim Anali, Univ di Roma	B
75	Inst Chim Anali, Univ di Roma	B
75	Inst Chim Anali, Univ di Roma	B
75	Inst Chim Anali, Univ di Roma	B
75	Inst Chim Anali, Univ di Roma	B
75	Inst Chim Anali, Univ di Roma	B
75	Inst Chim Anali, Univ di Roma	B
75	Inst Chim Anali, Univ di Roma	B
75	Inst Chim Anali, Univ di Roma	B
75	Inst Chim Anali, Univ di Roma	B
75	Inst Chim Anali, Univ di Roma	B
75	Inst Chim Anali, Univ di Roma	B
75	Inst Chim Anali, Univ di Roma	B
75	Inst Chim Anali, Univ di Roma	B
75	Inst Chim Anali, Univ di Roma	B
75	Inst Chim Anali, Univ di Roma	B
75	Inst Chim Anali, Univ di Roma	B
75	Inst Chim Anali, Univ di Roma	B

MUNICIPAL WASTE COMBUSTORS

REF #	SOURCE TYPE	FACILITY	SOURCE CHARACT.
75	MUNICIPAL WASTE COMBUSTORS	Italy (6)	N/A
75	MUNICIPAL WASTE COMBUSTORS	Italy (6)	After Recycling
75	MUNICIPAL WASTE COMBUSTORS	Italy (6)	After Recycling
75	MUNICIPAL WASTE COMBUSTORS	Italy (6)	After Recycling
75	MUNICIPAL WASTE COMBUSTORS	Italy (6)	After Recycling
75	MUNICIPAL WASTE COMBUSTORS	Italy (6)	After Recycling
75	MUNICIPAL WASTE COMBUSTORS	Italy (6)	After Recycling
75	MUNICIPAL WASTE COMBUSTORS	Italy (6)	After Recycling
75	MUNICIPAL WASTE COMBUSTORS	Italy (6)	After Recycling
75	MUNICIPAL WASTE COMBUSTORS	Italy (6)	After Compost Production
75	MUNICIPAL WASTE COMBUSTORS	Italy (6)	After Compost Production
75	MUNICIPAL WASTE COMBUSTORS	Italy (6)	After Compost Production
75	MUNICIPAL WASTE COMBUSTORS	Italy (6)	After Compost Production
75	MUNICIPAL WASTE COMBUSTORS	Italy (6)	After Compost Production
75	MUNICIPAL WASTE COMBUSTORS	Italy (6)	After Compost Production
75	MUNICIPAL WASTE COMBUSTORS	Italy (6)	After Compost Production
75	MUNICIPAL WASTE COMBUSTORS	Italy (6)	After Compost Production
75	MUNICIPAL WASTE COMBUSTORS	Italy (6)	After Compost Production
75	MUNICIPAL WASTE COMBUSTORS	Italy (6)	After Compost Production
75	MUNICIPAL WASTE COMBUSTORS	Italy (6)	After Compost Production
75	MUNICIPAL WASTE COMBUSTORS	Italy (6)	After Compost Production
77	MUNICIPAL WASTE COMBUSTORS	25 Installations	N/A
77	MUNICIPAL WASTE COMBUSTORS	25 Installations	N/A
77	MUNICIPAL WASTE COMBUSTORS	25 Installations	N/A
77	MUNICIPAL WASTE COMBUSTORS	25 Installations	N/A
77	MUNICIPAL WASTE COMBUSTORS	25 Installations	N/A
77	MUNICIPAL WASTE COMBUSTORS	25 Installations	N/A
77	MUNICIPAL WASTE COMBUSTORS	25 Installations	N/A
77	MUNICIPAL WASTE COMBUSTORS	25 Installations	N/A
77	MUNICIPAL WASTE COMBUSTORS	25 Installations	N/A
77	MUNICIPAL WASTE COMBUSTORS	25 Installations	N/A
77	MUNICIPAL WASTE COMBUSTORS	25 Installations	N/A
77	MUNICIPAL WASTE COMBUSTORS	25 Installations	N/A
77	MUNICIPAL WASTE COMBUSTORS	25 Installations	N/A
77	MUNICIPAL WASTE COMBUSTORS	25 Installations	N/A
77	MUNICIPAL WASTE COMBUSTORS	25 Installations	N/A
77	MUNICIPAL WASTE COMBUSTORS	25 Installations	N/A
77	MUNICIPAL WASTE COMBUSTORS	25 Installations	N/A
77	MUNICIPAL WASTE COMBUSTORS	25 Installations	N/A
77	MUNICIPAL WASTE COMBUSTORS	25 Installations	N/A
77	MUNICIPAL WASTE COMBUSTORS	25 Installations	N/A
*84	MUNICIPAL WASTE COMBUSTORS	U.S.	Incinerator-Boiler
*84	MUNICIPAL WASTE COMBUSTORS	U.S.	Incinerator-Boiler
*84	MUNICIPAL WASTE COMBUSTORS	U.S.	Incinerator-Boiler
*84	MUNICIPAL WASTE COMBUSTORS	U.S.	Incinerator-Boiler
*84	MUNICIPAL WASTE COMBUSTORS	U.S.	Converted Coal Boiler
*84	MUNICIPAL WASTE COMBUSTORS	U.S.	Converted Coal Boiler
*84	MUNICIPAL WASTE COMBUSTORS	U.S.	Converted Coal Boiler
*84	MUNICIPAL WASTE COMBUSTORS	U.S.	Converted Coal Boiler
86	MUNICIPAL WASTE COMBUSTORS	Arnhem, Netherlands	N/A
86	MUNICIPAL WASTE COMBUSTORS	Arnhem, Netherlands	N/A
86	MUNICIPAL WASTE COMBUSTORS	Arnhem, Netherlands	N/A
86	MUNICIPAL WASTE COMBUSTORS	Arnhem, Netherlands	N/A
86	MUNICIPAL WASTE COMBUSTORS	Arnhem, Netherlands	N/A

REF #	PROCESSES	SAMPLE	METHOD	SAMPLE NUM.	EXTRACTION	ANALYSIS
75	Furnace	Ash	GS	N/A	Xylene	GC
75	Cyclone	Sludge	GS	N/A	Xylene	GC
75	Cyclone	Sludge	GS	N/A	Xylene	GC
75	Cyclone	Sludge	GS	N/A	Xylene	GC
75	Cyclone	Sludge	GS	N/A	Xylene	GC/MS
75	Furnace	Ash	GS	N/A	Xylene	GC
75	Furnace	Ash	GS	N/A	Xylene	GC
75	Furnace	Ash	GS	N/A	Xylene	GC
75	Furnace	Ash	GS	N/A	Xylene	GC/MS
75	Cyclone	Sludge	GS	N/A	Xylene	GC
75	Cyclone	Sludge	GS	N/A	Xylene	GC
75	Cyclone	Sludge	GS	N/A	Xylene	GC
75	Cyclone	Sludge	GS	N/A	Xylene	GC/MS
75	Furnace	Ash	GS	N/A	Xylene	GC
75	Furnace	Ash	GS	N/A	Xylene	GC
75	Furnace	Ash	GS	N/A	Xylene	GC
75	Furnace	Ash	GS	N/A	Xylene	GC/MS
75	Cyclone	Sludge	GS	N/A	Xylene	GC
75	Cyclone	Sludge	GS	N/A	Xylene	GC
75	Cyclone	Sludge	GS	N/A	Xylene	GC
75	Cyclone	Sludge	GS	N/A	Xylene	GC/MS
77	ESP	FA	GS	N/A	Soxhlet/Hexane	GC/MS
77	ESP	FA	GS	N/A	Soxhlet/Hexane	GC/MS
77	ESP	FA	GS	N/A	Soxhlet/Hexane	GC/MS
77	ESP	FA	GS	N/A	Soxhlet/Hexane	GC/MS
77	ESP	FA	GS	N/A	Soxhlet/Hexane	GC/MS
77	ESP	FA	GS	N/A	Soxhlet/Hexane	GC/MS
77	ESP	FA	GS	N/A	Soxhlet/Hexane	GC/MS
77	ESP	FA	GS	N/A	Soxhlet/Hexane	GC/MS
77	ESP	FA	GS	N/A	Soxhlet/Hexane	GC/MS
77	ESP	FA	GS	N/A	Soxhlet/Hexane	GC/MS
77	Stack	FA	N/A	N/A	Soxhlet/Hexane	GC/MS
77	Stack	FA	N/A	N/A	Soxhlet/Hexane	GC/MS
77	Stack	FA	N/A	N/A	Soxhlet/Hexane	GC/MS
77	Stack	FA	N/A	N/A	Soxhlet/Hexane	GC/MS
77	Stack	FA	N/A	N/A	Soxhlet/Hexane	GC/MS
77	Stack	FA	N/A	N/A	Soxhlet/Hexane	GC/MS
77	Stack	FA	N/A	N/A	Soxhlet/Hexane	GC/MS
77	Stack	FA	N/A	N/A	Soxhlet/Hexane	GC/MS
77	Stack	FA	N/A	N/A	Soxhlet/Hexane	GC/MS
77	Stack	FA	N/A	N/A	Soxhlet/Hexane	GC/MS
*84	Stack	FG/FA	MM5T	3 Tests/4 Days	Methanol/Hexane	GC/MS
*84	Stack	FG/FA	MM5T	3 Tests/4 Days	Methanol/Hexane	GC/MS
*84	Stack	FG/FA	MM5T	3 Tests/4 Days	Methanol/Hexane	GC/MS
*84	Stack	FG/FA	MM5T	3 Tests/4 Days	Methanol/Hexane	GC/MS
*84	Stack	FG/FA	MM5T	3 Tests/2 Days	Methanol/Hexane	GC/MS
*84	Stack	FG/FA	MM5T	3 Tests/2 Days	Methanol/Hexane	GC/MS
*84	Stack	FG/FA	MM5T	3 Tests/2 Days	Methanol/Hexane	GC/MS
*84	Stack	FG/FA	MM5T	3 Tests/2 Days	Methanol/Hexane	GC/MS
86	ESP	FA	GS	5 months	Soxhlet/Toluene(24 hr)	GC/MS
86	ESP	FA	GS	5 months	Soxhlet/Toluene(24 hr)	GC/MS
86	ESP	FA	GS	5 months	Soxhlet/Toluene(24 hr)	GC/MS
86	ESP	FA	GS	5 months	Soxhlet/Toluene(24 hr)	GC/MS
86	ESP	FA	GS	5 months	Soxhlet/Toluene(24 hr)	GC/MS

MUNICIPAL WASTE COMBUSTORS

REF #	DETECTION LIMITS	ISOMER	ISOMER CONC.	DATA VARIABILITY	PRECURSORS
75	N/A	OCDD	390 ng/g	N/A	MSW
75	N/A	H6CDD	ND	N/A	MSW
75	N/A	H7CDD	5 ng/g	N/A	MSW
75	N/A	OCDD	13 ng/g	N/A	MSW
75	N/A	OCDD	10 ng/g	N/A	MSW
75	N/A	H6CDD	ND	N/A	MSW
75	N/A	H7CDD	3 ng/g	N/A	MSW
75	N/A	OCDD	7 ng/g	N/A	MSW
75	N/A	OCDD	8 ng/g	N/A	MSW
75	N/A	H6CDD	ND	N/A	MSW
75	N/A	H7CDD	5 ng/g	N/A	MSW
75	N/A	OCDD	5 ng/g	N/A	MSW
75	N/A	OCDD	ND	N/A	MSW
75	N/A	H6CDD	ND	N/A	MSW
75	N/A	H7CDD	1 ng/g	N/A	MSW
75	N/A	OCDD	3 ng/g	N/A	MSW
75	N/A	OCDD	3 ng/g	N/A	MSW
75	N/A	H6CDD	ND	N/A	MSW
75	N/A	H7CDD	1 ng/g	N/A	MSW
75	N/A	OCDD	1 ng/g	N/A	MSW
75	N/A	OCDD	ND	N/A	MSW
77	N/A	TCDD	54 ppb	5 - 110 ppb	MSW
77	N/A	P5CDD	122 ppb	31 - 485 ppb	MSW
77	N/A	HCDD	326 ppb	90 - 1200 ppb	MSW
77	N/A	H7CDD	285 ppb	190 - 902 ppb	MSW
77	N/A	OCDD	106 ppb	110 - 266 ppb	MSW
77	N/A	TCDF	111 ppb	13 - 223 ppb	MSW
77	N/A	P5CDF	196 ppb	42 - 510 ppb	MSW
77	N/A	HCDF	361 ppb	109 - 870 ppb	MSW
77	N/A	H7CDF	177 ppb	89 - 407 ppb	MSW
77	N/A	OCDF	18 ppb	20 - 26 ppb	MSW
77	N/A	TCDD	100 ppb	N/A	MSW
77	N/A	P5CDD	800 ppb	N/A	MSW
77	N/A	HCDD	1370 ppb	N/A	MSW
77	N/A	H7CDD	1370 ppb	N/A	MSW
77	N/A	OCDD	310 ppb	N/A	MSW
77	N/A	TCDF	460 ppb	N/A	MSW
77	N/A	P5CDF	960 ppb	N/A	MSW
77	N/A	HCDF	1600 ppb	N/A	MSW
77	N/A	H7CDF	1130 ppb	N/A	MSW
77	N/A	OCDF	140 ppb	N/A	MSW
*84	N/A	TCDD	443 ng/m3	253 - 770 ng/m3	Refuse
*84	N/A	PCDD	3,221 ng/m3	1,236 - 4,297 ng/m3	Refuse
*84	N/A	TCDF	2512 ng/m3	697 - 5,350 ng/m3	Refuse
*84	N/A	PCDF	5586 ng/m3	1,991 - 8,350 ng/m3	Refuse
*84	N/A	TCDD	1.6 ng/m3	0.4 - 3.9 ng/m3	RDF
*84	N/A	PCDD	34.3 ng/m3	7.7 - 60.3 ng/m3	RDF
*84	N/A	TCDF	16.5 ng/m3	8.2 - 30.8 ng/m3	RDF
*84	N/A	PCDF	81.9 ng/m3	26.0 - 169.2 ng/m3	RDF
86	N/A	TCDD	24 ppb	N/A	MSW
86	N/A	H6CDD	136 ppb	N/A	MSW
86	N/A	OCDD	51 ppb	N/A	MSW
86	N/A	TCDF	91 ppb	N/A	MSW
86	N/A	H6CDF	82 ppb	N/A	MSW

REF #	SAMPLING ORGANIZATION	RATING
75	Inst Chim Anali, Univ di Roma	G
75	Inst Chim Anali, Univ di Roma	I
75	Inst Chim Anali, Univ di Roma	G
75	Inst Chim Anali, Univ di Roma	G
75	Inst Chim Anali, Univ di Roma	G
75	Inst Chim Anali, Univ di Roma	I
75	Inst Chim Anali, Univ di Roma	G
75	Inst Chim Anali, Univ di Roma	G
75	Inst Chim Anali, Univ di Roma	G
75	Inst Chim Anali, Univ di Roma	I
75	Inst Chim Anali, Univ di Roma	G
75	Inst Chim Anali, Univ di Roma	G
75	Inst Chim Anali, Univ di Roma	I
75	Inst Chim Anali, Univ di Roma	I
75	Inst Chim Anali, Univ di Roma	G
75	Inst Chim Anali, Univ di Roma	G
75	Inst Chim Anali, Univ di Roma	G
75	Inst Chim Anali, Univ di Roma	I
75	Inst Chim Anali, Univ di Roma	G
75	Inst Chim Anali, Univ di Roma	G
75	Inst Chim Anali, Univ di Roma	I
77	Univ. of Amsterdam	G
77	Univ. of Amsterdam	G
77	Univ. of Amsterdam	G
77	Univ. of Amsterdam	G
77	Univ. of Amsterdam	G
77	Univ. of Amsterdam	G
77	Univ. of Amsterdam	G
77	Univ. of Amsterdam	G
77	Univ. of Amsterdam	G
77	Univ. of Amsterdam	G
77	Univ. of Amsterdam	G
77	Univ. of Amsterdam	G
77	Univ. of Amsterdam	G
77	Univ. of Amsterdam	G
77	Univ. of Amsterdam	G
77	Univ. of Amsterdam	G
77	Univ. of Amsterdam	G
77	Univ. of Amsterdam	G
77	Univ. of Amsterdam	G
77	Univ. of Amsterdam	G
*84	Scott Env. Services	G
*84	Scott Env. Services	G
*84	Scott Env. Services	G
*84	Scott Env. Services	G
*84	Scott Env. Services	G
*84	Scott Env. Services	G
*84	Scott Env. Services	G
*84	Scott Env. Services	G
86	Univ. of Amsterdam	G
86	Univ. of Amsterdam	G
86	Univ. of Amsterdam	G
86	Univ. of Amsterdam	G
86	Univ. of Amsterdam	G

REF #	SOURCE TYPE	FACILITY	SOURCE CHARACT.
86	MUNICIPAL WASTE COMBUSTORS	Arnnem, Netherlands	N/A
86	MUNICIPAL WASTE COMBUSTORS	Leewarden, Netherlands	N/A
86	MUNICIPAL WASTE COMBUSTORS	Leewarden, Netherlands	N/A
86	MUNICIPAL WASTE COMBUSTORS	Leewarden, Netherlands	N/A
86	MUNICIPAL WASTE COMBUSTORS	Leewarden, Netherlands	N/A
86	MUNICIPAL WASTE COMBUSTORS	Leewarden, Netherlands	N/A
86	MUNICIPAL WASTE COMBUSTORS	Leewarden, Netherlands	N/A
86	MUNICIPAL WASTE COMBUSTORS	Leiden, Netherlands	N/A
86	MUNICIPAL WASTE COMBUSTORS	Leiden, Netherlands	N/A
86	MUNICIPAL WASTE COMBUSTORS	Leiden, Netherlands	N/A
86	MUNICIPAL WASTE COMBUSTORS	Leiden, Netherlands	N/A
86	MUNICIPAL WASTE COMBUSTORS	Leiden, Netherlands	N/A
86	MUNICIPAL WASTE COMBUSTORS	Leiden, Netherlands	N/A
86	MUNICIPAL WASTE COMBUSTORS	Rijnmond, Netherlands	N/A
86	MUNICIPAL WASTE COMBUSTORS	Rijnmond, Netherlands	N/A
86	MUNICIPAL WASTE COMBUSTORS	Rijnmond, Netherlands	N/A
86	MUNICIPAL WASTE COMBUSTORS	Rijnmond, Netherlands	N/A
86	MUNICIPAL WASTE COMBUSTORS	Rijnmond, Netherlands	N/A
86	MUNICIPAL WASTE COMBUSTORS	Rijnmond, Netherlands	N/A
86	MUNICIPAL WASTE COMBUSTORS	Roosendaal, Netherlands	N/A
86	MUNICIPAL WASTE COMBUSTORS	Roosendaal, Netherlands	N/A
86	MUNICIPAL WASTE COMBUSTORS	Roosendaal, Netherlands	N/A
86	MUNICIPAL WASTE COMBUSTORS	Roosendaal, Netherlands	N/A
86	MUNICIPAL WASTE COMBUSTORS	Roosendaal, Netherlands	N/A
86	MUNICIPAL WASTE COMBUSTORS	Roosendaal, Netherlands	N/A
86	MUNICIPAL WASTE COMBUSTORS	Rotterdam, Netherlands	N/A
86	MUNICIPAL WASTE COMBUSTORS	Rotterdam, Netherlands	N/A
86	MUNICIPAL WASTE COMBUSTORS	Rotterdam, Netherlands	N/A
86	MUNICIPAL WASTE COMBUSTORS	Rotterdam, Netherlands	N/A
86	MUNICIPAL WASTE COMBUSTORS	Rotterdam, Netherlands	N/A
86	MUNICIPAL WASTE COMBUSTORS	Rotterdam, Netherlands	N/A
86	MUNICIPAL WASTE COMBUSTORS	Alkamaar, Netherlands	N/A
86	MUNICIPAL WASTE COMBUSTORS	Alkamaar, Netherlands	N/A
86	MUNICIPAL WASTE COMBUSTORS	Alkamaar, Netherlands	N/A
86	MUNICIPAL WASTE COMBUSTORS	Alkamaar, Netherlands	N/A
86	MUNICIPAL WASTE COMBUSTORS	Alkamaar, Netherlands	N/A
86	MUNICIPAL WASTE COMBUSTORS	Alkamaar, Netherlands	N/A
86	MUNICIPAL WASTE COMBUSTORS	Amsterdam, Netherlands	N/A
86	MUNICIPAL WASTE COMBUSTORS	Amsterdam, Netherlands	N/A
86	MUNICIPAL WASTE COMBUSTORS	Amsterdam, Netherlands	N/A
86	MUNICIPAL WASTE COMBUSTORS	Amsterdam, Netherlands	N/A
86	MUNICIPAL WASTE COMBUSTORS	Amsterdam, Netherlands	N/A
86	MUNICIPAL WASTE COMBUSTORS	Amsterdam, Netherlands	N/A
86	MUNICIPAL WASTE COMBUSTORS	Zaanstad, Netherlands	N/A
86	MUNICIPAL WASTE COMBUSTORS	Zaanstad, Netherlands	N/A
86	MUNICIPAL WASTE COMBUSTORS	Zaanstad, Netherlands	N/A
86	MUNICIPAL WASTE COMBUSTORS	Zaanstad, Netherlands	N/A
86	MUNICIPAL WASTE COMBUSTORS	Zaanstad, Netherlands	N/A
86	MUNICIPAL WASTE COMBUSTORS	Zaanstad, Netherlands	N/A
86	MUNICIPAL WASTE COMBUSTORS	Zaanstad, Netherlands	N/A
86	MUNICIPAL WASTE COMBUSTORS	Zaanstad, Netherlands	N/A
86	MUNICIPAL WASTE COMBUSTORS	Zaanstad, Netherlands	N/A
86	MUNICIPAL WASTE COMBUSTORS	Zaanstad, Netherlands	N/A
86	MUNICIPAL WASTE COMBUSTORS	Zaanstad, Netherlands	N/A

REF #	PROCESSES	SAMPLE	METHOD	SAMPLE NUM.	EXTRACTION	ANALYSIS
86	ESP	FA	GS	5 months	Soxhlet/Toluene(24 hr)	GC/MS
86	ESP	FA	GS	5 months	Soxhlet/Toluene(24 hr)	GC/MS
86	ESP	FA	GS	5 months	Soxhlet/Toluene(24 hr)	GC/MS
86	ESP	FA	GS	5 months	Soxhlet/Toluene(24 hr)	GC/MS
86	ESP	FA	GS	5 months	Soxhlet/Toluene(24 hr)	GC/MS
86	ESP	FA	GS	5 months	Soxhlet/Toluene(24 hr)	GC/MS
86	ESP	FA	GS	5 months	Soxhlet/Toluene(24 hr)	GC/MS
86	ESP	FA	GS	5 months	Soxhlet/Toluene(24 hr)	GC/MS
86	ESP	FA	GS	5 months	Soxhlet/Toluene(24 hr)	GC/MS
86	ESP	FA	GS	5 months	Soxhlet/Toluene(24 hr)	GC/MS
86	ESP	FA	GS	5 months	Soxhlet/Toluene(24 hr)	GC/MS
86	ESP	FA	GS	5 months	Soxhlet/Toluene(24 hr)	GC/MS
86	ESP	FA	GS	5 months	Soxhlet/Toluene(24 hr)	GC/MS
86	ESP	FA	GS	5 months	Soxhlet/Toluene(24 hr)	GC/MS
86	ESP	FA	GS	5 months	Soxhlet/Toluene(24 hr)	GC/MS
86	ESP	FA	GS	5 months	Soxhlet/Toluene(24 hr)	GC/MS
86	ESP	FA	GS	5 months	Soxhlet/Toluene(24 hr)	GC/MS
86	ESP	FA	GS	5 months	Soxhlet/Toluene(24 hr)	GC/MS
86	ESP	FA	GS	5 months	Soxhlet/Toluene(24 hr)	GC/MS
86	ESP	FA	GS	5 months	Soxhlet/Toluene(24 hr)	GC/MS
86	ESP	FA	GS	5 months	Soxhlet/Toluene(24 hr)	GC/MS
86	ESP	FA	GS	5 months	Soxhlet/Toluene(24 hr)	GC/MS
86	ESP	FA	GS	5 months	Soxhlet/Toluene(24 hr)	GC/MS
86	ESP	FA	GS	5 months	Soxhlet/Toluene(24 hr)	GC/MS
86	ESP	FA	GS	5 months	Soxhlet/Toluene(24 hr)	GC/MS
86	ESP	FA	GS	5 months	Soxhlet/Toluene(24 hr)	GC/MS
86	ESP	FA	GS	5 months	Soxhlet/Toluene(24 hr)	GC/MS
86	ESP	FA	GS	5 months	Soxhlet/Toluene(24 hr)	GC/MS
86	ESP	FA	GS	5 months	Soxhlet/Toluene(24 hr)	GC/MS
86	ESP	FA	GS	5 months	Soxhlet/Toluene(24 hr)	GC/MS
86	ESP	FA	GS	5 months	Soxhlet/Toluene(24 hr)	GC/MS
86	ESP	FA	GS	17 Samples/1.5 years	Soxhlet/Toluene(24 hr)	GC/MS
86	ESP	FA	GS	17 Samples/1.5 years	Soxhlet/Toluene(24 hr)	GC/MS
86	ESP	FA	GS	17 Samples/1.5 years	Soxhlet/Toluene(24 hr)	GC/MS
86	ESP	FA	GS	17 Samples/1.5 years	Soxhlet/Toluene(24 hr)	GC/MS
86	ESP	FA	GS	17 Samples/1.5 years	Soxhlet/Toluene(24 hr)	GC/MS
86	ESP	FA	GS	17 Samples/1.5 years	Soxhlet/Toluene(24 hr)	GC/MS
86	ESP	FA	GS	14 Samples/1.5 years	Soxhlet/Toluene(24 hr)	GC/MS
86	ESP	FA	GS	14 Samples/1.5 years	Soxhlet/Toluene(24 hr)	GC/MS
86	ESP	FA	GS	14 Samples/1.5 years	Soxhlet/Toluene(24 hr)	GC/MS
86	ESP	FA	GS	14 Samples/1.5 years	Soxhlet/Toluene(24 hr)	GC/MS
86	ESP	FA	GS	14 Samples/1.5 years	Soxhlet/Toluene(24 hr)	GC/MS
86	ESP	FA	GS	14 Samples/1.5 years	Soxhlet/Toluene(24 hr)	GC/MS
86	ESP	FA	GS	23 Samples/1.5 years	Soxhlet/Toluene(24 hr)	GC/MS
86	ESP	FA	GS	23 Samples/1.5 years	Soxhlet/Toluene(24 hr)	GC/MS
86	ESP	FA	GS	23 Samples/1.5 years	Soxhlet/Toluene(24 hr)	GC/MS
86	ESP	FA	GS	23 Samples/1.5 years	Soxhlet/Toluene(24 hr)	GC/MS
86	ESP	FA	GS	23 Samples/1.5 years	Soxhlet/Toluene(24 hr)	GC/MS
86	ESP	FA	GS	23 Samples/1.5 years	Soxhlet/Toluene(24 hr)	GC/MS
86	ESP	FA	Cont. S	10/2 hrs	Soxhlet/Toluene(24 hr)	GC/MS
86	ESP	FA	Cont. S	10/2 hrs	Soxhlet/Toluene(24 hr)	GC/MS
86	ESP	FA	Cont. S	10/2 hrs	Soxhlet/Toluene(24 hr)	GC/MS
86	ESP	FA	Cont. S	10/2 hrs	Soxhlet/Toluene(24 hr)	GC/MS
86	ESP	FA	Cont. S	10/2 hrs	Soxhlet/Toluene(24 hr)	GC/MS

REF #	DETECTION LIMITS	ISOMER	ISOMER CONC.	DATA VARIABILITY	PRECURSORS
86	N/A	OCDF	11 ppb	N/A	MSW
86	N/A	TCDD	226 ppb	N/A	MSW
86	N/A	H6CDD	560 ppb	N/A	MSW
86	N/A	OCDD	110 ppb	N/A	MSW
86	N/A	TCDF	240 ppb	N/A	MSW
86	N/A	H6CDF	280 ppb	N/A	MSW
86	N/A	OCDF	10 ppb	N/A	MSW
86	N/A	TCDD	212 ppb	N/A	MSW
86	N/A	H6CDD	910 ppb	N/A	MSW
86	N/A	OCDD	550 ppb	N/A	MSW
86	N/A	TCDF	220 ppb	N/A	MSW
86	N/A	H6CDF	530 ppb	N/A	MSW
86	N/A	OCDF	110 ppb	N/A	MSW
86	N/A	TCDD	ND	N/A	MSW
86	N/A	H6CDD	10 ppb	N/A	MSW
86	N/A	OCDD	10 ppb	N/A	MSW
86	N/A	TCDF	50 ppb	N/A	MSW
86	N/A	H6CDF	60 ppb	N/A	MSW
86	N/A	OCDF	10 ppb	N/A	MSW
86	N/A	TCDD	40 ppb	N/A	MSW
86	N/A	H6CDD	330 ppb	N/A	MSW
86	N/A	OCDD	190 ppb	N/A	MSW
86	N/A	TCDF	110 ppb	N/A	MSW
86	N/A	H6CDF	150 ppb	N/A	MSW
86	N/A	OCDF	40 ppb	N/A	MSW
86	N/A	TCDD	15 ppb	N/A	MSW
86	N/A	H6CDD	140 ppb	N/A	MSW
86	N/A	OCDD	190 ppb	N/A	MSW
86	N/A	TCDF	70 ppb	N/A	MSW
86	N/A	H6CDF	70 ppb	N/A	MSW
86	N/A	OCDF	20 ppb	N/A	MSW
86	N/A	TCDD	113.8 ppb	50 - 206	MSW
86	N/A	H6CDD	435.2 ppb	190 - 892 ppb	MSW
86	N/A	OCDD	96.4 ppb	22 - 236 ppb	MSW
86	N/A	TCDF	220.1 ppb	76 - 410 ppb	MSW
86	N/A	H6CDF	421.2 ppb	160 - 1260 ppb	MSW
86	N/A	OCDF	18 ppb	0 - 126 ppb	MSW
86	N/A	TCDD	14.1 ppb	2-29 ppb	MSW
86	N/A	H6CDD	152.2 ppb	40 - 283 ppb	MSW
86	N/A	OCDD	401.0 ppb	23 - 1565 ppb	MSW
86	N/A	TCDF	61.5 ppb	12 - 184 ppb	MSW
86	N/A	H6CDF	128.3 ppb	29 - 287 ppb	MSW
86	N/A	OCDF	28.0 ppb	ND - 97 ppb	MSW
86	N/A	TCDD	106.5 ppb	19 - 295 ppb	MSW
86	N/A	H6CDD	730.9 ppb	49 - 1600 ppb	MSW
86	N/A	OCDD	358.7 ppb	37 - 1017 ppb	MSW
86	N/A	TCDF	211.0 ppb	20 - 471 ppb	MSW
86	N/A	H6CDF	590.0 ppb	92 - 1330 ppb	MSW
86	N/A	OCDF	60.13 ppb	4 - 223 ppb	MSW
86	N/A	TCDD	88.8 ppb	61 - 135 ppb	MSW
86	N/A	P5CDD	433.8 ppb	242 - 633 ppb	MSW
86	N/A	H6CDD	1576.3 ppb	1070 - 2030 ppb	MSW
86	N/A	H7CDD	1701.5 ppb	1160 - 2140 ppb	MSW
86	N/A	OCDD	1372.6 ppb	598 - 1550 ppb	MSW

REF #	SAMPLING ORGANIZATION	RATING
86	Univ. of Amsterdam	G
86	Univ. of Amsterdam	G
86	Univ. of Amsterdam	G
86	Univ. of Amsterdam	G
86	Univ. of Amsterdam	G
86	Univ. of Amsterdam	G
86	Univ. of Amsterdam	G
86	Univ. of Amsterdam	G
86	Univ. of Amsterdam	G
86	Univ. of Amsterdam	G
86	Univ. of Amsterdam	G
86	Univ. of Amsterdam	G
86	Univ. of Amsterdam	G
86	Univ. of Amsterdam	I
86	Univ. of Amsterdam	G
86	Univ. of Amsterdam	G
86	Univ. of Amsterdam	G
86	Univ. of Amsterdam	G
86	Univ. of Amsterdam	G
86	Univ. of Amsterdam	G
86	Univ. of Amsterdam	G
86	Univ. of Amsterdam	G
86	Univ. of Amsterdam	G
86	Univ. of Amsterdam	G
86	Univ. of Amsterdam	G
86	Univ. of Amsterdam	G
86	Univ. of Amsterdam	G
86	Univ. of Amsterdam	G
86	Univ. of Amsterdam	G
86	Univ. of Amsterdam	G
86	Univ. of Amsterdam	G
86	Univ. of Amsterdam	G
86	Univ. of Amsterdam	G
86	Univ. of Amsterdam	G
86	Univ. of Amsterdam	G
86	Univ. of Amsterdam	G
86	Univ. of Amsterdam	G
86	Univ. of Amsterdam	G
86	Univ. of Amsterdam	G
86	Univ. of Amsterdam	G
86	Univ. of Amsterdam	G
86	Univ. of Amsterdam	G
86	Univ. of Amsterdam	G
86	Univ. of Amsterdam	G
86	Univ. of Amsterdam	G
86	Univ. of Amsterdam	G
86	Univ. of Amsterdam	G
86	Univ. of Amsterdam	G
86	Univ. of Amsterdam	G
86	Univ. of Amsterdam	G
86	Univ. of Amsterdam	G
86	Univ. of Amsterdam	G
86	Univ. of Amsterdam	G
86	Univ. of Amsterdam	G

MUNICIPAL WASTE COMBUSTORS

REF #	SOURCE TYPE	FACILITY	SOURCE CHARACT.
86	MUNICIPAL WASTE COMBUSTORS	Zaanstad, Netherlands	N/A
86	MUNICIPAL WASTE COMBUSTORS	Zaanstad, Netherlands	N/A
86	MUNICIPAL WASTE COMBUSTORS	Zaanstad, Netherlands	N/A
86	MUNICIPAL WASTE COMBUSTORS	Zaanstad, Netherlands	N/A
86	MUNICIPAL WASTE COMBUSTORS	Zaanstad, Netherlands	N/A
86	MUNICIPAL WASTE COMBUSTORS	Zaanstad, Netherlands	N/A
86	MUNICIPAL WASTE COMBUSTORS	Zaanstad, Netherlands	N/A
86	MUNICIPAL WASTE COMBUSTORS	Zaanstad, Netherlands	N/A
86	MUNICIPAL WASTE COMBUSTORS	Zaanstad, Netherlands	N/A
86	MUNICIPAL WASTE COMBUSTORS	Zaanstad, Netherlands	N/A
86	MUNICIPAL WASTE COMBUSTORS	Zaanstad, Netherlands	N/A
86	MUNICIPAL WASTE COMBUSTORS	Zaanstad, Netherlands	N/A
86	MUNICIPAL WASTE COMBUSTORS	Zaanstad, Netherlands	N/A
86	MUNICIPAL WASTE COMBUSTORS	Zaanstad, Netherlands	N/A
86	MUNICIPAL WASTE COMBUSTORS	Zaanstad, Netherlands	N/A
87	MUNICIPAL WASTE COMBUSTORS	N/A	Spiked MSW
87	MUNICIPAL WASTE COMBUSTORS	N/A	Spiked MSW
87	MUNICIPAL WASTE COMBUSTORS	N/A	Spiked MSW
87	MUNICIPAL WASTE COMBUSTORS	N/A	Spiked MSW
89	MUNICIPAL WASTE COMBUSTORS	SWARA Plant, Canada	Traveling Grate Boiler
89	MUNICIPAL WASTE COMBUSTORS	SWARA Plant, Canada	Traveling Grate Boiler
89	MUNICIPAL WASTE COMBUSTORS	SWARA Plant, Canada	Traveling Grate Boiler
89	MUNICIPAL WASTE COMBUSTORS	SWARA Plant, Canada	Traveling Grate Boiler
89	MUNICIPAL WASTE COMBUSTORS	SWARA Plant, Canada	Traveling Grate Boiler
89	MUNICIPAL WASTE COMBUSTORS	SWARA Plant, Canada	Traveling Grate Boiler
89	MUNICIPAL WASTE COMBUSTORS	SWARA Plant, Canada	Traveling Grate Boiler
89	MUNICIPAL WASTE COMBUSTORS	SWARA Plant, Canada	Traveling Grate Boiler
97	MUNICIPAL WASTE COMBUSTORS	Chicago NW	Raw Refuse Incineration 650C)
97	MUNICIPAL WASTE COMBUSTORS	Chicago NW	Raw Refuse Incineration 650C)
97	MUNICIPAL WASTE COMBUSTORS	Chicago NW	Raw Refuse Incineration 650C)
97	MUNICIPAL WASTE COMBUSTORS	Chicago NW	Raw Refuse Incineration 650C)
97	MUNICIPAL WASTE COMBUSTORS	Ames, Iowa	Coal/RDF Incineration (1200C)
101	MUNICIPAL WASTE COMBUSTORS	5 Incin. (North American)	N/A
101	MUNICIPAL WASTE COMBUSTORS	5 Incin. (North American)	N/A
101	MUNICIPAL WASTE COMBUSTORS	5 Incin. (North American)	N/A
101	MUNICIPAL WASTE COMBUSTORS	5 Incin. (North American)	N/A
110	MUNICIPAL WASTE COMBUSTORS	KVA, Zurich-Josefstrasse	N/A
114	MUNICIPAL WASTE COMBUSTORS	Hempstead	RDF/Energy Recovery
118	MUNICIPAL WASTE COMBUSTORS	Utility Plant (1)	N/A
118	MUNICIPAL WASTE COMBUSTORS	Utility Plant (1)	N/A
118	MUNICIPAL WASTE COMBUSTORS	Utility Plant (1)	N/A

REF #	PROCESSES	SAMPLE	METHOD	SAMPLE NUM.	EXTRACTION	ANALYSIS
86	ESP	FA	Cont. S	10/2 hrs	Soxhlet/Toluene(24 hr)	GC/MS
86	ESP	FA	Cont. S	10/2 hrs	Soxhlet/Toluene(24 hr)	GC/MS
86	ESP	FA	Cont. S	10/2 hrs	Soxhlet/Toluene(24 hr)	GC/MS
86	ESP	FA	Cont. S	10/2 hrs	Soxhlet/Toluene(24 hr)	GC/MS
86	ESP	FA	Cont. S	10/2 hrs	Soxhlet/Toluene(24 hr)	GC/MS
86	Stack	FG	Train	14 samples/1.5 years	Soxhlet/Toluene(24 hr)	GC/MS
86	Stack	FG	Train	14 samples/1.5 years	Soxhlet/Toluene(24 hr)	GC/MS
86	Stack	FG	Train	14 samples/1.5 years	Soxhlet/Toluene(24 hr)	GC/MS
86	Stack	FG	Train	14 samples/1.5 years	Soxhlet/Toluene(24 hr)	GC/MS
86	Stack	FG	Train	14 samples/1.5 years	Soxhlet/Toluene(24 hr)	GC/MS
86	Stack	FG	Train	14 samples/1.5 years	Soxhlet/Toluene(24 hr)	GC/MS
86	Stack	FG	Train	14 samples/1.5 years	Soxhlet/Toluene(24 hr)	GC/MS
86	Stack	FG	Train	14 samples/1.5 years	Soxhlet/Toluene(24 hr)	GC/MS
86	Stack	FG	Train	14 samples/1.5 years	Soxhlet/Toluene(24 hr)	GC/MS
86	Stack	FG	Train	14 samples/1.5 years	Soxhlet/Toluene(24 hr)	GC/MS
87	Stack	FG/FA	N/A	6 Samples	N/A	GC/MS
87	Stack	FG/FA	N/A	6 Samples	N/A	GC/MS
87	Stack	FG/FA	N/A	6 Samples	N/A	GC/MS
87	Stack	FG/FA	N/A	6 Samples	N/A	GC/MS
89	-----	Feed	GS	15 Runs	N/A	GC/MS
89	-----	Feed	GS	15 Runs	N/A	GC/MS
89	Grate	Ash	GS	15 Runs	N/A	GC/MS
89	Grate	Ash	GS	15 Runs	N/A	GC/MS
89	ESP	Ash	GS	15 Runs	N/A	GC/MS
89	ESP	Ash	GS	15 Runs	N/A	GC/MS
89	Stack	FG/FA	MM5T	15 Runs	N/A	GC/MS
89	Stack	FG/FA	MM5T	15 Runs	N/A	GC/MS
97	Furnace	Ash	GS	10 Days	Soxhlet/Benzene (8-24 hr)	GC/MS
97	ESP	FA	GS	10 Days	Soxhlet/Benzene (8-24 hr)	GC/MS
97	Stack	FG	MM5T	10 Days	Soxhlet/Benzene (8-24 hr)	GC/MS
97	Stack	FG	MM5T	10 Days	Soxhlet/Benzene (8-24 hr)	GC/MS
97	Stack/ESP	FG/FA	MM5T/GS	9 Days	Soxhlet/Benzene (8-24 hr)	GC/MS
101	Stack	FA	Filter	5 Samples	Soxhlet	GC/MS
101	Stack	FA	Filter	5 Samples	Soxhlet	GC/MS
101	Stack	FA	Filter	5 Samples	Soxhlet	GC/MS
101	Stack	FA	Filter	5 Samples	Soxhlet	GC/MS
110	Stack	FA/FG	Filter	N/A	N/A	GC/MS
114	Stack	FA	SSAS	11	Methylene Chloride	GC/HRMS
118	ESP	FA	GS	N/A	Soxhlet	GC/MS
118	Hopper	FA	GS	N/A	Soxhlet	GC/MS
119	Stack	FG	MM5T	N/A	Soxhlet	GC/MS

REF #	DETECTION LIMITS	ISOMER	ISOMER CONC.	DATA VARIABILITY	PRECURSORS
86	N/A	TCDF	182.7 ppb	105 - 291 ppb	MSW
86	N/A	PECDF	379.1 ppb	202 - 565 ppb	MSW
86	N/A	H6CDF	863.1	566 - 1310 ppb	MSW
86	N/A	H7CDF	541.5 ppb	397 - 699 ppb	MSW
86	N/A	OCDF	94.2 ppb	37 - 145 ppb	MSW
86	N/A	TCDD	57.1 ng/Nm3	10 - 218 ng/Nm3	MSW
86	N/A	P5CDD	132.1 ng/Nm3	22 - 714 ng/Nm3	MSW
86	N/A	H6CDD	439.9 ng/Nm3	111 - 1955 ng/Nm3	MSW
86	N/A	H7CDD	177.0 ng/Nm3	124 - 922 ng/Nm3	MSW
86	N/A	OCDD	481.7 ng/Nm3	25 - 3711 ng/Nm3	MSW
86	N/A	TCDF	161.1 ng/Nm3	46 - 556 ng/Nm3	MSW
86	N/A	P5CDF	155.2 ng/Nm3	109 - 702 ng/Nm3	MSW
86	N/A	H6CDF	526.4 ng/Nm3	174 - 1437 ng/Nm3	MSW
86	N/A	H7CDF	204.2 ng/Nm3	155 - 504 ng/Nm3	MSW
86	N/A	OCDF	67.6 ng/Nm3	ND - 201 ng/Nm3	MSW
87	N/A	TCDD	21.5 ng/m3	14 - 31 ng/m3	MSW and Cl6 Benzene
87	N/A	PCDD	544 ng/m3	329 - 701 ng/m3	MSW and Cl6 Benzene
87	N/A	TCDF	48 ng/m3	26 - 65 ng/m3	MSW and Cl6 Benzene
87	N/A	PCDF	495 ng/m3	316 - 693 ng/m3	MSW and Cl6 Benzene
89	N/A	PCDD	19.8 ng/g	3.7 - 97.8 ng/g	RDF
89	N/A	PCDF	2.3 ng/g	ND - 25 ng/g	RDF
89	N/A	PCDD	0.5 ng/g	ND - 3.3 ng/g	RDF
89	N/A	PCDF	0.6 ng/g	ND - 3.9 ng/g	RDF
89	N/A	PCDD	20.0 ng/g	6.2 - 94.2 ng/g	RDF
89	N/A	PCDF	46 ng/g	22 - 105 ng/g	RDF
89	N/A	PCDD	3.68 ug/m3	1.3 - 11.1 ug/m3	RDF
89	N/A	PCDF	7.89 ug/m3	3.7 - 12.5 ug/m3	RDF
97	0.5 ng/g	PCDD/PCDF	ND	N/A	Raw MSW
97	0.5 ng/g	PCDD/PCDF	ND	N/A	Raw MSW
97	.25 ng/dscm	2378 TCDD	0.41 ng/dscm	N/A	Raw MSW
97	.25 ng/dscm	TCDD	6.3 ng/dscm	N/A	Raw MSW
97	.25 ng/dscm	PCDD/PCDF	ND	N/A	85% Coal/15% RDF
101	0.5 ng/g	TCDD	20.6 ng/g	2.4 - 85 ng/g	MSW
101	0.5 ng/g	PCDD	236.5 ng/g	31.2 - 200.1 ng/g	MSW
101	0.5 ng/g	TCDF	45.7 ng/g	4.4 - 209 ng/g	MSW
101	0.5 ng/g	PCDF	517.3 ng/g	64.0 - 2363 ng/g	MSW
110	N/A	PCDD/PCDF	N/A	4 - 50 ng/m3	MSW
114	N/A	TCDD	19.1 ng/sample	1.2-35 ng/sample	RDF/Biocide
118	N/A	PCDF	Detected	N/A	MSW/Coal
118	N/A	PCDF	Detected	N/A	MSW/Coal
118	N/A	PCDF	Detected	N/A	MSW/Coal

REF #	SAMPLING ORGANIZATION	RATING
86	Univ. of Amsterdam	G
86	Univ. of Amsterdam	G
86	Univ. of Amsterdam	G
86	Univ. of Amsterdam	G
86	Univ. of Amsterdam	G
86	Univ. of Amsterdam	G
86	Univ. of Amsterdam	G
86	Univ. of Amsterdam	G
86	Univ. of Amsterdam	G
86	Univ. of Amsterdam	G
86	Univ. of Amsterdam	G
86	Univ. of Amsterdam	G
86	Univ. of Amsterdam	G
86	Univ. of Amsterdam	G
86	Univ. of Amsterdam	G
87	Univ. of Amsterdam	I
87	Univ. of Amsterdam	I
87	Univ. of Amsterdam	I
87	Univ. of Amsterdam	I
89	Ontario Research Found.	G
89	Ontario Research Found.	G
89	Ontario Research Found.	G
89	Ontario Research Found.	G
89	Ontario Research Found.	G
89	Ontario Research Found.	G
89	Ontario Research Found.	G
89	Ontario Research Found.	G
97	TRW	G
97	TRW	G
97	TRW	G
97	TRW	G
97	TRW	G
101	Texas A&M Univ. Col of Vet Med	G
101	Texas A&M Univ. Col of Vet Med	G
101	Texas A&M Univ. Col of Vet Med	G
101	Texas A&M Univ. Col of Vet Med	G
110	Dubendorf, Swit. F.M.T. & E.I.	F
114	Wright State Univ.	G
118	DOE	G
118	DOE	G
118	DOE	G

APPENDIX B. DETERMINATION OF SAMPLE SIZE

PROBLEM: Determine number of municipal waste combustors that should be tested in order to estimate the average dioxin emission rate within a 10 ng/m^3 interval with 95 percent confidence.

Municipal Waste Combustors: Total population = 40

Site	TCDD (ng/m^3)
A	240
B	29.7
C	6.3
D	3.15
E	1.2
F	ND

Assume: Sampling from a finite population without replacement

$$n = \frac{N\ z^2\ SD^2}{d^2\ (N-1) + Z^2\ SD^2}$$

n = sample size
N = population size = 40
Z = reliability coeff = 2 (95% confidence)
SD = standard deviation
d = confidence interval = 5 ng/m^3

<u>Case I</u>: (all sites listed)

$\bar{x}$ = 46.7
SD - 87.0

$$n = \frac{40\ (2)^2\ (87)^2}{5^2\ 40-1) + 2^2\ (87)^2} = 39$$

<u>Case II</u>: (drop sites with highest and lowest average TCDD levels)
$\bar{x}$ = 10.1
SD = 11.46

$$n = \frac{40\ (2)^2\ (11.46)^2}{5^2\ (40-1) + 2^2\ (11.46)^2} = 14$$

SOLUTION: In order to estimate average dioxin emission rate for municipal waste combustors, 14-39 sources should be tested. Based on 95% confidence, results would be within 5 ng/m^3 of true mean.

APPENDIX C

CURRENT REFERENCE LIST

LIST OF REFERENCES PERTAINING TO CHLORINATED DIOXIN AND FURAN AIR EMISSIONS

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