Columbus Waste-to-Energy Municipal Incinerator
Dioxin Soil Sampling Project

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THE COLUMBUS DIOXIN SOIL SAMPLING PROJECT

1.0 EXECUTIVE SUMMARY

This report presents interim results of a dioxin soil sampling project conducted in the vicinity of the Columbus Waste-to-Energy (WTE) facility in Columbus, Ohio. This report describes the analytical procedures and quality assurance programs, and presents a summary of the final data set. This project was designed to assess the presence and degree of residual dioxin/furan soil concentrations in the vicinity of the facility, and specifically to determine whether surface soils around the incinerator contain dioxin/furans at levels distinguishable from background. It is part of a cooperative effort with the United States Environmental Protection Agency's (EPA) Office of Research and Development (ORD) Exposure Assessment and Risk Characterization Group, the EPA ORD Laboratory in Las Vegas, Nevada, EPA Region 5, the Agency for Toxic Substances and Disease Registry (ATSDR, Atlanta, GA), the Ohio Environmental Protection Agency (OEPA), the Ohio Department of Health (ODH), and other state and local agencies. Funding for the project was obtained under EPA's Regional Applied Research Effort (RARE) program.

There were a total of 25 samples in the final data set for analysis. This included 4 samples that were taken on the site of the Columbus WTE, 18 samples taken outside the Columbus WTE but within the Columbus urban area, and 3 samples taken at a background site 28 miles away. In general, examination of the data suggested that it could be logically seperated into four groups: 1) a set of 4 samples taken on the site of the incinerator, 2) a set of 4 samples taken directly off-site and in the predominant wind direction, 3) a set of 14 samples which were the other samples in the city of Columbus, and 4) the set of 3 background samples.

Analysis suggests that the cluster of samples on the site of the Columbus WTE are influenced by activities at the Columbus WTE. The average toxic equivalent concentration (TEQ) of the four samples is 356 parts per trillion (ppt). The cluster of samples just outside the Columbus WTE appear as well to have been influenced by the Columbus WTE, although the evidence for such influence is weaker than the evidence for the on-site samples. The average TEQ soil concentration is 49 ppt. The 14 samples within the city of Columbus average 10 ppt, and the background samples have a low average soil concentration of 1 ppt.

Other soil data in America and around the world support the generality that soil concentrations within urban centers are higher than in rural areas. Sources in urban centers are more numerous than in rural centers, another generally accepted conclusion which explains this observation regarding soil concentrations. Limited information summarized in this report generally place rural, background soil concentrations to be near to or less than 5 ppt, urban soil concentrations in a range of 10 to 30 ppt, and industrial concentrations exceeding 100 ppt. Based on emission testing, there can be little doubt that the Columbus WTE has been a source of dioxins in the Columbus urban environment. This study has not attempted to identify other sources, and particularly to place the Columbus WTE in any perspective with other sources in the city of

Columbus. This study has confirmed that soil concentrations appear to be higher within the city of Columbus, as compared to background soils. However, except for the two clusters of samples (on the incinerator site and just outside the property), the 14 samples within the city of Columbus do not appear to be elevated compared to limited information on urban soils in general, and in comparison to these two clusters.

2.0 PROJECT DESCRIPTION

This report presents interim results of a dioxin soil sampling project conducted in the vicinity of the Columbus Waste-to-Energy (WTE) facility in Columbus, Ohio. This report describes the analytical procedures and quality assurance programs, and presents a summary of the final data set. The United States Environmental Protection Agency (EPA) will continue to analyze this data with regard to interpretations and future monitoring activities.

Polychlorinated dibenzo-p-dioxins and polychlorinated dibenzofurans (dioxins and furans) constitute a class of related chemicals formed inadvertantly during various combustion and chemical processes. Congeners of dioxin differ in the number and position of chlorine atoms attached to the basic dioxin or furan ring system. These congeners also differ in their degree of toxicity, with compounds chorinated at the 2,3,7, and 8 positions on the dioxin or furan rings considered to contribute to some degree to toxicity. EPA has derived relative potency estimates for the seventeen 2,3,7,8,chlorine-substituted congeners, based on relative potency to 2,3,7,8-tetrachlorodibenzodiozin (2,3,7,8-TCDD), the most potent chemical in the class (USEPA, 1989). These measures of relative potency are applied to the concentrations of seventeen congeners to derive toxicologically equivalent concentrations (TEQ) of 2,3,7,8-TCDD. This document reports both TEQ concentrations of dioxin, and total dioxin concentration in the results section.

This project was designed to assess the presence and degree of residual dioxin/furan soil concentrations in the vicinity of the facility, and specifically to determine whether surface soils around the incinerator contain dioxin/furans at levels distinguishable from background. In addition, the results of this study may also be used to improve the general understanding about dioxin fate and transport.

This project is part of a cooperative effort with the EPA's Office of Research and Development (ORD) Exposure Assessment and Risk Characterization Group, the ORD Laboratory in Las Vegas, Nevada, EPA Region 5, the Agency for Toxic Substances and Disease Registry (ATSDR, Atlanta, GA), the Ohio Environmental Protection Agency (OEPA), the Ohio Department of Health (ODH), and other state and local agencies. Funding for the project was obtained under EPA's Regional Applied Research Effort (RARE) program.

2.1 Facility Background and Description

The Columbus Municipal Waste-to Energy facility is located on the south side of

Columbus, Ohio, adjacent to the Columbus Workhouse. The power generating plant, fueled by both coal and municipal refuse, began operation in June, 1983 and ceased operation in December, 1994. The facility has six boilers and is equipped with hot-side electrostatic precipitators (ESP). Wastes from the plant include fly ash which was collected in the ESP hopper, just prior to the stack discharge, and bottom ash, the residue remaining on the grate after incineration of the fuel. Prior to process modifications completed in June 1994, the emission rate of dioxin/furan TEQs from the incinerator had been estimated at $3.12*10^{-5}$ g TEQ/sec (OEPA, 1994a), which translates to an annual emission of 984 g TEQ. This estimate is based on emission testing conducted in 1992 which produced concentration measurements and emission gas volumes, and the assumption that, on a continuous basis, 4.22 of 6 boilers were in operation (OEPA, 1994a).

Although the facility is not currently operating, and therefore most of its potential risk from exposure to stack emissions no longer exists, there remains the question of potential impacts to humans and the environment through exposure to soils which contain residual dioxins as a result of past emissions.

In May 1994, the Ohio EPA and Department of Health petitioned the ATSDR and the EPA to investigate the impact of the dioxin emissions on the environment and on the health of the community. As a result of this petition a multi-agency workgroup was formed to provide study recommendations. A subgroup on environmental exposure, chaired by EPA but whose members included OEPA, ODH, ATSDR, local health departments and a citizen's group, came to consensus on recommending soil sampling to investigate potential impacts.

Of all possible environmental media to sample, the environmental exposure workgroup concluded that soil best fits the needs of this study. Soil is expected to be a good measure of cumulative deposition of dioxins because dioxins are tightly bound to soils and are expected to have a relatively long half-life in soils. USEPA (1994a) has estimated that residues of dioxins in surface soils may have a 10-year half-life, and Paustenbach, et al (1992) have evaluated the literature on dioxins and suggests that dioxin residues beneath the surface can have a half-life of 25-100 years. Another issue considered by the workgroup was the ability to relate environmental measurements of any kind to emissions from the Columbus WTE. Given that dioxins are ubiquitous in the environment (USEPA, 1994a), any conclusion that an environmental measurement can be tied to a specific source has to be carefully considered. The workgroup had established that a principal study objective was to evaluate the impact of the Columbus WTE, to the extent possible, and not to do a general study of the Columbus area. With this in mind, the workgroup decided that a focus on environmental measurements physically near the Columbus WTE would be less ambiguous than measurements taken several kilometers away from the Columbus WTE. Another consideration for the environmental workgroup was that the Columbus WTE had ceased operation in December of 1994. Therefore, monitoring of air quality was no longer an option for consideration for a study conducted in 1995. Finally, it was recognized that this study was to be a "screening" study. Depending on the results and their interpretation, the workgroup understood that further study may be warranted.

3.0 SITE SELECTION AND SAMPLING PROCEDURES

3.1. Sampling Strategy

Sampling locations included three types: (1) areas anticipated to be most impacted by WTE emissions; (2) locations typical of the urban area but expected to be impacted by the WTE facility to a lesser extent; and (3) areas remote from the WTE (i.e., a control site). Prevailing winds were considered in targeting locations in the Columbus area most likely to have been impacted by the WTE.

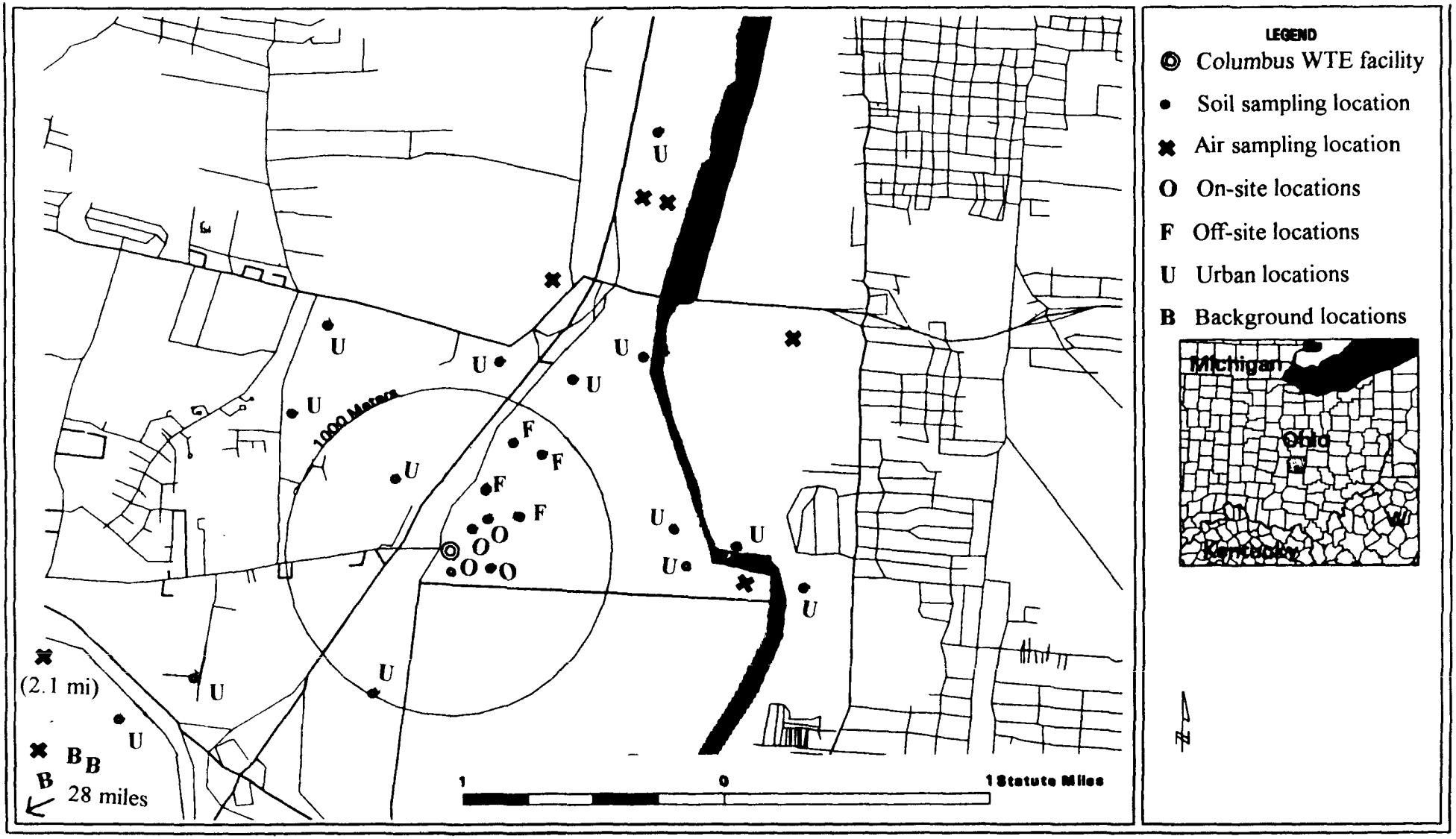
Figure 1 presents a topological map showing the area surrounding the WTE site; the circle represents the 1000-meter radii around the incinerator. Figure 2 shows a simple representation of the stratified random sampling plan. Stratified random sampling involves dividing the study area into two or more non-overlapping subsets (strata) which cover the entire area to be sampled. Stratification has been used to ensure that potentially significant areas of a site are represented in the sample data. Samples within a stratum are assumed to be more similar to each other than to samples from other strata. Additionally, a stratified random sample may provide more precise estimates of contaminant levels than those obtained from a simple random sample (USEPA, 1994b).

The four quadrants in Figure 2 can be thought of as four strata for study. Assuming that the incinerator is represented by the dot in the middle of Figure 2, the predominant wind direction is the top quadrant. Eight sampling locations were in the top quadrant. More samples were taken in this quadrant based on the assumption that dioxins would deposit more in the predominant wind direction than in other directions. As seen in Figure 2, the top quadrant was further divided into sub-strata. Three background samples were taken approximately 28 miles from the incinerator, and these locations are not shown in Figures 1 and 2. They are near the sampling location designated as #5 in the Franklin County Ohio Ambient Air Monitoring Study (OEPA, 1994b).

3.2 Sample Site Selection

Actual sample sites were selected through a series of on-site reconnaissance inspections. A list of these sites and general location descriptions is given in Attachment A. These locations were selected to conform to the stratified random sampling grid pattern shown in Figure 2. Because of the urban industrial Columbus WTE site location, it was impossible to meet all the criteria specified in the QAPP with respect to all possible dioxin sources. Samples were collected from sites having a level surface and a minimum potential for run-on/run-off from rain or snowmelt. Care was taken to sample undisturbed soils. Generally, undisturbed soils are those soils for which no tillage or other mixing has occurred. Information from mixed soils may be difficult to interpret with regard to long term depositions. Sites were also free of immediate tree cover. Trees may intercept dioxin depositions, and it would less clear how to interpret soil beneath trees as compared to soils in open settings. No sites were located near wooden structures

Figure 1. Columbus WTE site including soil sampling and air sampling sites.



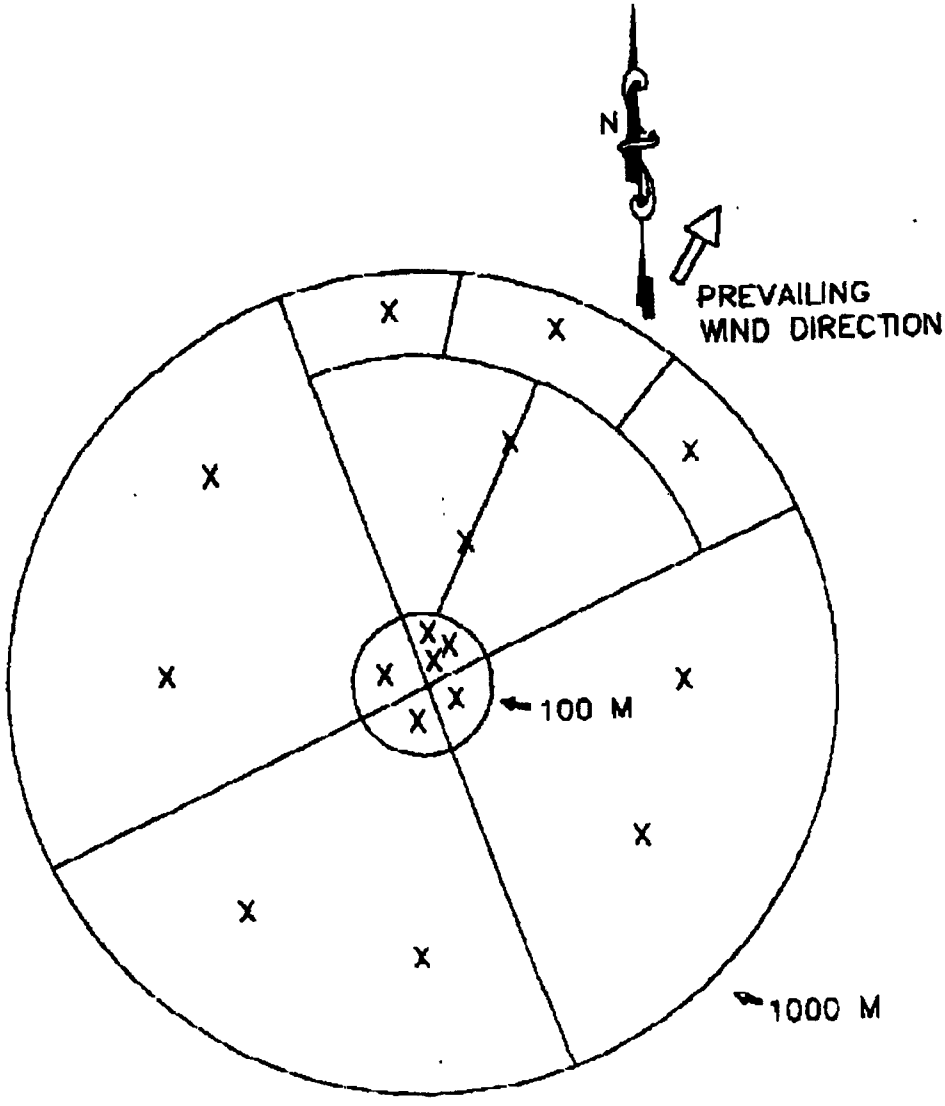


Figure 2. Representation of sampling design showing stratified approach.

where the wood may have been pressure treated. This decision was made because pentachlorophenol, or PCP, is known to be contaminated with dioxins, and soils near pressure treated wood may be influenced by the gradual leaching of dioxin residues from the treated wood. Finally, no sites were immediately adjacent to roads, although some of the sites were near roads. Roadside sampling was avoided so that results could not be attributed to vehicle emissions.

3.3 Sample Collection

Composite soil samples were collected at each of 27 difference sampling sites, on December 5-7, 1995. Samples were collected using pre-cleaned equipment dedicated to each sampling location. Each sample site consisted of an area of 5 ft x 5 ft. A grid of 25 sections was established at each site and used for random selection of aliquot sample sites. Four random aliquots were collected for each sample. A "sample" for this study was, therefore, a composite of four aliquots. Aliquots were collected using a stainless steel tulip bulb planting device. This device removed a plug approximately 3 inches (7.6 cm) in diameter to a depth of about 3 inches (7.6 cm).

Areas that were recently disturbed or which were in an obvious pathway were avoided. Before sampling, any plant materials were trimmed to just above the soil surface in the area to be sampled. The soil plugs were placed in an aluminum foil lined pan and miscellaneous debris (e.g., twigs, roots, wood chips, stones, pebbles and other non-soil material that could be distinguished) was removed by hand. A new set of gloves was used for each sample processed. The remaining soil was thoroughly mixed and randomly apportioned to sample containers. The sample containers were clear glass with teflon lids. Region 5 chain of custody procedures were followed. Samples were immediately tagged with a descriptive and unique label. Sample sites were permanently marked to allow for identification of sample point and resampling if necessary and were further documented with Global Positioning System determination of coordinates. Actual sample locations are shown in Figure 1. Samples were placed in ice chests and delivered directly to the laboratory the morning following the day of sampling. Samples were stored in the dark at 4 °C prior to analysis.

4.0 ANALYTICAL PROCEDURES

4.1. Quality Assurance Objectives

In order to use information from this project appropriately, the sample results must be technically sound and of defined and documented quality. To achieve this, and as required by the EPA for all monitoring and measurement programs, objectives must be established for data quality based on the proposed end use of the data (Stanley and Verner, 1985). The parameters generally accepted as indicators of data quality include precision, accuracy/bias, representativeness, completeness, and comparability. The detection/quantification limits of the method for the dioxin/furans in soil matrices is also of concern in that the analytical protocol (combined extraction and analysis) must reliably measure dioxin/furans at concentrations which will allow the discrimination of blanks, background samples, and routine samples. A Quality Assurance Project Plan (QAPP) was prepared for this study which specifies data quality objective, sampling, analytical and associated quality control activities to be performed (USEPA, 1995).

4.2. Summary of Analytical Method

Analytic Method 8290 (USEPA, 1994c) was used for the determination of the presence/absence and quantification of dioxins/furans (tetra- through octachlorinated homologues) in the soil samples. It uses high resolution gas chromatography/high resolution mass spectrometry (HRGC/HRMS) with selected ion monitoring (SIM), matrix-specific extraction, and analyte-specific cleanup. The target goals for the method detection limits (MDLs) were 1, 5, and 10 ppt or lower for the respective tetra, penta/hexa/hepta, and octa dioxan/furan congeners. Analysis was conducted on 43 samples in two sets. Included in each set was a method blanks, a matrix spike, a matrix spike duplicate and a sample duplicate.

Approximately 10 grams of each soil sample were used to determine percent solids (percent dry weight). Another 10 g of each sample were combined with sodium sulfate for extraction. All samples were spiked with isotopically labeled analogs of fifteen of the seventeen 2,3,7,8-substituted PCDD/PCDF prior to extraction. The samples were extracted for approximately 18 hours with toluene in a Soxhlet apparatus. Extracts were spiked with 37Cl4-2,3,7,8-TCDD cleanup standard, partitioned against base and acid solutions and processed through acid/base silica, basic alumina, and carbon AX-21/Celite® cleanup columns. Extracts were spiked with 1,2,3,4-TCDD- $^{13}C_{12}$- 1,2,3,7,8,9-HxCDD-$^{13}C_{12}$ recovery standard and concentrated to a final volume of 20 μL.

The sample extracts were analyzed on a VG AutoSpec® high resolution gas chromatography/high resolution mass spectrometer (HRGC/HRMS) (Serial #XO88, System #6744) in the selected ion monitoring mode on a J & W DB-5 capillary column® (Serial #4499117) at an instrument resolution of approximately 10,000 (10 percent valley). A Hewlett-Packard 5890 Series II Gas Chromatograph® (C128/83) served as the inlet. Data reduction was performed on a VAX station 3100, M38, Model ws42A-BC® (Serial #AB11300V6D) using Opus Quan® software. The criteria used to identify chromatographic peaks were: (1) greater than 2.5 signal to noise ratio; (2) ion abundance ratios within 15% of the theoretical values; (3) retention times of native analytes within 2 seconds of $^{13}C_{12}$-labelled internal standards; and (4) no diphenyl ether interferences. The target range for percent recoveries was 40-120%. Some samples were diluted to reduce chromatographic interference problems. The dilution factor is noted on individual analysis data sheets which are included in Attachment B. Because 2,3,7,8-TCDF is not completely resolved from all other tetrachlorinated isomers on the DB-5 column, second column confirmation of 2,3,7,8-TCDF levels above 1 pg/g dry weight in the initial analysis was performed on a J&W DB Dioxin Column® (Serial #2743516) for 14 samples.

The laboratory analysis was conducted by Battelle Laboratories (505 King Avenue, Columbus, Ohio, 43201-2693) under EPA Contract No. 68-D2-0139, under the supervision of EPA's ORD Laboratory in Las Vegas.

Attachments B and C show the results in detail. Attachment B gives the results for all 43 samples, and Attachment C summarizes the Quality Assurance data generated in the program.

4.3. Summary of the Data Analysis and Quality Assurance Results

4.3.1. Description of the data set

Forty-three analytical samples were submitted to Battelle for analysis including:

1) 27 field site samples. These included 24 samples taken in the city of Columbus and 3 samples taken 28 miles away in the background setting.

2) 3 field blanks. These field blanks were 500-mL glass jars rinsed with methylene chloride, filled about half full of playsand, and sealed with teflon tape. Prior to producing these blanks, analysis showed that playsand extract and jar rinsate samples were found to be free of PCDD/PCDF. These field blanks were put together at the Battelle laboratory. Samplers treated these samples in the field as if they were actual samples. Specifically, they opened the sealed jars, handled the sand as if it were a field soil sample, resealed the jars, and sent them to the laboratory along with actual samples.

3) 2 method blanks. One was processed with each set of samples. They were 10-g aliquots of sodium sulfate, which were processed through all extraction, cleanup, and analysis procedures as if they were actual samples. They were generated by the Battelle laboratory. There were no detections in the two method blanks.

4) 4 spiked samples. They were created in the lab by adding known amounts of all 17 dioxin congeners into samples taken in the field.

5) 2 laboratory duplicates. They were field samples split into two samples, where the second sample was analyzed to determine the reproducibility of analyses.

6) 3 field duplicates. These samples are distinct from laboratory duplicates in that a second field sample was taken from the same grid as the actual field site sample, using different random aliquots. One of these field duplicates was from the background site, and the two others were from sampling in the Columbus urban area.

7) 1 reference material. This was a soil standard reference material (Cambridge Isotope Laboratories #EDF-2513 ®) which was processed along with the first set of samples. Recoveries of the analytes from this standard reference material was 86.4% to 123.5%.

8) 1 detection-limited spike sample. This was taken from one of the background samples, and the quantity of each congener added was equal to 5 times the target detection limit.

4.3.2. Overall summary of QA results

The field sample collection team and the Battelle laboratory met the requirements of the Quality Assurance Program Plan (QAPP; USEPA, 1995) for the number of field and method

blanks, duplicates, matrix spikes (MS), and matrix spike duplicates (MSD). The data generally met or improved upon the desired detection limits of 1, 5, and 10 ppt for tetra-, penta- through hepta-, and octa-chloro congeners, respectively. Most detection limits were 0.5 ppt or better, with certain analytes in some cases being in the 1-2 ppt range, as would be expected with real sample matrices. Results for MS and MSD were generally good, with better recoveries than required. One recovery of OCDD was slightly above the target range, and some HxCDF recoveries were skewed by the presence of chlorinated diphenyl ethers (CDPE) interference. The issue of CDPE intereference is explored in more depth below. The relative percent differences (RPD) for MS/MSD results were better than required: less than 5% for sample S04, and less than 16% for sample S34. The former sample was a low level background; the latter was a high concentration field sample (see Attachment B for results of individual samples).

The cleanup procedures were satisfactory, based upon the absence of general chemical interferences (with the exception of CDPE) in the mass chromatograms, and the recovery of the cleanup standard. The analytical results on the performance evaluation material were satisfactory, and better than required recoveries were attained. Specifically, for field samples, they were generally in the range of 65-95%, which is better than required by the method and QAPP. For two samples, the recoveries were lower, but well within specifications: S21 had 52-68% recoveries, and S33 had 46-60%.

Low concentrations (0.2-0.5 ppt) of target analytes were observed in one method blank. This level reflects the lower limit capabilities of the method, so these levels are not unreasonable, particularly for a laboratory conducting routine analysis of low to high concentration samples. The second method blank did have problems in sample detection limits, and this method blank will be reanalyzed. In general, blanks and background samples did not appear to have suspiciously high concentrations of target analytes. High recoveries of OCDD in certain cases suggests a small background of this may exist in the laboratory. In general, the results of the quality assurance measures indicate that the Battelle laboratory maintained adequate cleanliness and prevented sample cross-contamination.

Interference with the analysis of two chlorodibenzofuran congeners, and the lack of a second column analysis for a third chlorodibenzofuran congener, led EPA to develop estimation procedures to assign concentrations for a small set of analyses. These estimation procedures are not part of standard practice for the use of Method 8290. No endorsement of these estimation procedures is implied by their use in this soil study. EPA concluded that the information learned from the estimated values justifies their inclusion in the data set examined in this report. Attachment B identifies all concentrations which were estimated rather than measured. The following sections describe in detail the situations requiring this estimation, and the procedures used.

4.3.3. Interefences With Two Chlorodibenzofuran (CDF) Congeners and Estimation Procedures

Method 8290 (USEPA, 1994c) describes the possibility of intereferences with some of the

dioxin congeners. Chlorinated diphenyl ethers (CDPE) are known to interfere with the CDF congeners. In this soil study, this compound was found to interfere with two hexa CDF congeners: 1,2,3,4,7,8-HxCDD and 1,2,3,6,7,8-HxCDF. There were no CDPE interferences in the method blanks, and only one of the three field blanks showed this interference. This would suggest that the CDPE was in the soil, or introduced to the soil through its handling, and did not originate at the laboratory. CDPE is a ubiquotous contaminant and is used as a plasticiser in various plastics. That is why the Method 8290 raises the possibility that this compound could interfere with the furan congeners. The precise reason why CDPE was in the soil (or was introduced into the soil through handling) is not known at this time. All soil samples showed this interference for 1,2,3,4,7,8-HxCDD, and 3 samples showed this interference for 1,2,3,6,7,8-HxCDF. Generally, the interference amounted to less than 1 ppt in the background samples and in the 1- 10 ppt range in the urban samples.

It was also found that another interference in the samples came from a non-target HxCDF that eluted just before the 1,2,3,4,7,8-HxCDF. This non-target interference was observable chromatographically as a fronting shoulder or widened peak.

It was possible to distinguish the concentration of the furan congener from the CPDE. Specifically, the CPDE concentrations could be estimated using their area counts and the interference could be subtracted from the HxCDF signal. Also subtracted from the 1,2,3,4,7,8-HxCDF signal was the interference from the non-target HxCDF that eluted just before 1,2,3,4,7,8-HxCDF. Both these refinements were done to complete the data set. In order to do so, it was assumed that: 1) all the CDPE signal was in the 1,2,3,4,7,8-HxCDF window, and none in the 1,2,3,6,7,8-HxCDF retention time window, 2) the CPDE area counts can be subtracted from the total area, 3) the CPDE signal at m/z 445.8 can be multiplied by a factor to estimate its contribution to the m/z 374 channel, and 4) the relative peak heights or shoulder and peak heights of the 1,2,3,4,6,7-HxCDF and 1,2,3,4,7,8-HxCDF can be used to proportion the peak area between target and non-target isomers.

With regard to the third assumption above, previous work done in USEPA's Las Vegas Laboratory (Donnelly, 1992) was used. In that project, mass spectra of eighteen chlorinated diphenyl ether analytical standards showed these compounds have a response ratio for m/z 374: m/z 446 in the range of 0.35 to 2.0, with an average of 1.23. Therefore, the ether contribution can be removed by multiplying the ether area at m/z 445.8 by 1.23 and subtracting that product from the total area.

With regard to the fourth assumption above, the relative peak and shoulder heights were measured against the relative % Y-axis on the mass chromatogram. The area fraction due to the target HxCDF is then expressed using the relative peak heights on the mass chromatogram submitted by Battelle as follows: (1,2,3,4,7,8-HxCDF relative peak height)/(1,2,3,4,6,7-HxCDF relative peak height + 1,2,3,4,7,8-HxCDF relative peak height). For example, a 1,2,3,4,6,7-HxCDF shoulder at 60% relative to the 1,2,3,4,7,8-HxCDF peak height would result in estimating the "peak height fraction" due to 1,2,3,4,7,8-HxCDF as being (100/160). The area due to 1,2,3,4,7,8-HxCDF is then, (total area) times (100/160).

Attachment B showing all the analytical results includes all these estimated concentrations for the 2 CDF congeners. The concentrations in all cases are flagged with a footnote indicating that interferences in the sample required that the concentration be estimated.

4.3.4. Second Column Analysis of 2,3,7,8-TCDF and Estimation Procedure

EPA Method 8290 does require a second column confirmation for 2,3,7,8-TCDF. The 2,3,7,8-TCDF congener is subject to chromatographic interference by a non-2,3,7,8 isomer when using the DB-5 column. That isomer may be 2,3,4,6, and/or 2,3,4,8-TCDD based upon data published by Hale, et al. (1985). In order to measure the concentration of 2,3,7,8-TCDF when a first column shows a positive response is to subject the sample to a second column analysis. In the Columbus WTE soil study, there were 29 samples which showed a positive response on the first column: a second column analysis determined the 2,3,7,8-TCDF concentration for 15 samples, but a second column analysis was not conducted on 14 samples. This was done in order to reserve funds for possible future additional analyses.

For these 14 samples, an estimation procedure was used to assign a value of 2,3,7,8-TCDF for that sample. Two of those fourteen were from four background samples (as described above, there were 3 background sample sites and one field duplicate from the background setting), the remaining 12 were from the city of Columbus. For the 14 samples requiring an estimated value for 2,3,7,8-TCDF, the following was done.

As noted, two of the four background samples did not have second column analysis, and two did. For the two which did have second column analysis, the ratios of the second column to the first column were 0.777 and 0.422, for an average of 0.600. To estimate the concentration of 2,3,7,8-TCDF in the two background samples without the second column, the concentration read from the first column was multiplied by 0.60. The other 13 samples from the city of Columbus having both a first and second column analysis for 2,3,7,8-TCDF, the second-to-first column quantitation ratios ranged from 0.171 to 0.424, with a mean of 0.290 ± 0.037. Therefore, estimated 2,3,7,8-TCDF values for the 12 samples showing positive on the first column but not having a second column analysis were calculated as the concentration from the first column times 0.29.

Attachment B which has all the analytical results does identify the concentrations for 2,3,7,8-TCDF which were quantified by the second column and those which required estimation using the methods described in this section.

4.3.5. Disposition of Samples S20 and S23

All 17 congeners of sample S20 had recoveries less than 40%, and 8 of 17 congeners in sample S23 had recoveries lower than 40%. The QAPP for this project specifies acceptable recovery ranges of 40-120%. Therefore, these samples will not be considered as part of the final data set for interpretation and analysis. EPA plans to revisit the actual soil sampling locations for S20 and S23, and take a second sample as near as possible to the first sample to characterize

these locations. The results for these two samples are included in Attachment B.

5.0 SUMMARY OF SOIL SAMPLING RESULTS

Table 1 shows the toxic equivalent (commonly abbreviated as TEQ) soil concentrations calculated with non-detects equal to ½ detection limit and non-detects equal to 0.00. The "toxic equivalent" concept is described in USEPA (1989), and generally is a way of describing the cumulative toxicity of a mixture of dioxin and dioxin-like congeners in relation to the most toxic dioxin congener, 2,3,7,8-TCDD. Toxic Equivalency Factors (TEFs) have been developed and adopted internationally which relate the toxicity of each congener to an equivalent toxic amount of 2,3,7,8-TCDD. In order to calculate a TEQ concentration in soil, the actual concentration of each of the 17 congeners is multiplied by its TEF and the products are then summed. The TEF for each congener other than 2,3,7,8-TCDD is a number less than 1.00; the TEF for 2,3,7,8-TCDD is 1.00. For example, the TEF for OCDD is 0.001, indicating that OCDD has been evaluated as being 1/1000 as toxic as 2,3,7,8-TCDD. This section of the report will also talk about "total concentrations". This is simply the sum of the concentrations of all congeners, with no correction for toxicity. There are 25 sample points listed on Table 1, including three from the background setting, and 22 from the city of Columbus. As noted above, two samples from the city of Columbus, S20 and S23, are not considered part of the final data set for analysis because of problems with analytical quality. As seen from a comparison of the two columns, there is not a significant difference in soil concentrations in the two ways in which the TEQ concentration is calculated. Some observations from the data include:

1) The TEQ soil concentrations for background samples S04, S05, and S06 are in the range of 1.0 to 2.0 ppt TEQ, and are clearly lower than the samples within the city of Columbus. The average TEQ concentration is 1.4 ppt, and the average total concentration for this cluster is 199 ppt.

2) The TEQ soil concentrations for the cluster on the site of the incinerator, samples S29, S30, S33, and S34, are substantially higher than the background and are in the range of 50 to 760 ppt. The average TEQ concentration of those four samples is 356 ppt TEQ, and the average total concentration is 4834 ppt.

3) There appears to be a second cluster of 4 samples, S25, S26, S27, and S28, which are in the predominant downwind direction outside the incinerator property, and which appear to have concentrations that are elevated above all other samples taken in Columbus (except for the samples on the Columbus WTE site). The TEQ soil concentrations for this cluster range from 31 to 61 ppt. The average TEQ concentration of these four samples is 49 ppt TEQ, and the average total concentration is 4789 ppt.

4) Not including the cluster of samples on the Columbus WTE site and the cluster of four samples immediately outside the Columbus WTE site, there are 14 samples in the city of Columbus. The TEQ soil concentrations for these 14 samples range from 3 to 33 ppt. Except for S14 and S15, all these samples are less than 20 ppt TEQ. The average TEQ concentration of these 14 samples

is 10 ppt, and the average total concentration is 1095 ppt.

The background soil concentrations in the 1-2 ppt TEQ range is consistent with other measurements in North America and around the world for background, rural settings. Reed, et al. (1990) reports on a background soil concentration of 5.2 ppt TEQ in rural Minnesota. Fiedler, et al. (1995) reports on 36 soil samples taken in 8 counties in Southern Mississippi, in predominantly rural areas. The TEQ concentration ranged from 0.08 to 22.9 ppt, with 20 samples being less than 1.0 ppt and a mean concentraiton of 3.1 ppt. A concentration of 5.0 ppt is reported for a background setting in the British Columbia (BC Environment, 1995). In England, soil measurements in a rural setting averaged 3.3 ppt TEQ (HMIP, 1995). Dioxin concentration have also been found to be elevated in urban settings as compared to rural settings, as was the case for this study. Soil measurements in England showed an urban TEQ concentration of 26 ppt TEQ (Ball, et al., 1994). A comprehensive soil data base including 1,594 samples from rural, urban and industrial settings in Germany also shows the difference between urban and rural soils (BLAG, 1992, as reported in Fiedler, et al., 1995). The soil levels in rural settings ranged from 1 to 5 ppt TEQ, and the range in urban areas was 10 to 30 ppt TEQ. Fiedler, et al. (1995) also reports that in industrial areas in Germany, concentrations were up to 100 ppt TEQ. Because of the lack of an extensive US data base of dioxin soil levels, estimates of background are based on a combination of US and European data.

Another analysis conducted on this data is a comparison of soil congener profiles with emissions from the 1992 stack emission test. A "congener profile" can be constructed by summing the concentrations of all the 17 congeners and describing the proportional contribution of each to the total in terms of fractions. For example, if the sum of the soil concentrations in a sample is 100, and the OCDD concentration is 65, then the profile contribution of OCDD is 0.65. In a congener profile, the sum of all fractional contributions from each of the 17 congeners is 1.00. It is important to note that these congener profiles are constructed from the actual concentrations, not concentrations which are adjusted based on the toxic equivalent factor (TEF) for that congener.

Figures 3 through 7 show the following: the congener profile for the 1992 emissions test (Figure 3), the congener profile for the four soil samples taken on-site - S29, S30, S33, and S34 (Figure 4); the congener profile taken on the second cluster of 4 samples which appeared to be elevated above other samples in the city of Columbus - S25, S26, S27, and S28 (Figure 5); the congener profile which is constructed as the average of the 14 other soil samples in the city of Columbus (Figure 6); and the congener profile from the background setting (Figure 7).

From these figures, the following observations are made:

1) The congener profile for the four samples taken at the site of the incinerator appear to be similar to the congener profile of the emissions from the 1992 stack emission test. Specifically, nearly all of the congeners show some relative contribution to the total concentration in both the stack and the soil samples. The three congeners of highest relative contribution to the stack emission and soil concentrations are 1234678-HpCDD, OCDD, and 1234678-HpCDF.

2) The congener profiles for samples S25 through S28 (the cluster immediately outside and downwind of the Columbus WTE) are dominated by OCDD and 1234678-HpCDD. In fact, all other clusters of soil samples evaluated, including the others from the city of Columbus and the background soils, show the same OCDD and HpCDD dominated profile. This OCDD/HpCDD dominated profile is typical of background rural and urban samples described throughout the literature. There does appear to be slightly more contributions from the other congeners in this impacted cluster (S25 through S28) as compared to the 14 other city samples and the background sample.

From the observations made above regarding concentrations and congener profiles, the following tentative conclusions/observations are offered. Further analysis of the data may lead to refinements to these conclusions and the addition of other conclusions or hypotheses:

1) The cluster of samples on the site of the Columbus WTE, S29, S30, S33, and S34, are influenced by activities at the Columbus WTE. These activities include stack emissions and possible ash handling. This conclusion is supported by both the high soil concentrations and the congener profile match.

2) The cluster of samples outside the Columbus WTE, S25 through S28, appears to have been influenced by the Columbus WTE, although the evidence for such influence is weaker than the evidence for the influence of the Columbus WTE for the on-site samples (S29, S30, S33, and S34). The evidence is twofold: the higher soil concentrations (total and TEQ) as compared to other samples in the city of Columbus and the background samples, and the congener profile for this cluster which does appear to have slightly higher proportional contributions from congeners other than the HpCDD and OCDD congeners, as compared to the other samples in Columbus and the background samples. The total concentration in this cluster, at an average of 4789 ppt, is similar to the average total concentration for the Columbus WTE site samples, at 4834 ppt.

3) While the congener profiles appear similar for all soil profiles except those at the Columbus WTE (S29, S30, S33, S34), there is a observable gradient in total and toxic equivalent concentrations. The TEQ concentrations drop from 356 ppt on the Columbus WTE site to 49 ppt for the cluster outside the Columbus WTE (S25-S28) to 10 ppt for the other 14 samples in the city of Columbus to 1 ppt for the background samples (S4, S5, S6). There is a similar gradient in total concentrations: 4834 ppt at the Columbus WTE, 4789 directly off-site but in the downwind direction, 1095 ppt in the city of Columbus, and 199 ppt for the background samples.

4) Other soil data in America and around the world support the generality that soil concentrations within urban centers are higher than in rural areas. Sources in urban centers are thought to be more numerous than in rural centers, which explains why urban soil concentrations are higher than rural soil concentrations. There can be little doubt that the Columbus WTE has been a source of dioxins in the Columbus urban environment. This study has not attempted to identify other sources, and particularly to place the Columbus WTE in any perspective with other sources in the city of Columbus. This study has confirmed that soil concentrations, both total and on a TEQ basis, appear to be higher within the city of Columbus, as compared to background soils.

However, except for the two clusters of samples (S25-S28, S29-S34), the 14 samples within the city of Columbus do not appear to be elevated compared to limited information on urban soils in general, and in comparison to these two clusters. This tentative conclusion is supported by the analysis of soil concentrations and congener profiles described above.

Table 1. TEQ concentrations in soils calculated with non-detect equal to ½ detection limit and non-detect equal to 0.0 (concentrations in pg/g, or ppt; LOD = limit of detection).

Sample ID	Non-detect = ½ LOD	Non-detect = 0.0
SO4 - Background	2.0	1.3
SO5 - Background	1.0	0.9
SO6 - Background	1.3	1.1
SO7	2.8	2.6
SO8	5.1	5.1
SO9	4.6	4.5
S10	11.0	11.0
S11	7.8	7.8
S12	5.6	5.6
S13	8.6	8.6
S14	22.3	22.3
S15	33.4	33.3
S18	15.4	15.4
S19	7.8	7.8
S21	4.1	3.9
S22	9.0	8.9
S24	9 3	8.5
S25	30.9	30.9
S26	61.3	61.2
S27	42.4	41.7
S28	60.9	60.9
S29	439.4	439.4
S30	759.3	759.3
S33	49.8	49.8
S34	175.3	175.3

Note: Samples S20 and S23 are not included in this table because they fail to meet quality assurance/quality control criteria. These locations will be resampled.

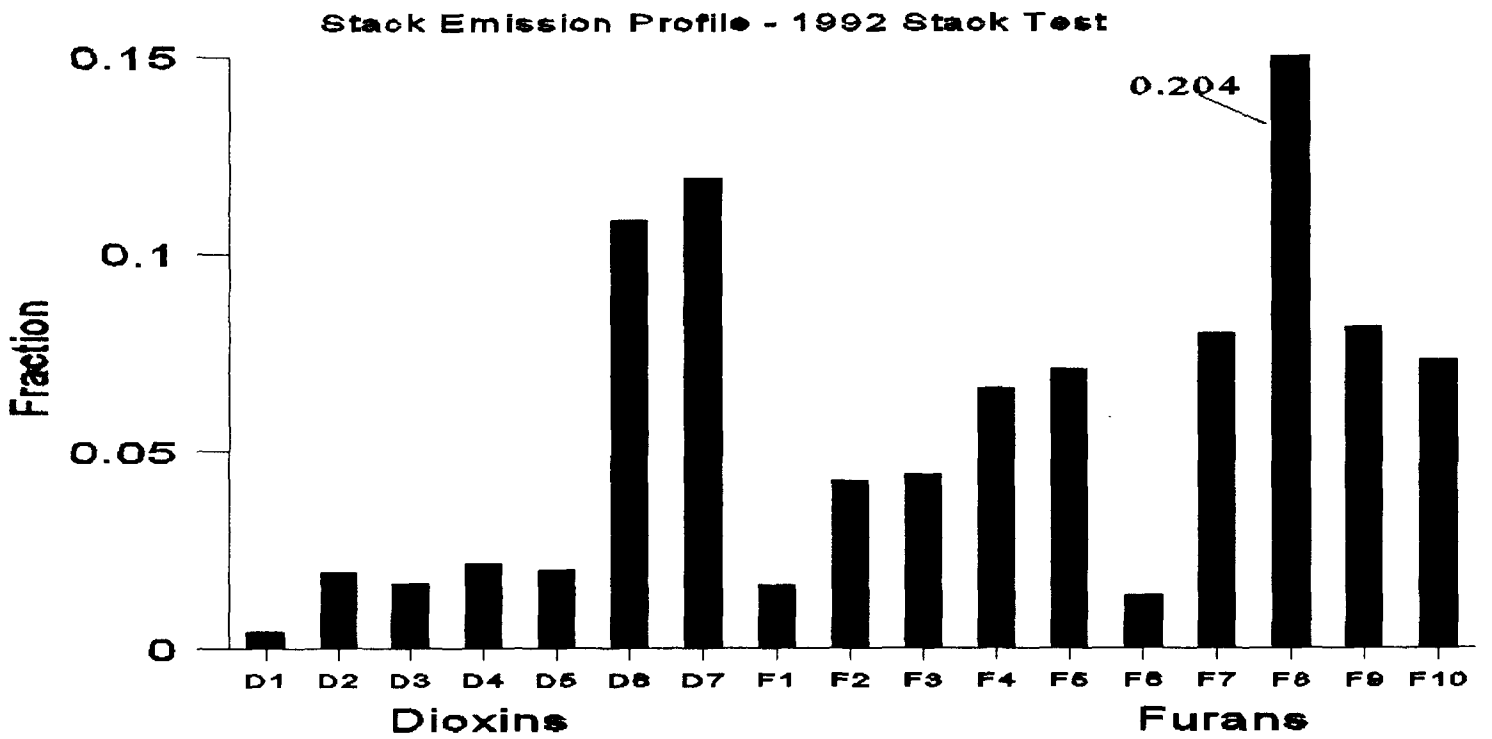


Figure 3. Congener profile for stack emissions based on 1992 stack emission (concentrations in stack gas from OEPA (1994)).

Key: Dioxins			Furans				
	D1	2378		F1	2378	F8	1234678
	D2	12378		F2	12378	F9	1234789
	D3	123478		F3	23478	F10	OCDF
	D4	123678		F4	123478		
	D5	123789		F5	123678		
	D6	1234678		F6	123789		
	D7	OCDD		F7	234678		

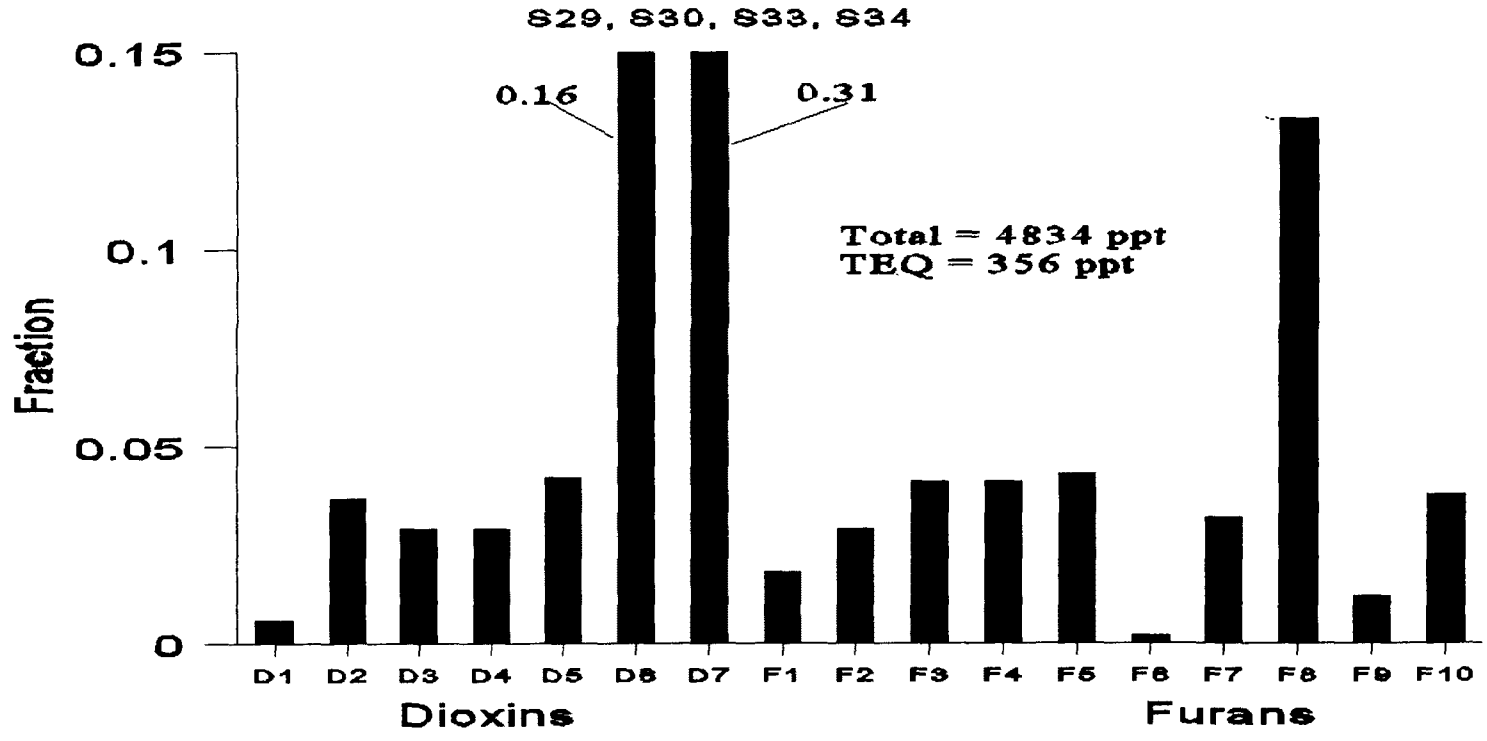


Figure 4. Congener profile for soil sites within the property of the Columbus WTE (S29, S30, S33, S34).

Key: Dioxins			Furans				
	D1	2378		F1	2378	F8	1234678
	D2	12378		F2	12378	F9	1234789
	D3	123478		F3	23478	F10	OCDF
	D4	123678		F4	123478		
	D5	123789		F5	123678		
	D6	1234678		F6	123789		
	D7	OCDD		F7	234678		

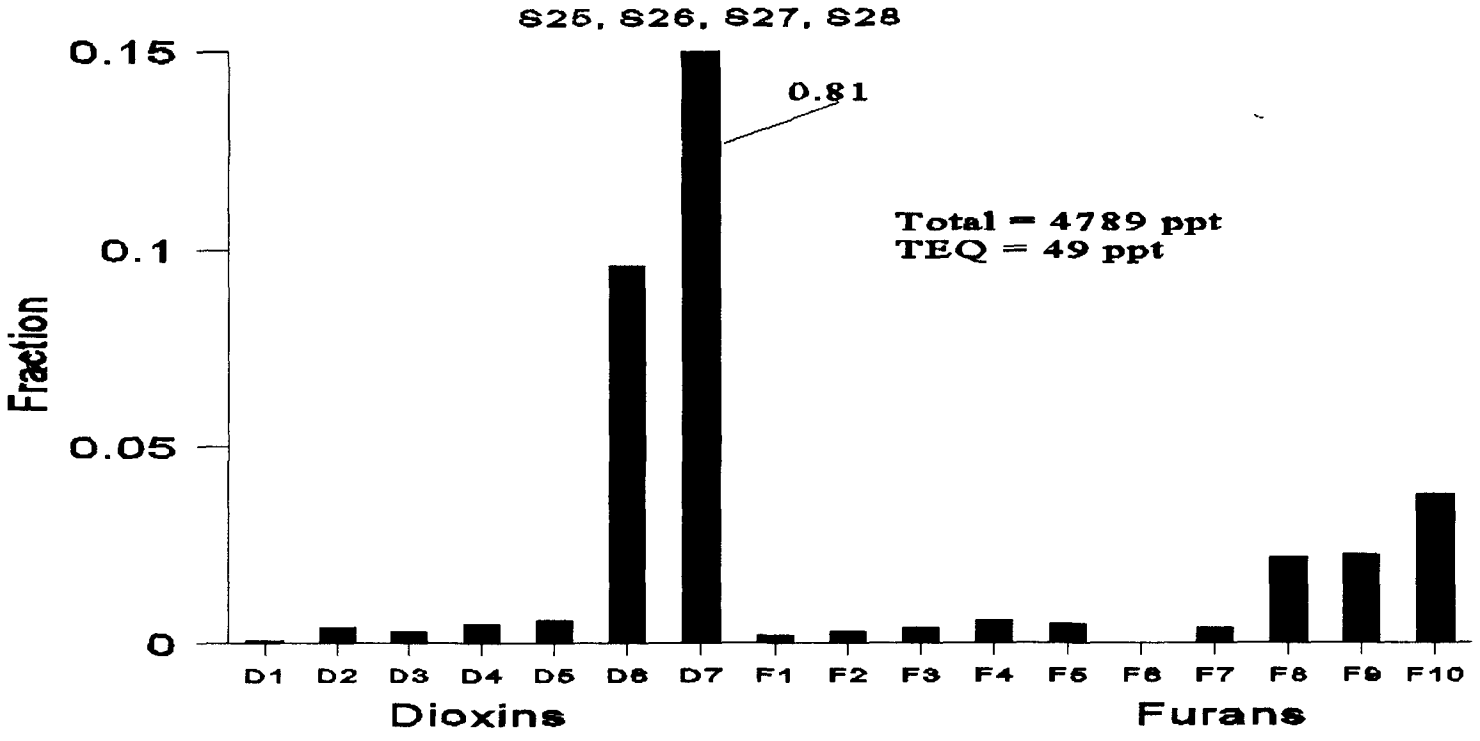


Figure 5. Congener profile for soil sites just outside and downwind from the Columbus WTE (S25, S26, S27, S28).

Key: Dioxins			Furans				
	D1	2378		F1	2378	F8	1234678
	D2	12378		F2	12378	F9	1234789
	D3	123478		F3	23478	F10	OCDF
	D4	123678		F4	123478		
	D5	123789		F5	123678		
	D6	1234678		F6	123789		
	D7	OCDD		F7	234678		

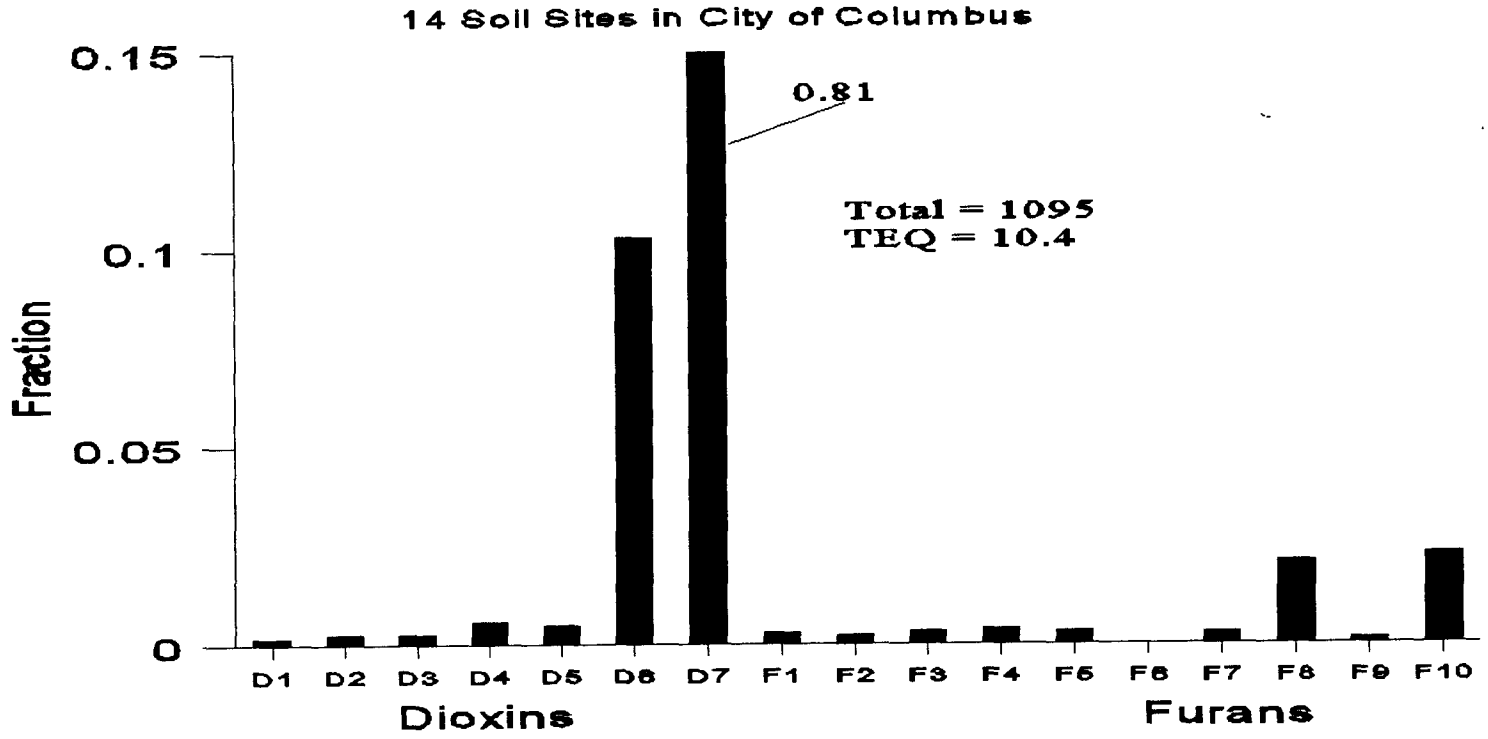


Figure 6. Congener profile for 14 soil sites just in Columbus not including sites within the Columbus WTE property (S29-S34), and sites just outside the Columbus WTE property (S25-S28).

Key: Dioxins			Furans				
	D1	2378		F1	2378	F8	1234678
	D2	12378		F2	12378	F9	1234789
	D3	123478		F3	23478	F10	OCDF
	D4	123678		F4	123478		
	D5	123789		F5	123678		
	D6	1234678		F6	123789		
	D7	OCDD		F7	234678		

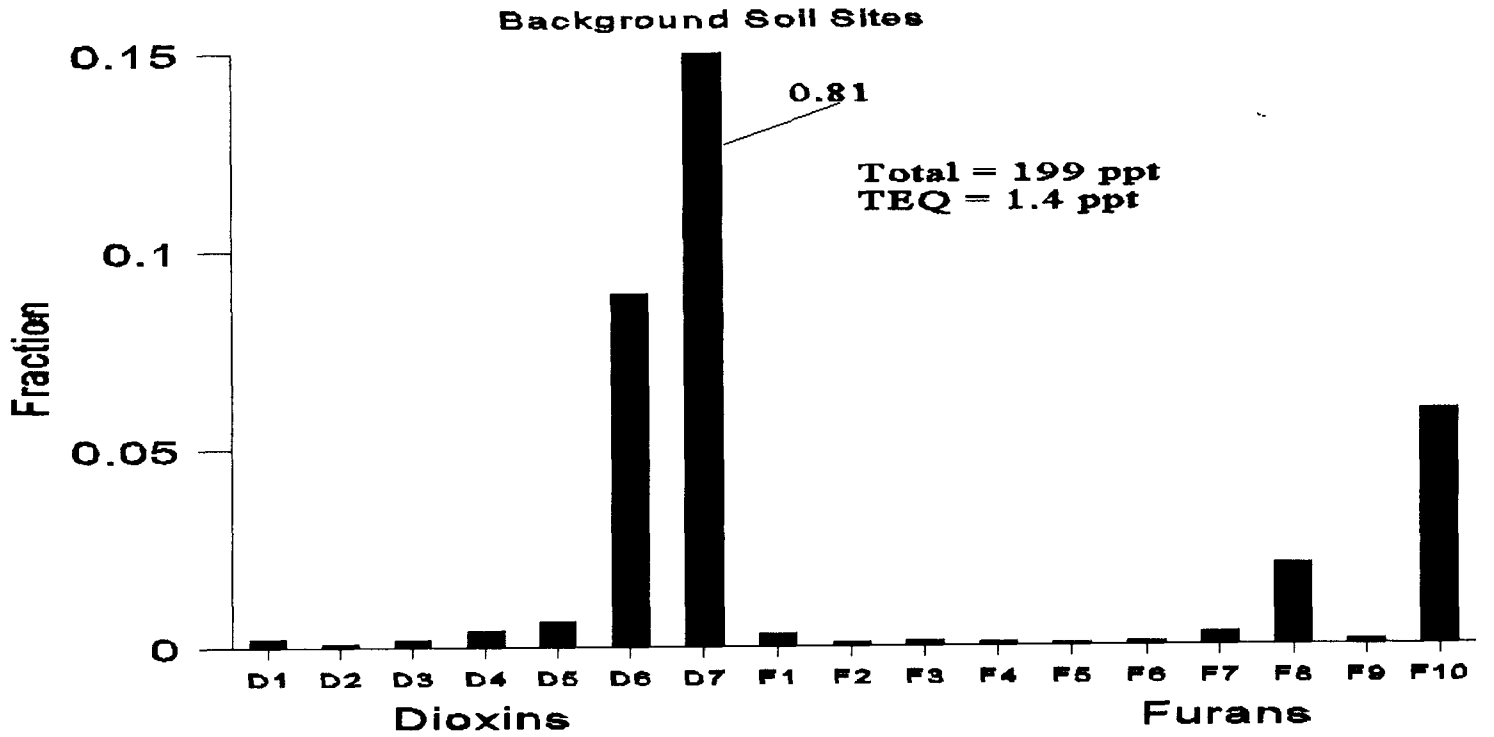


Figure 7. Congener profile for 3 background sites (S4, S5, S6).

Key	Dioxins			Furans				
		D1	2378		F1	2378	F8	1234678
		D2	12378		F2	12378	F9	1234789
		D3	123478		F3	23478	F10	OCDF
		D4	123678		F4	123478		
		D5	123789		F5	123678		
		D6	1234678		F6	123789		
		D7	OCDD		F7	234678		

6.0 REFERENCES

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ATTACHMENT A - SOIL SAMPLE SITE DESCRIPTIONS

Site No.	Sample No.	Site Descriptions
1.	S29	Flat grassy area to north of facility buildings
2.	S28	Front lawn area of Sheriff training center
3.	S27	Covered lagoon area north of American Aggregate's access road and east of ditch
4.	S30	Flat grassy area to east of stacks on facility property
5.	S33	Front yard area of Columbus Incinerator between the stacks and shredding operations and east of the creek
6.	S34	Front yard of facility slightly north of stacks
7.	S25	Behind fenced in area around influent control site for Jackson Pike WWTP east of Rt. 104
8.	S24	North side of Jackson Pike WWTP and just north of the structure covering Compost Filter 1.
9.	S12	Entrance to Roadway Trucking Co property- high grassy knoll to the west of the entrance drive south of Frank Rd. and east of I-71
10.	S13	West of office area for Agg Rok Materials off of Frank Rd. (711 Frank Rd.)
11.	S14	Scioto River levee approximately 1777 feet upstream of USGS gauging station on Jackson Pike WWTP property
12.	S15	Scioto River levee approximately 804 feet downstream of Jackson Pike WWTP outfall structure.
13	S18	Scioto River Levee at extreme southeast corner of Jackson Pike WWTP property (access from American Aggregates road)
14	S08	Flat area at top of landfill west of Jackson Pike and south of facility
15.	S10	Private property south of Dyer Rd.-Tannis Dr.

16. S11 Private property off Dyer Rd. at end of long tree covered lane

17. S09 Agg Rok Materials property off Brown Rd. opposite 2335 Brown Rd. flat area above creek valley

18. S07 WMNI Radio tower site off Marlane Dr.

19 S26 Fill area at southwest corner of Jackson Pike WWTP

20. S22 Southwest corner of Berliner Park

21. S23 Berliner Park north of Jackson Pike grit chamber unit high flat grassy area

22. S19 American Aggregate's property off Haul Rd. site south of old quarry train

23. S20 Heritage Temple Baptist Church middle level of open grassy area

24. S21 Scioto Trail School open lawn area behind school

25. S06 Madison Plains School east of new high school high area of lawn to east of package WWTP behind football practice field

26. S05 Madison Plains School east of new high school high grassy area even with front of new high school

27. S04 Madison Plains School east of old high school

Quality control sample numbers: S01,S02,S03,S16,S17,S31,& S32

ATTACHMENT B - LABORATORY ANALYSIS DATA SHEETS

Key for Sample Analysis Data Sheets

Laboratory Identifying Number	Description
47482-6-22	Method Blank
47482-6-16	S01 - Field Blank
47482-6-2	S04 - Background Sample
47482-6-3	S05 - Background Sample
47482-6-4	S06 - Background Sample
47482-6-5	S07
47482-6-15	S17 - Field Blank
47482-6-6	S08
47482-6-7	S09
47482-6-20	S09 - Laboratory Duplicate
47482-6-18	S03 - Field Duplicate
47482-6-19	S03 - Detection Limit Sample
47482-6-17	S02 - Soil Reference Material
47482-6-8	S10
47482-6-9	S11
47482-6-10	S12
47482-6-11	S13
47482-6-12	S14
47482-6-21	S04 - Matrix Spike
47482-6-23	S04 - Matrix Spike Duplicate
47482-6-13	S15
47482-6-14	S16 - Field Duplicate
47482-10-2	S18
47482-10-3	S19
47482-10-19	S34
47482-10-20	S34 - Matrix Spike
47482-10-21	S34 - Matrix Spike Duplicate
47482-10-22	Method Blank
47482-10-4	S20
47482-10-5	S21
47482-10-6	S22
47482-10-7	S23
47482-10-8	S24
47482-10-9	S25
47482-10-10	S26
47482-10-11	S27
47482-10-12	S28
47482-10-13	S29
47482-10-14	S30
47482-10-15	S31 - Field Duplicate
47482-10-16	S32 - Field Blank
47482-10-17	S33
47482-10-18	S33 - Laboratory Duplicate

PCDD/PCDF ANALYSIS DATA SHEET

Lab Name: BATTELLE
Matrix: SOIL
Sample Receipt Date: 2-06-95
Ext. Date: 12-07-95
Extract Volume (uL): 20
Injection Volume (uL): 1
Dilution Factor: NONE

Lab Sample ID: 47482-6-22, METHOD
Sample Wt/Vol: 10.0000 units: g
Initial Calibration Date: 04-13-95
Instrument ID: Autospec
Sample Data Filename: A037804
Blank Data Filename: A037803
Cal. Ver. Data Filename: A037802

ANALYTE	CONC. FOUND pg/g dry	SAMPLE LIMIT OF DETECTION pg/g dry	LOWEST CALIBRATION CONCENTRATION pg/g dry	ION RATIO
2,3,7,8-TCDD	*	0.26	1.00	*
1,2,3,7,8-PeCDD	0.36	0.20	5.00	1.43
1,2,3,4,7,8-HxCDD	*	0.25	5.00	*
1,2,3,6,7,8-HxCDD	*	0.27	5.00	1.21
1,2,3,7,8,9-HxCDD	*	0.14	5.00	1.23
1,2,3,4,6,7,8-HpCDD	0.53	0.51	5.00	1.20
OCDD	*	4.61	10.00	0.90
2,3,7,8-TCDF	*	0.30	1.00	0.77
1,2,3,7,8-PeCDF	*	0.23	5.00	*
2,3,4,7,8-PeCDF	0.26	0.26	5.00	1.69
1,2,3,4,7,8-HxCDF	*	0.16	5.00	*
1,2,3,6,7,8-HxCDF	0.24	0.13	5.00	1.24
1,2,3,7,8,9-HxCDF	*	0.17	5.00	1.30
2,3,4,6,7,8-HxCDF	0.45	0.10	5.00	1.24
1,2,3,4,6,7,8-HpCDF	0.43	0.05	5.00	1.06
1,2,3,4,7,8,9-HpCDF	*	0.22	5.00	*
OCDF	0.29	0.27	10.00	0.85
Total Tetra-Furans	*	0.34		*
Total Tetra-Dioxins	0.33			0.75
Total Penta-Furans	*	0.47		*
Total Penta-Dioxins	*	0.40		*
Total Hexa-Furans	1.25			*
Total Hexa-Dioxins	*	0.32		*
Total Hepta-Furans	1.16			*
Total Hepta-Dioxins	0.66			1.15

* Analyte not detected.

LABELED COMPOUNDS	SPIKE CONC. pg	CONC. FOUND pg	R(%)	ION RATIO
13C-2,3,7,8-TCDD	2000	1509	75	0.79
13C-1,2,3,7,8-PeCDD	2000	1428	71	1.55
13C-1,2,3,4,7,8-HxCDD	2000	1576	79	1.25
13C-1,2,3,6,7,8-HxCDD	2000	1728	86	1.27
13C-1,2,3,4,6,7,8-HpCDD	2000	1582	79	1.04
13C-OCDD	4000	2641	66	0.90
13C-2,3,7,8-TCDF	2000	1644	82	0.80
13C-1,2,3,7,8-PeCDF	2000	1699	85	1.58
13C-2,3,4,7,8-PeCDF	2000	1694	85	1.61
13C-1,2,3,4,7,8-HxCDF	2000	1642	82	0.53
13C-1,2,3,6,7,8-HxCDF	2000	1697	85	0.52
13C-1,2,3,7,8,9-HxCDF	2000	1555	78	0.51
13C-2,3,4,6,7,8-HxCDF	2000	1674	84	0.54
13C-1,2,3,4,6,7,8-HpCDF	2000	1612	81	0.44
13C-1,2,3,4,7,8,9-HpCDF	2000	1569	78	0.43
CLEANUP STANDARD				
37Cl-2,3,7,8-TCDD	200	197	98	

PCDD/PCDF ANALYSIS DATA SHEET

Lab Name: BATTELLE
Matrix: SOIL
Sample Receipt Date: 12-06-95
Ext. Date: 12-07-95
Analysis Date: 18-DEC-95 Time: 13:15:49
Extract Volume (uL): 20
Injection Volume (uL): 1

Lab Sample ID: 47482-6-16, S01
Sample Wt/Vol: 10.1772 units: g
Initial Calibration Date: 04-13-95
Instrument ID: Autospec
GC Column ID: 60M DB5
Sample Data Filename: A037806
Blank Data Filename: A037803
Cal. Ver. Data Filename: A037802

ANALYTE	CONC. FOUND pg/g dry	SAMPLE LIMIT OF DETECTION pg/g dry	LOWEST CALIBRATION CONCENTRATIO pg/g dry	ION RATIO
2,3,7,8-TCDD	*	0.22	0.98	*
1,2,3,7,8-PeCDD	*	0.16	4.91	*
1,2,3,4,7,8-HxCDD	*	0.23	4.91	*
1,2,3,6,7,8-HxCDD	*	0.25	4.91	*
1,2,3,7,8,9-HxCDD	*	0.13	4.91	*
1,2,3,4,6,7,8-HpCDD	0.62	0.44	4.91	1.10
OCDD	*	4.05	9.83	0.87
2,3,7,8-TCDF	0.39	0.28	0.98	0.86
1,2,3,7,8-PeCDF	*	0.20	4.91	*
2,3,4,7,8-PeCDF	0.46	0.24	4.91	1.65
1,2,3,4,7,8-HxCDF	ˆ	0.16	4.91	*
1,2,3,6,7,8-HxCDF	*	0.13	4.91	*
1,2,3,7,8,9-HxCDF	*	0.16	4.91	*
2,3,4,6,7,8-HxCDF	0.35	0.10	4.91	1.17
1,2,3,4,6,7,8-HpCDF	0.41	0.04	4.91	0.91
1,2,3,4,7,8,9-HpCDF	*	0.20	4.91	*
OCDF	0.38	0.24	9.83	0.96
Total Tetra-Furans	0.58			0.68
Total Tetra-Dioxins	0.54			0.70
Total Penta-Furans	0.60			1.48
Total Penta-Dioxins	*	0.32		*
Total Hexa-Furans	1.13			1.27
Total Hexa-Dioxins	*	0.29		*
Total Hepta-Furans	1.35			0.91
Total Hepta-Dioxins	1.29			1.13

LABELED COMPOUNDS	SPIKE CONC. pg	CON FOU pg	R(%)	ION RATIO
	2000	1593	80	0.78
13C-1,2,3,7,8-PeCDD	2000	1593	80	1.57
13C-1,2,3,4,7,8-HxCDD	2000	1582	79	1.26
13C-1,2,3,6,7,8-HxCDD	2000	1808	90	1.24
13C-1,2,3,4,6,7,8-HpCDD	2000	1666	83	1.05
13C-OCDD	4000	2821	71	0.90
13C-2,3,7,8-TCDF	2000	1549	77	0.81
13C-1,2,3,7,8-PeCDF	2000	1734	87	1.62
13C-2,3,4,7,8-PeCDF	2000	1654	83	1.60
13C-1,2,3,4,7,8-HxCDF	2000	1617	81	0.53
13C-1,2,3,6,7,8-HxCDF	2000	1579	79	0.52
13C-1,2,3,7,8,9-HxCDF	2000	1562	78	0.52
13C-2,3,4,6,7,8-HxCDF	2000	1609	80	0.52
13C-1,2,3,4,6,7,8-HpCDF	2000	1621	81	0.45
13C-1,2,3,4,7,8,9-HpCDF	2000	1590	80	0.43
CLEANUP STANDARD				
37Cl-2,3,7,8-TCDD	200	179	90	

ˆ Analyte concentration not quantified due to CDPE interference, see text for detail.
* Analyte not detected.

PCDD/PCDF ANALYSIS DATA SHEET

Lab Name: BATTELLE
Matrix: SOIL
Sample Receipt Date: 12-06-95
Ext. Date: 12-07-95
Analysis Date: 18-DEC-95 Time: 14:28:07
Extract Volume (uL): 20
Injection Volume (uL): 1
Dilution Factor: NONE

Lab Sample ID: 47482-6-2, S04
Sample Wt/Vol: 6.5575 units: g
Initial Calibration Date: 04-13-95
Instrument ID: Autospec
GC Column ID: 60M DB5
Sample Data Filename: A037807
Blank Data Filename: A037803
Cal. Ver. Data Filename: A037802

ANALYTE	CONC. FOUND pg/g dry	SAMPLE LIMIT OF DETECTION pg/g dry	LOWEST CALIBRATION CONCENTRATIO pg/g dry	ION RATIO
2,3,7,8-TCDD	*	0.54	1.52	*
1,2,3,7,8-PeCDD	*	0.41	7.62	*
1,2,3,4,7,8-HxCDD	0.74	0.60	7.62	1.14
1,2,3,6,7,8-HxCDD	1.39	0.65	7.62	1.36
1,2,3,7,8,9-HxCDD	2.11	0.34	7.62	1.12
1,2,3,4,6,7,8-HpCDD	31.60		7.62	1.03
OCDD	298.32		15.25	0.88
2,3,7,8-TCDF	*	1.97	3.05	*
1,2,3,7,8-PeCDF	*	0.52	7.62	*
2,3,4,7,8-PeCDF	*	0.59	7.62	*
1,2,3,4,7,8-HxCDF	*	0.44	7.62	*
1,2,3,6,7,8-HxCDF	0.55^	0.35	7.62	*
1,2,3,7,8,9-HxCDF	*	0.43	7.62	*
2,3,4,6,7,8-HxCDF	0.89	0.23	7.62	1.46
1,2,3,4,6,7,8-HpCDF	6.46	0.11	7.62	1.03
1,2,3,4,7,8,9-HpCDF	*	0.58	7.62	*
OCDF	18.02		15.25	0.92
Total Tetra-Furans	4.22			0.69
Total Tetra-Dioxins	1.98			0.72
Total Penta-Furans	4.58			1.60
Total Penta-Dioxins	*	0.83		*
Total Hexa-Furans	4.87			1.35
Total Hexa-Dioxins	7.72			1.19
Total Hepta-Furans	18.52			*
Total Hepta-Dioxins	74.13			1.02

LABELED COMPOUNDS	SPIKE CONC. pg	CONC. FOUN pg	R(%)	ION RATIO
13C-2,3,7,8-TCDD	2000	1333	67	0.78
13C-1,2,3,7,8-PeCDD	2000	1268	63	1.57
13C-1,2,3,4,7,8-HxCDD	2000	1376	69	1.24
13C-1,2,3,6,7,8-HxCDD	2000	1564	78	1.28
13C-1,2,3,4,6,7,8-HpCDD	2000	1302	65	1.03
13C-OCDD	4000	2355	59	0.90
13C-2,3,7,8-TCDF	2000	1243	62	0.81
13C-1,2,3,7,8-PeCDF	2000	1362	68	1.59
13C-2,3,4,7,8-PeCDF	2000	1352	68	1.61
13C-1,2,3,4,7,8-HxCDF	2000	1272	64	0.52
13C-1,2,3,6,7,8-HxCDF	2000	1345	67	0.53
13C-1,2,3,7,8,9-HxCDF	2000	1312	66	0.50
13C-2,3,4,6,7,8-HxCDF	2000	1490	74	0.52
13C-1,2,3,4,6,7,8-HpCDF	2000	1459	73	0.44
13C-1,2,3,4,7,8,9-HpCDF	2000	1208	60	0.44
CLEANUP STANDARD				
37Cl-2,3,7,8-TCDD	200	156	78	

^ Analyte concentration estimated; CDPE interference - see text for detail.
* Analyte not detected.

PCDD/PCDF ANALYSIS DATA SHEET

Lab Name: BATTELLE
Matrix: SOIL
Sample Receipt Date: 12-06-95
Ext. Date: 12-07-95
Analysis Date: 18-DEC-95 Time: 15:34:43
Extract Volume (uL): 20
Injection Volume (uL): 1
Dilution Factor: NONE

Lab Sample ID: 47482-6-3, S05
Sample Wt/Vol: 7.9895 units: g
Initial Calibration Date: 04-13-95
Instrument ID: Autospec
GC Column ID: 60M DB5
Sample Data Filename: A037808
Blank Data Filename: A037803
Cal. Ver. Data Filename: A037802

ANALYTE	CONC. FOUND pg/g dry	SAMPLE LIMIT OF DETECTION pg/g dry	LOWEST CALIBRATION CONCENTRATIO pg/g dry	ION RATIO
2,3,7,8-TCDD	0.34	0.28	1.25	0.69
1,2,3,7,8-PeCDD	*	0.21	6.26	*
1,2,3,4,7,8-HxCDD	*	0.32	6.26	*
1,2,3,6,7,8-HxCDD	0.52	0.36	6.26	1.46
1,2,3,7,8,9-HxCDD	0.75	0.18	6.26	1.37
1,2,3,4,6,7,8-HpCDD	9.40		6.26	1.09
OCDD	75.76		12.52	0.86
2,3,7,8-TCDF	*	0.35	1.25	0.65
1,2,3,7,8-PeCDF	*	0.26	6.26	*
2,3,4,7,8-PeCDF	*	0.33	6.26	*
1,2,3,4,7,8-HxCDF	0.23^	0.22	6.26	*
1,2,3,6,7,8-HxCDF	0.55^	0.17	6.26	*
1,2,3,7,8,9-HxCDF	*	0.24	6.26	*
2,3,4,6,7,8-HxCDF	0.55	0.13	6.26	1.20
1,2,3,4,6,7,8-HpCDF	2.42	0.06	6.26	1.08
1,2,3,4,7,8,9-HpCDF	*	0.32	6.26	*
OCDF	4.70	0.35	12.52	0.89
Total Tetra-Furans	0.85			0.81
Total Tetra-Dioxins	0.95			0.88
Total Penta-Furans	0.70			1.45
Total Penta-Dioxins	*	0.43		*
Total Hexa-Furans	2.43			1.18
Total Hexa-Dioxins	2.18			1.17
Total Hepta-Furans	5.93			*
Total Hepta-Dioxins	17.92			1.01

LABELED COMPOUNDS	SPIKE CONC. pg	C F pg	R(%)	ION RATIO
13C-2,3,7,8-TCDD	2000	14	73	0.79
13C-1,2,3,7,8-PeCDD	2000	14	72	1.55
13C-1,2,3,4,7,8-HxCDD	2000	16	81	1.23
13C-1,2,3,6,7,8-HxCDD	2000	16	84	1.23
13C-1,2,3,4,6,7,8-HpCDD	2000	16	82	1.05
13C-OCDD	4000	26	66	0.89
13C-2,3,7,8-TCDF	2000	15	75	0.79
13C-1,2,3,7,8-PeCDF	2000	15	78	1.61
13C-2,3,4,7,8-PeCDF	2000	14	73	1.58
13C-1,2,3,4,7,8-HxCDF	2000	15	80	0.52
13C-1,2,3,6,7,8-HxCDF	2000	16	83	0.52
13C-1,2,3,7,8,9-HxCDF	2000	14	74	0.52
13C-2,3,4,6,7,8-HxCDF	2000	16	83	0.52
13C-1,2,3,4,6,7,8-HpCDF	2000	15	79	0.43
13C-1,2,3,4,7,8,9-HpCDF	2000	13	66	0.43
CLEANUP STANDARD				
37Cl-2,3,7,8-TCDD	200	17	89	

^ Analyte concentration estimated; CDPE interference - see text for detail.
* Analyte not detected.

PCDD/PCDF ANALYSIS DATA SHEET

Lab Name: BATTELLE
Matrix: SOIL
Sample Receipt Date: 12-06-95
Ext. Date: 12-07-95
Analysis Date: 18-DEC-95 Time: 16:41:51
Extract Volume (uL): 20
Injection Volume (uL): 1
Dilution Factor: NONE

Lab Sample ID: 47482-6-4, S06
Sample Wt/Vol: 8.2683 units: g
Initial Calibration Date: 04-13-95
Instrument ID: Autospec
GC Column ID: 60M DB5
Sample Data Filename: A037809
Blank Data Filename: A037803
Cal. Ver. Data Filename: A037802

ANALYTE	CONC. FOUND pg/g dry	SAMPLE LIMIT OF DETECTION pg/g dry	LOWEST CALIBRATION CONCENTRATION pg/g dry	ION RATIO
2,3,7,8-TCDD	0.57	0.26	1.21	0.69
1,2,3,7,8-PeCDD	*	0.20	6.05	*
1,2,3,4,7,8-HxCDD	*	0.29	6.05	*
1,2,3,6,7,8-HxCDD	0.54	0.33	6.05	1.06
1,2,3,7,8,9-HxCDD	0.83	0.17	6.05	1.36
1,2,3,4,6,7,8-HpCDD	12.20		6.05	1.05
OCDD	108.60		12.09	0.87
2,3,7,8-TCDF	*	0.34	1.21	0.66
1,2,3,7,8-PeCDF	*	0.26	6.05	*
2,3,4,7,8-PeCDF	*	0.31	6.05	*
1,2,3,4,7,8-HxCDF	*	0.21	6.05	*
1,2,3,6,7,8-HxCDF	0.47^	0.16	6.05	*
1,2,3,7,8,9-HxCDF	*	0.21	6.05	*
2,3,4,6,7,8-HxCDF	0.47	0.12	6.05	1.26
1,2,3,4,6,7,8-HpCDF	3.30	0.05	6.05	1.09
1,2,3,4,7,8,9-HpCDF	0.35	0.28	6.05	1.06
OCDF	9.43	0.28	12.09	0.84
Total Tetra-Furans	1.70			0.65
Total Tetra-Dioxins	0.99			0.72
Total Penta-Furans	1.05			1.34
Total Penta-Dioxins	*	0.40		*
Total Hexa-Furans	3.08			1.31
Total Hexa-Dioxins	4.49			1.41
Total Hepta-Furans	10.42			*
Total Hepta-Dioxins	21.26			1.07

LABELED COMPOUNDS	SPIKE CONC. pg	CONC. FOUND pg	R(%)	ION RATIO
13C-2,3,7,8-TCDD	2000	1367	68	0.77
13C-1,2,3,7,8-PeCDD	2000	1328	66	1.56
13C-1,2,3,4,7,8-HxCDD	2000	1517	76	1.28
13C-1,2,3,6,7,8-HxCDD	2000	1649	82	1.27
13C-1,2,3,4,6,7,8-HpCDD	2000	1569	78	1.03
13C-OCDD	4000	2755	69	0.89
13C-2,3,7,8-TCDF	2000	1318	66	0.81
13C-1,2,3,7,8-PeCDF	2000	1399	70	1.61
13C-2,3,4,7,8-PeCDF	2000	1338	67	1.59
13C-1,2,3,4,7,8-HxCDF	2000	1486	74	0.53
13C-1,2,3,6,7,8-HxCDF	2000	1506	75	0.52
13C-1,2,3,7,8,9-HxCDF	2000	1439	72	0.52
13C-2,3,4,6,7,8-HxCDF	2000	1585	79	0.52
13C-1,2,3,4,6,7,8-HpCDF	2000	1628	81	0.42
13C-1,2,3,4,7,8,9-HpCDF	2000	1289	64	0.43
CLEANUP STANDARD				
37Cl-2,3,7,8-TCDD	200	173	87	

^ Analyte concentration estimated; CDPE interference - see text for detail.
* Analyte not detected.

PCDD/PCDF ANALYSIS DATA SHEET

Lab Name: BATTELLE
Matrix: SOIL
Sample Receipt Date: 12-06-95
Ext. Date: 12-07-95
Analysis Date: 18-DEC-95 Time: 17:48:26
Extract Volume (uL): 20
Injection Volume (uL): 1
Dilution Factor: NONE

Lab Sample ID: 47482-6-5, S07
Sample Wt/Vol: 7.4596 units: g
Initial Calibration Date: 04-13-95
Instrument ID: Autospec
GC Column ID: 60M DB5
Sample Data Filename: A037810
Blank Data Filename: A037803
Cal. Ver. Data Filename: A037802

ANALYTE	CONC. FOUND pg/g dry	SAMPLE LIMIT OF DETECTION pg/g dry	LOWEST CALIBRATION CONCENTRATIO pg/g dry	ION RATIO
2,3,7,8-TCDD	*	0.45	1.34	*
1,2,3,7,8-PeCDD	1.12	0.35	6.70	1.54
1,2,3,4,7,8-HxCDD	1.05	0.49	6.70	1.27
1,2,3,6,7,8-HxCDD	1.20	0.54	6.70	1.08
1,2,3,7,8,9-HxCDD	1.47	0.28	6.70	1.07
1,2,3,4,6,7,8-HpCDD	11.69		6.70	1.10
OCDD	93.36		13.41	0.89
2,3,7,8-TCDF#	0.78	0.66	1.34	0.82
1,2,3,7,8-PeCDF	1.01	0.44	6.70	1.36
2,3,4,7,8-PeCDF	1.41	0.54	6.70	1.40
1,2,3,4,7,8-HxCDF	1.80^	0.36	6.70	*
1,2,3,6,7,8-HxCDF	1.70	0.29	6.70	1.21
1,2,3,7,8,9-HxCDF	*	0.41	6.70	*
2,3,4,6,7,8-HxCDF	1.74	0.22	6.70	1.35
1,2,3,4,6,7,8-HpCDF	6.56	0.09	6.70	0.97
1,2,3,4,7,8,9-HpCDF	*	0.52	6.70	*
OCDF	3.67	0.57	13.41	0.79
Total Tetra-Furans	7.56			0.70
Total Tetra-Dioxins	4.04			0.68
Total Penta-Furans	12.61			1.45
Total Penta-Dioxins	3.61			1.33
Total Hexa-Furans	9.17			1.19
Total Hexa-Dioxins	9.24			1.21
Total Hepta-Furans	7.77			0.97
Total Hepta-Dioxins	22.96			1.02

LABELED COMPOUNDS	SPIKE CONC. pg	CONC FOUN pg	R(%)	ION RATIO
13C-2,3,7,8-TCDD	2000	1335	67	0.76
13C-1,2,3,7,8-PeCDD	2000	1201	60	1.56
13C-1,2,3,4,7,8-HxCDD	2000	1655	83	1.24
13C-1,2,3,6,7,8-HxCDD	2000	1748	87	1.25
13C-1,2,3,4,6,7,8-HpCDD	2000	1579	79	1.05
13C-OCDD	4000	2537	63	0.89
13C-2,3,7,8-TCDF	2000	1361	68	0.79
13C-1,2,3,7,8-PeCDF	2000	1290	64	1.57
13C-2,3,4,7,8-PeCDF	2000	1237	62	1.58
13C-1,2,3,4,7,8-HxCDF	2000	1576	79	0.52
13C-1,2,3,6,7,8-HxCDF	2000	1500	75	0.50
13C-1,2,3,7,8,9-HxCDF	2000	1379	69	0.52
13C-2,3,4,6,7,8-HxCDF	2000	1507	75	0.51
13C-1,2,3,4,6,7,8-HpCDF	2000	1622	81	0.43
13C-1,2,3,4,7,8,9-HpCDF	2000	1292	65	0.42
CLEANUP STANDARD				
37Cl-2,3,7,8-TCDD	200	156	78	

2,3,7,8-TCDF value from second column confirmation.

^ Analyte concentration estimated; CDPE interference - see text for detail.
* Analyte not detected.

PCDD/PCDF ANALYSIS DATA SHEET

Lab Name: BATTELLE
Matrix: SOIL
Sample Receipt Date: 12-07-95
Ext. Date: 12-07-95
Analysis Date: 19-DEC-95 Time: 11:00:03
Extract Volume (uL): 20
Injection Volume (uL): 1
Dilution Factor: NONE

Lab Sample ID: 47482-6-15, S17
Sample Wt/Vol: 10.0121 units: g
Initial Calibration Date: 04-13-95
Instrument ID: Autospec
GC Column ID: 60M DB5
Sample Data Filename: A037904
Blank Data Filename: A037903
Cal. Ver. Data Filename: A037902

ANALYTE	CONC. FOUND pg/g dry	SAMPLE LIMIT OF DETECTION pg/g dry	LOWEST CALIBRATION CONCENTRATIO pg/g dry	ION RATIO
2,3,7,8-TCDD	*	0.23	1.00	*
1,2,3,7,8-PeCDD	*	0.36	5.00	*
1,2,3,4,7,8-HxCDD	*	0.13	5.00	*
1,2,3,6,7,8-HxCDD	*	0.16	5.00	*
1,2,3,7,8,9-HxCDD	*	0.18	5.00	*
1,2,3,4,6,7,8-HpCDD	0.58	0.36	5.00	1.12
OCDD	*	5.81	10.00	*
2,3,7,8-TCDF	*	0.18	1.00	*
1,2,3,7,8-PeCDF	*	0.27	5.00	*
2,3,4,7,8-PeCDF	*	0.24	5.00	*
1,2,3,4,7,8-HxCDF	*	0.34	5.00	*
1,2,3,6,7,8-HxCDF	*	0.26	5.00	*
1,2,3,7,8,9-HxCDF	*	0.10	5.00	*
2,3,4,6,7,8-HxCDF	0.26	0.20	5.00	1.35
1,2,3,4,6,7,8-HpCDF	*	0.16	5.00	*
1,2,3,4,7,8,9-HpCDF	*	0.08	5.00	*
OCDF	*	0.31	10.00	*
Total Tetra-Furans	0.38			0.67
Total Tetra-Dioxins	*	0.40		*
Total Penta-Furans	*	0.32		*
Total Penta-Dioxins	0.52			1.28
Total Hexa-Furans	0.34			1.42
Total Hexa-Dioxins	*	0.18		*
Total Hepta-Furans	0.60			1.12
Total Hepta-Dioxins				

LABELED COMPOUNDS	SPIKE CONC. pg	CONC FOUN pg	R(%)	ION RATIO
13C-2,3,7,8-TCDD	2000	1256	63	0.78
13C-1,2,3,7,8-PeCDD	2000	1292	65	1.56
13C-1,2,3,4,7,8-HxCDD	2000	1375	69	1.26
13C-1,2,3,6,7,8-HxCDD	2000	1449	72	1.26
13C-1,2,3,4,6,7,8-HpCDD	2000	1300	65	1.04
13C-OCDD	4000	2177	54	0.90
13C-2,3,7,8-TCDF	2000	1273	64	0.78
13C-1,2,3,7,8-PeCDF	2000	1330	67	1.58
13C-2,3,4,7,8-PeCDF	2000	1351	68	1.61
13C-1,2,3,4,7,8-HxCDF	2000	1338	67	0.52
13C-1,2,3,6,7,8-HxCDF	2000	1287	64	0.53
13C-1,2,3,7,8,9-HxCDF	2000	1327	66	0.51
13C-2,3,4,6,7,8-HxCDF	2000	1355	68	0.51
13C-1,2,3,4,6,7,8-HpCDF	2000	1242	62	0.44
13C-1,2,3,4,7,8,9-HpCDF	2000	1214	61	0.43
CLEANUP STANDARD				
37Cl-2,3,7,8-TCDD	200	142	71	

* Analyte not detected.

PCDD/PCDF ANALYSIS DATA SHEET

Lab Name: BATTELLE
Matrix: SOIL
Sample Receipt Date: 12-06-95
Ext. Date: 12-07-95
Analysis Date: 19-DEC-95 Time: 12:06:56
Extract Volume (uL): 20
Injection Volume (uL): 1
Dilution Factor: NONE

Lab Sample ID: 47482-6-6, S08
Sample Wt/Vol: 8.3373 units: g
Initial Calibration Date: 04-13-95
Instrument ID: Autospec
GC Column ID: 60M DB5
Sample Data Filename: A037905
Blank Data Filename: A037903
Cal. Ver. Data Filename: A037902

ANALYTE	CONC. FOUND pg/g dry	SAMPLE LIMIT OF DETECTION pg/g dry	LOWEST CALIBRATION CONCENTRATIO pg/g dry	ION RATIO
2,3,7,8-TCDD	1.52		1.20	0.82
1,2,3,7,8-PeCDD	1.41	0.39	6.00	1.59
1,2,3,4,7,8-HxCDD	1.12	0.16	6.00	1.19
1,2,3,6,7,8-HxCDD	1.46	0.20	6.00	1.12
1,2,3,7,8,9-HxCDD	3.43	0.23	6.00	1.07
1,2,3,4,6,7,8-HpCDD	15.47		6.00	0.98
OCDD	312.42		11.99	0.86
2,3,7,8-TCDF#	0.76	0.34	1.20	0.84
1,2,3,7,8-PeCDF	1.24	0.31	6.00	1.67
2,3,4,7,8-PeCDF	2.13	0.36	6.00	1.49
1,2,3,4,7,8-HxCDF	1.80˙	0.42	6.00	*
1,2,3,6,7,8-HxCDF	1.71	0.32	6.00	1.20
1,2,3,7,8,9-HxCDF	*	0.13	6.00	*
2,3,4,6,7,8-HxCDF	1.65	0.25	6.00	1.25
1,2,3,4,6,7,8-HpCDF	6.11		6.00	1.14
1,2,3,4,7,8,9-HpCDF	0.49	0.11	6.00	1.01
OCDF	2.36	0.35	11.99	0.82
Total Tetra-Furans	13.96			0.85
Total Tetra-Dioxins	7.46			0.84
Total Penta-Furans	15.61			1.55
Total Penta-Dioxins	1.41			1.59
Total Hexa-Furans	9.37			1.09
Total Hexa-Dioxins	20.71			1.23
Total Hepta-Furans	6.60			*
Total Hepta-Dioxins	38.11			1.07

LABELED COMPOUNDS	SPIKE CONC. pg	CONC FOUN pg	R(%)	ION RATIO
13C-2,3,7,8-TCDD	2000	1508	75	0.77
13C-1,2,3,7,8-PeCDD	2000	1554	78	1.56
13C-1,2,3,4,7,8-HxCDD	2000	1589	79	1.26
13C-1,2,3,6,7,8-HxCDD	2000	1742	87	1.25
13C-1,2,3,4,6,7,8-HpCDD	2000	1551	78	1.06
13C-OCDD	4000	2856	71	0.89
13C-2,3,7,8-TCDF	2000	1586	79	0.77
13C-1,2,3,7,8-PeCDF	2000	1585	79	1.60
13C-2,3,4,7,8-PeCDF	2000	1394	70	1.60
13C-1,2,3,4,7,8-HxCDF	2000	1595	80	0.52
13C-1,2,3,6,7,8-HxCDF	2000	1602	80	0.52
13C-1,2,3,7,8,9-HxCDF	2000	1592	80	0.52
13C-2,3,4,6,7,8-HxCDF	2000	1676	84	0.53
13C-1,2,3,4,6,7,8-HpCDF	2000	1511	76	0.42
13C-1,2,3,4,7,8,9-HpCDF	2000	1334	67	0.43
CLEANUP STANDARD				
37Cl-2,3,7,8-TCDD	200	183	91	

2,3,7,8-TCDF value from second column confirmation.

˙ Analyte concentration estimated; CDPE interference - see text for detail
* Analyte not detected.

PCDD/PCDF ANALYSIS DATA SHEET

Lab Name: BATTELLE
Matrix: SOIL
Sample Receipt Date: 12-06-95
Ext. Date: 12-07-95
Analysis Date: 19-DEC-95 Time: 13:14:56
Extract Volume (uL): 20
Injection Volume (uL): 1
Dilution Factor: NONE

Lab Sample ID: 47482-6-7, S09
Sample Wt/Vol: 7.5058 units: g
Initial Calibration Date: 04-13-95
Instrument ID: Autospec
GC Column ID: 60M DB5
Sample Data Filename: A037906
Blank Data Filename: A037903
Cal. Ver. Data Filename: A037902

ANALYTE	CONC. FOUND pg/g dry	SAMPLE LIMIT OF DETECTION pg/g dry	LOWEST CALIBRATION CONCENTRATIO pg/g dry	ION RATIO
2,3,7,8-TCDD	0.49	0.36	1.33	0.74
1,2,3,7,8-PeCDD	1.69	0.61	6.66	1.64
1,2,3,4,7,8-HxCDD	1.53	0.20	6.66	1.11
1,2,3,6,7,8-HxCDD	1.79	0.26	6.66	1.10
1,2,3,7,8,9-HxCDD	2.85	0.28	6.66	1.39
1,2,3,4,6,7,8-HpCDD	16.64		6.66	1.05
OCDD	81.49		13.32	0.88
2,3,7,8-TCDF#	*	3.21"	1.33	*
1,2,3,7,8-PeCDF	1.61	0.43	6.66	1.71
2,3,4,7,8-PeCDF	2.51	0.38	6.66	1.51
1,2,3,4,7,8-HxCDF	3.00^	0.58	6.66	*
1,2,3,6,7,8-HxCDF	2.57	0.45	6.66	1.08
1,2,3,7,8,9-HxCDF	*	0.19	6.66	*
2,3,4,6,7,8-HxCDF	2.62	0.33	6.66	1.17
1,2,3,4,6,7,8-HpCDF	11.54		6.66	1.15
1,2,3,4,7,8,9-HpCDF	0.73	0.12	6.66	0.90
OCDF	6.76	0.42	13.32	0.89
Total Tetra-Furans	21.67			0.78
Total Tetra-Dioxins	11.70			0.79
Total Penta-Furans	21.46			1.50
Total Penta-Dioxins	7.85			1.43
Total Hexa-Furans	15.29			1.18
Total Hexa-Dioxins	22.15			1.17
Total Hepta-Furans	17.56			*
Total Hepta-Dioxins	31.68			1.07

LABELED COMPOUNDS	SPIKE CONC. pg	CONC. FOUN pg	R(%)	ION RATIO
13C-2,3,7,8-TCDD	2000	1166	58	0.77
13C-1,2,3,7,8-PeCDD	2000	1133	57	1.50
13C-1,2,3,4,7,8-HxCDD	2000	1425	71	1.26
13C-1,2,3,6,7,8-HxCDD	2000	1458	73	1.27
13C-1,2,3,4,6,7,8-HpCDD	2000	1398	70	1.03
13C-OCDD	4000	2506	63	0.90
13C-2,3,7,8-TCDF	2000	1206	60	0.78
13C-1,2,3,7,8-PeCDF	2000	1249	62	1.59
13C-2,3,4,7,8-PeCDF	2000	1273	64	1.59
13C-1,2,3,4,7,8-HxCDF	2000	1255	63	0.52
13C-1,2,3,6,7,8-HxCDF	2000	1225	61	0.51
13C-1,2,3,7,8,9-HxCDF	2000	1181	59	0.52
13C-2,3,4,6,7,8-HxCDF	2000	1361	68	0.53
13C-1,2,3,4,6,7,8-HpCDF	2000	1429	71	0.45
13C-1,2,3,4,7,8,9-HpCDF	2000	1220	61	0.44
CLEANUP STANDARD				
37Cl-2,3,7,8-TCDD	200	147	73	

2,3,7,8-TCDF value from second column confirmation.

" Sample limit of detection (LOD) higher than lowest calibration concentration.
^ Analyte concentration estimated; CDPE interference - see text for detail.
* Analyte not detected.

PCDD/PCDF ANALYSIS DATA SHEET

Lab Name: BATTELLE
Matrix: SOIL
Sample Receipt Date: 12-06-95
Ext. Date: 12-07-95
Analysis Date: 19-DEC-95 Time: 14:23:23
Extract Volume (uL): 20
Injection Volume (uL): 1
Dilution Factor: NONE

Lab Sample ID: 47482-6-20, S09, Duplicate
Sample Wt/Vol: 7.5170 units: g
Initial Calibration Date: 04-13-95
Instrument ID: Autospec
GC Column ID: 60M DB5
Sample Data Filename: A037907
Blank Data Filename: A037903
Cal. Ver. Data Filename: A037902

ANALYTE	CONC. FOUND pg/g dry	SAMPLE LIMIT OF DETECTION pg/g dry	LOWEST CALIBRATION CONCENTRATIO pg/g dry	ION RATIO
2,3,7,8-TCDD	0.54	0.26	1.33	0.75
1,2,3,7,8-PeCDD	2.41	0.46	6.65	1.72
1,2,3,4,7,8-HxCDD	2.00	0.17	6.65	1.33
1,2,3,6,7,8-HxCDD	2.33	0.22	6.65	1.35
1,2,3,7,8,9-HxCDD	4.16	0.24	6.65	1.34
1,2,3,4,6,7,8-HpCDD	19.71		6.65	1.02
OCDD	89.99		13.30	0.86
2,3,7,8-TCDF#	2.03		1.33	0.83
1,2,3,7,8-PeCDF	1.73	0.33	6.65	1.59
2,3,4,7,8-PeCDF	3.70	0.31	6.65	1.50
1,2,3,4,7,8-HxCDF	1.50^	0.45	6.65	*
1,2,3,6,7,8-HxCDF	3.89	0.34	6.65	1.25
1,2,3,7,8,9-HxCDF	0.36	0.13	6.65	1.11
2,3,4,6,7,8-HxCDF	3.36	0.26	6.65	1.15
1,2,3,4,6,7,8-HpCDF	13.82		6.65	1.08
1,2,3,4,7,8,9-HpCDF	1.04	0.10	6.65	0.99
OCDF	7.87	0.37	13.30	0.92
Total Tetra-Furans	27.12			0.73
Total Tetra-Dioxins	11.34			0.75
Total Penta-Furans	35.16			1.48
Total Penta-Dioxins	3.57			1.67
Total Hexa-Furans	19.55			1.36
Total Hexa-Dioxins	28.40			1.22
Total Hepta-Furans	21.69			*
Total Hepta-Dioxins	36.35			1.06

LABELED COMPOUNDS	SPIKE CONC pg	CONC. FOUN pg	R(%)	ION RATIO
13C-2,3,7,8-TCDD	2000	1356	68	0.78
13C-1,2,3,7,8-PeCDD	2000	1227	61	1.53
13C-1,2,3,4,7,8-HxCDD	2000	1554	78	1.26
13C-1,2,3,6,7,8-HxCDD	2000	1570	78	1.26
13C-1,2,3,4,6,7,8-HpCDD	2000	1588	79	1.02
13C-OCDD	4000	2724	68	0.88
13C-2,3,7,8-TCDF	2000	1318	66	0.77
13C-1,2,3,7,8-PeCDF	2000	1335	67	1.60
13C-2,3,4,7,8-PeCDF	2000	1281	64	1.61
13C-1,2,3,4,7,8-HxCDF	2000	1479	74	0.51
13C-1,2,3,6,7,8-HxCDF	2000	1459	73	0.50
13C-1,2,3,7,8,9-HxCDF	2000	1568	78	0.51
13C-2,3,4,6,7,8-HxCDF	2000	1560	78	0.52
13C-1,2,3,4,6,7,8-HpCDF	2000	1461	73	0.43
13C-1,2,3,4,7,8,9-HpCDF	2000	1350	68	0.43
CLEANUP STANDARD				
37Cl-2,3,7,8-TCDD	200	169	84	

2,3,7,8-TCDF value from second column confirmation.

^ Analyte concentration estimated; CDPE interference - see text for detail.
* Analyte not detected.

PCDD/PCDF ANALYSIS DATA SHEET

Lab Name: BATTELLE
Matrix: SOIL
Sample Receipt Date: 12-06-95
Ext. Date: 12-07-95
Analysis Date: 19-DEC-95 Time: 16:36:31
Extract Volume (uL): 20
Injection Volume (uL): 0.5
Dilution Factor: 1:2

Lab Sample ID: 47482-6-18, S03
Sample Wt/Vol: 6.6061 units: g
Initial Calibration Date: 04-13-95
Instrument ID: Autospec
GC Column ID: 60M DB5
Sample Data Filename: A037909
Blank Data Filename: A037903
Cal. Ver. Data Filename: A037902

ANALYTE	CONC. FOUND pg/g dry	SAMPLE LIMIT OF DETECTION pg/g dry	LOWEST CALIBRATION CONCENTRATION pg/g dry	ION RATIO
2,3,7,8-TCDD	*	2.27	6.06	*
1,2,3,7,8-PeCDD	*	1.95	30.28	*
1,2,3,4,7,8-HxCDD	1.48	0.83	30.28	1.23
1,2,3,6,7,8-HxCDD	1.67	1.06	30.28	1.20
1,2,3,7,8,9-HxCDD	2.00	1.18	30.28	1.32
1,2,3,4,6,7,8-HpCDD	28.00	2.17	30.28	1.07
OCDD	285.65		60.55	0.88
2,3,7,8-TCDF#	1.60	1.05	6.06	0.78
1,2,3,7,8-PeCDF	1.97	1.82	30.28	1.32
2,3,4,7,8-PeCDF	*	3.94	30.28	*
1,2,3,4,7,8-HxCDF	*	2.52	30.28	*
1,2,3,6,7,8-HxCDF	2.10	1.79	30.28	*
1,2,3,7,8,9-HxCDF	0.84	0.70	30.28	*
2,3,4,6,7,8-HxCDF	2.00	1.42	30.28	*
1,2,3,4,6,7,8-HpCDF	7.40	1.00	30.28	1.20
1,2,3,4,7,8,9-HpCDF	1.38	0.49	30.28	1.05
OCDF	18.28	1.77	60.55	0.78
Total Tetra-Furans	2.06			0.71
Total Tetra-Dioxins	*	2.09		*
Total Penta-Furans	*	4.35		*
Total Penta-Dioxins	*	1.75		*
Total Hexa-Furans	*	1.94		*
Total Hexa-Dioxins	6.25			1.33
Total Hepta-Furans	20.63			*
Total Hepta-Dioxins	64.01			1.10

LABELED COMPOUNDS	SPIKE CONC. pg	CON FOU pg	R(%)	ION RATIO
13C-2,3,7,8-TCDD	2000	1337	67	0.77
13C-1,2,3,7,8-PeCDD	2000	1213	61	1.56
13C-1,2,3,4,7,8-HxCDD	2000	1472	74	1.25
13C-1,2,3,6,7,8-HxCDD	2000	1590	79	1.24
13C-1,2,3,4,6,7,8-HpCDD	2000	1555	78	1.05
13C-OCDD	4000	2677	67	0.88
13C-2,3,7,8-TCDF	2000	1437	72	0.80
13C-1,2,3,7,8-PeCDF	2000	1246	62	1.57
13C-2,3,4,7,8-PeCDF	2000	840	42	1.63
13C-1,2,3,4,7,8-HxCDF	2000	1307	65	0.53
13C-1,2,3,6,7,8-HxCDF	2000	1368	68	0.50
13C-1,2,3,7,8,9-HxCDF	2000	1406	70	0.49
13C-2,3,4,6,7,8-HxCDF	2000	1384	69	0.53
13C-1,2,3,4,6,7,8-HpCDF	2000	1452	73	0.44
13C-1,2,3,4,7,8,9-HpCDF	2000	1347	67	0.43
CLEANUP STANDARD				
37Cl-2,3,7,8-TCDD	200	179	89	

2,3,7,8-TCDF value from second column confirmation.

* Analyte not detected.

PCDD/PCDF ANALYSIS DATA SHEET

Lab Name: BATTELLE
Matrix: SOIL
Sample Receipt Date: 12-06-95
Ext. Date: 12-07-95
Analysis Date: 19-DEC-95 Time: 17:52:10
Extract Volume (uL): 20
Injection Volume (uL): 0.5
Dilution Factor: 1:2

Lab Sample ID: 47482-6-19, S03, DL Spike
Sample Wt/Vol: 6.6138 units: g
Initial Calibration Date: 04-13-95
Instrument ID: Autospec
GC Column ID: 60M DB5
Sample Data Filename: A037910
Blank Data Filename: A037903
Cal. Ver. Data Filename: A037902

ANALYTE	CONC. FOUND pg/g dry	SAMPLE LIMIT OF DETECTION pg/g dry	LOWEST CALIBRATION CONCENTRATIO pg/g dry	ION RATIO
2,3,7,8-TCDD	9.64		6.05	0.71
1,2,3,7,8-PeCDD	46.40		30.24	1.43
1,2,3,4,7,8-HxCDD	40.54		30.24	1.30
1,2,3,6,7,8-HxCDD	35.90		30.24	1.28
1,2,3,7,8,9-HxCDD	39.03		30.24	1.14
1,2,3,4,6,7,8-HpCDD	60.44		30.24	1.01
OCDD	270.77		60.48	0.90
2,3,7,8-TCDF	9.82		6.05	0.77
1,2,3,7,8-PeCDF	40.52		30.24	1.54
2,3,4,7,8-PeCDF	43.62		30.24	1.52
1,2,3,4,7,8-HxCDF	40.79		30.24	1.17
1,2,3,6,7,8-HxCDF	42.32		30.24	1.19
1,2,3,7,8,9-HxCDF	42.32		30.24	1.30
2,3,4,6,7,8-HxCDF	40.64		30.24	1.22
1,2,3,4,6,7,8-HpCDF	38.85		30.24	1.01
1,2,3,4,7,8,9-HpCDF	40.83		30.24	1.05
OCDF	87.91		60.48	0.85
Total Tetra-Furans	9.82			*
Total Tetra-Dioxins	9.64			0.71
Total Penta-Furans	86.18			1.74
Total Penta-Dioxins	46.40			1.43
Total Hexa-Furans	169.51			1.26
Total Hexa-Dioxins	115.47			1.30
Total Hepta-Furans	79.68			*
Total Hepta-Dioxins	89.91			1.06

LABELED COMPOUNDS	SPIKE CONC. pg	CONC FOUN pg	R(%)	ION RATIO
13C-2,3,7,8-TCDD	2000	1386	69	0.78
13C-1,2,3,7,8-PeCDD	2000	1351	68	1.60
13C-1,2,3,4,7,8-HxCDD	2000	1545	77	1.25
13C-1,2,3,6,7,8-HxCDD	2000	1664	83	1.24
13C-1,2,3,4,6,7,8-HpCDD	2000	1623	81	1.03
13C-OCDD	4000	3012	75	0.89
13C-2,3,7,8-TCDF	2000	1409	70	0.82
13C-1,2,3,7,8-PeCDF	2000	1366	68	1.58
13C-2,3,4,7,8-PeCDF	2000	1346	67	1.59
13C-1,2,3,4,7,8-HxCDF	2000	1438	72	0.53
13C-1,2,3,6,7,8-HxCDF	2000	1397	70	0.51
13C-1,2,3,7,8,9-HxCDF	2000	1536	77	0.51
13C-2,3,4,6,7,8-HxCDF	2000	1537	77	0.52
13C-1,2,3,4,6,7,8-HpCDF	2000	1492	75	0.42
13C-1,2,3,4,7,8,9-HpCDF	2000	1371	69	0.43
CLEANUP STANDARD				
37Cl-2,3,7,8-TCDD	200	164	82	

PCDD/PCDF ANALYSIS DATA SHEET

Lab Name: BATTELLE
Matrix: SOIL
Sample Receipt Date: 12-06-95
Ext. Date: 12-07-95
Analysis Date: 19-DEC-95 Time: 18:58:11
Extract Volume (uL): 20
Injection Volume (uL): 1.0
Dilution Factor: NONE

Lab Sample ID: 47482-6-17, S02,
Sample Wt/Vol: 10.0000 units: g
Initial Calibration Date: 04-13-95
Instrument ID: Autospec
GC Column ID: 60M DB5
Sample Data Filename: A037911
Blank Data Filename: A037903
Cal. Ver. Data Filename: A037902

ANALYTE	CONC. FOUND pg/g dry	SAMPLE LIMIT OF DETECTION pg/g dry	LOWEST CALIBRATION CONCENTRATIO pg/g dry	ION RATIO
2,3,7,8-TCDD	486.79		1.00	0.77
1,2,3,7,8-PeCDD	1072.82		5.00	1.54
1,2,3,4,7,8-HxCDD	941.48		5.00	1.24
1,2,3,6,7,8-HxCDD	864.45		5.00	1.24
1,2,3,7,8,9-HxCDD	926.91		5.00	1.24
1,2,3,4,6,7,8-HpCDD	1450.53		5.00	1.06
OCDD	3086.77		10.00	0.88
2,3,7,8-TCDF	467.75		1.00	0.76
1,2,3,7,8-PeCDF	925.28		5.00	1.53
2,3,4,7,8-PeCDF	972.43		5.00	1.52
1,2,3,4,7,8-HxCDF	965.78		5.00	1.21
1,2,3,6,7,8-HxCDF	942.33		5.00	1.21
1,2,3,7,8,9-HxCDF	1010.55		5.00	1.22
2,3,4,6,7,8-HxCDF	936.04		5.00	1.20
1,2,3,4,6,7,8-HpCDF	1332.23		5.00	1.00
1,2,3,4,7,8,9-HpCDF	1414.48		5.00	1.00
OCDF	2348.15		10.00	0.86
Total Tetra-Furans	467.75			*
Total Tetra-Dioxins	486.79			0.77
Total Penta-Furans	1897.71			1.53
Total Penta-Dioxins	1072.82			1.54
Total Hexa-Furans	3854.70			1.21
Total Hexa-Dioxins	2732.84			1.24
Total Hepta-Furans	2746.71			1.00
Total Hepta-Dioxins	1464.93			1.06

LABELED COMPOUNDS	SPIKE CONC. pg	CONC FOUN pg	R(%)	ION RATIO
13C-2,3,7,8-TCDD	2000	1436	72	0.78
13C-1,2,3,7,8-PeCDD	2000	1420	71	1.56
13C-1,2,3,4,7,8-HxCDD	2000	1480	74	1.22
13C-1,2,3,6,7,8-HxCDD	2000	1503	75	1.24
13C-1,2,3,4,6,7,8-HpCDD	2000	1592	80	1.04
13C-OCDD	4000	2865	72	0.89
13C-2,3,7,8-TCDF	2000	1381	69	0.79
13C-1,2,3,7,8-PeCDF	2000	1464	73	1.58
13C-2,3,4,7,8-PeCDF	2000	1385	69	1.60
13C-1,2,3,4,7,8-HxCDF	2000	1374	69	0.52
13C-1,2,3,6,7,8-HxCDF	2000	1382	69	0.52
13C-1,2,3,7,8,9-HxCDF	2000	1536	77	0.51
13C-2,3,4,6,7,8-HxCDF	2000	1396	70	0.51
13C-1,2,3,4,6,7,8-HpCDF	2000	1427	71	0.44
13C-1,2,3,4,7,8,9-HpCDF	2000	1496	75	0.43
CLEANUP STANDARD				
37Cl-2,3,7,8-TCDD	200	175	87	

PCDD/PCDF ANALYSIS DATA SHEET

Lab Name: BATTELLE
Matrix: SOIL
Sample Receipt Date: 12-06-95
Ext. Date: 12-07-95
Analysis Date: 15-JAN-96 Time: 11:10:41
Extract Volume (uL): 20
Injection Volume (uL): 1
Dilution Factor: NONE

Lab Sample ID: 47482-6-8, S10
Sample Wt/Vol: 6.8140 units: g
Initial Calibration Date: 04-13-95
Instrument ID: Autospec
GC Column ID: 60M DB5
Sample Data Filename: A038904
Blank Data Filename: A038903
Cal. Ver. Data Filename: A038902

ANALYTE	CONC. FOUND pg/g dry	SAMPLE LIMIT OF DETECTION pg/g dry	LOWEST CALIBRATION CONCENTRATIO pg/g dry	ION RATIO
2,3,7,8-TCDD	0.74	0.15	1.47	0.69
1,2,3,7,8-PeCDD	2.42	0.29	7.34	1.58
1,2,3,4,7,8-HxCDD	3.76	0.35	7.34	1.28
1,2,3,6,7,8-HxCDD	5.69	0.21	7.34	1.32
1,2,3,7,8,9-HxCDD	8.85		7.34	1.22
1,2,3,4,6,7,8-HpCDD	145.09		7.34	1.08
OCDD	1204.99		14.68	0.88
2,3,7,8-TCDF	(4.00)		1.47	(0.74)
1,2,3,7,8-PeCDF	1.95	0.25	7.34	1.58
2,3,4,7,8-PeCDF	4.55	0.21	7.34	1.39
1,2,3,4,7,8-HxCDF	6.50 ^	0.21	7.34	*
1,2,3,6,7,8-HxCDF	3.39	0.32	7.34	1.11
1,2,3,7,8,9-HxCDF	*	0.13	7.34	*
2,3,4,6,7,8-HxCDF	3.43	0.09	7.34	1.21
1,2,3,4,6,7,8-HpCDF	37.32		7.34	1.05
1,2,3,4,7,8,9-HpCDF	2.51	0.78	7.34	1.03
OCDF	81.41		14.68	0.87
Total Tetra-Furans	78.74			0.79
Total Tetra-Dioxins	8.25			0.67
Total Penta-Furans	50.94			1.62
Total Penta-Dioxins	2.42			1.58
Total Hexa-Furans	43.33			1.28
Total Hexa-Dioxins	55.54			1.31
Total Hepta-Furans	104.54			*
Total Hepta-Dioxins	256.53			1.04

LABELED COMPOUNDS	SPIKE CONC. pg	CONC FOUN pg	R(%)	ION RATIO
13C-2,3,7,8-TCDD	2000	1493	75	0.78
13C-1,2,3,7,8-PeCDD	2000	1590	79	1.57
13C-1,2,3,4,7,8-HxCDD	2000	1499	75	1.24
13C-1,2,3,6,7,8-HxCDD	2000	1658	83	1.25
13C-1,2,3,4,6,7,8-HpCDD	2000	1530	77	1.02
13C-OCDD	4000	2738	68	0.88
13C-2,3,7,8-TCDF	2000	1484	74	0.77
13C-1,2,3,7,8-PeCDF	2000	1594	80	1.57
13C-2,3,4,7,8-PeCDF	2000	1582	79	1.57
13C-1,2,3,4,7,8-HxCDF	2000	1533	77	0.51
13C-1,2,3,6,7,8-HxCDF	2000	1563	78	0.51
13C-1,2,3,7,8,9-HxCDF	2000	1565	78	0.51
13C-2,3,4,6,7,8-HxCDF	2000	1629	81	0.52
13C-1,2,3,4,6,7,8-HpCDF	2000	1645	82	0.43
13C-1,2,3,4,7,8,9-HpCDF	2000	1481	74	0.43
CLEANUP STANDARD				
37Cl-2,3,7,8-TCDD	200	192	96	

( ) Second column confirmation not done. 2,3,7,8-TCDF concentration estimated; see text for detail.

^Analyte concentration estimated; CDPE interference - see text for detail.
* Analyte not detected.

PCDD/PCDF ANALYSIS DATA SHEET

Lab Name: BATTELLE
Matrix: SOIL
Sample Receipt Date: 12-06-95
Ext. Date: 12-07-95
Analysis Date: 15-JAN-96 Time: 12:39:50
Extract Volume (uL): 20
Injection Volume (uL): 1
Dilution Factor: NONE

Lab Sample ID: 47482-6-9, S11
Sample Wt/Vol: 7.5250 units: g
Initial Calibration Date: 04-13-95
Instrument ID: Autospec
GC Column ID: 60M DB5
Sample Data Filename: A038905
Blank Data Filename: A038903
Cal. Ver. Data Filename: A038902

ANALYTE	CONC. FOUND pg/g dry	SAMPLE LIMIT OF DETECTION pg/g dry	LOWEST CALIBRATION CONCENTRATIO pg/g dry	ION RATIO
2,3,7,8-TCDD	0.79	0.12	1.33	0.71
1,2,3,7,8-PeCDD	2.84	0.23	6.64	1.55
1,2,3,4,7,8-HxCDD	2.95	0.26	6.64	1.32
1,2,3,6,7,8-HxCDD	3.37	0.16	6.64	1.24
1,2,3,7,8,9-HxCDD	6.71		6.64	1.25
1,2,3,4,6,7,8-HpCDD	31.22		6.64	1.04
OCDD	124.76		13.29	0.88
2,3,7,8-TCDF	(2.11)		1.33	(0.79)
1,2,3,7,8-PeCDF	2.15	0.19	6.64	1.34
2,3,4,7,8-PeCDF	3.88	0.17	6.64	1.45
1,2,3,4,7,8-HxCDF	4.30 ^	0.17	6.64	*
1,2,3,6,7,8-HxCDF	4.00	0.25	6.64	1.13
1,2,3,7,8,9-HxCDF	*	0.10	6.64	*
2,3,4,6,7,8-HxCDF	4.49	0.07	6.64	1.16
1,2,3,4,6,7,8-HpCDF	23.83		6.64	1.00
1,2,3,4,7,8,9-HpCDF	1.59	0.58	6.64	0.93
OCDF	32.95		13.29	0.89
Total Tetra-Furans	37.50			0.68
Total Tetra-Dioxins	10.80			0.74
Total Penta-Furans	45.76			1.56
Total Penta-Dioxins	22.37			1.53
Total Hexa-Furans	23.95			1.22
Total Hexa-Dioxins	40.95			1.37
Total Hepta-Furans	36.08			*
Total Hepta-Dioxins	57.44			1.08

LABELED COMPOUNDS	SPIKE CONC pg	CONC. FOUND pg	R(%)	ION RATIO
13C-2,3,7,8-TCDD	2000	1547	77	0.80
13C-1,2,3,7,8-PeCDD	2000	1608	80	1.55
13C-1,2,3,4,7,8-HxCDD	2000	1555	78	1.34
13C-1,2,3,6,7,8-HxCDD	2000	1684	84	1.17
13C-1,2,3,4,6,7,8-HpCDD	2000	1550	77	1.05
13C-OCDD	4000	2894	72	0.89
13C-2,3,7,8-TCDF	2000	1482	74	0.81
13C-1,2,3,7,8-PeCDF	2000	1680	84	1.57
13C-2,3,4,7,8-PeCDF	2000	1604	80	1.60
13C-1,2,3,4,7,8-HxCDF	2000	1557	78	0.52
13C-1,2,3,6,7,8-HxCDF	2000	1530	76	0.53
13C-1,2,3,7,8,9-HxCDF	2000	1581	79	0.51
13C-2,3,4,6,7,8-HxCDF	2000	1656	83	0.52
13C-1,2,3,4,6,7,8-HpCDF	2000	1551	78	0.44
13C-1,2,3,4,7,8,9-HpCDF	2000	1462	73	0.44
CLEANUP STANDARD				
37Cl-2,3,7,8-TCDD	200	205	102	

( ) Second column confirmation not done. 2,3,7,8-TCDF concentration estimated; see text for detail.
^ Analyte concentration estimated; CDPE interference, see text for detail.
* Analyte not detected.

PCDD/PCDF ANALYSIS DATA SHEET

Lab Name: BATTELLE
Matrix: SOIL
Sample Receipt Date: 12-07-95
Ext. Date: 12-07-95
Analysis Date: 15-JAN-96 Time: 14:57:09
Extract Volume (uL): 20
Injection Volume (uL): 1
Dilution Factor: NONE

Lab Sample ID: 47482-6-11, S13
Sample Wt/Vol: 8.0366 units: g
Initial Calibration Date: 04-13-95
Instrument ID: Autospec
GC Column ID: 60M DB5
Sample Data Filename: A038907
Blank Data Filename: A038903
Cal. Ver. Data Filename: A038902

ANALYTE	CONC. FOUND pg/g dry	SAMPLE LIMIT OF DETECTION pg/g dry	LOWEST CALIBRATION CONCENTRATIO pg/g dry	ION RATIO
2,3,7,8-TCDD	0.67	0.14	1.24	0.67
1,2,3,7,8-PeCDD	3.41	0.28	6.22	1.53
1,2,3,4,7,8-HxCDD	3.23	0.34	6.22	1.31
1,2,3,6,7,8-HxCDD	3.81	0.20	6.22	1.18
1,2,3,7,8,9-HxCDD	5.21	0.27	6.22	1.22
1,2,3,4,6,7,8-HpCDD	29.20		6.22	1.05
OCDD	126.12		12.44	0.89
2,3,7,8-TCDF	(2.15)		1.24	(0.72)
1,2,3,7,8-PeCDF	2.73	0.23	6.22	1.62
2,3,4,7,8-PeCDF	4.92	0.21	6.22	1.60
1,2,3,4,7,8-HxCDF	4.90^	0.23	6.22	*
1,2,3,6,7,8-HxCDF	4.91	0.33	6.22	1.25
1,2,3,7,8,9-HxCDF	0.25	0.12	6.22	*
2,3,4,6,7,8-HxCDF	4.80	0.09	6.22	1.15
1,2,3,4,6,7,8-HpCDF	20.96		6.22	0.99
1,2,3,4,7,8,9-HpCDF	1.59	0.77	6.22	0.94
OCDF	11.18	0.55	12.44	0.87
Total Tetra-Furans	40.17			0.79
Total Tetra-Dioxins	15.71			0.68
Total Penta-Furans	50.32			1.48
Total Penta-Dioxins	20.64			1.48
Total Hexa-Furans	24.82			1.28
Total Hexa-Dioxins	44.22			1.25
Total Hepta-Furans	32.65			*
Total Hepta-Dioxins	55.01			1.05

LABELED COMPOUNDS	SPIKE CONC pg	CONC. FOUND pg	R(%)	ION RATIO
13C-2,3,7,8-TCDD	2000	1436	72	0.78
13C-1,2,3,7,8-PeCDD	2000	1326	66	1.52
13C-1,2,3,4,7,8-HxCDD	2000	1386	69	1.26
13C-1,2,3,6,7,8-HxCDD	2000	1554	78	1.29
13C-1,2,3,4,6,7,8-HpCDD	2000	1524	76	1.04
13C-OCDD	4000	2679	67	0.89
13C-2,3,7,8-TCDF	2000	1311	66	0.81
13C-1,2,3,7,8-PeCDF	2000	1392	70	1.59
13C-2,3,4,7,8-PeCDF	2000	1348	67	1.59
13C-1,2,3,4,7,8-HxCDF	2000	1380	69	0.52
13C-1,2,3,6,7,8-HxCDF	2000	1403	70	0.52
13C-1,2,3,7,8,9-HxCDF	2000	1537	77	0.51
13C-2,3,4,6,7,8-HxCDF	2000	1473	74	0.52
13C-1,2,3,4,6,7,8-HpCDF	2000	1482	74	0.44
13C-1,2,3,4,7,8,9-HpCDF	2000	1407	70	0.43
CLEANUP STANDARD				
37Cl-2,3,7,8-TCDD	200	160	80	

( ) Second column confirmation not done. 2,3,7,8-TCDF concentration estimated; see text for detail.
^ Analyte concentration estimated; CDPE interference, see text for detail
* Analyte not detected.

PCDD/PCDF ANALYSIS DATA SHEET

Lab Name: BATTELLE
Matrix: SOIL
Sample Receipt Date: 12-07-95
Ext. Date: 12-07-95
Analysis Date: 15-JAN-96 Time: 16:06:00
Extract Volume (uL): 20
Injection Volume (uL): 1
Dilution Factor: NONE

Lab Sample ID: 47482-6-12, S14
Sample Wt/Vol: 7.2963 units: g
Initial Calibration Date: 04-13-95
Instrument ID: Autospec
GC Column ID: 60M DB5
Sample Data Filename: A038908
Blank Data Filename: A038903
Cal. Ver. Data Filename: A038902

ANALYTE	CONC. FOUND pg/g dry	SAMPLE LIMIT OF DETECTION pg/g dry	LOWEST CALIBRATION CONCENTRATIO pg/g dry	ION RATIO
2,3,7,8-TCDD	10.91		1.37	0.73
1,2,3,7,8-PeCDD	4.08	0.29	6.85	1.67
1,2,3,4,7,8-HxCDD	3.90	0.32	6.85	1.11
1,2,3,6,7,8-HxCDD	7.34		6.85	1.24
1,2,3,7,8,9-HxCDD	5.93	0.26	6.85	1.15
1,2,3,4,6,7,8-HpCDD	127.53		6.85	1.06
OCDD	997.01		13.71	0.87
2,3,7,8-TCDF	(3.92)		1.37	(0.81)
1,2,3,7,8-PeCDF	4.14	0.25	6.85	1.42
2,3,4,7,8-PeCDF	5.79	0.21	6.85	1.45
1,2,3,4,7,8-HxCDF	5.70^	0.23	6.85	*
1,2,3,6,7,8-HxCDF	5.04	0.34	6.85	1.22
1,2,3,7,8,9-HxCDF	*	0.13	6.85	*
2,3,4,6,7,8-HxCDF	4.76	0.10	6.85	1.23
1,2,3,4,6,7,8-HpCDF	30.87		6.85	0.97
1,2,3,4,7,8,9-HpCDF	1.70	0.83	6.85	1.02
OCDF	31.49		13.71	0.86
Total Tetra-Furans	86.66			0.69
Total Tetra-Dioxins	32.32			0.76
Total Penta-Furans	63.76			1.53
Total Penta-Dioxins	4.08			1.67
Total Hexa-Furans	42.85			1.12
Total Hexa-Dioxins	62.86			1.19
Total Hepta-Furans	64.79			*
Total Hepta-Dioxins	230.85			1.04

LABELED COMPOUNDS	SPIKE CONC pg	CONC. FOUN pg	R(%)	ION RATIO
13C-2,3,7,8-TCDD	2000	1247	62	0.80
13C-1,2,3,7,8-PeCDD	2000	1234	62	1.54
13C-1,2,3,4,7,8-HxCDD	2000	1325	66	1.22
13C-1,2,3,6,7,8-HxCDD	2000	1463	73	1.26
13C-1,2,3,4,6,7,8-HpCDD	2000	1286	64	1.04
13C-OCDD	4000	2370	59	0.89
13C-2,3,7,8-TCDF	2000	1170	58	0.81
13C-1,2,3,7,8-PeCDF	2000	1239	62	1.58
13C-2,3,4,7,8-PeCDF	2000	1198	60	1.57
13C-1,2,3,4,7,8-HxCDF	2000	1244	62	0.52
13C-1,2,3,6,7,8-HxCDF	2000	1187	59	0.51
13C-1,2,3,7,8,9-HxCDF	2000	1290	65	0.51
13C-2,3,4,6,7,8-HxCDF	2000	1291	65	0.52
13C-1,2,3,4,6,7,8-HpCDF	2000	1251	63	0.44
13C-1,2,3,4,7,8,9-HpCDF	2000	1129	56	0.42
CLEANUP STANDARD				
37Cl-2,3,7,8-TCDD	200	141	70	

( ) Second column confirmation not done. 2,3,7,8-TCDF concentration estimated; see text for detail.
^ Analyte concentration estimated; CDPE interference, see text for detail.
* Analyte not detected.

PCDD/PCDF ANALYSIS DATA SHEET

Lab Name: BATTELLE
Matrix: SOIL
Sample Receipt Date: 12-06-95
Ext. Date: 12-07-95
Analysis Date: 15-JAN-96 Time: 17:12:38
Extract Volume (uL): 20
Injection Volume (uL): 1
Dilution Factor: NONE

Lab Sample ID: 47482-6-21, S04, MS
Sample Wt/Vol: 6.5583 units: g
Initial Calibration Date: 04-13-95
Instrument ID: Autospec
GC Column ID: 60M DB5
Sample Data Filename: A038909
Blank Data Filename: A038903
Cal. Ver. Data Filename: A038902

ANALYTE	CONC. FOUND pg/g dry	SAMPLE LIMIT OF DETECTION pg/g dry	LOWEST CALIBRATION CONCENTRATION pg/g dry	ION RATIO
2,3,7,8-TCDD	37.23		1.52	0.76
1,2,3,7,8-PeCDD	193.83		7.62	1.56
1,2,3,4,7,8-HxCDD	168.85		7.62	1.34
1,2,3,6,7,8-HxCDD	147.66		7.62	1.21
1,2,3,7,8,9-HxCDD	160.72		7.62	1.23
1,2,3,4,6,7,8-HpCDD	191.35		7.62	1.08
OCDD	544.99		15.25	0.88
2,3,7,8-TCDF	35.49		1.52	0.77
1,2,3,7,8-PeCDF	167.14		7.62	1.55
2,3,4,7,8-PeCDF	169.57		7.62	1.54
1,2,3,4,7,8-HxCDF	172.18		7.62	1.25
1,2,3,6,7,8-HxCDF	172.44		7.62	1.18
1,2,3,7,8,9-HxCDF	179.73		7.62	1.24
2,3,4,6,7,8-HxCDF	169.94		7.62	1.21
1,2,3,4,6,7,8-HpCDF	158.59		7.62	1.00
1,2,3,4,7,8,9-HpCDF	171.61		7.62	1.00
OCDF	359.45		15.25	0.91
Total Tetra-Furans	36.31			0.87
Total Tetra-Dioxins	37.23			0.76
Total Penta-Furans	336.70			1.55
Total Penta-Dioxins	193.83			1.56
Total Hexa-Furans	694.29			*
Total Hexa-Dioxins	477.23			1.34
Total Hepta-Furans	340.29			*
Total Hepta-Dioxins	218.67			1.05

LABELED COMPOUNDS	SPIKE CONC pg	CONC FOUN pg	R(%)	ION RATIO
13C-2,3,7,8-TCDD	2000	1450	73	0.79
13C-1,2,3,7,8-PeCDD	2000	1442	72	1.53
13C-1,2,3,4,7,8-HxCDD	2000	1509	75	1.24
13C-1,2,3,6,7,8-HxCDD	2000	1606	80	1.25
13C-1,2,3,4,6,7,8-HpCDD	2000	1514	76	1.03
13C-OCDD	4000	2525	63	0.87
13C-2,3,7,8-TCDF	2000	1477	74	0.78
13C-1,2,3,7,8-PeCDF	2000	1511	76	1.60
13C-2,3,4,7,8-PeCDF	2000	1433	72	1.55
13C-1,2,3,4,7,8-HxCDF	2000	1378	69	0.52
13C-1,2,3,6,7,8-HxCDF	2000	1337	67	0.51
13C-1,2,3,7,8,9-HxCDF	2000	1438	72	0.51
13C-2,3,4,6,7,8-HxCDF	2000	1433	72	0.52
13C-1,2,3,4,6,7,8-HpCDF	2000	1470	73	0.43
13C-1,2,3,4,7,8,9-HpCDF	2000	1323	66	0.44
CLEANUP STANDARD				
37Cl-2,3,7,8-TCDD	200	184	92	

PCDD/PCDF ANALYSIS DATA SHEET

Lab Name: BATTELLE
Matrix: SOIL
Sample Receipt Date: 12-06-95
Ext. Date: 12-07-95
Analysis Date: 15-JAN-96 Time: 18:19:06
Extract Volume (uL): 20
Injection Volume (uL): 1
Dilution Factor: NONE

Lab Sample ID: 47482-6-23,S04MSD
Sample Wt/Vol: 6.5930 units: g
Initial Calibration Date: 04-13-95
Instrument ID: Autospec
GC Column ID: 60M DB5
Sample Data Filename: A038910
Blank Data Filename: A038903
Cal. Ver. Data Filename: A038902

ANALYTE	CONC. FOUND pg/g dry	SAMPLE LIMIT OF DETECTION pg/g dry	LOWEST CALIBRATION CONCENTRATIO pg/g dry	ION RATIO
2,3,7,8-TCDD	36.00		1.52	0.77
1,2,3,7,8-PeCDD	193.90		7.58	1.54
1,2,3,4,7,8-HxCDD	173.60		7.58	1.24
1,2,3,6,7,8-HxCDD	140.62		7.58	1.27
1,2,3,7,8,9-HxCDD	159.06		7.58	1.24
1,2,3,4,6,7,8-HpCDD	197.31		7.58	1.04
OCDD	568.12		15.17	0.88
2,3,7,8-TCDF	34.94		1.52	0.75
1,2,3,7,8-PeCDF	162.82		7.58	1.56
2,3,4,7,8-PeCDF	169.29		7.58	1.56
1,2,3,4,7,8-HxCDF	170.26		7.58	1.20
1,2,3,6,7,8-HxCDF	167.91		7.58	1.18
1,2,3,7,8,9-HxCDF	176.07		7.58	1.20
2,3,4,6,7,8-HxCDF	165.92		7.58	1.21
1,2,3,4,6,7,8-HpCDF	158.11		7.58	1.01
1,2,3,4,7,8,9-HpCDF	169.34		7.58	1.01
OCDF	336.43		15.17	0.86
Total Tetra-Furans	35.71			0.66
Total Tetra-Dioxins	36.00			0.77
Total Penta-Furans	332.11			1.56
Total Penta-Dioxins	193.90			1.54
Total Hexa-Furans	680.17			*
Total Hexa-Dioxins	477.83			1.09
Total Hepta-Furans	338.67			*
Total Hepta-Dioxins	233.51			1.03

LABELED COMPOUNDS	SPIKE CONC. pg	CONC. FOUND pg	R(%)	ION RATIO
13C-2,3,7,8-TCDD	2000	1398	70	0.80
13C-1,2,3,7,8-PeCDD	2000	1273	64	1.52
13C-1,2,3,4,7,8-HxCDD	2000	1426	71	1.22
13C-1,2,3,6,7,8-HxCDD	2000	1585	79	1.24
13C-1,2,3,4,6,7,8-HpCDD	2000	1436	72	1.04
13C-OCDD	4000	2548	64	0.89
13C-2,3,7,8-TCDF	2000	1362	68	0.79
13C-1,2,3,7,8-PeCDF	2000	1334	67	1.57
13C-2,3,4,7,8-PeCDF	2000	1274	64	1.58
13C-1,2,3,4,7,8-HxCDF	2000	1321	66	0.53
13C-1,2,3,6,7,8-HxCDF	2000	1276	64	0.50
13C-1,2,3,7,8,9-HxCDF	2000	1417	71	0.51
13C-2,3,4,6,7,8-HxCDF	2000	1425	71	0.52
13C-1,2,3,4,6,7,8-HpCDF	2000	1376	69	0.44
13C-1,2,3,4,7,8,9-HpCDF	2000	1198	60	0.44
CLEANUP STANDARD				
37Cl-2,3,7,8-TCDD	200	172	86	

PCDD/PCDF ANALYSIS DATA SHEET

Lab Name: BATTELLE
Matrix: SOIL
Sample Receipt Date: 12-07-95
Ext. Date: 12-07-95
Analysis Date: 16-JAN-96 Time: 11:20:42
Extract Volume (uL): 20
Injection Volume (uL): 1
Dilution Factor: NONE

Lab Sample ID: 47482-6-13, S15
Sample Wt/Vol: 7.9766 units: g
Initial Calibration Date: 04-13-95
Instrument ID: Autospec
GC Column ID: 60M DB5
Sample Data Filename: A039004
Blank Data Filename: A039003
Cal. Ver. Data Filename: A039002

ANALYTE	CONC. FOUND pg/g dry	SAMPLE LIMIT OF DETECTION pg/g dry	LOWEST CALIBRATION CONCENTRATION pg/g dry	ION RATIO
2,3,7,8-TCDD	3.46		1.25	0.75
1,2,3,7,8-PeCDD	9.79		6.27	1.67
1,2,3,4,7,8-HxCDD	9.95		6.27	1.31
1,2,3,6,7,8-HxCDD	31.83		6.27	1.23
1,2,3,7,8,9-HxCDD	19.18		6.27	1.29
1,2,3,4,6,7,8-HpCDD	572.53		6.27	1.07
OCDD	3994.50		12.54	0.89
2,3,7,8-TCD	(5.19)		1.25	(0.75)
1,2,3,7,8-PeCDF	7.52		6.27	1.50
2,3,4,7,8-PeCDF	8.21		6.27	1.45
1,2,3,4,7,8-HxCDF	16.00^	0.34	6.27	*
1,2,3,6,7,8-HxCDF	8.82		6.27	1.20
1,2,3,7,8,9-HxCDF	*	1.01	6.27	*
2,3,4,6,7,8-HxCDF	7.98		6.27	1.19
1,2,3,4,6,7,8-HpCDF	75.66		6.27	1.00
1,2,3,4,7,8,9-HpCDF	3.82		6.27	0.97
OCDF	74.74		12.54	0.87
Total Tetra-Furans	89.94			0.80
Total Tetra-Dioxins	51.87			0.77
Total Penta-Furans	113.25			1.62
Total Penta-Dioxins	39.58			1.55
Total Hexa-Furans	105.07			1.11
Total Hexa-Dioxins	205.82			1.22
Total Hepta-Furans	170.54			*
Total Hepta-Dioxins	1028.51			1.05

LABELED COMPOUNDS	SPIKE CONC. pg	CONC. FOUN pg	R(%)	ION RATIO
13C-2,3,7,8-TCDD	2000	1376	69	0.80
13C-1,2,3,7,8-PeCDD	2000	1429	71	1.56
13C-1,2,3,4,7,8-HxCDD	2000	1403	70	1.27
13C-1,2,3,6,7,8-HxCDD	2000	1538	77	1.26
13C-1,2,3,4,6,7,8-HpCDD	2000	1441	72	1.05
13C-OCDD	4000	2815	70	0.88
13C-2,3,7,8-TCDF	2000	1394	70	0.79
13C-1,2,3,7,8-PeCDF	2000	1528	76	1.57
13C-2,3,4,7,8-PeCDF	2000	1462	73	1.59
13C-1,2,3,4,7,8-HxCDF	2000	1424	71	0.55
13C-1,2,3,6,7,8-HxCDF	2000	1428	71	0.51
13C-1,2,3,7,8,9-HxCDF	2000	1450	73	0.52
13C-2,3,4,6,7,8-HxCDF	2000	1502	75	0.52
13C-1,2,3,4,6,7,8-HpCDF	2000	1461	73	0.43
13C-1,2,3,4,7,8,9-HpCDF	2000	1379	69	0.42
CLEANUP STANDARD				
37Cl-2,3,7,8-TCDD	200	149	74	

( ) Second column confirmation not done. 2,3,7,8-TCDF concentration estimated; see text for detail.
* Analyte not detected.
^ Analyte concentration estimated; CDPE interference, see text for detail.

PCDD/PCDF ANALYSIS DATA SHEET

Lab Name: BATTELLE
Matrix: SOIL
Sample Receipt Date: 12-07-95
Ext. Date: 12-07-95
Analysis Date: 16-JAN-96 Time: 12:27:46
Extract Volume (uL): 20
Injection Volume (uL): 1
Dilution Factor: NONE

Lab Sample ID: 47482-6-14, S16
Sample Wt/Vol: 8.0213 units: g
Initial Calibration Date: 04-13-95
Instrument ID: Autospec
GC Column ID: 60M DB5
Sample Data Filename: A039005
Blank Data Filename: A039003
Cal. Ver. Data Filename: A039002

ANALYTE	CONC. FOUND pg/g dry	SAMPLE LIMIT OF DETECTION pg/g dry	LOWEST CALIBRATION CONCENTRATIO pg/g dry	ION RATIO
2,3,7,8-TCDD	3.33		1.25	0.74
1,2,3,7,8-PeCDD	8.81		6.23	1.62
1,2,3,4,7,8-HxCDD	9.07		6.23	1.27
1,2,3,6,7,8-HxCDD	32.10		6.23	1.20
1,2,3,7,8,9-HxCDD	17.64		6.23	1.32
1,2,3,4,6,7,8-HpCDD	591.09		6.23	1.07
OCDD	4300.91		12.47	0.88
2,3,7,8-TCDF	(4.91)		1.25	(0.75)
1,2,3,7,8-PeCDF	8.14		6.23	1.36
2,3,4,7,8-PeCDF	9.35		6.23	1.50
1,2,3,4,7,8-HxCDF	21.00^	0 34	6.23	*
1,2,3,6,7,8-HxCDF	.8.23		6.23	1.15
1,2,3,7,8,9-HxCDF	*	1.02	6.23	*
2,3,4,6,7,8-HxCDF	7.91		6.23	1.19
1,2,3,4,6,7,8-HpCDF	84.56		6.23	1.02
1,2,3,4,7,8,9-HpCDF	3.48	0.45	6.23	0.94
OCDF	83.05		12.47	0.86
Total Tetra-Furans	121.64			0.73
Total Tetra-Dioxins	44.78			0.78
Total Penta-Furans	118.08			1.61
Total Penta-Dioxins	56.27			1.51
Total Hexa-Furans	115.03			1.22
Total Hexa-Dioxins	200.08			1.23
Total Hepta-Furans	192.32			*
Total Hepta-Dioxins	1041.07			1.06

LABELED COMPOUNDS	SPIKE CONC. pg	CONC. FOUND pg	R(%)	ION RATIO
13C-2,3,7,8-TCDD	2000	1464	73	0.79
13C-1,2,3,7,8-PeCDD	2000	1517	76	1.57
13C-1,2,3,4,7,8-HxCDD	2000	1483	74	1.24
13C-1,2,3,6,7,8-HxCDD	2000	1639	82	1.26
13C-1,2,3,4,6,7,8-HpCDD	2000	1577	79	1.04
13C-OCDD	4000	2927	73	0.90
13C-2,3,7,8-TCDF	2000	1552	78	0.77
13C-1,2,3,7,8-PeCDF	2000	1617	81	1.59
13C-2,3,4,7,8-PeCDF	2000	1573	79	1.61
13C-1,2,3,4,7,8-HxCDF	2000	1521	76	0.52
13C-1,2,3,6,7,8-HxCDF	2000	1494	75	0.51
13C-1,2,3,7,8,9-HxCDF	2000	1515	76	0.52
13C-2,3,4,6,7,8-HxCDF	2000	1552	78	0.52
13C-1,2,3,4,6,7,8-HpCDF	2000	1447	72	0.43
13C-1,2,3,4,7,8,9-HpCDF	2000	1404	70	0.42
CLEANUP STANDARD				
37Cl-2,3,7,8-TCDD	200	161	80	

( ) Second column confirmation not done. 2,3,7,8-TCDF concentration estimated; see text for detail.
^ Analyte concentration estimated; CDPE interference, see text for detail.
* Analyte not detected.

PCDD/PCDF ANALYSIS DATA SHEET

Lab Name: BATTELLE
Matrix: SOIL
Sample Receipt Date: 12-07-95
Ext. Date: 12-12-95
Analysis Date: 16-JAN-96 Time: 13:36:12
Extract Volume (uL): 20
Injection Volume (uL): 1
Dilution Factor: NONE

Lab Sample ID: 47482-10-2, S18
Sample Wt/Vol: 8.4973 units: g
Initial Calibration Date: 04-13-95
Instrument ID: Autospec
GC Column ID: 60M DB5
Sample Data Filename: A039006
Blank Data Filename: A039003
Cal. Ver. Data Filename: A039002

ANALYTE	CONC. FOUND pg/g dry	SAMPLE LIMIT OF DETECTION pg/g dry	LOWEST CALIBRATION CONCENTRATIO pg/g dry	ION RATIO
2,3,7,8-TCDD	*	0.40	1.18	*
1,2,3,7,8-PeCDD	4.80	0.36	5.88	1.67
1,2,3,4,7,8-HxCDD	6.31		5.88	1.20
1,2,3,6,7,8-HxCDD	16.17		5.88	1.28
1,2,3,7,8,9-HxCDD	9.88		5.88	1.31
1,2,3,4,6,7,8-HpCDD	312.06		5.88	1.06
OCDD	2275.10		11.77	0.88
2,3,7,8-TCDF	(2.21)		1.18	(0.81)
1,2,3,7,8-PeCDF	2.99	0.35	5.88	1.66
2,3,4,7,8-PeCDF	4.09	0.49	5.88	1.69
1,2,3,4,7,8-HxCDF	5.00 ^	0.22	5.88	*
1,2,3,6,7,8-HxCDF	3.97	0.17	5.88	1.28
1,2,3,7,8,9-HxCDF	*	0.72	5.88	*
2,3,4,6,7,8-HxCDF	3.61	0.36	5.88	1.18
1,2,3,4,6,7,8-HpCDF	34.78		5.88	1.02
1,2,3,4,7,8,9-HpCDF	1.90	0.33	5.88	1.07
OCDF	48.78		11.77	0.86
Total Tetra-Furans	36.32			0.85
Total Tetra-Dioxins	25.78			0.74
Total Penta-Furans	45.76			1.56
Total Penta-Dioxins	22.41			1.51
Total Hexa-Furans	47.36			1.23
Total Hexa-Dioxins	101.42			1.28
Total Hepta-Furans	96.64			*
Total Hepta-Dioxins	561.94			1.06

LABELED COMPOUNDS	SPIKE CONC. pg	CONC. FOUND pg	R(%)	ION RATIO
13C-2,3,7,8-TCDD	2000	1489	74	0.80
13C-1,2,3,7,8-PeCDD	2000	2113	106	1.54
13C-1,2,3,4,7,8-HxCDD	2000	1592	80	1.24
13C-1,2,3,6,7,8-HxCDD	2000	1673	84	1.26
13C-1,2,3,4,6,7,8-HpCDD	2000	1270	64	1.04
13C-OCDD	4000	1533	38<	0.90
13C-2,3,7,8-TCDF	2000	1908	95	0.81
13C-1,2,3,7,8-PeCDF	2000	2322	116	1.56
13C-2,3,4,7,8-PeCDF	2000	2336	117	1.58
13C-1,2,3,4,7,8-HxCDF	2000	1546	77	0.51
13C-1,2,3,6,7,8-HxCDF	2000	1454	73	0.52
13C-1,2,3,7,8,9-HxCDF	2000	1456	73	0.52
13C-2,3,4,6,7,8-HxCDF	2000	1483	74	0.52
13C-1,2,3,4,6,7,8-HpCDF	2000	1104	55	0.44
13C-1,2,3,4,7,8,9-HpCDF	2000	1291	65	0.44
CLEANUP STANDARD				
37Cl-2,3,7,8-TCDD	200	225	113	

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( ) Second column confirmation not done. 2,3,7,8-TCDF concentration estimated; see text for detail.
^ Analyte concentration estimated; CDPE interference, see text for detail.
* Analyte not detected.

PCDD/PCDF ANALYSIS DATA SHEET

Lab Name: BATTELLE
Matrix: SOIL
Sample Receipt Date: 12-07-95
Ext. Date: 12-12-95
Analysis Date: 16-JAN-96 Time: 14:42:05
Extract Volume (uL): 20
Injection Volume (uL): 0.5
Dilution Factor: NONE

Lab Sample ID: 47482-10-3, S19
Sample Wt/Vol: 8.8356 units: g
Initial Calibration Date: 04-13-95
Instrument ID: Autospec
GC Column ID: 60M DB5
Sample Data Filename: A039007
Blank Data Filename: A039003
Cal. Ver. Data Filename: A039002

ANALYTE	CONC. FOUND pg/g dry	SAMPLE LIMIT OF DETECTION pg/g dry	LOWEST CALIBRATION CONCENTRATION pg/g dry	ION RATIO
2,3,7,8-TCDD	0.93	0.30	2.26	0.84
1,2,3,7,8-PeCDD	2.69	0.71	11.32	1.43
1,2,3,4,7,8-HxCDD	2.26	0.38	11.32	1.24
1,2,3,6,7,8-HxCDD	3.74	0.28	11.32	1.20
1,2,3,7,8,9-HxCDD	3.86	0.53	11.32	1.10
1,2,3,4,6,7,8-HpCDD	58.39		11.32	1.03
OCDD	615.85		22.64	0.88
2,3,7,8-TCDF	(1.63)		2.26	(0.73)
1,2,3,7,8-PeCDF	2.22	0.68	11.32	1.63
2,3,4,7,8-PeCDF	3.53	1.03	11.32	1.46
1,2,3,4,7,8-HxCDF	3.50`	0.39	11.32	*
1,2,3,6,7,8-HxCDF	3.34	0.29	11.32	1.14
1,2,3,7,8,9-HxCDF	*	1.12	11.32	*
2,3,4,6,7,8-HxCDF	3.05	0.55	11.32	1.23
1,2,3,4,6,7,8-HpCDF	21.82		11.32	0.99
1,2,3,4,7,8,9-HpCDF	1.62	0.48	11.32	1.04
OCDF	22.73		22.64	0.84
Total Tetra-Furans	30.61	0.38		0.85
Total Tetra-Dioxins	12.73	0.49		0.83
Total Penta-Furans	32.72	0.70		1.48
Total Penta-Dioxins	18.49	0.55		1.78
Total Hexa-Furans	28.14	0.53		1.26
Total Hexa-Dioxins	32.93	0.42		1.22
Total Hepta-Furans	49.68	0.35		*
Total Hepta-Dioxins	107.20	0.60		1.04

LABELED COMPOUNDS	SPIKE CONC. pg	CONC FOUN pg	R(%)	ION RATIO
13C-2,3,7,8-TCDD	2000	1517	76	0.78
13C-1,2,3,7,8-PeCDD	2000	1520	76	1.54
13C-1,2,3,4,7,8-HxCDD	2000	1575	79	1.25
13C-1,2,3,6,7,8-HxCDD	2000	1650	83	1.24
13C-1,2,3,4,6,7,8-HpCDD	2000	1579	79	1.02
13C-OCDD	4000	2741	69	0.89
13C-2,3,7,8-TCDF	2000	1594	80	0.82
13C-1,2,3,7,8-PeCDF	2000	1676	84	1.59
13C-2,3,4,7,8-PeCDF	2000	1633	82	1.58
13C-1,2,3,4,7,8-HxCDF	2000	1492	75	0.50
13C-1,2,3,6,7,8-HxCDF	2000	1426	71	0.51
13C-1,2,3,7,8,9-HxCDF	2000	1541	77	0.49
13C-2,3,4,6,7,8-HxCDF	2000	1577	79	0.51
13C-1,2,3,4,6,7,8-HpCDF	2000	1493	75	0.44
13C-1,2,3,4,7,8,9-HpCDF	2000	1430	71	0.43
CLEANUP STANDARD				
37Cl-2,3,7,8-TCDD	200	218	109	

( ) Second column confirmation not done. 2,3,7,8-TCDF concentration estimated; see text for detail.
` Analyte concentration estimated; CDPE interference, see text for detail.
* Analyte not detected.

PCDD/PCDF ANALYSIS DATA SHEET

Lab Name: BATTELLE
Matrix: SOIL
Sample Receipt Date: 12-07-95
Ext. Date: 12-12-95
Analysis Date: 16-JAN-96 Time: 15:48:21
Extract Volume (uL): 20
Injection Volume (uL): 0.5
Dilution Factor: NONE

Lab Sample ID: 47482-10-19, S34
Sample Wt/Vol: 7.6565 units: g
Initial Calibration Date: 04-13-95
Instrument ID: Autospec
GC Column ID: 60M DB5
Sample Data Filename: A039008
Blank Data Filename: A039003
Cal. Ver. Data Filename: A039002

ANALYTE	CONC. FOUND pg/g dry	SAMPLE LIMIT OF DETECTION pg/g dry	LOWEST CALIBRATION CONCENTRATION pg/g dry	ION RATIO
2,3,7,8-TCDD	14.62		2.61	0.79
1,2,3,7,8-PeCDD	84.78		13.06	1.53
1,2,3,4,7,8-HxCDD	71.47		13.06	1.22
1,2,3,6,7,8-HxCDD	64.68		13.06	1.26
1,2,3,7,8,9-HxCDD	96.10		13.06	1.27
1,2,3,4,6,7,8-HpCDD	411.19		13.06	1.03
OCDD	773.32		26.12	0.89
2,3,7,8-TCDF#	41.85		2.61	0.75
1,2,3,7,8-PeCDF	70.83		13.06	1.56
2,3,4,7,8-PeCDF	99.65		13.06	1.55
1,2,3,4,7,8-HxCDF	100.00 ^	0.81	13.06	*
1,2,3,6,7,8-HxCDF	105.99		13.06	1.15
1,2,3,7,8,9-HxCDF	5.37	2.30	13.06	1.39
2,3,4,6,7,8-HxCDF	77.02		13.06	1.07
1,2,3,4,6,7,8-HpCDF	344.45		13.06	1.00
1,2,3,4,7,8,9-HpCDF	29.80		13.06	1.04
OCDF	87.93		26.12	0.83
Total Tetra-Furans	786.22			0.74
Total Tetra-Dioxins	425.73			0.75
Total Penta-Furans	1010.97			1.54
Total Penta-Dioxins	632.56			1.54
Total Hexa-Furans	537.05			1.20
Total Hexa-Dioxins	748.54			1.25
Total Hepta-Furans	494.36			*
Total Hepta-Dioxins	716.51			1.04

LABELED COMPOUNDS	SPIKE CONC. pg	CONC FOUN pg	R(%)	ION RATIO
13C-2,3,7,8-TCDD	2000	1623	81	0.79
13C-1,2,3,7,8-PeCDD	2000	1518	76	1.55
13C-1,2,3,4,7,8-HxCDD	2000	1628	81	1.26
13C-1,2,3,6,7,8-HxCDD	2000	1855	93	1.26
13C-1,2,3,4,6,7,8-HpCDD	2000	1798	90	1.04
13C-OCDD	4000	3247	81	0.90
13C-2,3,7,8-TCDF	2000	1657	83	0.79
13C-1,2,3,7,8-PeCDF	2000	1631	82	1.57
13C-2,3,4,7,8-PeCDF	2000	1604	80	1.59
13C-1,2,3,4,7,8-HxCDF	2000	1534	77	0.52
13C-1,2,3,6,7,8-HxCDF	2000	1530	77	0.52
13C-1,2,3,7,8,9-HxCDF	2000	1696	85	0.50
13C-2,3,4,6,7,8-HxCDF	2000	1600	80	0.52
13C-1,2,3,4,6,7,8-HpCDF	2000	1722	86	0.45
13C-1,2,3,4,7,8,9-HpCDF	2000	1605	80	0.44
CLEANUP STANDARD				
37Cl-2,3,7,8-TCDD	200	223	112	

2,3,7,8-TCDF value from second column confirmation.

^ Analyte concentration estimated; CDPE interference, see text for detail.
* Analyte not detected.

PCDD/PCDF ANALYSIS DATA SHEET

Lab Name: BATTELLE
Matrix: SOIL
Sample Receipt Date: 12-07-95
Ext. Date: 12-12-95
Analysis Date: 16-JAN-96 Time: 16:55:40
Extract Volume (uL): 20
Injection Volume (uL): 0.5
Dilution Factor: NONE

Lab Sample ID: 47482-10-20, S34, MS
Sample Wt/Vol: 7.6950 units: g
Initial Calibration Date: 04-13-95
Instrument ID: Autospec
GC Column ID: 60M DB5
Sample Data Filename: A039009
Blank Data Filename: A039003
Cal. Ver. Data Filename: A039002

ANALYTE	CONC. FOUND pg/g dry	SAMPLE LIMIT OF DETECTION pg/g dry	LOWEST CALIBRATION CONCENTRATION pg/g dry	ION RATIO
2,3,7,8-TCDD	45.57		2.60	0.75
1,2,3,7,8-PeCDD	233.48		13.00	1.53
1,2,3,4,7,8-HxCDD	212.73		13.00	1.25
1,2,3,6,7,8-HxCDD	201.38		13.00	1.22
1,2,3,7,8,9-HxCDD	313.61		13.00	1.25
1,2,3,4,6,7,8-HpCDD	597.88		13.00	1.07
OCDD	1058.34		25.99	0.89
2,3,7,8-TCDF	202.97		2.60	0.76
1,2,3,7,8-PeCDF	174.41		13.00	1.68
2,3,4,7,8-PeCDF	228.11		13.00	1.59
1,2,3,4,7,8-HxCDF	244.72		13.00	1.17
1,2,3,6,7,8-HxCDF	241.33		13.00	1.19
1,2,3,7,8,9-HxCDF	149.02		13.00	1.18
2,3,4,6,7,8-HxCDF	212.90		13.00	1.24
1,2,3,4,6,7,8-HpCDF	510.32		13.00	1.03
1,2,3,4,7,8,9-HpCDF	164.88		13.00	1.04
OCDF	332.72		25.99	0.88
Total Tetra-Furans	977.98			0.75
Total Tetra-Dioxins	523.46			0.77
Total Penta-Furans	1269.31			1.61
Total Penta-Dioxins	987.36			1.35
Total Hexa-Furans	1242.53			1.21
Total Hexa-Dioxins	1351.72			1.28
Total Hepta-Furans	811.74			*
Total Hepta-Dioxins	950.77			1.05

LABELED COMPOUNDS	SPIKE CONC pg	CONC. FOUND pg	R(%)	ION RATIO
13C-2,3,7,8-TCDD	2000	1388	69	0.77
13C-1,2,3,7,8-PeCDD	2000	1311	66	1.58
13C-1,2,3,4,7,8-HxCDD	2000	1381	69	1.25
13C-1,2,3,6,7,8-HxCDD	2000	1478	74	1.26
13C-1,2,3,4,6,7,8-HpCDD	2000	1654	83	1.05
13C-OCDD	4000	3006	75	0.87
13C-2,3,7,8-TCDF	2000	1384	69	0.77
13C-1,2,3,7,8-PeCDF	2000	1309	65	1.60
13C-2,3,4,7,8-PeCDF	2000	1279	64	1.58
13C-1,2,3,4,7,8-HxCDF	2000	1329	66	0.52
13C-1,2,3,6,7,8-HxCDF	2000	1300	65	0.52
13C-1,2,3,7,8,9-HxCDF	2000	1450	73	0.51
13C-2,3,4,6,7,8-HxCDF	2000	1393	70	0.52
13C-1,2,3,4,6,7,8-HpCDF	2000	1510	76	0.44
13C-1,2,3,4,7,8,9-HpCDF	2000	1431	72	0.43
CLEANUP STANDARD				
37Cl-2,3,7,8-TCDD	200	187	93	

PCDD/PCDF ANALYSIS DATA SHEET

Lab Name: BATTELLE
Matrix: SOIL
Sample Receipt Date: 12-07-95
Ext. Date: 12-12-95
Analysis Date: 16-JAN-96 Time: 18:01:38
Extract Volume (uL): 20
Injection Volume (uL): 0.5
Dilution Factor: NONE

Lab Sample ID: 47482-10-21, S34, MSD
Sample Wt/Vol: 7.6564 units: g
Initial Calibration Date: 04-13-95
Instrument ID: Autospec
GC Column ID: 60M DB5
Sample Data Filename: A039010
Blank Data Filename: A039003
Cal. Ver. Data Filename: A039002

ANALYTE	CONC. FOUND pg/g dry	SAMPLE LIMIT OF DETECTION pg/g dry	LOWEST CALIBRATION CONCENTRATION pg/g dry	ION RATIO
2,3,7,8-TCDD	46.33		2.61	0.77
1,2,3,7,8-PeCDD	255.46		13.06	1.60
1,2,3,4,7,8-HxCDD	209.34		13.06	1.23
1,2,3,6,7,8-HxCDD	172.39		13.06	1.26
1,2,3,7,8,9-HxCDD	281.64		13.06	1.21
1,2,3,4,6,7,8-HpCDD	591.83		13.06	1.02
OCDD	1145.12		26.12	0.87
2,3,7,8-TCDF	186.98		2.61	0.76
1,2,3,7,8-PeCDF	181.54		13.06	1.34
2,3,4,7,8-PeCDF	231.60		13.06	1.58
1,2,3,4,7,8-HxCDF	246.72		13.06	1.20
1,2,3,6,7,8-HxCDF	261.15		13.06	1.28
1,2,3,7,8,9-HxCDF	153.39		13.06	1.18
2,3,4,6,7,8-HxCDF	224.36		13.06	1.19
1,2,3,4,6,7,8-HpCDF	490 06		13.06	1.00
1,2,3,4,7,8,9-HpCDF	162.78		13.06	1.00
OCDF	331.61		26.12	0.89
Total Tetra-Furans	903.60		0.79	0.79
Total Tetra-Dioxins	491.90		0.74	0.74
Total Penta-Furans	1158.30		1.57	1.57
Total Penta-Dioxins	884.17		1.50	1.50
Total Hexa-Furans	1269.46		1.20	1.20
Total Hexa-Dioxins	1214.11		1.26	1.26
Total Hepta-Furans	780.94		*	*
Total Hepta-Dioxins	917.13		1.09	1.09

LABELED COMPOUNDS	SPIKE CONC. pg	CONC FOUN pg	R(%)	ION RATIO
13C-2,3,7,8-TCDD	2000	1190	59	0.78
13C-1,2,3,7,8-PeCDD	2000	972	49	1.53
13C-1,2,3,4,7,8-HxCDD	2000	1119	56	1.25
13C-1,2,3,6,7,8-HxCDD	2000	1266	63	1.26
13C-1,2,3,4,6,7,8-HpCDD	2000	1217	61	1.05
13C-OCDD	4000	2193	55	0.87
13C-2,3,7,8-TCDF	2000	1159	58	0.78
13C-1,2,3,7,8-PeCDF	2000	1115	56	1.59
13C-2,3,4,7,8-PeCDF	2000	1042	52	1.57
13C-1,2,3,4,7,8-HxCDF	2000	1055	53	0.51
13C-1,2,3,6,7,8-HxCDF	2000	992	50	0.51
13C-1,2,3,7,8,9-HxCDF	2000	1141	57	0.51
13C-2,3,4,6,7,8-HxCDF	2000	1050	53	0.52
13C-1,2,3,4,6,7,8-HpCDF	2000	1121	56	0.44
13C-1,2,3,4,7,8,9-HpCDF	2000	1053	53	0.43
CLEANUP STANDARD				
37Cl-2,3,7,8-TCDD	200	158	79	

PCDD/PCDF ANALYSIS DATA SHEET

Lab Name: BATTELLE
Matrix: SOIL
Sample Receipt Date: 12-07-95
Ext. Date: 12-12-95
Analysis Date: 17-JAN-96 Time: 11:33:14
Extract Volume (uL): 20
Injection Volume (uL): 0.5
Dilution Factor: 1:2

Lab Sample ID: 47482-10-22, METHOD
Sample Wt/Vol: 10.0000 units: g
Initial Calibration Date: 04-13-95
Instrument ID: Autospec
GC Column ID: 60M DB5
Sample Data Filename: A039105
Blank Data Filename: A039103
Cal. Ver. Data Filename: A039102

ANALYTE	CONC. FOUND pg/g dry	SAMPLE LIMIT OF DETECTION pg/g dry	LOWEST CALIBRATION CONCENTRATION pg/g dry	ION RATIO
2,3,7,8-TCDD	*	1.08	4.00	*
1,2,3,7,8-PeCDD	*	1.34	20.00	*
1,2,3,4,7,8-HxCDD	*	1.68	20.00	*
1,2,3,6,7,8-HxCDD	*	1.61	20.00	*
1,2,3,7,8,9-HxCDD	*	1.57	20.00	*
1,2,3,4,6,7,8-HpCDD	*	3.73	20.00	*
OCDD	*	45.49"	40.00	*
2,3,7,8-TCDF	*	4.81"	4.00	*
1,2,3,7,8-PeCDF	*	1.62	20.00	*
2,3,4,7,8-PeCDF	*	*	20.00	*
1,2,3,4,7,8-HxCDF	*	1.57	20.00	*
1,2,3,6,7,8-HxCDF	*	2.59	20.00	*
1,2,3,7,8,9-HxCDF	*	1.40	20.00	*
2,3,4,6,7,8-HxCDF	*	1.92	20.00	*
1,2,3,4,6,7,8-HpCDF	*	1.98	20.00	*
1,2,3,4,7,8,9-HpCDF	*	1.14	20.00	*
OCDF	*	1.74	40.00	*
Total Tetra-Furans	*	2.84		*
Total Tetra-Dioxins	*	2.00		*
Total Penta-Furans	*	2.44		*
Total Penta-Dioxins	*	1.48		*
Total Hexa-Furans	*	1.26		*
Total Hexa-Dioxins	*	1.78		*
Total Hepta-Furans	*	1.52		*
Total Hepta-Dioxins	*	2.36		*

LABELED COMPOUNDS	SPIKE CONC. pg	CONC. FOUND pg	R(%)	ION RATIO
13C-2,3,7,8-TCDD	2000	1600	80	0.79
13C-1,2,3,7,8-PeCDD	2000	1443	72	1.58
13C-1,2,3,4,7,8-HxCDD	2000	1668	83	1.25
13C-1,2,3,6,7,8-HxCDD	2000	1856	93	1.26
13C-1,2,3,4,6,7,8-HpCDD	2000	1674	84	1.00
13C-OCDD	4000	2916	73	0.88
13C-2,3,7,8-TCDF	2000	1573	79	0.82
13C-1,2,3,7,8-PeCDF	2000	1473	74	1.60
13C-2,3,4,7,8-PeCDF	2000	811	41	1.56
13C-1,2,3,4,7,8-HxCDF	2000	1568	78	0.56
13C-1,2,3,6,7,8-HxCDF	2000	1603	80	0.49
13C-1,2,3,7,8,9-HxCDF	2000	1659	83	0.51
13C-2,3,4,6,7,8-HxCDF	2000	1635	82	0.49
13C-1,2,3,4,6,7,8-HpCDF	2000	1617	81	0.44
13C-1,2,3,4,7,8,9-HpCDF	2000	1432	72	0.44
CLEANUP STANDARD				
37Cl-2,3,7,8-TCDD	200	177	88	

" Sample limit of detection (LOD) higher than lowest calibration concentration
* Analyte not detected.

PCDD/PCDF ANALYSIS DATA SHEET

Lab Name: BATTELLE
Matrix: SOIL
Sample Receipt Date: 12-07-95
Ext. Date: 12-12-95
Analysis Date: 17-JAN-96 Time: 12:43:14
Extract Volume (uL): 20
Injection Volume (uL): 0.5
Dilution Factor: NONE

Lab Sample ID: 47482-10-4, S20
Sample Wt/Vol: 8.7148 units: g
Initial Calibration Date: 04-13-95
Instrument ID: Autospec
GC Column ID: 60M DB5
Sample Data Filename: A039106
Blank Data Filename: A039103
Cal. Ver. Data Filename: A039102

ANALYTE	CONC. FOUND pg/g dry	SAMPLE LIMIT OF DETECTION pg/g dry	LOWEST CALIBRATION CONCENTRATION pg/g dry	ION RATIO
2,3,7,8-TCDD	31.06		2.29	0.80
1,2,3,7,8-PeCDD	84.70		11.47	1.57
1,2,3,4,7,8-HxCDD	14.51		11.47	1.21
1,2,3,6,7,8-HxCDD	74.43		11.47	1.23
1,2,3,7,8,9-HxCDD	169.09		11.47	1.24
1,2,3,4,6,7,8-HpCDD	878.03		11.47	1.06
OCDD	9005.18		22.95	0.88
2,3,7,8-TCDF	(1.53)		2.29	(0.72)
1,2,3,7,8-PeCDF	*	2.04	11.47	*
2,3,4,7,8-PeCDF	*	2.96	11.47	*
1,2,3,4,7,8-HxCDF	^	2.10	11.47	*
1,2,3,6,7,8-HxCDF	4.04	3.47	11.47	1.33
1,2,3,7,8,9-HxCDF	*	1.67	11.47	*
2,3,4,6,7,8-HxCDF	3.64	2.30	11.47	1.14
1,2,3,4,6,7,8-HpCDF	37.16		11.47	0.98
1,2,3,4,7,8,9-HpCDF	2.66	1.44	11.47	1.15
OCDF	79.09		22.95	0.86
Total Tetra-Furans	16.91			0.77
Total Tetra-Dioxins	78.00			0.72
Total Penta-Furans	73.89			1.49
Total Penta-Dioxins	287.85			1.54
Total Hexa-Furans	58.48			1.25
Total Hexa-Dioxins	1473.65			1.24
Total Hepta-Furans	110.03			*
Total Hepta-Dioxins	2200.80			1.05

LABELED COMPOUNDS	SPIKE CONC. pg	CONC. FOUND pg	R(%)	ION RATIO
13C-2,3,7,8-TCDD	2000	567	28<	0.81
13C-1,2,3,7,8-PeCDD	2000	522	26<	1.56
13C-1,2,3,4,7,8-HxCDD	2000	513	26<	1.28
13C-1,2,3,6,7,8-HxCDD	2000	620	31<	1.26
13C-1,2,3,4,6,7,8-HpCDD	2000	588	29<	1.04
13C-OCDD	4000	1029	26<	0.89
13C-2,3,7,8-TCDF	2000	543	27<	0.80
13C-1,2,3,7,8-PeCDF	2000	558	28<	1.57
13C-2,3,4,7,8-PeCDF	2000	519	26<	1.60
13C-1,2,3,4,7,8-HxCDF	2000	512	26<	0.52
13C-1,2,3,6,7,8-HxCDF	2000	525	26<	0.52
13C-1,2,3,7,8,9-HxCDF	2000	601	30<	0.50
13C-2,3,4,6,7,8-HxCDF	2000	541	27<	0.51
13C-1,2,3,4,6,7,8-HpCDF	2000	481	24<	0.44
13C-1,2,3,4,7,8,9-HpCDF	2000	488	24<	0.42
CLEANUP STANDARD				
37Cl-2,3,7,8-TCDD	200	73	36<	
	< Outside			

( ) Second column confirmation not done. 2,3,7,8-TCDF concentration estimated; see text for detail.

^ Analyte concentration not quantified due to CDPE interference; see text.
* Analyte not detected.

PCDD/PCDF ANALYSIS DATA SHEET

Lab Name: BATTELLE
Matrix: SOIL
Sample Receipt Date: 12-07-95
Ext. Date: 12-12-95
Analysis Date: 17-JAN-96 Time: 13:51:19
Extract Volume (uL): 20
Injection Volume (uL): 0.5
Dilution Factor: NONE

Lab Sample ID: 47482-10-5, S21
Sample Wt/Vol: 7.5419 units: g
Initial Calibration Date: 04-13-95
Instrument ID: Autospec
GC Column ID: 60M DB5
Sample Data Filename: A039107
Blank Data Filename: A039103
Cal. Ver. Data Filename: A039102

ANALYTE	CONC. FOUND pg/g dry	SAMPLE LIMIT OF DETECTION pg/g dry	LOWEST CALIBRATION CONCENTRATION pg/g dry	ION RATIO
2,3,7,8-TCDD	*	0.46	2.65	*
1,2,3,7,8-PeCDD	1.67	0.97	13.26	1.53
1,2,3,4,7,8-HxCDD	1.68	1.09	13.26	1.09
1,2,3,6,7,8-HxCDD	1.62	1.06	13.26	1.47
1,2,3,7,8,9-HxCDD	3.31	1.02	13.26	1.10
1,2,3,4,6,7,8-HpCDD	14.48		13.26	1.02
OCDD	76.61		26.52	0.86
2,3,7,8-TCDF	(1.12)		2.65	(0.82)
1,2,3,7,8-PeCDF	1.84	1.03	13.26	1.58
2,3,4,7,8-PeCDF	2.49	1.34	13.26	1.61
1,2,3,4,7,8-HxCDF	2.40^	1.09	13.26	*
1,2,3,6,7,8-HxCDF	2.32	1.74	13.26	1.05
1,2,3,7,8,9-HxCDF	*	0.93	13.26	*
2,3,4,6,7,8-HxCDF	2.42	1.17	13.26	1.29
1,2,3,4,6,7,8-HpCDF	9.28	1.46	13.26	0.92
1,2,3,4,7,8,9-HpCDF	*	0.77	13.26	*
OCDF	5.03	1.14	26.52	0.86
Total Tetra-Furans	16.57			0.80
Total Tetra-Dioxins	5.29			0.88
Total Penta-Furans	21.38			1.62
Total Penta-Dioxins	5.66			1.51
Total Hexa-Furans	6.78			1.17
Total Hexa-Dioxins	14.54			1.14
Total Hepta-Furans	11.36			0.92
Total Hepta-Dioxins	27.92			1.02

LABELED COMPOUNDS	SPIKE CONC. pg	CONC. FOUND pg	R(%)	ION RATIO
13C-2,3,7,8-TCDD	2000	1140	57	0.78
13C-1,2,3,7,8-PeCDD	2000	1177	59	1.60
13C-1,2,3,4,7,8-HxCDD	2000	1078	54	1.22
13C-1,2,3,6,7,8-HxCDD	2000	1353	68	1.24
13C-1,2,3,4,6,7,8-HpCDD	2000	1186	59	1.04
13C-OCDD	4000	2143	54	0.89
13C-2,3,7,8-TCDF	2000	1184	59	0.80
13C-1,2,3,7,8-PeCDF	2000	1138	57	1.63
13C-2,3,4,7,8-PeCDF	2000	1233	62	1.59
13C-1,2,3,4,7,8-HxCDF	2000	1113	56	0.51
13C-1,2,3,6,7,8-HxCDF	2000	1193	60	0.50
13C-1,2,3,7,8,9-HxCDF	2000	1259	63	0.49
13C-2,3,4,6,7,8-HxCDF	2000	1177	59	0.52
13C-1,2,3,4,6,7,8-HpCDF	2000	1045	52	0.44
13C-1,2,3,4,7,8,9-HpCDF	2000	1040	52	0.43
CLEANUP STANDARD				
37Cl-2,3,7,8-TCDD	200	158	79	

( ) Second column confirmation not done. 2,3,7,8-TCDF concentration estimated; see text for detail.

^ Analyte concentration estimated; CDPE interference, see text for detail.
* Analyte not detected.

PCDD/PCDF ANALYSIS DATA SHEET

Lab Name: BATTELLE
Matrix: SOIL
Sample Receipt Date: 12-07-95
Ext. Date: 12-12-95
Analysis Date: 17-JAN-96 Time: 14:58:33
Extract Volume (uL): 20
Injection Volume (uL): 0.5
Dilution Factor: NONE

Lab Sample ID: 47482-10-6, S22
Sample Wt/Vol: 7.8343 units: g
Initial Calibration Date: 04-13-95
Instrument ID: Autospec
GC Column ID: 60M DB5
Sample Data Filename: A039108
Blank Data Filename: A039103
Cal. Ver. Data Filename: A039102

ANALYTE	CONC. FOUND pg/g dry	SAMPLE LIMIT OF DETECTION pg/g dry	LOWEST CALIBRATION CONCENTRATIO pg/g dry	ION RATIO
2,3,7,8-TCDD	1.76	0.25	2.55	0.69
1,2,3,7,8-PeCDD	2.85	0.75	12.76	1.68
1,2,3,4,7,8-HxCDD	2.73	0.67	12.76	1.15
1,2,3,6,7,8-HxCDD	5.24	0.68	12.76	1.28
1,2,3,7,8,9-HxCDD	4.10	0.64	12.76	1.16
1,2,3,4,6,7,8-HpCDD	76.76		12.76	1.02
OCDD	572.75		25.53	0.88
2,3,7,8-TCDF	(1.83)		2.55	(0.75)
1,2,3,7,8-PeCDF	2.51	0.72	12.76	1.33
2,3,4,7,8-PeCDF	3.84	1.01	12.76	1.53
1,2,3,4,7,8-HxCDF	^	0.70	12.76	*
1,2,3,6,7,8-HxCDF	3.96	1.17	12.76	1.13
1,2,3,7,8,9-HxCDF	*	0.61	12.76	*
2,3,4,6,7,8-HxCDF	3.36	0.73	12.76	1.18
1,2,3,4,6,7,8-HpCDF	20.18		12.76	1.03
1,2,3,4,7,8,9-HpCDF	1.13	0.48	12.76	0.97
OCDF	11.78	0.70	25.53	0.91
Total Tetra-Furans	34.57			0.68
Total Tetra-Dioxins	16.54			0.73
Total Penta-Furans	42.43			1.65
Total Penta-Dioxins	11.69			1.66
Total Hexa-Furans	27.88			1.20
Total Hexa-Dioxins	41.02			1.20
Total Hepta-Furans	40.11			*
Total Hepta-Dioxins	138.28			1.07

LABELED COMPOUNDS	SPIKE CONC. pg	CONC. FOUND pg	R(%)	ION RATIO
13C-2,3,7,8-TCDD	2000	1557	78	0.78
13C-1,2,3,7,8-PeCDD	2000	1365	68	1.52
13C-1,2,3,4,7,8-HxCDD	2000	1460	73	1.22
13C-1,2,3,6,7,8-HxCDD	2000	1706	85	1.21
13C-1,2,3,4,6,7,8-HpCDD	2000	1493	75	1.05
13C-OCDD	4000	2745	69	0.89
13C-2,3,7,8-TCDF	2000	1447	72	0.78
13C-1,2,3,7,8-PeCDF	2000	1411	71	1.55
13C-2,3,4,7,8-PeCDF	2000	1361	68	1.60
13C-1,2,3,4,7,8-HxCDF	2000	1402	70	0.52
13C-1,2,3,6,7,8-HxCDF	2000	1434	72	0.51
13C-1,2,3,7,8,9-HxCDF	2000	1512	76	0.53
13C-2,3,4,6,7,8-HxCDF	2000	1527	76	0.52
13C-1,2,3,4,6,7,8-HpCDF	2000	1467	73	0.44
13C-1,2,3,4,7,8,9-HpCDF	2000	1310	66	0.45
CLEANUP STANDARD				
37Cl-2,3,7,8-TCDD	200	210	105	

( ) Second column confirmation not done. 2,3,7,8-TCDF concentration estimated; see text for detail.

^ Analyte concentration not quantified due to CDPE interference; see text.
* Analyte not detected.

PCDD/PCDF ANALYSIS DATA SHEET

Lab Name: BATTELLE
Matrix: SOIL
Sample Receipt Date: 12-07-95
Ext. Date: 12-12-95
Analysis Date: 17-JAN-96 Time: 16:04:48
Extract Volume (uL): 20
Injection Volume (uL): 0.5
Dilution Factor: 1:2

Lab Sample ID: 47482-10-7, S23
Sample Wt/Vol: 7.6321 units: g
Initial Calibration Date: 04-13-95
Instrument ID: Autospec
GC Column ID: 60M DB5
Sample Data Filename: A039109
Blank Data Filename: A039103
Cal. Ver. Data Filename: A039102

ANALYTE	CONC. FOUND pg/g dry	SAMPLE LIMIT OF DETECTION pg/g dry	LOWEST CALIBRATION CONCENTRATION pg/g dry	ION RATIO
2,3,7,8-TCDD	*	3.00	5.24	*
1,2,3,7,8-PeCDD	*	6.55	26.21	*
1,2,3,4,7,8-HxCDD	30.41		26.21	1.36
1,2,3,6,7,8-HxCDD	24.49	4.23	26.21	1.36
1,2,3,7,8,9-HxCDD	29.66		26.21	1.32
1,2,3,4,6,7,8-HpCDD	1174.14		26.21	1.07
OCDD	18875.28		52.41	0.87
2,3,7,8-TCDF	*	53.63"	5.24	*
1,2,3,7,8-PeCDF	*	6.59	26.21	*
2,3,4,7,8-PeCDF	*	7.95	26.21	*
1,2,3,4,7,8-HxCDF	^	5.67	26.21	*
1,2,3,6,7,8-HxCDF	*	9.28	26.21	*
1,2,3,7,8,9-HxCDF	*	3.16	26.21	*
2,3,4,6,7,8-HxCDF	*	7.21	26.21	*
1,2,3,4,6,7,8-HpCDF	226.39		26.21	1.04
1,2,3,4,7,8,9-HpCDF	19.26	2.75	26.21	0.94
OCDF	422.85		52.41	0.85
Total Tetra-Furans	198.25			0.79
Total Tetra-Dioxins	*	5.56		*
Total Penta-Furans	323.36			1.78
Total Penta-Dioxins	*	7.24		*
Total Hexa-Furans	201.39			1.39
Total Hexa-Dioxins	575.90			1.41
Total Hepta-Furans	882.00			*
Total Hepta-Dioxins	2449.77			1.05

LABELED COMPOUNDS	SPIKE CONC. pg	CONC. FOUND pg	R(%)	ION RATIO
13C-2,3,7,8-TCDD	2000	405	20<	0.81
13C-1,2,3,7,8-PeCDD	2000	513	26<	1.72
13C-1,2,3,4,7,8-HxCDD	2000	485	24<	1.29
13C-1,2,3,6,7,8-HxCDD	2000	519	26<	1.29
13C-1,2,3,4,6,7,8-HpCDD	2000	1437	72	1.04
13C-OCDD	4000	2534	63	0.91
13C-2,3,7,8-TCDF	2000	306	15<	0.75
13C-1,2,3,7,8-PeCDF	2000	544	27<	1.70
13C-2,3,4,7,8-PeCDF	2000	505	25<	1.75
13C-1,2,3,4,7,8-HxCDF	2000	1146	57	0.52
13C-1,2,3,6,7,8-HxCDF	2000	958	48	0.49
13C-1,2,3,7,8,9-HxCDF	2000	1323	66	0.50
13C-2,3,4,6,7,8-HxCDF	2000	490	25<	0.51
13C-1,2,3,4,6,7,8-HpCDF	2000	1261	63	0.45
13C-1,2,3,4,7,8,9-HpCDF	2000	1235	62	0.44
CLEANUP STANDARD				
37Cl-2,3,7,8-TCDD	200	*	*	
		<		

^ Analyte concentration not quantified due to CDPE interference; see text.
" Sample limit of detection (LOD) higher than lowest calibration concentration.
* Analyte not detected.

PCDD/PCDF ANALYSIS DATA SHEET

Lab Name: BATTELLE
Matrix: SOIL
Sample Receipt Date: 12-08-95
Ext. Date: 12-12-95
Analysis Date: 17-JAN-96 Time: 17:10:51
Extract Volume (uL): 20
Injection Volume (uL): 0.5
Dilution Factor: NONE

Lab Sample ID: 47482-10-8, S24
Sample Wt/Vol: 7.2232 units: g
Initial Calibration Date: 04-13-95
Instrument ID: Autospec
GC Column ID: 60M DB5
Sample Data Filename: A039110
Blank Data Filename: A039103
Cal. Ver. Data Filename: A039102

ANALYTE	CONC. FOUND pg/g dry	SAMPLE LIMIT OF DETECTION pg/g dry	LOWEST CALIBRATION CONCENTRATION pg/g dry	ION RATIO
2,3,7,8-TCDD	1.82	0.55	2.77	0.73
1,2,3,7,8-PeCDD	2.17	1.50	13.84	1.60
1,2,3,4,7,8-HxCDD	1.76	1.25	13.84	1.40
1,2,3,6,7,8-HxCDD	6.56	1.32	13.84	1.06
1,2,3,7,8,9-HxCDD	4.93	1.23	13.84	1.13
1,2,3,4,6,7,8-HpCDD	147.41		13.84	1.05
OCDD	1892.40		27.69	0.86
2,3,7,8-TCDF	(1.29)		2.77	(0.76)
1,2,3,7,8-PeCDF	*	1.53	13.84	*
2,3,4,7,8-PeCDF	*	2.32	13.84	*
1,2,3,4,7,8-HxCDF	4.00^	1.43	13.84	*
1,2,3,6,7,8-HxCDF	*	2.42	13.84	*
1,2,3,7,8,9-HxCDF	*	1.11	13.84	*
2,3,4,6,7,8-HxCDF	2.58	1.63	13.84	1.14
1,2,3,4,6,7,8-HpCDF	13.53	1.80	13.84	0.90
1,2,3,4,7,8,9-HpCDF	0.98	0.93	13.84	1.00
OCDF	13.16	1.25	27.69	0.86
Total Tetra-Furans	18.32			0.65
Total Tetra-Dioxins	12.98			0.77
Total Penta-Furans	24.64			1.71
Total Penta-Dioxins	7.23			1.39
Total Hexa-Furans	19.92			1.34
Total Hexa-Dioxins	53.06			1.18
Total Hepta-Furans	29.86			1.00
Total Hepta-Dioxins	262.01			1.09

LABELED COMPOUNDS	SPIKE CONC. pg	CONC. FOUND pg	R(%)	ION RATIO
13C-2,3,7,8-TCDD	2000	1447	72	0.80
13C-1,2,3,7,8-PeCDD	2000	1384	69	1.54
13C-1,2,3,4,7,8-HxCDD	2000	1441	72	1.24
13C-1,2,3,6,7,8-HxCDD	2000	1434	72	1.26
13C-1,2,3,4,6,7,8-HpCDD	2000	1327	66	1.03
13C-OCDD	4000	2503	63	0.89
13C-2,3,7,8-TCDF	2000	1398	70	0.78
13C-1,2,3,7,8-PeCDF	2000	1374	69	1.59
13C-2,3,4,7,8-PeCDF	2000	1337	67	1.58
13C-1,2,3,4,7,8-HxCDF	2000	1168	58	0.52
13C-1,2,3,6,7,8-HxCDF	2000	1175	59	0.52
13C-1,2,3,7,8,9-HxCDF	2000	1411	71	0.52
13C-2,3,4,6,7,8-HxCDF	2000	1220	61	0.53
13C-1,2,3,4,6,7,8-HpCDF	2000	1147	57	0.43
13C-1,2,3,4,7,8,9-HpCDF	2000	1139	57	0.44
CLEANUP STANDARD				
37Cl-2,3,7,8-TCDD	200	190	95	

( ) Second column confirmation not done. 2,3,7,8-TCDF concentration estimated; see text for detail.

^ Analyte concentration estimated; CDPE interference, see text for detail.
* Analyte not detected.

PCDD/PCDF ANALYSIS DATA SHEET

Lab Name: BATTELLE
Matrix: SOIL
Sample Receipt Date: 12-08-95
Ext. Date: 12-12-95
Analysis Date: 17-JAN-96 Time: 18:20:42
Extract Volume (uL): 20
Injection Volume (uL): 0.5
Dilution Factor: NONE

Lab Sample ID: 47482-10-9, S25
Sample Wt/Vol: 8.1293 units: g
Initial Calibration Date: 04-13-95
Instrument ID: Autospec
GC Column ID: 60M DB5
Sample Data Filename: A039111
Blank Data Filename: A039103
Cal. Ver. Data Filename: A039102

ANALYTE	CONC. FOUND pg/g dry	SAMPLE LIMIT OF DETECTION pg/g dry	LOWEST CALIBRATION CONCENTRATION pg/g dry	ION RATIO
2,3,7,8-TCDD	3.37		2.46	0.75
1,2,3,7,8-PeCDD	11.53	1.03	12.30	1.63
1,2,3,4,7,8-HxCDD	10.34	0.87	12.30	1.19
1,2,3,6,7,8-HxCDD	13.67		12.30	1.27
1,2,3,7,8,9-HxCDD	17.81		12.30	1.25
1,2,3,4,6,7,8-HpCDD	154.90		12.30	1.04
OCDD	1075.87		24.60	0.88
2,3,7,8-TCDF	(7.06)		2.46	(0.80)
1,2,3,7,8-PeCDF	10.31	0.95	12.30	1.62
2,3,4,7,8-PeCDF	14.27		12.30	1.36
1,2,3,4,7,8-HxCDF	24.00^	0.88	12.30	*
1,2,3,6,7,8-HxCDF	17.64		12.30	1.27
1,2,3,7,8,9-HxCDF	1.07	0.77	12.30	1.25
2,3,4,6,7,8-HxCDF	14.49		12.30	1.33
1,2,3,4,6,7,8-HpCDF	74.88		12.30	1.01
1,2,3,4,7,8,9-HpCDF	5.95	0.58	12.30	0.89
OCDF	48.85		24.60	0.89
Total Tetra-Furans	120.59			0.75
Total Tetra-Dioxins	61.09			0.72
Total Penta-Furans	146.88			1.34
Total Penta-Dioxins	12.37			1.72
Total Hexa-Furans	91.20			1.20
Total Hexa-Dioxins	139.43			1.24
Total Hepta-Furans	127.28			0.89
Total Hepta-Dioxins	284.29			1.01

LABELED COMPOUNDS	SPIKE CONC. pg	CONC. FOUND pg	R(%)	ION RATIO
13C-2,3,7,8-TCDD	2000	1483	74	0.79
13C-1,2,3,7,8-PeCDD	2000	1392	70	1.53
13C-1,2,3,4,7,8-HxCDD	2000	1486	74	1.23
13C-1,2,3,6,7,8-HxCDD	2000	1546	77	1.23
13C-1,2,3,4,6,7,8-HpCDD	2000	1377	69	1.07
13C-OCDD	4000	2566	64	0.89
13C-2,3,7,8-TCDF	2000	1367	68	0.80
13C-1,2,3,7,8-PeCDF	2000	1481	74	1.60
13C-2,3,4,7,8-PeCDF	2000	1388	69	1.61
13C-1,2,3,4,7,8-HxCDF	2000	1436	72	0.52
13C-1,2,3,6,7,8-HxCDF	2000	1351	68	0.51
13C-1,2,3,7,8,9-HxCDF	2000	1482	74	0.51
13C-2,3,4,6,7,8-HxCDF	2000	1463	73	0.51
13C-1,2,3,4,6,7,8-HpCDF	2000	1279	64	0.44
13C-1,2,3,4,7,8,9-HpCDF	2000	1302	65	0.42
CLEANUP STANDARD				
37Cl-2,3,7,8-TCDD	200	202	101	

( ) Second column confirmation not done. 2,3,7,8-TCDF concentration estimated; see text for detail.

^ Analyte concentration estimated; CDPE interference, see text for detail.
* Analyte not detected.

PCDD/PCDF ANALYSIS DATA SHEET

Lab Name: BATTELLE
Matrix: SOIL
Sample Receipt Date: 12-08-95
Ext. Date: 12-12-95
Analysis Date: 17-JAN-96 Time: 19:26:41
Extract Volume (uL): 20
Injection Volume (uL): 0.5
Dilution Factor: NONE

Lab Sample ID: 47482-10-10, S26
Sample Wt/Vol: 6.5986 units: g
Initial Calibration Date: 04-13-95
Instrument ID: Autospec
GC Column ID: 60M DB5
Sample Data Filename: A039112
Blank Data Filename: A039103
Cal. Ver. Data Filename: A039102

ANALYTE	CONC. FOUND pg/g dry	SAMPLE LIMIT OF DETECTION pg/g dry	LOWEST CALIBRATION CONCENTRATION pg/g dry	ION RATIO
2,3,7,8-TCDD	6.86		3.03	0.84
1,2,3,7,8-PeCDD	17.31		15.15	1.66
1,2,3,4,7,8-HxCDD	15.18		15.15	1.21
1,2,3,6,7,8-HxCDD	40.17		15.15	1.29
1,2,3,7,8,9-HxCDD	36.59		15.15	1.25
1,2,3,4,6,7,8-HpCDD	902.55		15.15	1.06
OCDD	6995.43		30.31	0.88
2,3,7,8-TCDF	(9.39)		3.03	(0.84)
1,2,3,7,8-PeCDF	15.48		15.15	1.41
2,3,4,7,8-PeCDF	19.38		15.15	1.45
1,2,3,4,7,8-HxCDF	36.00^	1.80	15.15	*
1,2,3,6,7,8-HxCDF	21.26		15.15	1.11
1,2,3,7,8,9-HxCDF	*		15.15	*
2,3,4,6,7,8-HxCDF	18.87		15.15	1.22
1,2,3,4,6,7,8-HpCDF	115.09		15.15	1.01
1,2,3,4,7,8,9-HpCDF	15.05	1.16	15.15	1.07
OCDF	127.34		30.31	0.85
Total Tetra-Furans	102.95			0.75
Total Tetra-Dioxins	180.85			0.75
Total Penta-Furans	207.96			1.52
Total Penta-Dioxins	*	2.33		*
Total Hexa-Furans	125.37			1.18
Total Hexa-Dioxins	44.32			1.28
Total Hepta-Furans	274.56			*
Total Hepta-Dioxins	1664.02			1.07

LABELED COMPOUNDS	SPIKE CONC. pg	CONC. FOUND pg	R(%)	ION RATIO
13C-2,3,7,8-TCDD	2000	1608	80	0.82
13C-1,2,3,7,8-PeCDD	2000	1554	78	1.57
13C-1,2,3,4,7,8-HxCDD	2000	1557	78	1.24
13C-1,2,3,6,7,8-HxCDD	2000	1708	85	1.25
13C-1,2,3,4,6,7,8-HpCDD	2000	1604	80	1.05
13C-OCDD	4000	2995	75	0.90
13C-2,3,7,8-TCDF	2000	1653	83	0.78
13C-1,2,3,7,8-PeCDF	2000	1659	83	1.64
13C-2,3,4,7,8-PeCDF	2000	1571	79	1.59
13C-1,2,3,4,7,8-HxCDF	2000	1571	79	0.53
13C-1,2,3,6,7,8-HxCDF	2000	1527	76	0.51
13C-1,2,3,7,8,9-HxCDF	2000	1617	81	0.51
13C-2,3,4,6,7,8-HxCDF	2000	1618	81	0.51
13C-1,2,3,4,6,7,8-HpCDF	2000	1464	73	0.44
13C-1,2,3,4,7,8,9-HpCDF	2000	1458	73	0.44
CLEANUP STANDARD				
37Cl-2,3,7,8-TCDD	200	291	145	

( ) Second column confirmation not done. 2,3,7,8-TCDF concentration estimated; see text for detail.
^ Analyte concentration estimated; CDPE interference, see text for detail.
* Analyte not detected.

PCDD/PCDF ANALYSIS DATA SHEET

Lab Name: BATTELLE
Matrix: SOIL
Sample Receipt Date: 12-08-95
Ext. Date: 12-12-95
Analysis Date: 18-JAN-96 Time: 11:30:40
Extract Volume (uL): 20
Injection Volume (uL): 0.5
Dilution Factor: NONE

Lab Sample ID: 47482-10-11, S27
Sample Wt/Vol: 7.4562 units: g
Initial Calibration Date: 04-13-95
Instrument ID: Autospec
GC Column ID: 60M DB5
Sample Data Filename: A039204
Blank Data Filename: A039203
Cal. Ver. Data Filename: A039202

ANALYTE	CONC. FOUND pg/g dry	SAMPLE LIMIT OF DETECTION pg/g dry	LOWEST CALIBRATION CONCENTRATION pg/g dry	ION RATIO
2,3,7,8-TCDD	*	1.52	2.68	*
1,2,3,7,8-PeCDD	16.91		13.41	1.69
1,2,3,4,7,8-HxCDD	14.76		13.41	1.28
1,2,3,6,7,8-HxCDD	19.47		13.41	1.33
1,2,3,7,8,9-HxCDD	21.65		13.41	1.18
1,2,3,4,6,7,8-HpCDD	298.28		13.41	1.06
OCDD	2690.97		26.82	0.88
2,3,7,8-TCDF#	10.35		2.68	0.77
1,2,3,7,8-PeCDF	14.15		13.41	1.76
2,3,4,7,8-PeCDF	23.17		13.41	1.73
1,2,3,4,7,8-HxCDF	27.00`	0.62	13.41	*
1,2,3,6,7,8-HxCDF	25.99		13.41	1.18
1,2,3,7,8,9-HxCDF	1.42	0.74	13.41	1.09
2,3,4,6,7,8-HxCDF	20.79		13.41	1.23
1,2,3,4,6,7,8-HpCDF	95.99		13.41	0.96
1,2,3,4,7,8,9-HpCDF	7.05	0.54	13.41	0.92
OCDF	61.79		26.82	0.92
Total Tetra-Furans	156.51			0.80
Total Tetra-Dioxins	48.78			0.85
Total Penta-Furans	202.33			1.48
Total Penta-Dioxins	57.25			1.66
Total Hexa-Furans	127.49			1.37
Total Hexa-Dioxins	183.13			1.20
Total Hepta-Furans	168.95			0.92
Total Hepta-Dioxins	525.38			1.07

LABELED COMPOUNDS	SPIKE CONC. pg	CONC. FOUND pg	R(%)	ION RATIO
13C-2,3,7,8-TCDD	2000	1721	86	0.80
13C-1,2,3,7,8-PeCDD	2000	1645	82	1.57
13C-1,2,3,4,7,8-HxCDD	2000	1644	82	1.22
13C-1,2,3,6,7,8-HxCDD	2000	1709	85	1.24
13C-1,2,3,4,6,7,8-HpCDD	2000	1636	82	1.02
13C-OCDD	4000	2993	75	0.89
13C-2,3,7,8-TCDF	2000	1780	89	0.77
13C-1,2,3,7,8-PeCDF	2000	1684	84	1.60
13C-2,3,4,7,8-PeCDF	2000	1465	73	1.59
13C-1,2,3,4,7,8-HxCDF	2000	1586	79	0.50
13C-1,2,3,6,7,8-HxCDF	2000	1509	75	0.49
13C-1,2,3,7,8,9-HxCDF	2000	1707	85	0.52
13C-2,3,4,6,7,8-HxCDF	2000	1597	80	0.52
13C-1,2,3,4,6,7,8-HpCDF	2000	1518	76	0.44
13C-1,2,3,4,7,8,9-HpCDF	2000	1423	71	0.44
CLEANUP STANDARD				
37Cl-2,3,7,8-TCDD	200	231	116	

2,3,7,8-TCDF value from second column confirmation.

` Analyte concentration estimated; CDPE interference, see text for detail.
* Analyte not detected.

PCDD/PCDF ANALYSIS DATA SHEET

Lab Name: BATTELLE
Matrix: SOIL
Sample Receipt Date: 12-08-95
Ext. Date: 12-12-95
Analysis Date: 18-JAN-96 Time: 12:37:55
Extract Volume (uL): 20
Injection Volume (uL): 0.5
Dilution Factor: NONE

Lab Sample ID: 47482-10-12, S28
Sample Wt/Vol: 8.4043 units: g
Initial Calibration Date: 04-13-95
Instrument ID: Autospec
GC Column ID: 60M DB5
Sample Data Filename: A039205
Blank Data Filename: A039203
Cal. Ver. Data Filename: A039202

ANALYTE	CONC. FOUND pg/g dry	SAMPLE LIMIT OF DETECTION pg/g dry	LOWEST CALIBRATION CONCENTRATION pg/g dry	ION RATIO
2,3,7,8-TCDD	4.71		2.38	0.75
1,2,3,7,8-PeCDD	24.62		11.90	1.56
1,2,3,4,7,8-HxCDD	21.94		11.90	1.32
1,2,3,6,7,8-HxCDD	29.91		11.90	1.33
1,2,3,7,8,9-HxCDD	36.29		11.90	1.28
1,2,3,4,6,7,8-HpCDD	482.26		11.90	1.08
OCDD	4811.18		23.80	0.89
2,3,7,8-TCDF#	10.66		2.38	0.82
1,2,3,7,8-PeCDF	18.51		11.90	1.53
2,3,4,7,8-PeCDF	26.61		11.90	1.72
1,2,3,4,7,8-HxCDF	34.00^	0.34	11.90	*
1,2,3,6,7,8-HxCDF	28.13		11.90	1.31
1,2,3,7,8,9-HxCDF	1.98	0.44	11.90	1.37
2,3,4,6,7,8-HxCDF	20.43		11.90	1.21
1,2,3,4,6,7,8-HpCDF	138.76		11.90	1.03
1,2,3,4,7,8,9-HpCDF	11.10	0.32	11.90	0.98
OCDF	199.37		23.80	0.88
Total Tetra-Furans	244.29			0.81
Total Tetra-Dioxins	115.10			0.79
Total Penta-Furans	278.91			1.55
Total Penta-Dioxins	161.29			1.57
Total Hexa-Furans	188.32			1.18
Total Hexa-Dioxins	278.57			1.26
Total Hepta-Furans	322.68			*
Total Hepta-Dioxins	843.23			1.08

LABELED COMPOUNDS	SPIKE CONC. pg	CONC. FOUND pg	R(%)	ION RATIO
13C-2,3,7,8-TCDD	2000	1704	85	0.80
13C-1,2,3,7,8-PeCDD	2000	1807	90	1.55
13C-1,2,3,4,7,8-HxCDD	2000	1596	80	1.23
13C-1,2,3,6,7,8-HxCDD	2000	1833	92	1.24
13C-1,2,3,4,6,7,8-HpCDD	2000	1588	79	1.04
13C-OCDD	4000	3046	76	0.88
13C-2,3,7,8-TCDF	2000	1760	88	0.79
13C-1,2,3,7,8-PeCDF	2000	1845	92	1.58
13C-2,3,4,7,8-PeCDF	2000	1760	88	1.59
13C-1,2,3,4,7,8-HxCDF	2000	1614	81	0.52
13C-1,2,3,6,7,8-HxCDF	2000	1578	79	0.52
13C-1,2,3,7,8,9-HxCDF	2000	1716	86	0.52
13C-2,3,4,6,7,8-HxCDF	2000	1664	83	0.51
13C-1,2,3,4,6,7,8-HpCDF	2000	1550	77	0.43
13C-1,2,3,4,7,8,9-HpCDF	2000	1530	76	0.43
CLEANUP STANDARD				
37Cl-2,3,7,8-TCDD	200	235	117	

2,3,7,8-TCDF value from second column confirmation.

^ Analyte concentration estimated; CDPE interference, see text for detail.
* Analyte not detected.

PCDD/PCDF ANALYSIS DATA SHEET

Lab Name: BATTELLE
Matrix: SOIL
Sample Receipt Date: 12-08-95
Ext. Date: 12-12-95
Analysis Date: 18-JAN-96 Time: 13:49:28
Extract Volume (uL): 20
Injection Volume (uL): 0.5
Dilution Factor: NONE

Lab Sample ID: 47482-10-13, S29
Sample Wt/Vol: 8.2512 units: g
Initial Calibration Date: 04-13-95
Instrument ID: Autospec
GC Column ID: 60M DB5
Sample Data Filename: A039206
Blank Data Filename: A039203
Cal. Ver. Data Filename: A039202

ANALYTE	CONC. FOUND pg/g dry	SAMPLE LIMIT OF DETECTION pg/g dry	LOWEST CALIBRATION CONCENTRATION pg/g dry	ION RATIO
2,3,7,8-TCDD	38.27		2.42	0.75
1,2,3,7,8-PeCDD	220.55		12.12	1.60
1,2,3,4,7,8-HxCDD	179.48		12.12	1.33
1,2,3,6,7,8-HxCDD	172.87		12.12	1.17
1,2,3,7,8,9-HxCDD	260.79		12.12	1.21
1,2,3,4,6,7,8-HpCDD	1001.35		12.12	1.05
OCDD	1973.49		24.24	0.88
2,3,7,8-TCDF#	105.66		2.42	0.78
1,2,3,7,8-PeCDF	168.48		12.12	1.53
2,3,4,7,8-PeCDF	239.20		12.12	1.56
1,2,3,4,7,8-HxCDF	230.00^	0.36	12.12	*
1,2,3,6,7,8-HxCDF	261.58		12.12	1.23
1,2,3,7,8,9-HxCDF	14.88		12.12	1.27
2,3,4,6,7,8-HxCDF	195.87		12.12	1.22
1,2,3,4,6,7,8-HpCDF	772.00		12.12	1.00
1,2,3,4,7,8,9-HpCDF	68.64		12.12	1.01
OCDF	297.35		24.24	0.87
Total Tetra-Furans	2171.82			0.76
Total Tetra-Dioxins	1101.21			0.77
Total Penta-Furans	2304.49			1.60
Total Penta-Dioxins	1825.92			1.44
Total Hexa-Furans	1078.75			1.27
Total Hexa-Dioxins	1893.64			1.23
Total Hepta-Furans	1184.23			*
Total Hepta-Dioxins	1779.71			1.05

LABELED COMPOUNDS	SPIKE CONC. pg	CONC. FOUND pg	R(%)	ION RATIO
13C-2,3,7,8-TCDD	2000	1652	83	0.78
13C-1,2,3,7,8-PeCDD	2000	1524	76	1.55
13C-1,2,3,4,7,8-HxCDD	2000	1530	76	1.27
13C-1,2,3,6,7,8-HxCDD	2000	1789	89	1.27
13C-1,2,3,4,6,7,8-HpCDD	2000	1572	79	1.03
13C-OCDD	4000	3077	77	0.89
13C-2,3,7,8-TCDF	2000	1577	79	0.80
13C-1,2,3,7,8-PeCDF	2000	1617	81	1.60
13C-2,3,4,7,8-PeCDF	2000	1595	80	1.57
13C-1,2,3,4,7,8-HxCDF	2000	1519	76	0.55
13C-1,2,3,6,7,8-HxCDF	2000	1515	76	0.50
13C-1,2,3,7,8,9-HxCDF	2000	1651	83	0.53
13C-2,3,4,6,7,8-HxCDF	2000	1615	81	0.51
13C-1,2,3,4,6,7,8-HpCDF	2000	1489	74	0.44
13C-1,2,3,4,7,8,9-HpCDF	2000	1441	72	0.44
CLEANUP STANDARD				
37Cl-2,3,7,8-TCDD	200	234	117	

2,3,7,8-TCDF value from second column confirmation.
^ Analyte concentration estimated; CDPE interference, see text for detail.
* Analyte not detected.

PCDD/PCDF ANALYSIS DATA SHEET

Lab Name: BATTELLE
Matrix: SOIL
Sample Receipt Date: 12-08-95
Ext. Date: 12-12-95
Analysis Date: 18-JAN-96 Time: 14:55:00
Extract Volume (uL): 20
Injection Volume (uL): 0.5
Dilution Factor: NONE

Lab Sample ID:47482-10-14, S30
Sample Wt/Vol: 8.0175 units: g
Initial Calibration Date: 04-13-95
Instrument ID: Autospec
GC Column ID: 60M DB5
Sample Data Filename: A039207
Blank Data Filename: A039203
Cal. Ver. Data Filename:

ANALYTE	CONC. FOUND pg/g dry	SAMPLE LIMIT OF DETECTION pg/g dry	LOWEST CALIBRATION CONCENTRATION pg/g dry	ION RATIO
2,3,7,8-TCDD	56.99		2.49	0.76
1,2,3,7,8-PeCDD	393.18		12.47	1.57
1,2,3,4,7,8-HxCDD	297.59		12.47	1.22
1,2,3,6,7,8-HxCDD	295.49		12.47	1.25
1,2,3,7,8,9-HxCDD	422.85		12.47	1.24
1,2,3,4,6,7,8-HpCDD	1508.86		12.47	1.06
OCDD	2581.50		24.95	0.89
2,3,7,8-TCDF#	184.66		2.49	0.75
1,2,3,7,8-PeCDF	298.89		12.47	1.58
2,3,4,7,8-PeCDF	434.37		12.47	1.54
1,2,3,4,7,8-HxCDF	420.00 ^	0.41	12.47	*
1,2,3,6,7,8-HxCDF	437.19		12.47	1.15
1,2,3,7,8,9-HxCDF	24.16		12.47	1.23
2,3,4,6,7,8-HxCDF	327.62		12.47	1.18
1,2,3,4,6,7,8-HpCDF	1340.60		12.47	1.01
1,2,3,4,7,8,9-HpCDF	123.81		12.47	1.01
OCDF	307.96		24.95	0.85
Total Tetra-Furans	3517.40			0.72
Total Tetra-Dioxins	1839.01			0.76
Total Penta-Furans	4422.76			1.53
Total Penta-Dioxins	3037.44			1.47
Total Hexa-Furans	2024.89			1.38
Total Hexa-Dioxins	3078.33			1.24
Total Hepta-Furans	1927.79			*
Total Hepta-Dioxins	2683.34			1.04

LABELED COMPOUNDS	SPIKE CONC. pg	CONC. FOUND pg	R(%)	ION RATIO
13C-2,3,7,8-TCDD	2000	1678	84	0.78
13C-1,2,3,7,8-PeCDD	2000	1523	76	1.54
13C-1,2,3,4,7,8-HxCDD	2000	1667	83	1.25
13C-1,2,3,6,7,8-HxCDD	2000	1868	93	1.26
13C-1,2,3,4,6,7,8-HpCDD	2000	1737	87	1.04
13C-OCDD	4000	3282	82	0.88
13C-2,3,7,8-TCDF	2000	1696	85	0.78
13C-1,2,3,7,8-PeCDF	2000	1673	84	1.59
13C-2,3,4,7,8-PeCDF	2000	1586	79	1.60
13C-1,2,3,4,7,8-HxCDF	2000	1598	80	0.51
13C-1,2,3,6,7,8-HxCDF	2000	1565	78	0.52
13C-1,2,3,7,8,9-HxCDF	2000	1763	88	0.51
13C-2,3,4,6,7,8-HxCDF	2000	1685	84	0.51
13C-1,2,3,4,6,7,8-HpCDF	2000	1593	80	0.44
13C-1,2,3,4,7,8,9-HpCDF	2000	1500	75	0.44
CLEANUP STANDARD				
37Cl-2,3,7,8-TCDD	200	229	114	

2,3,7,8-TCDF value from second column confirmation.
^Analyte concentration estimated; see text for detail.
* Analyte not detected.

PCDD/PCDF ANALYSIS DATA SHEET

Lab Name: BATTELLE
Matrix: SOIL
Sample Receipt Date: 12-08-95
Ext. Date: 12-12-95
Analysis Date: 18-JAN-96 Time: 16:01:00
Extract Volume (uL): 20
Injection Volume (uL): 0.5
Dilution Factor: NONE

Lab Sample ID: 47482-10-15, S31
Sample Wt/Vol: 8.1683 units: g
Initial Calibration Date: 04-13-95
Instrument ID: Autospec
GC Column ID: 60M DB5
Sample Data Filename: A039208
Blank Data Filename: A039203
Cal. Ver. Data Filename: A039202

ANALYTE	CONC. FOUND pg/g dry	SAMPLE LIMIT OF DETECTION pg/g dry	LOWEST CALIBRATION CONCENTRATION pg/g dry	ION RATIO
2,3,7,8-TCDD	72.54		2.45	0.77
1,2,3,7,8-PeCDD	405.88		12.24	1.54
1,2,3,4,7,8-HxCDD	358.99		12.24	1.25
1,2,3,6,7,8-HxCDD	305.24		12.24	1.27
1,2,3,7,8,9-HxCDD	462.25		12.24	1.28
1,2,3,4,6,7,8-HpCDD	1634.40		12.24	1.07
OCDD	2662.38		24.48	0.89
2,3,7,8-TCDF#	208.93		2.45	0.77
1,2,3,7,8-PeCDF	337.39		12.24	1.50
2,3,4,7,8-PeCDF	486.79		12.24	1.55
1,2,3,4,7,8-HxCDF	460.00^	0.44	12.24	*
1,2,3,6,7,8-HxCDF	530.30		12.24	1.21
1,2,3,7,8,9-HxCDF	26.25		12.24	1.18
2,3,4,6,7,8-HxCDF	375.89		12.24	1.24
1,2,3,4,6,7,8-HpCDF	1435.59		12.24	1.01
1,2,3,4,7,8,9-HpCDF	130.35		12.24	1.01
OCDF	300.56		24.48	0.88
Total Tetra-Furans	4219.69			0.74
Total Tetra-Dioxins	2034.88			0.77
Total Penta-Furans	4797.72			1.54
Total Penta-Dioxins	2530.19			1.44
Total Hexa-Furans	2635.91			1.18
Total Hexa-Dioxins	3495.62			1.26
Total Hepta-Furans	2036.93			*
Total Hepta-Dioxins	2834.56			1.06

LABELED COMPOUNDS	SPIKE CONC. pg	CONC. FOUN pg	R(%)	ION RATIO
13C-2,3,7,8-TCDD	2000	1760	88	0.79
13C-1,2,3,7,8-PeCDD	2000	1738	87	1.53
13C-1,2,3,4,7,8-HxCDD	2000	1702	85	1.24
13C-1,2,3,6,7,8-HxCDD	2000	2023	101	1.27
13C-1,2,3,4,6,7,8-HpCDD	2000	1723	86	1.05
13C-OCDD	4000	2793	70	0.87
13C-2,3,7,8-TCDF	2000	1818	91	0.78
13C-1,2,3,7,8-PeCDF	2000	1764	88	1.60
13C-2,3,4,7,8-PeCDF	2000	1752	88	1.62
13C-1,2,3,4,7,8-HxCDF	2000	1756	88	0.52
13C-1,2,3,6,7,8-HxCDF	2000	1756	88	0.51
13C-1,2,3,7,8,9-HxCDF	2000	1700	85	0.52
13C-2,3,4,6,7,8-HxCDF	2000	1804	90	0.52
13C-1,2,3,4,6,7,8-HpCDF	2000	1621	81	0.42
13C-1,2,3,4,7,8,9-HpCDF	2000	1503	75	0.43
CLEANUP STANDARD				
37Cl-2,3,7,8-TCDD	200	242	121	

2,3,7,8-TCDF value from second column confirmation.
^ Analyte concentration estimated; CDPE interference, see text for detail.
* Analyte not detected.

PCDD/PCDF ANALYSIS DATA SHEET

Lab Name: BATTELLE
Matrix: SOIL
Sample Receipt Date: 12-08-95
Ext. Date: 12-12-95
Analysis Date: 18-JAN-96 Time: 17:11:56
Extract Volume (uL): 20
Injection Volume (uL): 0.5
Dilution Factor: NONE

Lab Sample ID: 47482-10-16, S32
Sample Wt/Vol: 10.0644 units: g
Initial Calibration Date: 04-13-95
Instrument ID: Autospec
GC Column ID: 60M DB5
Sample Data Filename: A039209
Blank Data Filename: A039203
Cal. Ver. Data Filename: A039202

ANALYTE	CONC. FOUND pg/g dry	SAMPLE LIMIT OF DETECTION pg/g dry	LOWEST CALIBRATION CONCENTRATION pg/g dry	ION RATIO
2,3,7,8-TCDD	*	0.57	1.99	*
1,2,3,7,8-PeCDD	*	1.25	9.94	*
1,2,3,4,7,8-HxCDD	*	0.52	9.94	*
1,2,3,6,7,8-HxCDD	*	0.34	9.94	*
1,2,3,7,8,9-HxCDD	*	0.41	9.94	*
1,2,3,4,6,7,8-HpCDD	*	0.96	9.94	*
OCDD	*	28.06 "	19.87	*
2,3,7,8-TCDF	*	0.30	1.99	*
1,2,3,7,8-PeCDF	*	1.67	9.94	*
2,3,4,7,8-PeCDF	*	0.95	9.94	*
1,2,3,4,7,8-HxCDF	*	0.46	9.94	*
1,2,3,6,7,8-HxCDF	*	0.41	9.94	*
1,2,3,7,8,9-HxCDF	*	0.54	9.94	*
2,3,4,6,7,8-HxCDF	*	0.77	9.94	*
1,2,3,4,6,7,8-HpCDF	*	0.74	9.94	*
1,2,3,4,7,8,9-HpCDF	*	0.41	9.94	*
OCDF	*	0.91	19.87	*
Total Tetra-Furans	*	0.62		*
Total Tetra-Dioxins	*	0.55		*
Total Penta-Furans	*	1.20		*
Total Penta-Dioxins	*	1.51		*
Total Hexa-Furans	*	0.58		*
Total Hexa-Dioxins	*	0.61		*
Total Hepta-Furans	*	0.85		*
Total Hepta-Dioxins	*	0.96		*

LABELED COMPOUNDS	SPIKE CONC. pg	CONC. FOUND pg	R(%)	ION RATIO
13C-2,3,7,8-TCDD	2000	1449	72	0.79
13C-1,2,3,7,8-PeCDD	2000	1255	63	1.50
13C-1,2,3,4,7,8-HxCDD	2000	1435	72	1.20
13C-1,2,3,6,7,8-HxCDD	2000	1804	90	1.24
13C-1,2,3,4,6,7,8-HpCDD	2000	1449	72	1.04
13C-OCDD	4000	2606	65	0.89
13C-2,3,7,8-TCDF	2000	1362	68	0.78
13C-1,2,3,7,8-PeCDF	2000	1298	65	1.58
13C-2,3,4,7,8-PeCDF	2000	1292	65	1.59
13C-1,2,3,4,7,8-HxCDF	2000	1316	66	0.53
13C-1,2,3,6,7,8-HxCDF	2000	1390	69	0.51
13C-1,2,3,7,8,9-HxCDF	2000	1441	72	0.50
13C-2,3,4,6,7,8-HxCDF	2000	1375	69	0.52
13C-1,2,3,4,6,7,8-HpCDF	2000	1326	66	0.43
13C-1,2,3,4,7,8,9-HpCDF	2000	1282	64	0.43
CLEANUP STANDARD				
37Cl-2,3,7,8-TCDD	200	192	96	

" Sample limit of detection (LOD) higher than lowest calibration concentration.
* Analyte not detected.

PCDD/PCDF ANALYSIS DATA SHEET

Lab Name: BATTELLE
Matrix: SOIL
Sample Receipt Date: 12-08-95
Ext. Date: 12-12-95
Analysis Date: 18-JAN-96 Time: 18:17:54
Extract Volume (uL): 20
Injection Volume (uL): 0.5
Dilution Factor: NONE

Lab Sample ID: 47482-10-17, S33
Sample Wt/Vol: 7.9871 units: g
Initial Calibration Date: 04-13-95
Instrument ID: Autospec
GC Column ID: 60M DB5
Sample Data Filename: A039210
Blank Data Filename: A039203
Cal. Ver. Data Filename: A039202

ANALYTE	CONC. FOUND pg/g dry	SAMPLE LIMIT OF DETECTION pg/g dry	LOWEST CALIBRATION CONCENTRATIO pg/g dry	ION RATIO
2,3,7,8-TCDD	4.20		2.50	0.76
1,2,3,7,8-PeCDD	21.52		12.52	1.60
1,2,3,4,7,8-HxCDD	20.61		12.52	1.18
1,2,3,6,7,8-HxCDD	18.15		12.52	1.19
1,2,3,7,8,9-HxCDD	26.69		12.52	1.20
1,2,3,4,6,7,8-HpCDD	139.24		12.52	1.04
OCDD	653.25		25.04	0.88
2,3,7,8-TCDF#	11.40		2.50	0.82
1,2,3,7,8-PeCDF	20.11		12.52	1.46
2,3,4,7,8-PeCDF	26.55		12.52	1.47
1,2,3,4,7,8-HxCDF	37.00^	0.61	12.52	*
1,2,3,6,7,8-HxCDF	31.68		12.52	1.18
1,2,3,7,8,9-HxCDF	1.79	0.73	12.52	1.08
2,3,4,6,7,8-HxCDF	26.13		12.52	1.18
1,2,3,4,6,7,8-HpCDF	106.75		12.52	1.01
1,2,3,4,7,8,9-HpCDF	9.30	0.59	12.52	1.01
OCDF	44.74		25.04	0.84
Total Tetra-Furans	195.62			0.81
Total Tetra-Dioxins	105.97			0.74
Total Penta-Furans	254.09			1.45
Total Penta-Dioxins	134.88			1.59
Total Hexa-Furans	142.44			1.18
Total Hexa-Dioxins	215.79			1.23
Total Hepta-Furans	165.87			*
Total Hepta-Dioxins	255.32			1.08

LABELED COMPOUNDS	SPIKE CONC pg	CONC. FOUND pg	R(%)	ION RATIO
13C-2,3,7,8-TCDD	2000	1075	54	0.79
13C-1,2,3,7,8-PeCDD	2000	980	49	1.58
13C-1,2,3,4,7,8-HxCDD	2000	941	47	1.22
13C-1,2,3,6,7,8-HxCDD	2000	1197	60	1.25
13C-1,2,3,4,6,7,8-HpCDD	2000	1025	51	1.02
13C-OCDD	4000	2137	53	0.87
13C-2,3,7,8-TCDF	2000	1000	50	0.77
13C-1,2,3,7,8-PeCDF	2000	949	47	1.56
13C-2,3,4,7,8-PeCDF	2000	914	46	1.60
13C-1,2,3,4,7,8-HxCDF	2000	924	46	0.51
13C-1,2,3,6,7,8-HxCDF	2000	925	46	0.51
13C-1,2,3,7,8,9-HxCDF	2000	1075	54	0.52
13C-2,3,4,6,7,8-HxCDF	2000	933	47	0.53
13C-1,2,3,4,6,7,8-HpCDF	2000	923	46	0.44
13C-1,2,3,4,7,8,9-HpCDF	2000	922	46	0.43
CLEANUP STANDARD				
37Cl-2,3,7,8-TCDD	200	139	70	

2,3,7,8-TCDF value from second column confirmation.

^ Analyte concentration estimated; CDPE interference, see text for detail.
* Analyte not detected.

PCDD/PCDF ANALYSIS DATA SHEET

Lab Name: BATTELLE
Matrix: SOIL
Sample Receipt Date: 12-08-95
Ext. Date: 12-12-95
Analysis Date: 18-JAN-96 Time: 19:24:45
Extract Volume (uL): 20
Injection Volume (uL): 0.5
Dilution Factor: NONE

Lab Sample ID: 47482-10-18, S33, Duplicate
Sample Wt/Vol: 8.0124 units: g
Initial Calibration Date: 04-13-95
Instrument ID: Autospec
GC Column ID: 60M DB5
Sample Data Filename: A039211
Blank Data Filename: A039203
Cal. Ver. Data Filename: A039202

ANALYTE	CONC. FOUND pg/g dry	SAMPLE LIMIT OF DETECTION pg/g dry	LOWEST CALIBRATION CONCENTRATIO pg/g dry	ION RATIO
2,3,7,8-TCDD	4.15		2.50	0.66
1,2,3,7,8-PeCDD	21.02		12.48	1.42
1,2,3,4,7,8-HxCDD	18.30		12.48	1.20
1,2,3,6,7,8-HxCDD	17.54		12.48	1.29
1,2,3,7,8,9-HxCDD	26.64		12.48	1.16
1,2,3,4,6,7,8-HpCDD	130.35		12.48	1.06
OCDD	668.85		24.96	0.87
2,3,7,8-TCDF#	11 24		2.50	0.79
1,2,3,7,8-PeCDF	17.66		12.48	1.46
2,3,4,7,8-PeCDF	23.94		12.48	1.44
1,2,3,4,7,8-HxCDF	27.00^	0.53	12.48	*
1,2,3,6,7,8-HxCDF	29.92		12.48	1.16
1,2,3,7,8,9-HxCDF	1.74	0.63	12.48	1.31
2,3,4,6,7,8-HxCDF	22.72		12.48	1.11
1,2,3,4,6,7,8-HpCDF	98.58		12.48	1.01
1,2,3,4,7,8,9-HpCDF	8.79	0.48	12.48	0.93
OCDF	42.12		24.96	0.84
Total Tetra-Furans	195.58			0.69
Total Tetra-Dioxins	87.06			0.81
Total Penta-Furans	238.88			1.52
Total Penta-Dioxins	119.68			1.42
Total Hexa-Furans	149.99			1.13
Total Hexa-Dioxins	192.53			1.23
Total Hepta-Furans	150.98			*
Total Hepta-Dioxins	236.82			1.01

LABELED COMPOUNDS	SPIKE CONC pg	CONC. FOUN pg	R(%)	ION RATIO
13C-2,3,7,8-TCDD	2000	1756	88	0.78
13C-1,2,3,7,8-PeCDD	2000	1547	77	1.52
13C-1,2,3,4,7,8-HxCDD	2000	1628	81	1.32
13C-1,2,3,6,7,8-HxCDD	2000	1883	94	1.13
13C-1,2,3,4,6,7,8-HpCDD	2000	1697	85	1.02
13C-OCDD	4000	3260	82	0.89
13C-2,3,7,8-TCDF	2000	1664	83	0.79
13C-1,2,3,7,8-PeCDF	2000	1493	75	1.55
13C-2,3,4,7,8-PeCDF	2000	1467	73	1.57
13C-1,2,3,4,7,8-HxCDF	2000	1449	72	0.52
13C-1,2,3,6,7,8-HxCDF	2000	1448	72	0.51
13C-1,2,3,7,8,9-HxCDF	2000	1740	87	0.52
13C-2,3,4,6,7,8-HxCDF	2000	1525	76	0.51
13C-1,2,3,4,6,7,8-HpCDF	2000	1541	77	0.43
13C-1,2,3,4,7,8,9-HpCDF	2000	1492	75	0.42
CLEANUP STANDARD				
37Cl-2,3,7,8-TCDD	200	220	110	

2,3,7,8-TCDF value from second column confirmation.

^ Analyte concentration estimated, CDPE interference, see text for detail.
* Analyte not detected.

ATTACHMENT C - SUMMARY OF LABORATORY QUALITY CONTROL RESULTS

Matrix Spike/Matrix Spike Duplicate Results for S04:

Analyte	S04 conc. found (pg/g)	S04 MS conc. found (pg/g)	S04 MS Dup conc. found (pg/g)	MS Spike conc. (pg/g)	MSD Spike conc. (pg/g)	S04 MS % REC	S04 MSD % REC	MS/MSD RPD
2378-TCDD	*	37.2	36.0	30.5	30.3	122 1	118.7	3.35
12378-PeCDD	*	193.8	193.9	152.5	151 7	127.1	127.8	0.04
123478-HxCDD	0.7	168 9	173 6	152.5	151.7	110.3	114 0	2.78
123678-HxCDD	1.4	147.7	140 6	152.5	151 7	95.9	91.8	4.88
123789-HxCDD	2 1	160.7	159 1	152.5	151 7	104.0	103.5	1.04
1234678-HpCDD	31 6	191.3	197.3	152.5	151.7	104 8	109.3	3 07
OCDD	298.3	545.0	568.1	305.0	303 4	80.9	88.9	4.16
2378-TCDF	*	35.5	34 9	30.5	30.3	116.4	115 2	1.58
12378-PeCDF	*	167.1	162.8	152.5	151.7	109.6	107.3	2.62
23478-PeCDF	*	169.6	169.3	152.5	151.7	111.2	111.6	0.16
123478-HxCDF	*	172.2	170.3	152.5	151 7	112.9	112.3	1.12
123678-HxCDF	0 55^	172.4	167.9	152.5	151.7	113.1	110.7	2.66
123789-HxCDF	*	179 7	176 1	152.5	151.7	117.9	116.1	2.06
234678-HxCDF	0.9	169.9	165.9	152.5	151.7	110.9	108.8	2.39
1234678-HpCDF	6.5	158.6	158.1	152.5	151 7	99.8	100 0	0.31
1234789-HpCDF	*	171.6	169.3	152 5	151 7	112.5	111.6	1.34
OCDF	18.0	359 5	336.4	305.0	303.4	112.0	105.0	6.62

* Analyte peak not detected
^Analyte concentration estimated; CDPE interference, see text for detail

Matrix Spike/Matrix Spike Duplicate Results for S34:

Analyte	S34 conc. found (pg/g)	S34 MS conc. found (pg/g)	S34 MS Dup conc. found (pg/g)	MS Spike conc. (pg/g)	MSD Spike conc. (pg/g)	S34 MS % REC #	S34 MSD % REC #	MS/MSD RPD
2378-TCDD	14.6	45.6	46.3	26.0	26.1	112.2	113.7	1.66
12378-PeCDD	84.8	233.5	255 5	130 0	130.6	108.7	118.6	8.99
123478-HxCDD	71.5	212.7	209.3	130.0	130.6	105.6	103.6	1.61
123678-HxCDD	64 7	201.4	172.4	130.0	130.6	103.5	88.3	15.51
123789-HxCDD	96.1	313.6	281.6	130.0	130.6	138.7	124.2	10.74
1234678-HpCDD	411.2	597.9	591.8	130.0	130.6	110.5	109.2	1.02
OCDD	773.3	1058.3	1145.1	259.9	261.2	102.4	110.7	7.88
2378-TCDF	152.3	203 0	187 0	26 0	26.1	113.8	104.8	8.20
12378-PeCDF	70.8	174.4	181.5	130 0	130.6	86 9	90.1	4.01
23478-PeCDF	99.7	228 1	231 6	130 0	130 6	99.4	100.6	1 51
123478-HxCDF	100.00^	244.7	246 7	130.0	130.6	188 3	188 9	0.82
123678-HxCDF	106 0	241.3	261.1	130.0	130.6	102.3	110.4	7 89
123789-HxCDF	5.4	149.0	153.4	130.0	130.6	110.1	112.8	2.89
234678-HxCDF	77.0	212.9	224.4	130.0	130 6	102.9	108.1	5.24
1234678-HpCDF	344.4	510 3	490.1	130 0	130.6	107.6	103.2	4.05
1234789-HpCDF	29.8	164.9	162.8	130 0	130.6	103.2	101.5	1.28
OCDF	87.9	332.7	331.6	259 9	261.2	95.7	95.0	0.33

^ Analyte concentration estimated; CDPE interference, see text for detail.

Percent recovery calculated using the equation:

% REC = 100 (MS conc found)/(Spike conc + Background conc.)

Soil SRM (Sample S02) Recovery Results:

Analyte	Soil SRM Target conc. (pg/g)	S02 conc. found (pg/g)	S02 % REC
2378-TCDD	500	487	97.4
12378-PeCDD	1000	1072	107 2
123478-HxCDD	1000	941	94.1
123678-HxCDD	1000	864	86 4
123789-HxCDD	1000	927	92.7
1234678-HpCDD	1500	1451	96.7
OCDD	2500	3087	123 5
2378-TCDF	500	468	93.6
12378-PeCDF	1000	925	92.5
23478-PeCDF	1000	972	97.2
123478-HxCDF	1000	966	96 6
123678-HxCDF	1000	942	94.2
123789-HxCDF	1000	1011	101.1
234678-HxCDF	1000	936	93.6
1234678-HpCDF	1500	1332	88 8
1234789-HpCDF	1500	1414	94.3
OCDF	2500	2348	93.9

Detection Limit (DL) Results for S03:

Analyte	S03 conc. found (pg/g)	S03 DL conc. found (pg/g)	DL Spike conc. (pg/g)	S03 DL % REC #
2378-TCDD	*	9.6	7.6	127.5
12378-PeCDD	*	46.4	37.8	122.8
123478-HxCDD	1.5	40.5	37.8	103.2
123678-HxCDD	1.7	35 9	37.8	91.0
123789-HxCDD	2 0	39 0	37.8	98.1
1234678-HpCDD	28.0	60.4	37.8	91.9
OCDD	285 7	270.8	75.6	75.0
2378-TCDF	1.6	9.8	7.6	107.2
12378-PeCDF	2 0	40.5	37.8	101.9
23478-PeCDF	*	43.6	37.8	115.4
123478-HxCDF	*	40 8	37.8	107.9
123678-HxCDF	1.3	42.3	37.8	108 2
123789-HxCDF	*	42.3	37.8	112.0
234678-HxCDF	*	40.6	37.8	107.5
1234678-HpCDF	7 4	38.9	37.8	86.0
1234789-HpCDF	1.4	40.8	37.8	104.2
OCDF	18.3	87.9	75.6	93.6

Percent recovery calculated using the equation:

% REC = 100 (MS conc. found)/(Spike conc. + Background conc.)

Duplicate Sample Results for S09:

Analyte	S09 conc. found (pg/g)	S09 Dup conc. found (pg/g)	RPD (%)	
2378-TCDD	0.5	0.5	9.6	
12378-PeCDD	1.7	2.4	35.2	#
123478-HxCDD	1.5	2.0	26 5	#
123678-HxCDD	1.8	2.3	26.4	#
123789-HxCDD	2 9	4.2	37.3	#
1234678-HpCDD	16.6	19 7	16 9	
OCDD	81 5	90.0	9.9	
2378-TCDF	*	2 0	NC	
12378-PeCDF	1 6	1 7	7.1	
23478-PeCDF	2.5	3.7	38.3	#
123478-HxCDF	3.00^	1.50^	*	
123678-HxCDF	2.6	3.9	40.9	#
123789-HxCDF	*	0 4	NC	
234678-HxCDF	2 6	3.4	24.8	
1234678-HpCDF	11.5	13.8	18.0	
1234789-HpCDF	0.7	1.0	35.4	#
OCDF	6.8	7.9	15.2	

* Analyte peak not detected.

RPD outside 25% control limit but measurement made at or below the lowest calibration concentration.

^ Analyte concentration estimated; CDPE interference, see text for detail.

NC - % RPD not calculated due to a non-detect for this analyte in S09

Duplicate Sample Results for S33:

Analyte	S33 conc. found (pg/g)	S33 Dup conc. found (pg/g)	RPD (%)
2378-TCDD	4.2	4 2	1.2
12378-PeCDD	21.5	21.0	2.4
123478-HxCDD	20.6	18.3	11.9
123678-HxCDD	18 2	17.5	3 4
123789-HxCDD	26.7	26 6	0.2
1234678-HpCDD	139.2	130.3	6 6
OCDD	653.3	668.9	2.4
2378-TCDF	11.4	11.2	1.4
12378-PeCDF	20.1	17.7	13.0
23478-PeCDF	26.6	23.9	10.3
123478-HxCDF	37.00^	27.00^	*
123678-HxCDF	31.7	29 9	5.7
123789-HxCDF	1.8	1.7	2.8
234678-HxCDF	26.1	22 7	14.0
1234678-HpCDF	106.8	98.6	8.0
1234789-HpCDF	9.3	8.8	5.6
OCDF	44.7	42 1	6.0

* Analyte peak not detected.

^ Analyte concentration estimated, CDPE interference, see text for detail