United States
Environmental Protection
Agency

Office of Research and
Development
Washington DC 20460

EPA/600/2-91/019
May 1991

EPA

On-Site Treatment of Creosote and Pentachlorophenal Sludges and Contaminated Soil

EPA/600/2-91/019
May 1991

ON-SITE TREATMENT OF CREOSOTE AND PENTACHLOROPHENOL SLUDGES AND CONTAMINATED SOIL

by

Gary D. McGinnis
Hamid Borazjani
Daniel F. Pope
David A Strobel
Linda K. McFarland
Mississippi Forest Products Laboratory
Mississippi State University
Mississippi State, Mississippi 39762

PROJECT CR-811498

Project Officer

John Matthews
Extramural Activities and Assistance Division
Robert S. Kerr Environmental Research Laboratory
Ada, Oklahoma 74820

ROBERT S. KERR ENVIRONMENTAL RESEARCH LABORATORY
OFFICE OF RESEARCH AND DEVELOPMENT
U.S. ENVIRONMENTAL PROTECTION AGENCY
ADA, OKLAHOMA 74820

Printed on Recycled Paper

NOTICE

The information in this document has been funded wholly or in part by the United States Environmental Protection Agency under Cooperative Agreement CR-811498 with Mississippi State University. It has been subjected to the Agency's peer and administrative review, and it has been approved for publication as an EPA document. Mention of trade names or commercial products does not constitute endorsement or recommendation for use.

FOREWORD

EPA is charged by Congress to protect the nation's land, air, and water systems. Under a mandate of national environmental laws focused on air and water quality, solid waste management and the control of toxic substances, pesticides, noise and radiation, the Agency strives to formulate and implement actions which lead to a compatible balance between human activities and the ability of natural systems to support and nurture life.

The Robert S. Kerr Environmental Research Laboratory is the Agency's center of expertise for investigation of the soil and subsurface environment. Personnel at the laboratory are responsible for management of research programs to (a) determine the fate, transport, and transformation rates of pollutants in the soil, the unsaturated and saturated zones of the subsurface environment; (b) define the processes to be used in characterizing the soil and subsurface environment as a receptor of pollutants; (c) develop techniques for predicting the effect of pollutants on ground water, soil, and indigenous organisms; and (d) define and demonstrate the applicability and limitations of using natural processes, indigenous to the soil and subsurface environment, for the protection of this resource.

Environmentally acceptable management of process sludges and contaminated soils from wood treating facilities presents a widespread problem that must be addressed under both RCRA and CERCLA regulations and guidelines. On-site management of these wastes may be the most desirable alternative currently available from both an environmental and economic viewpoint. Treatment of these wastes in well designed and operated soil systems is one of the on-site management technologies proposed. There currently is a lack of readily available information relative to the treatability potential of wood preservative waste contaminants in complex waste-soil matrices. This report adds to this information base by presenting and discussing data from the field evaluation phase of a three-phase study directed toward quantitative evaluation of treatment potential for pentachlorophenol and creosote waste contaminants in the site soil at wood treating facilities. Comprehensive sets of soil core and soil pore liquid samples were collected during a two-year field evaluation study period. Data from these samples are discussed and evaluated relative to transformation and migration of polycyclic aromatic hydrocarbon and pentachlorophenol components contained in the wood treating wastes used for this study. Results from the characterization and screening phases are presented in a previously published EPA report (EPA-600/2-88-055).

Clinton W. Hall

Clinton W. Hall, Director
Robert S. Kerr Environmental
Research Laboratory

ABSTRACT

Information is presented for quantitative evaluation of treatment potential for creosote and pentachlorophenol (PCP) wood treating contaminants in soil systems. The study was conducted in three phases: (1) characterization, (2) treatability screening and (3) field evaluation. Data generated in phases 1 and 2 were discussed in a previous EPA Report (EPA/-600/2-88-055). This report provides review of data generated during phases 1 and 2 plus discussion of data generated during the two-year field evaluation study. Results from this three-phase study indicated that creosote contaminants, i.e., polycyclic aromatic hydrocarbon (PAH) compounds, and PCP are subject to degradation in soil systems; loading rates and previous exposure of site soil to particular contaminants were identified as important factors in determining rates of transformation for a particular site. Although populations of PAH and PCP acclimated organisms increased markedly when these compounds were applied to test soils, no correlation was found between microbial population levels and transformation rates for specific compounds of concern. Migration of compounds of interest was negligible except in a highly sandy soil from one of the eight sites for which column leaching studies were conducted.

CONTENTS

NOTICE ii

FOREWORD iii

ABSTRACT iv

FIGURES x

TABLES xi

1. INTRODUCTION 1

OBJECTIVE 1

EVALUATION REQUIREMENTS 1

EXPERIMENTAL APPROACH 3

Site, Soil, and Sludge Characterization 3

Sludge Treatability/Immobilization 3

Field Evaluation 4

2. CONCLUSIONS 5

3. LITERATURE REVIEW 6

INTRODUCTION 6

WOOD PRESERVING INDUSTRY 7

Introduction (Burdell, 1984) 7

BASIC WOOD-TREATING PROCESS 8

CHARACTERIZATION OF THE ORGANIC WOOD PRESERVATIVES 8

CHARACTERIZATION OF WOOD-PRESERVING WASTES 20

DECOMPOSITION/IMMOBILIZATION OF PCP AND CREOSOTE COMPONENTS IN SOIL 22

Pentachlorophenol 22

Creosote Components 27

BIOACCUMULATION/TOXICITY OF PCP AND CREOSOTE 35

Plant/Animal Uptake of PCP 35

Toxic Effects of PCP 36

Plant/Animal Uptake of Creosote 38

4. EXPERIMENTAL METHODOLOGY 44

INTRODUCTION 44

PHASE I - SITE, SOIL, AND SLUDGE CHARACTERIZATION 44

PHASE II - LABORATORY TREATABILITY STUDIES 45

Transformation/Degradation Using a Standard Creosote/PCP Mixture: Experiment 1 45

Transformation/Degradation of Site Specific Sludges: Experiment 2 46

Soil Transport 47

PHASE III - FIELD DEMONSTRATION STUDY 47

5. RESULTS AND DISCUSSION 53

PHASE I - SITE, SOIL, AND SLUDGE CHARACTERIZATION 53

Grenada, MS 53

Gulfport, MS 55

Wiggins, MS 55

Columbus, MS 55

Atlanta, GA 56

Wilmington, NC 56

Meridian, MS 56

Chattanooga, TN 57

Chemical Analysis of Wood-Treating Chemicals in the Soil 57

Sludge Characterization 64

PHASE II - LABORATORY TRANSFORMATION/DEGRADATION STUDIES 71

Transformation/Degradation Using a Standard Creosote/PCP Mixture: Experiment 1 71

Transformation/Degradation of Site Specific Sludges: Experiment 2 81

Migration Studies 90

PHASE III - FIELD DEMONSTRATION STUDY 91

SOIL CORE SAMPLES 91

Creosote Cells - Background Levels (10/26/87) 91

Creosote Cells - 10/30/87 Loading 105

Creosote Cells - 11/13/87 Sampling 105

Creosote Cells - 2/26/88 Sampling 106

Creosote Cells - 4/20/88 Loading 108

Creosote Cells - 5/10/88 Sampling 108

Creosote Cells - 7/29/88 Sampling (Incorporation Zone) 108

Creosote Cells - 8/4/88 Loading 109

Creosote Cells - 10/7/88 Sampling (Incorporation Zone) 109

Creosote Cells - 6/15/89 Sampling 109

Creosote Cells - 7/13/89 Sampling (Incorporation Zone) 109

Creosote Cells - 8/11/89 Sampling 109

Creosote Cells - 9/8/89 Sampling (Incorporation Zone) 109

Creosote Cells - 10/27/89 Sampling (Incorporation Zone) 110

Pentachlorophenol Cells - Background Levels 110

Pentachlorophenol Cells - 10/30/87 Loading 110

Pentachlorophenol Cells - 11/13/87 Sampling 110

Pentachlorophenol Cells - 2/26/88 Sampling 111

Pentachlorophenol Cells - 4/20/88 Loading 112

Pentachlorophenol Cells - 5/10/88 Sampling 112

Pentachlorophenol Cells - 7/29/88 Sampling (Incorporation Zone) 112

Pentachlorophenol Cells - 8/4/88 Loading 112

Pentachlorophenol Cells - 10/7/88 Sampling (Incorporation Zone) 112

Pentachlorophenol Cells - 6/15/89 Sampling 113

Pentachlorophenol Cells - 7/13/89 Sampling (Incorporation Zone) 113

Pentachlorophenol Cells - 8/11/89 Sampling (Incorporation Zone) 113

Pentachlorophenol Cells - 8/11/89 Sampling 113

Pentachlorophenol Cells - 9/8/89 Sampling (Incorporation Zone) 114

Pentachlorophenol Cells - 10/27/89 Sampling (Incorporation Zone) 114

MICROORGANISMS IN CELL SOIL 114

SOIL PORE LIQUID SAMPLES 114

Groundwater 115

GENERAL DISCUSSION 115

6. SUMMARY 120

REFERENCES 121

APPENDIX A ANALYTICAL METHODOLOGY 132

EXTRACTION OF PCP, PAH's AND OCDD FROM SOIL 133

CLEAN-UP AND DETERMINATION OF PAH's AND PCP IN SOIL EXTRACTS 133

CLEAN-UP AND DETERMINATION OF OCTACHLORODIBENZO-P-DIOXIN IN SOIL (MSU 1984) 134

Method Summary 135

Blanks 136

Spike Samples 136

Standard Solution for Gas Chromatography Calibration 137

Blind Samples 137

GC/MS Analysis 137

APPENDIX B MICROBIOLOGICAL PROCEDURES 141

APPENDIX C SITE AND SOIL CHARACTERIZATION EXPERIMENTAL PROCEDURES 143

APPENDIX D RATIONALE FOR THE ADDITION OF CHICKEN MANURE TO SOIL IN THE DEGRADATION/ TRANSFORMATION STUDIES 145

APPENDIX E STATISTICAL PROCEDURES 148

APPENDIX F RAW DATA FROM EXPERIMENT 1, EXPERIMENT 2, AND FROM THE OPERATION OF THE WIGGINS SOIL TREATMENT UNIT 150

FIGURES

1. Principal Cuts Produced in Coal-Tar Distillation 14

2. Proposed Route for Decomposition of Pentachlorophenol 23

3. Proposed Mechanism for the Microbiological Degradation of Anthracene (Rogoff 1961) 30

TABLES

1. Volume of Wood Commodities Treated in 1978 7

2. Comparison of Composition of Commercial Grade and Purified Grade Pentachlorophenol (U.S. EPA 1978) 9

3. Chlorodioxin Isomer Distributions in Commercial Grade PCP (Dowicide 7) and PCP-Na Samples (Buser 1975, 1976) 10

4. Physical Properties of PCP (Crosby 1981; Bevenue et al. 1967) 11

5. Chemical Composition of a United States and a German Creosote 13

6. Physical Properties of Creosote and Its Fractions (USDA 1980) 15

7. American Wood Preservers' Association Specifications for Creosote-Coal Tar Solutions 16

8. Properties of 16 Priority Pollutant PAH Compounds (Sims 1987) 17

9. Daily Discharge of Creosote Wastewater Pollutants by the Wood-Preserving Industry (USDA 1980) 21

10. Degradation of Pentachlorophenol in Soil (USDA 1980) 26

11. Kinetic Parameters Describing Rates of Degradation of PAH and Phenolic Compounds in Soil Systems (Sims and Overcash 1983, ERT 1985b) 31

12. Toxicity of Various Dioxin Isomers to Experimental Animals 40

13. Health Effects of Chemical Constituents of Creosote (U.S. EPA 1984) 41

14. Loading Rates in Soil Treatment Unit Cells 50

15. Site Location in Major Land Resource Areas 54

16. Overall Field Evaluation Site Soil Composition 54

17. Soil Concentration of PCP at the Proposed Field Evaluation Sites 59

18. Soil Concentration of PAH's at the Proposed Field Evaluation Sites 60

19. Soil Concentration of Octachlorodibenzo-p-dioxin at the Proposed Land Treatment Sites (0-6 inches) 61

20. Abbreviations and Method Detection Limits of Compounds Analyzed in this Study 62

21. Microbial Plate Counts at Proposed Field Evaluation Sites 63

22. Nitrogen and Phosphorous at the Eight Selected Sites 63

23. Characteristics of the Eight Sites Used in this Study 65

24. Composition of the Sludges 66

25. Chemical Composition of the Sludges 66

26. Concentration of PCP, Total PAH's and OCDD in Each Sludge Samples 67

27. Concentration of PAH Constituents in Sludges from the Selected Sites (g/g dry weight) 68

28. Minor Components Present in Sludge 69

29. Concentration of Metals in Each Sludge Sample 70

30. Kinetic Data for PAH Degradation/Transformation in Atlanta Soils 72

31. Kinetic Data for PAH Degradation/Transformation in Chattanooga Soils 73

32. Kinetic Data for PAH Degradation/Transformation in Columbus Soils 74

33. Kinetic Data for PAH Degradation/Transformation in Grenada Soils 75

34. Kinetic Data for PAH Degradation/Transformation in Gulfport Soils 76

35. Kinetic Data for PAH Degradation/Transformation in Meridian Soils 77

36. Kinetic Data for PAH Degradation/Transformation in Wiggins Soils 78

37. Kinetic Data for PAH Degradation/Transformation in Wilmington Soils 79

38. Kinetic Data for PCP Degradation/Transformation in Site Soils 80

39. Half-Lives and 95% Confidence Limits of PAH's and PCP in Atlanta Soil Loaded with Site Sludges at 0.33, 1.0, and 3.0% by Soil Dry Weight 82

40. Half-Lives and 95% Confidence Limits of PAH's and PCP in Chattanooga Soil Loaded with Site Sludges at 0.33, 1.0, and 3.0% by Soil Dry Weight 83

41. Half-Lives and 95% Confidence Limits of PAH's and PCP in Columbus Soil Loaded with Site Sludges at 0.33, 1.0, and 3.0% by Soil Dry Weight 84

42. Half-Lives and 95% Confidence Limits of PAH's and PCP in Grenada Soil Loaded with Site Sludges at 0.33, 1.0, and 3.0% by Soil Dry Weight 85

43. Half-Lives and 95% Confidence Limits of PAH's and PCP in Gulfport Soil Loaded with Site Sludges at 0.33, 1.0, and 3.0% by Soil Dry Weight 86

44. Half-Lives and 95% Confidence Limits of PAH's and PCP in Meridian Soil Loaded with Site Sludges at 0.33, 1.0, and 3.0% by Soil Dry Weight 87

45. Half-Lives and 95% Confidence Limits of PAH's and PCP in Wiggins Soil Loaded with Site Sludges at 0.33, 1.0, and 3.0% by Soil Dry Weight 88

46. Half-Lives and 95% Confidence Limits of PAH's and PCP in Wilmington Soil Loaded with Site Sludges at 0.33, 1.0, and 3.0% by Soil Dry Weight 89

47. Polycyclic Aromatic Hydrocarbons in Soil Core Leachate (ppb) 92

48. Pentachlorophenol in Soil Core Leachate (ppb) 93

49. Polycyclic Aromatic Hydrocarbons in Soil Core Sections (ppm) 94

50. Pentachlorophenol in Soil Core Sections (ppm) 99

51. Octachlorodibenzo-p-dioxin in Soil Core Sections (ppm) 101

52. Wiggins Soil Treatment Unit - PAH, PCP, and OCDD in Zone 1 Soil, Creosote Loaded Cells (ppm) 102

53. Wiggins Soil Treatment Unit - PAH, PCP, and OCDD in Zone 1 Soil, Pentachlorophenol Loaded Cells (ppm) 103

54. Wiggins Soil Treatment Unit - PAH, PCP, and OCDD in Zone 1 Soil, Control Cells (ppm) 104

55. Nutrients and pH of Treatment Unit Soil After First Loading 107

56. Wiggins Soil Treatment Unit - PAH in Lysimeters (ppb) 116

57. Wiggins Soil Treatment Unit - Pentachlorophenol in Lysimeters (ppb) 117

58. Pentachlorophenol and Total PAH's in Wiggins LTDU Monitoring Wells (mg/L) 119

59. Analytical Procedures for Soil and Water (U.S. EPA 1986a) 139

60. Analytical Procedures for Sludges 140

61. Bacteria Levels in Four Soils at 0% Loading Before and After Addition of Chicken Manure 147

62. Experiment I: PAH in Site Soil (ppm) 151

63. Experiment I: PCP in Site Soil (ppm) 157

64. Experiment I: OCDD in Site Soils (ppm) 158

65. Experiment II - Polycyclic Aromatic Hydrocarbons in Site Soil (ppm) 159

66. Experiment II - Pentachlorophenol in Site Soil (ppm) 183

67. Experiment II - Octachlorodibenzo-p-dioxin in Site Soil (ppm) 191

68. Wiggins Soil Treatment Unit - PAH in Site Soil (ppm) 199

69. Wiggins Soil Treatment Unit - PCP in Soil (ppm) 215

70. Wiggins Soil Treatment Unit - OCDD in Soil (ppm) 218

71. Wiggins Soil Treatment Unit - Polycyclic Aromatic Hydrocarbons and Pentachlorophenol in Zone of Incorporation Soil (ppm) 221

SECTION 1

INTRODUCTION

Soil treatment systems have been used for a variety of industrial wastes; however, biological treatment of hazardous industrial waste in a soil system using a controlled engineering design and a management approach has not been widely practiced. This is due, in part, to lack of a comprehensive technical information base detailing behavior of hazardous constituents as specifically related to current concern regarding the treatability of such constituents in soil, i.e., degradation, transformation, and immobilization. Soil treatment systems that are designed and managed based on a knowledge of soil-waste interactions may provide a significant technology for the environmentally acceptable treatment and disposal of selected hazardous wastes.

OBJECTIVE

The overall objective of this study was to evaluate the efficacy of biological treatment in a soil system as an on-site management alternative for contaminated soils and sludges containing pentachlorophenol and creosote. This goal was pursued in a three phase study: Phase I - Site, soil and sludge characterization, Phase II - Sludge treatability/immobilization screening, and Phase III - Pilot scale evaluation. Phase I was conducted in order to determine the nature of the contaminated soil problem at wood treating plant sites - i.e., what kinds of contaminants are present and where they are located. The soil characteristics (chemical and pedological) were studied to develop data for comparison of the effect of soil type and constituents on soil treatment of wood treating wastes. Phase II was conducted to determine if soil treatment of wood treating wastes was effective in controlled laboratory studies, and if the results of such studies could predict results of soil treatment in the field. The tendency of the different soils to immobilize the waste components and retain them in the treatment zone was studied. Phase III was conducted to apply the results of the earlier phases in the field and to study the accumulation or transformation of the waste components in soil under field conditions. Management operations feasible in a high rainfall hot climate were studied.

EVALUATION REQUIREMENTS

Standards for demonstrating treatment of hazardous wastes in soils of a land treatment system are promulgated in 40 CFR Part 264.272. The standards require demonstration of degradation, transformation, and/or immobilization of a candidate waste in the treatment soil. These same standards should be applicable for any soil treatment system.

Complete degradation is the term used to describe the process whereby waste constituents are mineralized to inorganic end products, generally including carbon dioxide, water, and inorganic species of nitrogen, phosphorus, and sulfur.

Transformation refers to partial degradation which converts a substance into an innocuous form or which converts wastes into environmentally safe forms (Huddleston et al., 1986). Ward et al. (1986) also discussed the difference between rates of mineralization (for complete degradation) and rates of biotransformation. The rate of degradation/transformation may be established by measuring the loss of the parent compound from the soil/waste matrix over time.

Immobilization refers to the extent of retardation of the downward transport, or "leaching potential," and upward transport, or "volatilization potential," of waste constituents. The mobility potential for waste constituents to partition from the waste to water, air, and soil is affected by the relative affinity of the waste constituents for each phase and can be characterized in column and batch test units.

Demonstration of soil treatment requires an evaluation of degradation, transformation, and immobilization processes. Quantification of these processes is needed to obtain an integrated assessment of design and management requirements for successful assimilation of a waste in a soil system. The requirement for demonstrating treatment, i.e., degradation, transformation, and/or immobilization, can be addressed using several approaches. Information can be obtained from several sources including literature data, laboratory analyses and studies, theoretical parameter estimation methods, field tests, and operating data from existing soil treatment units. Literature data is discussed in the Literature Review section of this report.

At this time, the U.S. EPA (1986b) considers the use of only information from the literature to be insufficient to support demonstration of treatment of hazardous wastes in soil. Site and waste specific data must be generated in laboratory and field studies to demonstrate that the particular waste can be successfully treated in the particular soil. The regulations require that the effect of design and management practices on soil treatment be evaluated. Design and management practices specifically identified in the regulations include waste application rate (loading rate) and frequency of waste application. Finally, the ability of the soil to immobilize the waste compounds must be evaluated.

EXPERIMENTAL APPROACH

Site, Soil and Sludge Characterization

Eight wood treating sites located in the southeastern United States were selected for study. Sites having a variety of soil types were selected in order to determine how the rates of degradation/transformation are affected by soil characteristics such as the organic carbon and clay content. The history and physiographic characteristics of each site were evaluated and the physical and chemical characteristics of the soils were determined.

The chemical and physical characteristics of the waste sludges from each site were determined. Some sites had several sludge types available, but only one from each site was chosen for use in Phase II.

Sludge Treatability/Immobilization

The potential for degradation/transformation of the organic hazardous constituents in the sludges was determined by applying the sludges at three loading rates to the site soils in bench scale batch tests. Soil concentrations of specific constituents were measured at thirty-day intervals. The first-order reaction-rate constant was used to calculate half-lives for each constituent. The half-lives provided quantitative information for evaluating the extent and rate of treatment, the effect of different loading rates and for comparing treatment effectiveness for each waste/soil combination as a function of design and management factors. First-order kinetics were used for convenience of comparison only; it should not be inferred that particular compounds were undergoing a first-order reaction at a particular site.

Treatment of a hazardous waste refers specifically to treatment of hazardous constituents contained in the waste. Standards identified in 40 CFR Part 264.272(c)(i) refer to Appendix VIII constituents listed in Part 26. Where waste(s) are from an identified process, i.e., wood preserving, EPA may accept analyses performed on a subset of constituents. In this study, the semi-volatile polycyclic aromatic hydrocarbons (PAH's) including naphthalene and methyl naphthalenes, larger molecular weight PAH's, pentachlorophenol (PCP), and octachlorodibenzo-p-dioxin (OCDD), a total of nineteen compounds, were used as the key parameters.

Evaluation of treatment also involved an investigation of the extent of migration of each hazardous waste. A loading rate based on biodegradation potential was selected for each soil/waste combination using data generated in an earlier study (Sims et al., 1987). The leaching potentials were characterized for these loading rates in laboratory soil-column studies using semi-undisturbed soil cores.

Field Evaluation

A research and demonstration land treatment unit was constructed at the Wiggins, MS site to evaluate design and management scenarios developed from the laboratory studies. Degradation/transformation/migration of PCP and creosote containing sludges applied at three loading rates to test plot soils were studied over a period of three years.

SECTION 2
CONCLUSIONS

The following conclusions are based on transformation and migration data from laboratory studies and the field evaluation study:

1) PAH and PCP compounds in wood treating wastes were transformed in soil treatment systems.

2) Loading rates and previous exposure of the soil to particular compounds were identified as important factors in determining transformation rates.

3) Populations of PAH and PCP acclimated microorganisms increased markedly when these compounds were applied to soil.

4) Migration of the compounds studied was negligible except in the almost pure sand from one of the eight sites for which column leaching studies were conducted.

5) Results of the field evaluation study closely approximated results of the laboratory study both for transformation and migration data.

SECTION 3

LITERATURE REVIEW

INTRODUCTION

Treatment in soil systems may represent a significant engineering method for control/treatment and ultimate disposal of selected hazardous constituents in applied waste. Land application for the assimilation and treatment of hazardous constituents is a potentially significant cost-effective, environmentally safe, low energy technology that has been successfully used for a multitude of domestic and industrial wastes. Soil systems for treatment of a variety of industrial wastes, including food processing, organic chemical manufacturing, coke industries, textile, and pulp and paper have been utilized for many years (Overcash and Pal, 1979). However, Phung et al. (1978) reported that routine application of industrial hazardous wastes onto the soil surface and incorporation into the soil for treatment is not widely practiced, except for the oil refining industry. There are few definitive data in the literature which quantify treatment rates in full-scale soil treatment systems (Huddleston et al., 1986).

Land treatment is defined in RCRA as "the hazardous waste management technology pertaining to application and/or incorporation of waste into the upper layers of the soil in order to degrade, transform, or immobilize hazardous constituents contained in the applied waste" (40 CFR Part 264, Subpart M). Land treatment also has been defined as "a controlled application of hazardous wastes onto or into the aerobic surface soil horizon, accompanied by continued monitoring and management, in order to alter the physical, chemical, and biological state of the waste via biological degradation and chemical reactions in the soil so as to render such waste nonhazardous" (Brown et al., 1980).

The current regulatory requirement for demonstrating treatment, i.e., degradation, transformation, and/or immobilization of hazardous waste constituents in soil systems, can be addressed using several approaches. Information concerning each treatment component can be obtained from several sources including literature data, field tests, laboratory studies, laboratory analyses, theoretical parameters, estimation methods, and operating date from existing land treatment units (40 CFR Part 264.272). It is suggested that a combination of data sources be utilized (e. g., literature data, laboratory analyses, laboratory studies, and field verification tests) to strengthen confirmation of hazardous constituent treatment efficiency. The availability and completeness of existing literature data influence the need for further collection of performance data. The U.S. EPA considers the use of only literature data to be insufficient to support a demonstration treatment at the present time.

In this project, hazardous waste from eight wood-preserving sites was used to evaluate the soil treatment potential of these types of waste in various soil types. A comprehensive assessment of literature available for both waste types, pentachlorophenol (PCP) and creosote, was conducted as an aid in making these evaluations.

WOOD PRESERVING INDUSTRY

Introduction (Burdell, 1984)

Wood preserving in the United States is a hundred-year-old industry. Wood is treated under pressure in cylinders with one of four types of preservatives: 1) creosote, 2) PCP in petroleum (penta), 3) water solutions of copper, chromium, and arsenic (CCA), and 4) fire retardants.

The 1978 volume of wood commodities treated is shown in Table 1 (USDA, 1980).

Table 1: Volume of wood commodities treated in 1978.

Product	Volume treated with		
	Creosote solutions	Penta	Inorganic salts[a]
	1,000 cu. ft.		
Crossties, switch ties, and landscape ties	103,138	449	2,498
Pole	18,237	41,905	4,038
Crossarms	41	1,615	29
Piling	9,993	1,154	943
Lumber and timbers	10,780	21,209	73,317
Fence posts	4,584	10,983	4,461
Other products	7,815	2,681	7,616
Total	154,587	79,996	92,903

[a] The main inorganic salts are copper, chromium, and arsenic.

About 99% of the creosote solutions, 90% of the penta, and all of the arsenical salts in the preceding tabulation are applied by pressure methods in closed systems. A small amount of creosote and about 3.8 million pounds of penta are applied by commercial thermal and dip treatment methods in open tanks.

BASIC WOOD-TREATING PROCESS

The basic oil-preservative wood-treating cycle begins by placing either seasoned or green wood into a pressure cylinder. If green materials are used, they can be artificially seasoned in the cylinder with steam and either oil preservative or hydrocarbon vapor. Then an initial air pressure (vacuum or positive pressure) is introduced into the system. Next the preservative is pumped into the cylinder and the pressure is increased until a predetermined liquid volume is absorbed into the wood. The pressure is released and the preservative is pumped back into the tanks. A final vacuum is applied to remove most of the free liquid on the surface.

The organic preservative most used is coal tar creosote, a by-product from the production of coke from coal. When coal tar is distilled, the 200°C to 400°C fractions are creosote. Creosote is mostly aromatic single to multiple ring compounds (polycyclic aromatic hydrocarbons). Over 200 different components have been identified in creosote.

Pentachlorophenol (4-8%) dissolved in No. 2 fuel oil carrier is the second most common organic wood preservative. Technical grade PCP is about 85% to 90% pure PCP plus various levels of other chlorinated phenolic compounds.

CHARACTERIZATION OF THE ORGANIC WOOD PRESERVATIVES

The two major organic wood preservatives used in the United States are PCP and creosote.

Technical-grade PCP used for treating wood contains 85% to 90% PCP. The remaining materials in technical grade PCP are 2,3,4,6-tetrachlorophenol (4% to 8%), "higher chlorophenols" (2% to 6%), and dioxins and furans (0.1%). The tetrachlorophenol is added to PCP to increase the rate of solubilization.

The other contaminants found in technical-grade PCP are formed during manufacture. In the United States, PCP is manufactured from phenol by a catalytic chlorination process. During chlorination, the temperature must be maintained above the melting point of the products formed which is believed to contribute to the side reaction that gives rise to contaminants, including traces of trichlorophenol, chlorinated dibenzo-p-dioxins, chlorinated dibenzofurans, chlorophenoxy phenols, chlorodiphenyl ethers, chlorohydroxydiphenyl ethers, and traces of even more complex reaction products of phenol. Chlorodibenzodioxins and furans are

the by-products which generate the greatest concerns. Analyses of PCP have revealed that the principal chlorodibenzodioxin and chlorodibenzofuran contaminants are those containing six to eight chlorines. The highly toxic 2,3,7,8,-tetrachlorodibenzo-p-dioxin (TCDD) has not been identified in any sample of PCP produced in the United States that has been analyzed (USDA 1980). The composition of a sample of commercial PCP and of a sample of purified PCP is given in Table 2. A representative distribution of isomers is given in Table 3 (U.S. EPA 1978).

Table 2: Comparison of composition of commercial grade and purified grade pentachlorophenol (U. S. EPA 1978).

	Analytical results	
Component	Commercial[a] (Dowicide 7)	Purified[b] (Dowicide EC-7)
Pentachlorophenol	88.4%	89.8%
Tetrachlorophenol	4.4%	10.1%
Trichlorophenol	0.1%	0.1%
Chlorinated phenoxyphenols	6.2%	--
Octachlorodioxin	2500 ppm	15.0 ppm
Heptachlorodioxins	125 ppm	6.5 ppm
Hexachlorodioxins	4 ppm	1.0 ppm
Octachlorodibenzofuran	80 ppm	1.0 ppm
Heptachlorodibenzofurans	80 ppm	1.8 ppm
Hexachlorodibenzofurans	30 ppm	1.0 ppm

[a] Sample 9522A.
[b] Technical grade PCP purified by distillation.

Table 3: Chlorodioxin isomer distributions in commercial grade PCP (Dowicide 7) and PCP-Na samples (Buser 1975, 1976).

Chlorodioxin	PCP[a] (ppm)	PCP-Na[b] (ppm)
1,2,3,6,7,9-Cl_6D	1	0.5
1,2,3,6,8,9-Cl_6D	3	1.6
1,2,3,6,7,8-Cl_6D	5	1.2
1,2,3,7,8,9-Cl_6D	0	0.1
1,2,3,4,6,7,9-Cl_7D	63	16.0
1,2,3,4,6,7,8-Cl_7D	171	22.0
1,2,3,4,6,7,8,9-Cl_8D	250	110.0

[a] Dowicide 7 (commercial PCP).
[b] Sodium salt of PCP.

The physical properties of a compound play an important role in how the compound behaves under different conditions. These properties influence the mobility of a compound in air or water, its ability to adsorb to surfaces, and its susceptibility to degradation. These factors are important because they relate to the route and rate of exposure by which a compound might be received by man or other organism. Some of the selected physical properties of pentachlorophenol are given in Table 4.

Pentachlorophenol is quite stable. It does not decompose when heated at temperatures up to its boiling point for extended periods of time. Pure PCP is considered to be rather inert chemically (Bevenue and Beckman, 1967). The chlorinated ring structure tends to increase stability, but the polar hydroxyl group tends to facilitate biological degradation (Renberg, 1974). Pentachlorophenol is not subject to the easy oxidative coupling or electrophilic substitution reactions common to most phenols. All monovalent alkali metal salts of PCP are very soluble in water, but the protonated (phenolic) form is virtually insoluble. Hence, transport of PCP in water is related to the pH of the environment.

Since pentachlorophenol is moderately volatile, a closed system should be used when heating environmental samples to prevent poor recoveries (Bevenue and Beckman, 1967). By contrast to other chlorinated organic compounds of low vapor pressure, PCP can be lost from soils by volatilization (Briggs, 1975).

Table 4: Physical properties of PCP (Crosby 1981; Bevenue et al. 1967).

Property	Value
Empirical formula	C_6Cl_5OH
Molecular weight	255.36
Melting point	190°C
Boiling point	293°C
Density	1.85 g/cc
pK_A (25°)	4.70-4.80
Partition coefficient (Kp), 25°	
Octanol-water	1760
Hexane-water	1.03×10^5
Vapor pressure, Torr (mm Hg)	
0°C	1.7×10^{-5}
20°C	1.7×10^{-4}
50°C	3.1×10^{-3}
100°C	0.14
200°C	25.6
300°C	758.4
Solubility in water (g/L)	
0°C	0.005
20°C	0.014
30°C	0.020
50°C	0.035
70°C	0.085
Solubility in organic solvents (g/100g solvent)	
in methanol 20°C	57
in methanol 30°C	65
in diethylether 20°C	53
in diethylether 30°C	60
in ethanol 20°C	47
in ethanol 30°C	52
in acetone 20°C	21
in acetone 30°C	33
in xylene 20°C	14
in xylene 30°C	17
in benzene 20°C	11
in benzene 30°C	14
in carbon tetrachloride 20°C	2
in carbon tetrachloride 30°C	3

The other major organic wood preservative used in the United States is creosote. Creosote, in contrast to PCP, is a very complex mixture of organic compounds produced from coal.

At least 200 chemical compounds have been identified in creosote. Although the chemical composition of this material varies because of the production process discussed below, it is generally agreed that creosote contains several thousand different compounds which could be identified with GC/MS. Most of these are present in very small amounts. The major components of a typical creosote of U.S. origin and one of German origin are shown in Table 5. There are some rather striking differences between the two types of creosote in the levels of particular polycyclic aromatic hydrocarbons and in the overall levels of total PAH's.

The greater part of the composition of creosote consists of neutral fractions. Tar acids, such as phenol and the cresols, as well as such tar bases as pyridines, quinolines, and acridines, constitute a rather small percentage of the total weight of creosote.

A schematic of the distillation processes is presented in Figure 1. Creosote is a blend of the various distillates designed to impart specific physical characteristics that meet standards of the American Wood Preservers' Association (AWPA). Compared to the starting material, the yield of fractions that are blended to make creosote ranges from 25% to 40%, depending upon the point at which distillation is terminated. Both the yield and the chemical and physical properties of the various fractions are influenced by the characteristics of the coal from which the tar originates, the type of equipment used in the distillation process, and the particular process used.

There were 64 producers of coal tar in the United States in 1972 and 24 tar distillation plants producing creosote (U.S. EPA, 1975). Because their chemical composition and properties are not uniform, creosote and blends of creosote and coal-tar are normally described in terms of their physical properties. The American Wood Preservers' Association specifications for creosote for various uses are given in Table 6. Similar standards have been promulgated by the American Society for Testing and Materials (ASTM) and the General Services Administration (GSA). The principal differences among creosotes for the three uses shown are in specific gravity and the fraction of the oil distilled within various temperature ranges.

Table 5: Chemical composition of a United States and a German creosote.

Compound or component	Percent of total	
	U.S. creosote[a]	German creosote[b]
Naphthalene	3.0	7.3
Methyl naphthalene	2.1	4.2
Diphenyl dimethylnaphthalene	--	3.2
Biphenyl	0.8	--
Acenaphthene	9.0	4.1
Dimethylnaphthalene	2.0	--
Diphenyloxide	--	3.4
Dibenzofuran	5.0	--
Fluorene-related compounds	10.0	9.6
Methyl fluorenes	3.0	--
Phenanthrene	21.0	12.6
Anthracene	2.0	--
Carbazole	2.0	--
Methylphenanthrene	3.0	5.4
Methyl anthracenes	4.0	--
Fluoranthene	10.0	6.8
Pyrene	8.5	5.0
Benzofluorene	2.0	4.6
Chrysene	3.0	2.8
TOTAL	90.4	69.0

[a] Lorenz and Gjovik, 1972.
[b] Becker, 1977.

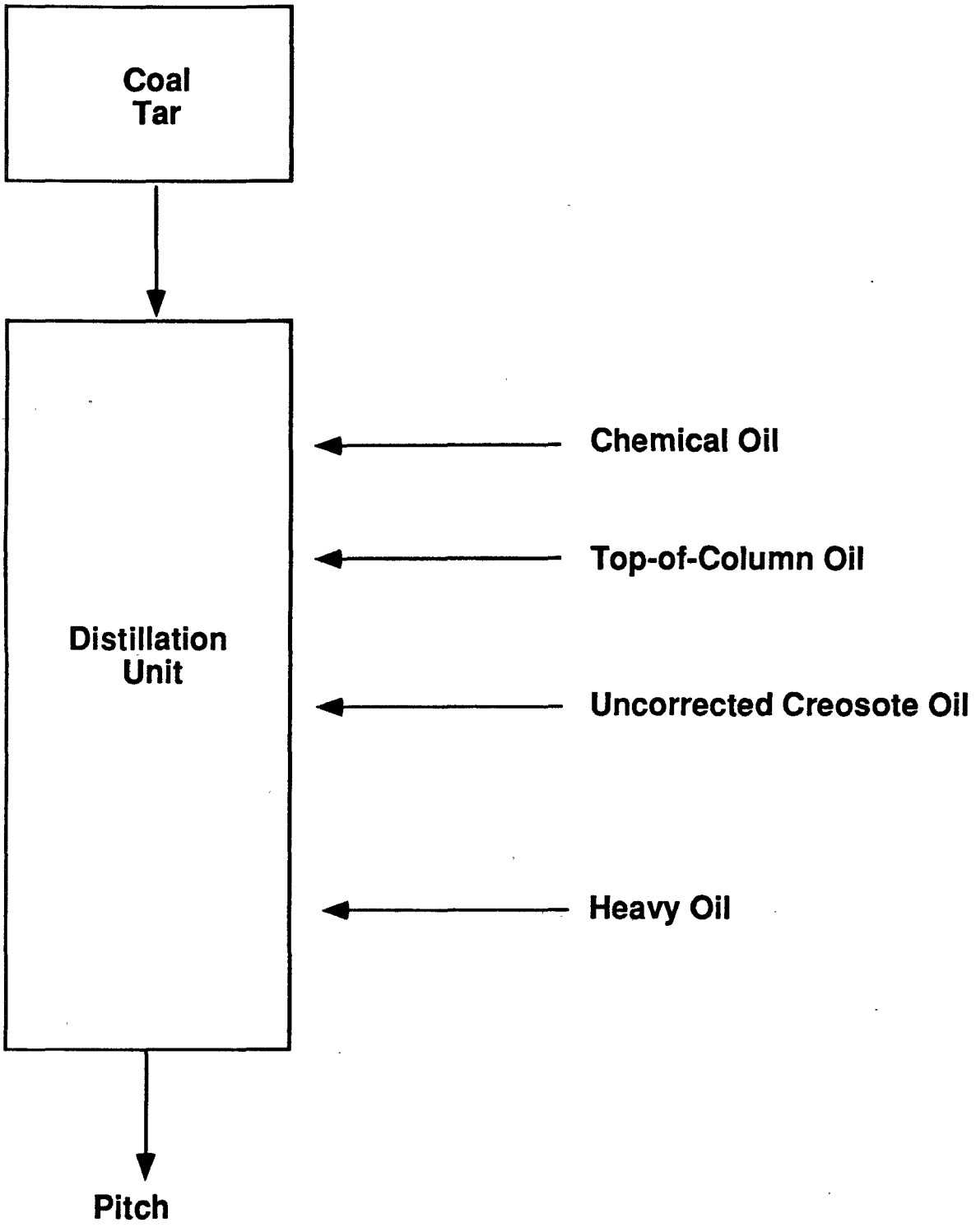


Figure 1. Principal cuts produced in coal-tar distillation.

Table 6: Physical properties of creosote and its fractions (USDA 1980).

	American Wood Preservers' Association Standards					
	P1-65[a]		P7-72[b]		P13-65[c]	
Water % volume	< 1.5		< 1.0		< 1.5	
Xylene, insoluble, % by wt.	< 0.5		< 0.5		< 0.5	
Specific gravity 38/15.5°C						
Whole creosote	> 1.050		> 1.060		> 1.080	
Fraction 235-315°C	> 1.027		--		> 1.030	
Fraction 315-355°C	> 1.095		--		> 1.105	
Residue above 355°C	--		--		> 1.160	
Distillation, % by wt.	Min.	Max.	Min.	Max.	Min.	Max.
Up to 210°C	--	2.0	--	1.0	--	2.0
235°C	--	12.0	--	10.0	--	12.0
270°C	20.0	40.0	--	--	20.0	40.0
315°C	45.0	65.0	--	--	45.0	65.0
355°C	65.0	82.0	65.0	--	65.0	75.0

[a] For land and fresh water use.
[b] For brush or spray application.
[c] For marine (coastal water) use.

A comparison of physical properties of creosote and creosote/coal tar mixtures as shown in Table 7 indicates much higher distillation residue for coal tar. A list of the properties of some of the 16 priority pollutant PAH compounds found in creosote is given in Table 8 (Sims et al., 1987).

Another group of compounds which have been identified in creosote and which are related to the PAH's are the azaarenes which make up approximately 0.13% of creosote (Adams et al., 1984). These compounds are polycyclic hydrocarbons containing nitrogen (e.g., quinoline and acridine).

Table 7: American Wood Preservers' Association specifications for creosote-coal tar solutions.[a]

		Grade			
		A	B	C	D
Composition					
Creosote	100%	< 80	< 70	< 60	> 50
Coal tar	--	--	--	--	--
Water (% by volume)		> 3.0	> 3.0	> 3.0	> 3.0
Xylene, insol. (% by weight)		> 2.0	> 3.0	> 3.5	> 4.0
Coke residue (% by weight)	0.99	> 5.0	> 7.0	> 9.0	> 11.0
Specific gravity 38/15.5°C					
Whole oil	1.102	1.06-1.11	1.07-1.12	1.08-1.13	1.09-1.14
235-315°C	1.054	1.025	1.025	1.025	1.025
315-355°C	1.133	1.085	1.085	1.085	1.085
Residue		--	--	--	--
Distillation					
To 210°C	1.87	5	5	5	5
To 235°C	6.89	25	25	25	25
To 270°C	19.39	--	--	--	--
To 315°C	49.8	36	34	32	30
To 355°C	72.58	60	56	52	48
Residue	26.67	--	--	--	--

[a] Lorenz and Gjovik, 1972.

Table 8. Properties of 16 pollutant PAH compounds. (Sims 1987).

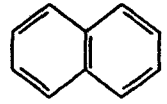
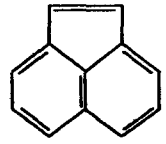
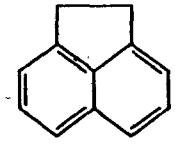
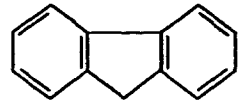
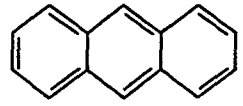
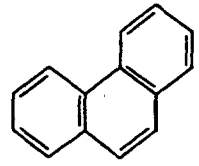
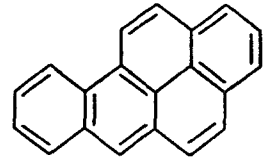
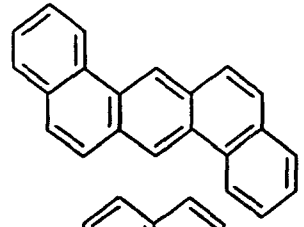
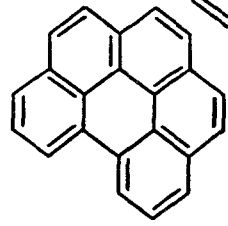
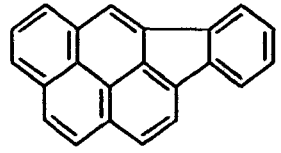
		Molecular Weight	Aqueous Solubility* mg/l	Melting Point * °C	Boiling Point * °C	Vapor Pressure @ 20°C torr	Log K_{ow}*	Length of Molecule A*	K_{oc}
1. <u>Two Rings</u> Naphthalene		128	31,700	80	218	4.92×10^{-2}	3.37	8.0	1,300*
2. <u>Three Rings</u> Acenaphthylene		152	3,470	92	265	2.9×10^{-2}	4.07		
Acenaphthene		154	3,930	96	279	2.0×10^{-2}	4.33		
Fluorene		166	1,900	116	293	1.3×10^{-2}	4.18		
Anthracene		178	73	216	340	1.96×10^{-4}	4.45	10.5	2,600*
Phenanthrene		178	1,290	101	340	6.80×10^{-4}	4.46	9.5	23,000*

Table 8. (continued)

	Molecular Weight	Aqueous Solubility* mg/l	Melting Point * °C	Boiling Point * °C	Vapor Pressure @ 20°C torr	Log K_{ow}*	Length of Molecule A°	K_{oc}
3. Four Rings Fluoranthene	202	260	111	..	6.0×10^{-6}	5.33	9.4	
Pyrene	202	135	149	360	6.85×10^{-7}	5.32	9.5	62,700[8] 84,000[4]
Benz(a)anthracene	228	14	158	400	5.0×10^{-9}	5.61	11.8	
Chrysene	228	2	255	..	6.3×10^{-7}	5.61	11.8	
4. Five Rings Benzo(b)fluoranthene	252	1.2	167	..	5.0×10^{-7}	6.57		
Benzo(k)fluoranthene	252	0.55	217	400	5.0×10^{-7}	6.84		

Table 8. (continued)

		Molecular Weight	Aqueous Solubility* mg/l	Melting Point * °C	Boiling Point * °C	Vapor Pressure @ 20°C torr	Log K_{oc}*	Length of Molecule A°	K_{oc}
Benzo(a)pyrene		252	3.0	179	496	5.0×10^{-7}	6.04		4,510,651
Dibenz(a,h)anthracene		278	2.49	262	..	1.0×10^{-10}	5.97	13.5	2,029,000[§]
Benz(a,h,i)perylene		276	0.26	222	..	1.0×10^{-10}	7.23		
Indeno(1,2,3,c,d)pyrene		276	62	163	..	1.0×10^{-10}	7.66		

* Sims and Overcash (1983).
\+ Karickhoff et al. (1979).
§ Means et al. (1980) (mean value is reported).

CHARACTERIZATION OF WOOD-PRESERVING WASTES

There are several sources of contamination at wood-treating sites. During the treatment cycle, waste water with traces of preservative is produced from the live steaming of the wood, from vapor drying or oil seasoning, from cleanup, and from contaminated rain water. Treatment of this plant process water produces sludges that are classified by EPA as K001, Hazardous Waste.

Prior to the environmental rules on wastewater discharge, the treating plant wastewater effluent generally went directly to surface drainage or to a stream. A large number of the plants had sumps or ponds to trap the heavy oil residuals before discharging to a creek or to the publicly-owned treating works (POTW). Ponds ranged from less than an acre to eight acres. Normally the ponds were lined with the local soils. Typical constituents present in creosote wastewater are given in Table 9.

Normal wood-treatment operations create additional preservative waste. Treating tanks and cylinders have to be cleaned periodically to maintain quality standards. In the past, these preservative sludges were used as fuel or for road paving or were buried at the facility.

Preservative-contaminated soil is another source of environmental concern. Treated material is withdrawn from the cylinder and moved by rails to storage areas. During transportation, the preservative drips from the treated wood onto the soil along the track. The areas around storage, treating, and unloading tanks have had minor preservative spillage from broken pipes, bleeding of treated wood, etc. These areas can be rather large, especially in the older railroad ties and pole plants.

Table 9: Daily discharge of creosote wastewater pollutants by the wood-preserving industry (USDA 1980).

Creosote Component	Composition of Whole Creosote	Allowable Discharge[a] 1977	Allowable Discharge[a] 1983
	Percent	Pounds/day	
Naphthalene	3.0	5.0	1.4
2-Methylnaphthalene	1.2	2.0	.6
1-Methylnaphthalene	.9	1.5	.4
Biphenyl	.8	1.3	.4
Dimethylnaphthalenes	2.0	3.4	1.0
Acenaphthene	9.0	15.1	4.3
Dibenzofuran	5.0	8.4	2.4
Fluorene	10.0	16.8	4.8
Methylfluorenes	3.0	5.0	1.4
Phenanthrene	21.0	35.3	10.0
Anthracene	2.0	3.4	1.0
Carbazole	2.0	3.4	1.0
Methylphenanthrenes	3.0	5.0	1.4
Methylanthracenes	4.0	6.7	1.9
Fluoranthene	10.0	16.8	4.8
Pyrene	8.5	14.2	4.0
Benzofluorenes	2.0	3.4	1.0
Chrysene	3.0	5.0	1.4

[a] Discharges are based on a flow rate of 5,000 gal/day per plant, 90 plants, and discharge limitations on oil and grease of 45 mg/liter in 1977 and 13 mg/liter in 1983.

DECOMPOSITION/IMMOBILIZATION OF PCP AND CREOSOTE COMPONENTS IN SOIL

Pentachlorophenol

Biodegradation of PCP in soil has been extensively studied. The sequence of reactions that have been shown to occur is summarized in Figure 2. In soil, PCP undergoes a reversible methylation reaction to form pentachloroanisole, but this reaction apparently is not part of the main decomposition pathway. The main route for decomposition is not through the methyl derivative, but through PCP (Kaufman, 1978; Matsunaka and Kuwatsuka, 1975). The route of decomposition involves dechlorination leading to a series of partial dechlorinated products, such as 2,3,5,6-tetrachlorophenol.

The second step in the decomposition reaction involves an oxidation step to form substituted hydroquinones or catechols, such as 2,3,4,5-tetrachlorocatechol. The oxidation product then undergoes ring cleavage, ultimately forming CO_2 and inorganic chloride ions.

Mobility, persistence, and fate of PCP in soils depend on physical and chemical characteristics of the soil as well as the prevailing microbial population.

Hilton and Yuen (1963) compared soil adsorption of PCP to the soil adsorption of a number of substituted urea herbicides. They found that the adsorption of PCP was the highest of all compounds studied.

Choi and Aomine (1972, 1974, 1974a) studied the interaction of PCP and soil in detail. Adsorption and/or precipitation of PCP occurred to some extent on all soils tested. Choi and Aomine (1974) concluded in a study of 13 soils that adsorption of PCP depended primarily on the pH of the system. The more acid the soil, the more complete was the "apparent adsorption" of PCP. Different mechanisms of adsorption dominate at different pH values. It should be noted that PCP is an acid which forms a salt at the higher pH's. In the salt form, PCP would be more soluble in water but also more polar. In acid clays, "apparent adsorption" involved the adsorption on colloids, and precipitation in the micelle and in the external liquid phase. Organic matter content of soils is important to adsorption of PCP at all pH values. Soil containing humus always adsorbs more PCP than soil treated with H_2O_2 to remove organic matter. Later investigations led to the conclusion that adsorption of PCP by humus is important when the concentration is low, but at higher concentrations the inorganic fraction increases in importance.

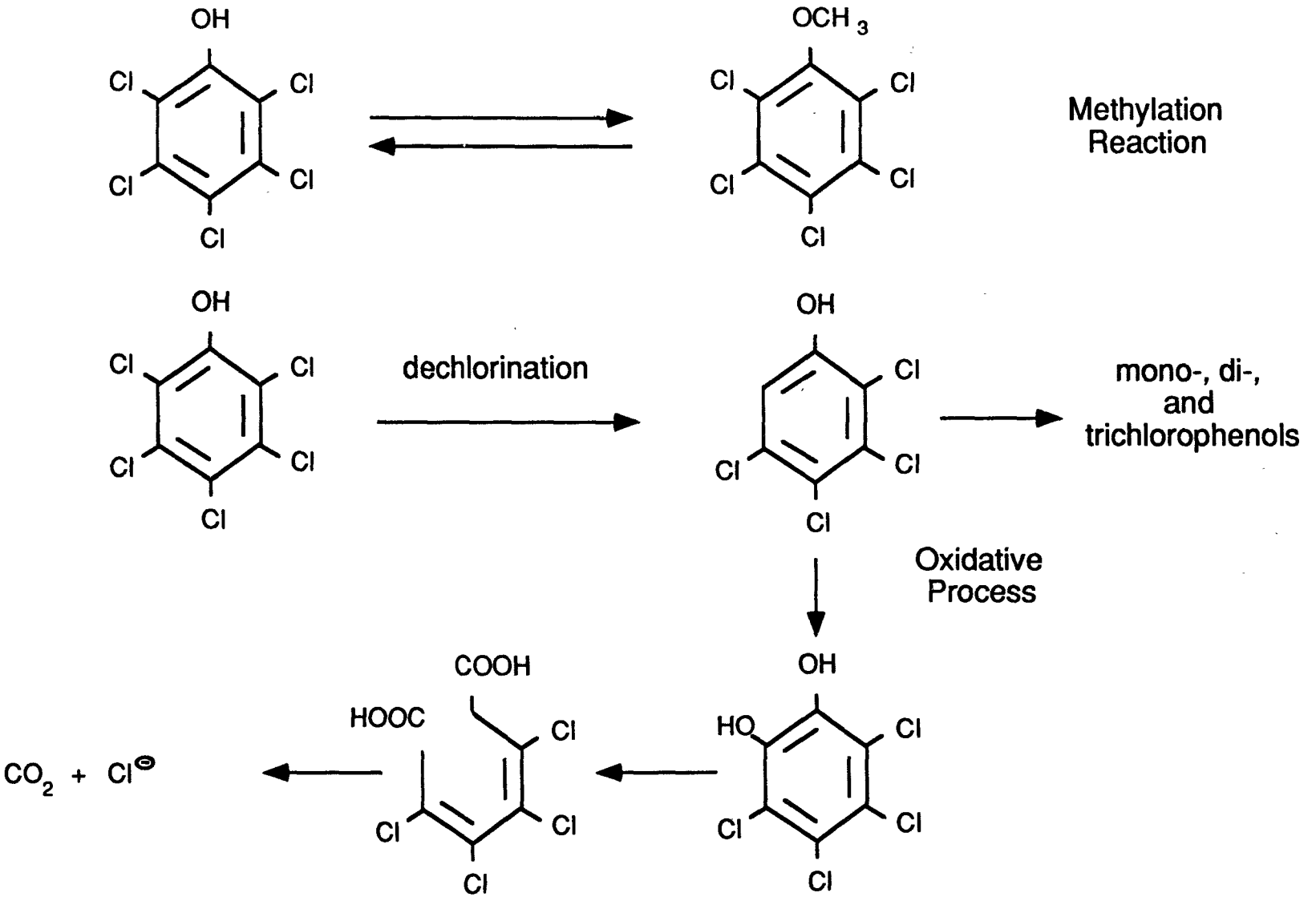


Figure 2. Proposed route for decomposition of pentachlorophenol.

Three of four allophanic soils showed a significant increase in PCP adsorption at higher temperatures, while the fourth soil showed a decrease (Choi and Aomine, 1974a). The difference between the three soils and the fourth soil could be explained by assuming that andosols chiefly adsorb PCP as an anion; whereas, the major factor influencing PCP adsorption by the fourth soil, showing a decrease with increasing temperature, is Van der Waal's forces. Decreasing the concentration of chlorides or sulfate ions also increases the adsorption of PCP to soil. These results indicate the occurrence of competition between inorganic anions and PCP anions for adsorption sites on the soil colloid.

The persistence of PCP in soil depends on a number of environmental factors. Young and Carroll (1951) noted that PCP degradation was optimum when the moisture content of soil was near saturation. Kuwatsuka and Igarashi (1975) reported that the degradation of PCP is faster under flooded conditions than under upland conditions. Loustalot and Ferrer (1950) found that the sodium salt of PCP was relatively stable in air-dried soils and persisted for 2 months in soil of medium moisture content and for 1 month in water-saturated soil. Although the rates of degradation may be maximized at the higher moisture values, these conditions would not be suitable for land treatment because of the increased potential for migration.

There are several factors in soil which affect the persistence of PCP. PCP is broken down slower in heavy clay than in sandy or sandy clay soils (Loustalot and Ferrer, 1950). This could be due to factors in the soil or to a slower oxygen transfer in the soil. An extensive study of the soil variables affecting the rate of degradation of PCP was carried out by Kuwatsuda and Igarashi (1975). The rate was correlated with clay mineral composition, free iron content, phosphate adsorption coefficients and cation exchange capacity of the soil, while the greatest effect was correlated with organic matter. According to these authors, little or no correlation could be found with soil texture, clay content, degree of base saturation, soil pH, and available phosphorus.

The preponderance of information indicates that microbial activity plays an important part in the degradation of PCP in soil. PCP decays more rapidly when the ambient temperature approaches the optimum value for microbiological activity (Young and Carroll, 1951). Ide et al. (1972) found no decay in sterilized soil samples. These factors suggest that microorganisms play an important role in PCP degradation (Kuwatsuka and Igarashi, 1975; Young and Carroll, 1951). Kuwatsuka and Igarashi (1975) studied degradation of PCP in soils collected from flooded and upland areas. Upland soils degraded PCP more rapidly in the laboratory when studied in the aerated condition, while soils obtained from flood conditions degraded PCP more rapidly when tested in the flooded stage. Thus, PCP-degrading microorganisms present in the soil survived the

transfer to the laboratory and were most active when placed in an environment to which they were adapted.

A summary of the literature values for the persistence of PCP in soil is presented in Table 10. The persistence ranged between 22 days and 5 years. The 5-year value obtained by Hetrick (1952) was from dry soil sealed in a jar and probably does not represent a realistic evaluation of the environmental half-life. Thus, PCP can be considered moderately persistent under most conditions.

Numerous degradation products have been isolated from PCP-treated soil. Ide et al. (1972) identified 2,3,4,5-, 2,3,5,6-, 2,3,4,6-tetrachlorophenol; 2,4,5- and 2,3,5-trichlorophenol; 3,4- and 3,5-dichlorophenol; and 3-chlorophenol. Similar products were obtained by Kuwatsuka and Igarashi (1975), who also identified pentachloroanisole as a PCP degradation product. This reaction is reversible and pentachloroanisole can subsequently degrade back to PCP. Demethylation and methylation of phenolic groups in biological systems are well known (Williams, 1959). Ide et al. (1972) found 2,3,4,5-, 2,3,5,6- and 2,3,4,6-tetrachloroanisoles; 2,3,5-trichloroanisole; 3,4- and 3,5-dichloroanisoles; and 3-chloroanisole as methylated products of PCP in incubated soil. Based on the results obtained from these investigations, Matsunaka and Kuwatsuka (1975) proposed the soil degradation pathway shown in Figure 2. An excellent review of the parameters important for degradation of pentachlorophenol in soil can be found in a review by Kaufman (1978).

Many types of bacteria and fungi are capable of degrading pentachlorophenol, including Pseudomonas, Aspergillus, Trichoderma, and Flavobacterium. Chu and Kirsch (1972) isolated a bacterial culture by continuous flow enrichment that was capable of metabolizing PCP as a sole source of organic carbon. The morphological and physiological characteristics of the organisms suggest a relationship to the saprophytic coryneform bacteria. Chu and Kirsch (1973) established that the organism was responsive to enzyme induction with PCP as the inducer. Lesser induction occurred with 2,4,6-trichlorophenol. The degradation products resulting from the metabolism of PCP by this organism were not characterized.

Kirsch and Etzel (1973) derived a microbial population capable of rapid PCP degradation from a soil sample obtained on the grounds of a wood products manufacturer. When fully acclimated, the populations were dosed with 100 mg/liter of PCP and 68% of the PCP was degraded in 24 hours. These cultures were most effective when the PCP was the sole source of carbon.

Table 10: Degradation of pentachlorophenol in soil (USDA 1980).

Degradation parameter	Soil type	Special conditions	Time
90% degradation	Arable layer in rice fields (11 soils)	60% water 25% water	Approx. 50 days Approx. 30 days
	Forest red-yellow soil sublayer	60% water 25% water	No degradation in 50 days
90% degradation	Wooster silt loam	7.5 kg/ha penta, optimum conditions for microbial growth	Approx. 22 days
Complete	Dry soil	Sealed in air-tight container	> 5 years
Effect on growth of corn and cucumbers	Fertile sandy loam	Air-dried Medium water Water saturated	> 2 months 2 months 1 month
90% degradation	Mature paddy soil	Low organic content	1 month
Complete degradation	Dunkirk silt loam	Aerated, aqueous soil suspension	Approx. 72 days
Complete degradation	Paddy soil	Soil perfusion	21 days
Complete degradation	Warm, moist soil	--	> 12 months
98% degradation	Permeable soil	Composted with sludge from wood-treating plant	205 days

Topp et. al. (1988) found that lag periods before PCP removal by a Flavobacterium sp. were reduced by addition of glutamate, aspartate, succinate, acetate, glucose, or cellobiose. However, the rate of PCP removal in micrograms PCP/cell/hour was lower when these substrates were added.

Lewis et al (1986) found that lag periods in field-collected periphyton were longer for field sites that were low in dissolved inorganic nitrogen and phosphorus. Addition of nitrogen and phosphorus decreased lag periods.

Watanable (1973) reported penta degradation in soil samples perfused with 40 mg/liter PCP. Bacteria isolates capable of PCP decomposition were derived from a soil perfusion enrichment culture. Degradation and complete dechlorination occurred after 2 to 3 weeks of incubation. The bacterium was characterized as a Pseudomonas sp. or an organism from a closely related genus. Tetrachlorodihydroxyphenols and their monoethyl ethers were tentatively identified as a metabolic product of PCP by Aspergillus sp. (Cserjesi, 1972). A soil bacterium isolated by Suzuki and Nose (1971) was capable of degrading PCP. The major metabolites were pentachloroanisole with minor amounts of tetrachlorohydroquinone.

More recently, Edgehill (Edgehill et al., 1984) isolated a soil bacterium capable of utilizing PCP as a sole source of carbon. The organism was a member of the coryneform group of bacteria, probably the genus Arthrobacter.

Clearly, bacteria and fungi capable of degrading PCP exist in nature. However, the number of species and their population may be limited. In most cases where rapid degradation of PCP by microorganisms has been demonstrated, the source of inoculum was from areas where PCP had been used for a long time. It may be advantageous in some cases to augment the existing populations with known degraders to enhance degradation. Edgehill and Finn (1983) found that an Arthrobacter sp. added at the rate of a million cells per gram of soil (dry weight) greatly reduced the half-life of PCP in laboratory and field tests.

Creosote Components

The major components of creosote are the polycyclic aromatic hydrocarbons (PAH's) with trace amounts of phenols and azaarenes. A wide range of soil organisms, including bacteria, fungi, cyanobacteria (blue-green algae), and eukaryotic algae, have been shown to have the enzymatic capacity to oxidize PAH's. Prokaryotic organisms, bacteria, and cyanobacteria use different biodegradation pathways than the eukaryotes, fungi, and algae, but all involve molecular oxygen.

Tausson (1950) first demonstrated that several PAH's, including naphthalene, anthracene, and phenanthrene, can serve as substrates for some soil organisms and are completely metabolized. Groenewegen and Stolp (1981) isolated microorganisms that can use the compounds mentioned above as their sole C source. However, they could show degradation of some of the less-water-soluble PAH's, such as benz(a)anthracene and benzo(a)pyrene (BaP), only when the PAH's were mixed with soil, water, and a substance to stimulate growth of oxygenase-active organisms. Shabad et al. (1971) discussed a number of experiments that demonstrated bacterial degradation of BaP in soil. They reported 50% to 80% destruction of BaP over a period of several days by bacteria in soil contaminated with shale oil containing high concentrations (up to 20,000 mg/kg) of BaP. Shabad et al. also found that the capacity of bacteria to degrade BaP increased with BaP content in the soil and that microflora of soil contaminated with BaP were more active in metabolizing BaP than those in "clean" soil. Cerniglia and Crow (1981) demonstrated the metabolism of naphthalene, biphenyl, and BaP by a number of different species of yeast, some of which were previously reported in high numbers of oil-polluted soils. Cerniglia and Gibson (1979) reported the degradation of BaP by a filamentous fungus and Dodge and Gibson (1980) demonstrated the degradation of benz(a)anthracene by the same fungal species.

Cerniglia and Gibson (1979) reported that the metabolites formed during the degradation of BaP by a fungus were very similar to those formed during BaP metabolism in mammals. Such metabolites are probably responsible for the carcinogenicity of BaP. However, Shabad et al. (1971) reported that extracts of a medium containing BaP were less carcinogenic to mice (Mus spp.) after microbial degradation than before degradation. A more complete review of earlier research (before 1970) on microbial oxidation of PAH's was presented by Gibson (1972). Biochemical pathways for the degradation of a number of PAH's by soil microorganisms have been proposed by Fernley and Evans (1958), Evans et al. (1965) and Gibson et al. (1975). One proposed mechanism for the reaction is shown in Figure 3.

The toxicity of intermediate degradation products is of interest in soil treatment systems. Complete mineralization of PAH's is slow and some intermediates might be present for substantial periods of time. Aprill et al (1990) found that no Ames test mutagenicity was found in soil with incorporated wood treating wastes after one year of treatment, but some Microtox toxicity was found in water soluble fractions and leachate samples.

Generally, rates of degradation for PAH compounds decrease as the molecular weight increases, rates of degradation are faster in soil than water, and overall rates of degradation are faster where

there is an acclimated bacteria population (Herbes et al., 1980). These observations had also been made earlier (Sims and Overcash, 1983).

Compounds such as naphthalene, phenanthrene, and anthracene, which are readily metabolized, are relatively water soluble; while persistent PAH's, such as chrysene and benzo(a)pyrene, have a lower water solubility (Table 11). Exceptions exist with pyrene and fluoranthene in that these compounds are more soluble than anthracene and yet have not been found by some researchers (Groenewegen and Stolp, 1981) to be appreciably metabolized by soil microorganisms. Other factors that may affect the persistence of PAH compounds are insufficient bacterial membrane permeability to the compounds, lack of enzyme specificity, and lack of aerobic conditions (Overcash and Pal, 1979).

Two sets of studies were recently completed by Bulman et al. (1985) to assess PAH loss from soil. In the first, a mixture containing levels of 5 and 50 mg/kg of eight PAH's [naphthalene, phenanthrene, anthracene, fluoranthene, pyrene, benzo(a)anthracene, chrysene, and benzo(a)pyrene] was added to soil and the concentration of each compound was monitored with time. In the second experiment, ^{14}C labeled benzo(a)pyrene and anthracene were added to unacclimated agriculture soil in biometer flasks. The distribution of ^{14}C as volatile, adsorbed, and degraded products was determined in sterilized and biologically active soil. In the first set of studies, naphthalene, phenanthrene, anthracene, pyrene, and fluoranthene disappeared rapidly from soil during an initial period of 200 days or less. A loss of 94% to 98% occurred during this period and approximated first-order kinetics, in some cases following a lag period. With the exception of anthracene, the first-order kinetic rate constants were the same for 5 and 50 $mg \cdot kg^{-1}$ additions of PAH. Following the initial period, the remaining 2% to 6% of the added PAH was lost at a much reduced rate, and the first-order rate constants tended to be higher with the 50 $mg \cdot kg^{-1}$ addition than the 5 $mg \cdot kg^{-1}$ addition of PAH.

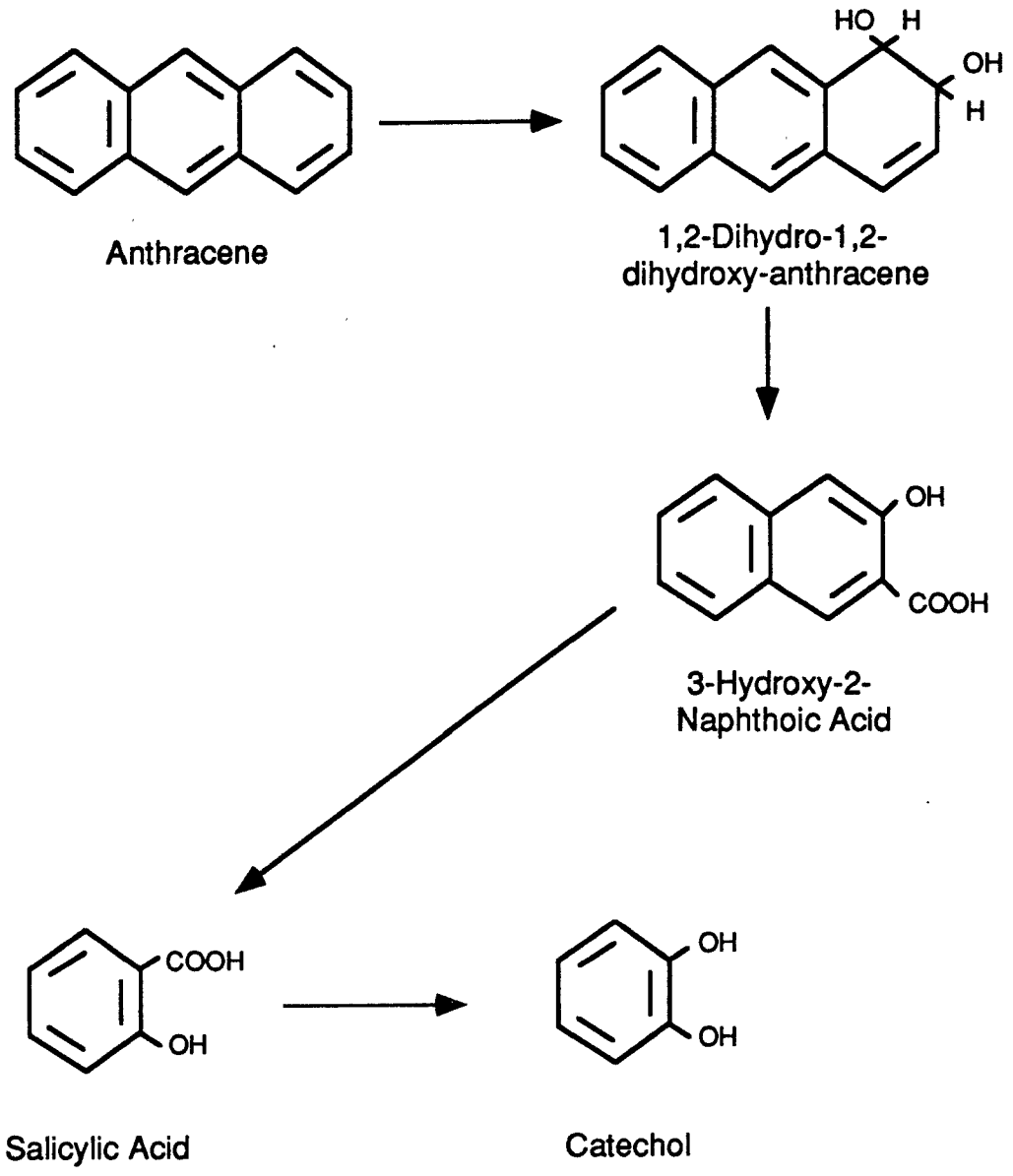


Figure 3. Proposed mechanism for the microbiological degradation of anthracene (Rogoff 1961).

Table 11: Kinetic parameters describing rates of degradation of PAH and phenolic compounds in soil systems (Sims and Overcash 1983, ERT 1985b).

Substance	Initial Concentration (μg/g soil)	k (day^{-1})	1/2 Life (days)	Reference
Phenol	500	0.693	1.0	Medvedev & Davidov (1972)
Phenol	500	0.315*	2.2*	Medvedev & Davidov (1972)
2,4-dimethylphenol	500	0.35-0.69	1-2	Medvedev & Davidov (1972)
4,6-dinitro-o-cresol	--	0.023	30	Versar, Inc. (1979)
2,4-dinitrophenol	5-50	0.025	28	Overcash et al. (1982)
2,4-dinitrophenol	20-25	0.099-0.23	3-7	Sudharkar-Barik & Sethunathan (1978)
4-nitrophenol	--	0.043	16	Verschuerer (1977)
Pentachlorophenol	--	0.018	28	Murthy et al. (1979)
Naphthalene	7	5.78	0.12	Herbes & Schwall (1978)
Naphthalene	7	0.005*	125*	Herbes & Schwall (1978)
Naphthalene	7	0.173	4+	Herbes & Schwall (1978)
Acenaphthylene	0.57	0.039	18	Sims (1982)
Acenaphthylene	57	0.035	20	Sims (1982)
Anthracene	0.041	0.019	36	Sims (1982)
Anthracene	41	0.017	42	Sims (1982)
Phenanthrene	2.1	0.027	26	Groenewegen and Stolp (1976)
Phenanthrene	25,000	0.277	2.5+	Sisler and Zobell (1947)
Benz(a)anthracene	0.12	0.046*	15.2*	Herbes & Schwall (1978)
Benz(a)anthracene	3.5	0.007	102	Groenewegen & Stolp (1976)
Benz(a)anthracene	20.8	0.003	231	Gardner et al. (1979)
Benz(a)anthracene	25.8	0.005	133	Gardner et al. (1979)
Benz(a)anthracene	17.2	0.008	199	Gardner et al. (1979)
Benz(a)anthracene	22.1	0.006	118	Gardner et al. (1979)
Benz(a)anthracene	42.6	0.003	252	Gardner et al. (1979)

* Low temperature (<15°C).
\+ High temperature (>25°C).

Table 11: Kinetic parameters describing rates of degradation of PAH and phenolic compounds in soil systems (Sims and Overcash 1983, ERT 1985b) - Continued.

Substance	Initial Concentration (µg/g soil)	k (day^{-1})	1/2 Life (days)	Reference
Benz(a)anthracene	72.8	0.004	196	Gardner et al. (1979)
Benz(a)anthracene	0.07	0.005	134	Sims (1982)
Benz(a)anthracene	0.10	0.005	142	Sims (1982)
Benz(a)anthracene	0.15	0.005	154	Sims (1982)
Benz(a)anthracene	7	0.016	43	Sims (1982)
Fluoranthene	3.9	0.016	44	Groenewegen and Stolp (1976)
Fluoranthene	18.8	0.004	182	Gardner et al. (1979)
Fluoranthene	23.0	0.007	105	Gardner et al. (1979)
Fluoranthene	16.5	0.005	143	Gardner et al. (1979)
Fluoranthene	20.9	0.006	109	Gardner et al. (1979)
Fluoranthene	44.5	0.004	175	Gardner et al. (1979)
Fluoranthene	72.8	0.005	133	Gardner et al. (1979)
Pyrene	3.1	0.020	35	Groenewegen and Stolp (1976)
Pyrene	500	0.067	10.5	Medvedev and Davidov (1972)
Pyrene	5	0.231	3	Medvedev and Davidov (1972)
Chrysene	4.4	0	-	Groenewegen and Stolp (1976)
Chrysene	500	0.067	10.5	Medvedev and Davidov (1972)
Chrysene	5	0.126	5.5	Medvedev and Davidov (1972)
Benz(a)pyrene	0.048	0.014	50*	Herbes and Schwall (1978)
Benz(a)pyrene	0.01	0.001	694*	Herbes and Schwall (1978)
Benz(a)pyrene	3.4	0.012	57	Groenewegen and Stolp (1976)
Benz(a)pyrene	9.5	0.002	294	Gardner et al. (1979)
Benz(a)pyrene	12.3	0.005	147	Gardner et al. (1979)
Benz(a)pyrene	7.6	0.003	264	Gardner et al. (1979)
Benz(a)pyrene	17.0	0.002	420	Gardner et al. (1979)
Benz(a)pyrene	32.6	0.004	175	Gardner et al. (1979)

* Low temperature (<15°C).
\+ High temperature (>25°C).

Table 11: Kinetic parameters describing rates of degradation of PAH and phenolic compounds in soil systems (Sims and Overcash 1983, ERT 1985b) - Continued.

Substance	Initial Concentration (μg/g soil)	k (day^{-1})	1/2 Life (days)	Reference
Benz(a)pyrene	1.0	0.347	2+	Shabad et al. (1971)
Benz(a)pyrene	0.515	0.347	2+	Shabad et al. (1971)
Benz(a)pyrene	0.00135	0.139	5+	Shabad et al. (1971)
Benz(a)pyrene	0.0094	0.002	406*	Shabad et al. (1971)
Benz(a)pyrene	0.545	0.011	66*	Shabad et al. (1971)
Benz(a)pyrene	28.5	0.019	37*	Shabad et al. (1971)
Benz(a)pyrene	29.2	0	--	Shabad et al. (1971)
Benz(a)pyrene	9,100	0.018	39+	Sims et al. (1987)
Benz(a)pyrene	19.5	0.099	7+	Sims et al. (1987)
Benz(a)pyrene	19.5	0.139	5+	Sims et al. (1987)
Benz(a)pyrene	19.5	0.231	3+	Sims et al. (1987)
Benz(a)pyrene	130.6	0.173	4+	Sims et al. (1987)
Benz(a)pyrene	130.6	0.116	6+	Sims et al. (1987)
Dibenz(a,h)anthracene	9,700	0.033	21+	Sims et al. (1987)
Dibenz(a,h)anthracene	25,000	0.039	18+	Sisler and Zobell (1947)

* Low temperature (<15°C).
\+ High temperature (>25°C).

Losses of only 22% to 88% were observed for benzo(a)anthracene, chrysene, and benzo(a)pyrene, and only one kinetic period was identified within the 400-day incubation period. With chrysene, the first-order kinetic rate constants were the same at the 5 and 50 $mg \cdot kg^{-1}$ levels of addition; however, for benzo(a)anthracene and benzo(a)pyrene the rate constants differed. The disappearance of benzo(a)anthracene approximated first-order kinetics; however, a zero-order kinetic was found for the disappearance of benzo(a)pyrene and chrysene.

The mechanisms of disappearance of anthracene and benzo(a)pyrene were assessed in a second set of studies using ^{14}C labeling. The results indicated that biological activity was responsible for some of the loss of anthracene from soil; however, binding to soil solids and volatilization (either as anthracene or as metabolites) were identified as the major loss mechanisms. Identification of loss mechanisms for benzo(a)pyrene was less successful due to the small amount of benzo(a)pyrene that disappeared during the incubation period. Binding of benzo(a)pyrene to soil solids appeared to be the major mechanism involved, while microbial transformation of the compound was minimal.

Tortensson and Stenstrom (1986) have cautioned, however, that an indirect measurement of mineralization such as liberated $^{14}CO_2$ from a ^{14}C-labeled compound may not always be reliable. They recommend that the rate of transformation of a substance be defined by direct measurement of its disappearance. Liberation of labeled CO_2 may not be concurrent with transformation because transformed compounds may not be further degraded to labeled CO_2 during the time frame of the study.

Some PAH's with more than four rings are not known to be utilized as a sole carbon source but have been reported to be co-metabolized with other organic compounds. This process involves the concurrent metabolism of a compound that a microorganism is unable to use as a sole source of energy along with metabolism of a carbon source capable of sustaining growth. In a study by McKenna and Heath (1976), the co-metabolism of refractory PAH compounds in the presence of two- and three-ring PAH compounds was investigated. The degradation of pyrene, 3,4-benzpyrene, 1,2-benzanthracene, and 1,2,5,6-dibenzanthracene in the presence and in the absence of phenanthrene was measured. Separate cultures of Flavobacterium and Pseudomonas were maintained in the presence of each of the PAH compounds. Both Flavobacterium and Pseudomonas exhibited negligible utilization of the refractory PAH compounds in the absence of phenanthrene. However, Flavobacterium, in the presence of phenanthrene, was able to significantly degrade all four test compounds. Co-metabolism by Pseudomonas was not observed. In a similar experiment, PAH compound degradation by a mixed culture was measured. For each PAH compound studied, one container of inoculum received naphthalene as a growth substrate while a second container received phenanthrene as a growth substrate. Cometabolism of pyrene, 1,2-benzanthracene, 3,4-benzpyrene, and 1,2,5,6-

dibenzanthracene by the mixed culture was exhibited in the presence of either naphthalene or phenanthrene.

The fate of PAH compounds in terrestrial systems has been reviewed by Sims and Overcash (1983), Edwards (1983), and Cerniglia (1984). These reviews present additional information on PAH degradation.

The types of phenols present in creosote in general are more readily degraded than PAH's or PCP. The effect of phenols on soil microorganisms is dependent on the soil concentration or amount added (Overcash and Pal, 1979). At low doses (0.01-0.1 percent of soil weight), the phenol serves as an available substrate and there is an increase in microbial numbers. As the dose level is increased (0.1-1.0 percent of soil weight), an increasingly strong inhibitory or sterilizing effect is noted. At these levels, a partial sterilization occurs in which there is a depression in microbial numbers, but not a complete die-off. After a period of time, microbes adapt or phenol is lost through sorptive inactivation or volatilization and a regrowth of population occurs.

BIOACCUMULATION/TOXICITY OF PCP AND CREOSOTE

Plant/Animal Uptake of PCP

Information on the uptake and translocation of PCP by plants is limited and there is no information on the metabolism of PCP by plants. Jaworski (1955) found less than 0.01 mg/kg PCP in cottonseed oil of field-grown plants sprayed with ^{14}C-PCP. Similarly, Miller and Aboul-Ela (1969) could not detect PCP in cottonseed kernels of open bolls on sprayed plants. However, in contrast to Jaworski (1955), they found some translocation of PCP or a possible metabolite within the plants. PCP residues definitely existed in seed from bolls that were closed at the time of treatment. Miller and Aboul-Ela (1969) also observed the movement of ^{14}C-labeled PCP in the first two leaves of cotton within 1 hour of treatment. After 8 hours, radioactivity was distributed through all the veins of treated leaves, but there was no movement of radioactivity out of the treated leaves even after 8 days.

Hilton et al. (1970) studied the distribution of radioactivity in sugar cane following either foliage or root application of ^{14}C-PCP. With leaf application, 100% of the radioactivity was found in the treated leaf after 2 weeks. After 8 weeks, 84% of the activity was in the treated leaf with minor amounts in all plant parts except roots. Root application was studied by growing plants in a nutrient solution containing ^{14}C-PCP for 4 weeks. Approximately 90% of the original radioactivity was recovered from the plants after 4 weeks, with over 99% found in the root system.

Uptake of PCP by animals can occur by inhalation, oral ingestion (including consumption of PCP-contaminated food and licking or chewing treated wood), and dermal absorption by direct contact with treated wood. There is some evidence that PCP may be a metabolic product of other environmental contaminants, but the significance of this source is not known. Koss and Koransky (1978) demonstrated the formation of PCP from hexachlorobenzene in rats, mice, hens, and trout. Hexachlorobenzene occurs widely in the environment and low-level residues are frequently encountered in animal tissues. The rate of PCP formation from hexachlorobenzene is slow compared to the rate of PCP elimination. Thus, the levels of hexachlorobenzene encountered in tissues are not sufficient to account for the levels of PCP generally found.

Many phenols undergo conjugation reactions in animals (Williams, 1959). These reactions include the formation of glucuronides, ethereal sulphates, and monoesters of sulfuric acid. Some PCP is excreted unchanged and the amount that is metabolized or conjugated depends on the species.

Approximately 40% of the ^{14}C-labeled PCP given to mice and rats was excreted unchanged in the urine (Ahlborg et al., 1974). ^{14}C-tetrachlorohydroquinone accounted for 5% of the excreted radioactivity in rats and 24% in mice. Larsen et al. (1972) found that 50% of the radioactivity of orally administered ^{14}C-PCP was excreted in the urine of rats in 24 hours and 68% was excreted in 10 days. Between 9% and 13% was excreted in the feces. Tissue analysis showed small amounts of ^{14}C activity in all tissues with the highest level in liver, kidneys, and blood. In blood, 99% of the radioactivity was in the serum. A two-compartment urinary excretion pattern was proposed that had a 10-hour half-life for the first 2 days, followed by a 102-day half-life.

Braun et al. (1976) studied the pharmacokinetics and metabolism of PCP in rats and monkeys. Excretion of ^{14}C from the labeled PCP was mainly through the urine in both species. In the monkeys, only PCP was found; while in rats, PCP, tetrachlorohydroquinone, and the glucuronide conjugate of PCP were found. Residues were high in liver, kidneys, and blood. These results agreed with Larsen et al. (1972). Quite possibly, reversible binding of PCP to blood proteins occurred. The half-life ranged from 13 to 17 hours in rats and from 72 to 84 hours in monkeys. This work failed to confirm the presence of the long half-life compartment suggested by Larsen et al. (1972). The short half-lives of PCP suggest that there will be no buildup of residues to a toxic level with continuing intake of PCP.

Toxic Effects of PCP

The widespread use of PCP as an antimicrobial agent and the likelihood of commercial products being contaminated with certain highly toxic polychlorinated dibenzo-p-dioxins and dibenzofurans

necessitate a review of the toxicological information currently available. Although this review is primarily concerned with data on PCP per se, available data on commercial samples are included for comparative purposes.

Oral Toxicity--The LD_{50} for PCP in male rats has been reported as 78 mg/kg (Deichmann et al., 1942), 90 mg/kg (Gabrilevskaya and Laskina, 1964), 146 mg/kg and 205 mg/kg, the last being Dowicide EC-7 (USDA, 1980). For the female rat, it was 135 mg/kg (Dow Chemical Co. Summary, 1969) and 175 mg/kg (EC-7) (Gaines, 1969).

The LD_{50} for mice was reported as 130 $\pm$ 9.5 mg/kg (Pleskova and Bencze, 1959); for rabbits, 100-130 mg/kg (Deichmann et al., 1942); for guinea pigs, 250 mg/kg (Gabrilevskaya and Laskina, 1964); and for swine, 120 mg/kg (Harrison, 1959). Dreisbach (1963) has estimated an LD_{50} dose for man to be as low as 29 mg/kg.

These data suggest that PCP has moderate acute oral toxicity, but that the LD_{50} value may vary with the quality and quantity of contaminants. Man appears to be more susceptible than the rodent and the female to be more susceptible than the male.

Skin Absorption--When PCP in an organic solvent was applied to rabbit skin under occlusion for 24 hours, 200 mg/kg was lethal, but 100 mg/kg and 50 mg/kg were not (Dow 1969). The LD_{50} for rats has been reported as 96 mg/kg, 105 mg/kg, and 320 mg/kg (Demidenko, 1966; Noakes and Sanderson, 1969; Gaines, 1969) and that for mice as 261 $\pm$ 39 mg/kg (Pleskova and Bencze, 1959).

Subcutaneous Injection--The LD_{50} for rats was 100 mg/kg, for rabbits 70 mg/kg (5% in olive oil) (Deichmann et al., 1942), and for mice 63 $\pm$ 3.2 mg/kg (Pleskova and Bencze, 1959).

Intravenous Injection--The lowest dose of PCP reported to kill rabbits was 22 mg/kg (Kehoe et al., 1939) when it was instilled as 1% aqueous sodium pentachlorophenate.

Inhalation--Exposure to 5 mg/l dust for one hour did not kill male and female rats (Reichhold Chemicals, 1974). Demidenko (1969) reported the LD_{50} by inhalation to be 225 mg/kg for rats and 355 mg/kg for mice. The exposure concentration and the calculations to arrive at the LD_{50} dose were not given in the abstract. Workers have reported that the dust is irritating to the mucous membrane of the nose and throat.

Irritancy Tests--Rabbit eyes exposed to solid material showed slight conjunctival and slight iritic congestion. Exposure of rabbit skin under occlusion caused minimal irritation on intact skin and slightly more on abraded skin (Dow, 1969).

Commercial samples have produced chloracne in the rabbit ear bioassay; whereas, the purified material has not. Positive reactions have been produced by topical or oral application (Johnson et al., 1973). Allergic contact dermatitis has not been a problem in handling the chemical.

Mutagenic-Cytotoxic Potential--PCP has not shown mutagenic activity in the Ames test (Anderson et al., 1972), the host-mediated assay (Buselmaier et al., 1973), or the sex-linked lethal test on drosophila (Vogel and Chandler, 1974).

Teratogenic and Embryotoxic Potential--PCP did not cause deformities, but it was highly embryolethal and embryotoxic following oral administration to rats of 15, 30, or 50 mg/kg per day on days 6-15 of gestation. No effects were produced at 5 mg/kg (Schwetz and Gehring, 1973; Schwetz et al., 1974). Purified PCP, with its low nonphenolic content, was slightly more toxic than the commercial grade (Schwetz et al., 1974).

Oral administration of PCP to golden Syrian hamsters at levels ranging from 1.25 to 20 mg/kg daily from days 5 to 10 of gestation resulted in fetal deaths and/or resorptions in three of six test groups. PCP was found in the blood and fat of the fetuses (Hinkle, 1973).

Pregnant rats (Charles River-CD Strain) were given 60 mg/kg of labeled PCP on days 8 through 13 of gestation and were sacrificed on the 20th day. Only a small amount of PCP crossed the placental barrier and only slight teratogenic effects were noted (Larsen et al., 1975).

One of the concerns in the use of technical grade PCP is the presence of trace contaminants including the chlorinated dioxins and furans. Limited toxicity data on two of the dioxins, hexachlorodibenzo-p-dioxin and octachlorodibenzo-p-dioxin, present in technical grade PCP are given in Table 12.

Plant/Animal Uptake of Creosote

There is very little information on bioaccumulation/toxicity of creosote (Brown et al., 1984). The limited information on plant/animal uptake has recently been reviewed by the USDA (1980). There is considerably more information on the bioaccumulation/ toxicity of the individual PAH's found in creosote. Edwards (1983), in a comprehensive review of PAH's in the terrestrial environment, summarizes the sources and fate of these compounds in the environment. His conclusions regarding the uptake, translocation, and metabolism in vegetation were:

1) Some terrestrial plants can take up PAH's through their roots and/or leaves and translocate them to various other plant parts.

2) Uptake rates are dependent on PAH concentrations, solubility, phase (vapor or particulate), molecular size, support media anchoring the plants, and plant species.

3) PAH's may concentrate in certain plant parts more than in other parts.

4) Some PAH's can be catabolized by plants.

The health effects of the major PAH constituents in creosote are summarized in Table 13.

Table 12: Toxicity of various dioxin isomers to experimental animals.[a]

Compound	LD-50	Teratogenic Effect[b]	Embryo Toxicity[b]	Acnegenic Effect[b]
	mg/kg Body wt.	mg/kg/day	mg/kg/day	mg/liter
2,7-Dichlorodi-benzo-*p*-dioxin	1,000	None	None	None
2,3,7,8-Tetrachloro-dibenzo-*p*-dioxin	0.0006	0.001	0.00003	0.00004
Hexachlorodibenzo-*p*-dioxin	100	0.1	0.0001	0.01
Octachlorodibenzo-*p*-dioxin	1,000	None	100	None

[a] Source: Modified from Alliot, 1975.

[b] Values denote the lowest dosage or concentration which gives rise to the corresponding effect.

Table 13. Health effects of chemical constituents of creosote (U.S. EPA 1984).

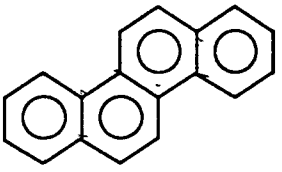
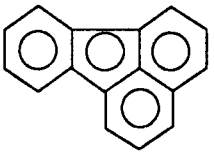
Compound	Effect
1. Unsubstituted 6-carbon aromatic ring systems	
	
chrysene	mutagenic initiator, carcinogenic
pyrene	co-carcinogen [with fluoranthene benzo(a)pyrene] mutagenic
benzo(a)pyrene	mutagenic carcinogenic, fetotoxic, teratogenic
benzo(e)pyrene	carcinogenic, mutagenic
benzo(a)anthracene	mutagenic, carcinogenic
benzo(a)phenanthrene	initiator, mutagenic
naphthalene	inhibitor
phenanthrene	initiator, mutagenic
anthracene	mutagenic
dibenzanthracene	mutagenic
acenaphthene	mutagenic
triphenylene	mutagenic
2. Unsubstituted aromatic ring systems containing 5-carbon rings	
	
fluoranthene	co-carcinogenic, initiator, mutagenic
benz(j)fluoranthene	carcinogenic, mutagenic
fluorene	mutagenic

Table 13. (continued)

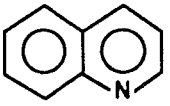
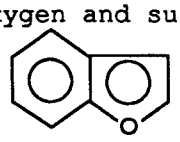
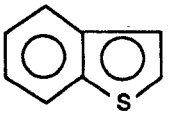
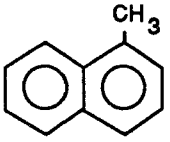
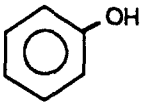
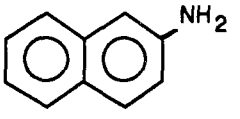
Compound	Effect
3. Heterocyclic nitrogen bases 	
quinoline	carcinogenic
indole	mutagenic
benzocarbazoles	carcinogenic
isoquinoline	mutagenic
1-methyl isoquinoline	possibly carcinogenic
3-methyl isoquinoline	possibly carcinogenic
5-methyl quinoline	possibly carcinogenic
4-methyl quinoline	possibly carcinogenic, mutagenic
6-methyl quinoline	possibly carcinogenic
5-methyl isoquinoline	possibly carcinogenic
7-methyl isoquinoline	possibly carcinogenic
6-methyl isoquinoline	possibly carcinogenic
1,3-dimethyl isoquinoline	possibly carcinogenic
acridine	mutagenic
carbazole	mutagenic
4. Heterocyclic oxygen and sulfur compounds	
coumarone 	No effects found in the literature for this structural class.
thionaphthene 	
5. Alkyl substituted compounds 	
1-methyl naphthacene	mutagenic
2-methyl anthracene	mutagenic
methyl fluoranthene	possibly carcinogenic
1-methyl naphthalene	inhibitor
2-methyl naphthalene	inhibitor
ethyl naphthalene	inhibitor
2,6-dimethyl naphthalene	inhibitor
1,5-dimethyl naphthalene	inhibitor
2,3-dimethyl naphthalene	accelerator
2,3,5-trimethyl naphthalene	inhibitor
2,3,6-trimethyl naphthalene	accelerator
methyl chrysene	initiator
1,4-dimethyl phenanthrene	initiator, mutagenic
1-methylphenanthrene	mutagenic

Table 13. (continued)

	Compound	Effect
6.	Hydroxy compounds 	
	phenol	promoter
	p-cresol	promoter
	o-cresol	promoter
	m-cresol	promoter
7.	Aromatic amines 	
	2-naphthylamine	carcinogenic
	p-toluidine	carcinogenic
	o-toluidine	carcinogenic
	2,4-xylidine	carcinogenic
	2,5-xylidine	carcinogenic
8.	Paraffins and naphthenes	
	$\left[-CH_2- \right]_n$	(n is large, e.g., greater than 15)
	No effects found in the literature for this structural class.	

SECTION 4

EXPERIMENTAL METHODOLOGY

INTRODUCTION

The experimental work, started on February 15, 1985, was conducted in three phases: Phase I--site selection and characterization studies for defining selected soil and sludge characteristics at eight wood-treating sites; Phase II--laboratory treatability studies for determining degradation/transformation process rates and soil transport properties of creosote and pentachlorophenol; and Phase III--a field evaluation study at the Wiggins, MS, site.

Partial results of the first two phases were reported in a progress report entitled "Characterization and Laboratory Soil Treatability Studies For Creosote and Pentachlorophenol Sludges and Contaminated Soil (No. PB 89-109 920/AS)".

The following is a summary of the experimental methods for the three phases. Additional notes on methodology are presented in Appendices A-E.

PHASE I - SITE, SOIL AND SLUDGE CHARACTERIZATION

Eight wood-treating sites were selected in the southeastern United States, each having a different soil type. At each plant, a site was selected approximately ½ to 1 acre in area which could be used for the field evaluation. The sites were selected using the following criteria:

1. Site must have a source of sludges, preferably a separate source for PCP and creosote sludges.

2. Site should have low level exposure to PCP and creosote so that an acclimated bacteria population is available, but there should not be high levels of contamination within or below the treatment zone.

3. There must be a method of collecting and disposing of runoff water from the site.

During the first visit to each plant site, one or more potential demonstration sites were selected and composite soil samples were collected. Soil samples were collected at 0-6 inches and 6-12 inches and subsequently analyzed for creosote and pentachlorophenol. Based on the chemical analysis, microbial population, and initial observations, one potential field evaluation site was selected at each plant location.

A second visit to each site was made in order to do a thorough site assessment as well as more complete chemical and microbiological characterization of the site soil. Soil samples were collected using a systematic sampling plan. The site was divided with a 10 x 10 grid, with the distance between successive points in the grid determined by the size of the area. Ten of the one hundred points indicated by the grid were randomly chosen as sampling points. Samples at the indicated depths were taken at the ten chosen points, and the samples at each depth composited for analysis. See Appendices A and B for details of the chemical and microbiological methods.

A third visit was made to each site for soil evaluation. Soil profiles were examined at each site in freshly excavated pits and described and sampled using standard methods (Soil Survey Staff, 1951). Soil morphological descriptions included horizonation, Munsell color, texture, horizon boundaries, consistency, coarse fragments, root distribution, concretions, and pedological features. Each horizon was sampled for laboratory analyses. Detailed procedures used for soil evaluation at each site are summarized in Appendix C.

PHASE II - LABORATORY TREATABILITY STUDIES

Partial results of the first two phases were reported in a progress report entitled "Characterization and Laboratory Soil Treatability Studies For Creosote and Pentachlorophenol Sludges and Contaminated Soil (No. PB 89-109 920/AS)".

Transformation/Degradation Using a Standard Creosote/PCP Mixture:

Experiment 1

Wet soil from the sites was air-dried until constant weight was attained. The dried soil was stored in clean glass containers until used. Each new soil was analyzed for nitrogen, phosphorus, organic carbon, inorganic metals, pH, and chloride ion. The soil was sieved just before use to remove coarse plant materials from the soil and the moisture content was determined. Loaded soil samples were prepared using the following procedure: Soil samples (50.0 g/beaker) were accurately weighed into 10 beakers. Known amounts of creosote and/or technical grade PCP were added into each beaker. Technical grade PCP was dissolved in methylene chloride or methanol before being added to the soil. Then contents of all ten beakers were combined and mixed for 2 hours in a clean glass jar using a sample rotator turning at 50 revolutions/minute. This dual procedure for mixing was found to give more uniformly mixed material. Soil moisture was adjusted to 70% of water-holding capacity by adding deionized H_2O to the soil when mixing was finished. The same mixing procedure was used for controls.

Two test units were set up for each site. One unit was a control (0% loading) and one was loaded at 1% by weight with the standard creosote/PCP mixture. Each unit consisted of a covered brown glass container containing 500 g of soil (dry weight). Soil moisture content was adjusted to 70% of water-holding capacity and the total weight was determined. The test units were put into a constant temperature room maintained at 22° ± 2°C for the duration of the study.

The soil in each unit was mixed with a spatula and two separate 20-g samples of soil (air-dry weight) were taken from each unit. One sample was used to analyze for PAH's, PCP, and OCDD using the procedures described in Appendix A. The second sample was used for microbiological analysis, pH and chloride ion analysis. Microbiological analyses were conducted according to the procedures in Appendix B.

The moisture content of each unit was adjusted weekly to 70% of field capacity by adding deionized water. The soil was thoroughly mixed every 7 days. Soil samples were taken every 30 days until the experiment was complete.

Soils from sites at Gulfport, Grenada, and Wiggins were loaded initially and at 30 and 60 days. Soils from sites at Atlanta, Meridian, and Wilmington were loaded initially and at 30 days, while the soil from sites at Columbus and Chattanooga were loaded only at day 0. A change was made in loading frequency because data for several sites indicated that the bacteria at the sites were readily acclimated with one loading. Data used for rate calculations were from analyses made over a 60-120 day period after the final loading.

Transformation/Degradation of Site Specific Sludges: Experiment 2

Four loading rates in soil were studied--0.0%, 0.3%, 1.0%, and 3.0% sludge solids/soil dry weight. A single loading was used instead of multiple loading and three replications of each soil/loading rate combination were prepared. The waste sludge from each site was used to load the soil from that site. Chicken manure was added to all soil at 4% by weight. The rationale for addition of chicken manure is presented in Appendix D. Since sludges from the Columbus, Wilmington, and Chattanooga sites did not contain PCP, 128-3000 ppm of PCP were added to these soils in addition to the site sludges in order to determine the transformation of PCP in soils with little or no previous exposure to PCP. All other experimental methods were the same as in Experiment 1.

Soil Transport

Eighteen semi-undisturbed soil cores were taken at each site for the migration studies. A stainless steel cylinder (22 cm diameter x 76 cm long) lined with a section (18 cm x 60 cm) of high density polyethylene pipe (Phillips Driscopipe) was driven into the soil with a backhoe bucket. This produced an semi-undisturbed soil core (18 cm x 51 cm) enclosed in the section of pipe.

In the laboratory, soil cores were placed on a rack with the lower end of each core resting on a fiberglass mat supported by a stainless steel screen set in a large glass funnel. Each soil core was subjected to a chloride breakthrough experiment. Five hundred (500) ml of a solution of 500 ppm NaCl in water was poured on the top of each core. After this solution entered the soil, distilled water was added to the top of each core periodically. Water draining from the bottom of each core was collected in 500-ml increments and tested for chloride ion concentration. The 12 cores from each site showing the sharpest, most uniform chloride ion 'peak' were chosen for the migration studies.

Half the soil cores from each site were randomly chosen as controls to measure background levels of creosote compounds and PCP. All cores had the top 15 cm of soil removed, pulverized, and mixed with 4% chicken manure. The soil was replaced in the control cores without further modification. In the remaining cores, site sludge was mixed with removed soil at 3% by weight. Removed soil was replaced in the soil cores ('loaded cores'). For site sludges with no pentachlorophenol, pentachlorophenol was added to the removed soil at 200 ppm by weight in order to determine the mobility of PCP in all soils tested. Distilled water was added to each core at a rate equivalent to 5-cm rainfall each week (1300 ml/core/week). Water draining from each core was sampled and analyzed at monthly intervals. After three months, each soil core was sectioned into six equal portions for analysis to determine how far sludge components had moved down through the core.

PHASE III - FIELD DEMONSTRATION STUDY

The Wiggins site was chosen for establishment of the field demonstration and research facility. This facility was permitted by Region IV and the State of Mississippi for operation as a Hazardous Waste Land Treatment Facility. The site was cleared, surface debris (treated poles, scrap metal, tarry materials) was removed to eliminate any surface contamination, and the site was graded to a 0.5% slope. Since the site had about a 2% slope initially, soil was removed from the area at the upper end of the site (cells 1-6) to bring the site to grade. This removed soil was used to build the berm. The surface soil in these cells after grading was the yellowish-red subsoil underlying the site. During installation of the lysimeters, a sludge pit containing used PCP treating solution was discovered under Cell 4 and parts of Cells

1, 2, 3 and 5. The solution had apparently been placed in a shallow bowl shaped pit and covered with soil. This procedure produced a bowl shaped, thin (approximately 1-5 cm thick) layer of mixed sludge/soil varying from about 30 cm below the soil surface at the edges of the "bowl" to about 3 m deep at the center of the bowl. This material was excavated for proper disposal and replaced with clean soil. Also during lysimeter installation, part of the area containing Cells 7-9 was found to have been filled previously with soil mixed with debris including treated poles, fence posts, fence wire, and scrap metal. The fill material was found at the subcell 2 end of Cells 7-9. Since the large debris was found below the treatment zone (1.0 m), this fill material was left in place.

A soil berm (height 0.66 m) was constructed around the site to control runon and runoff of surface waters. Nine test plots (cells; each 24 m x 5 m) were laid out in the cleared area within the berm. Each cell was divided into two 12 m x 5 m subcells.

Three 30-cm square glass brick free drainage lysimeters with fiberglass covers were buried in random locations in each subcell - one lysimeter at each of three depths (0.433 m, 0.866 m, and 1.3 m). A trench was excavated for installing each lysimeter and the lysimeters were placed in the side wall of the trench under undisturbed soil. The soil was replaced in the trenches and compacted after lysimeter installation. A 1.27-cm internal diameter (ID) Teflon sample line from each lysimeter led to a sampling station located outside of the cell.

Each cell was sloped (0.5%) to a drainage sump at one end of the cell. A 20-cm high wooden edging enclosed each cell so that any water falling on the cell must run into the sump and any water falling outside the cell could not run onto the cell. The sumps were designed so that water entering the sump would flow out through a 7.5-cm ID pipe with an inlet suspended 15 cm above the bottom of the sump. This arrangement allowed soil carried along by drainage water to settle out in the bottom of the sump where it could be returned to the cell. This sump was connected to a 15-cm ID drainage line that drained into a 20,000-gallon storage tank. The drainage water was pumped from this tank through an activated carbon filter and sent to the local POTW.

Three groundwater monitoring wells were installed at the field demonstration facility. One well was placed about 20 m upgradient (groundwater hydraulic gradient) from the facility and two wells were placed about 30 m and 50 m downgradient from the facility.

Each cell was provided with an independently controlled irrigation system to maintain the soil moisture conditions necessary for microbial activity and to control wind dispersal of the soil. Initial plans were to maintain soil moisture at 70% of field capacity, but abundant rainfall and the long distance between the university and the soil treatment unit (200 miles) combined to

cause the soil moisture to vary between saturation immediately after rain and somewhat below 70% at other times between irrigations. Due to the high rainfall in the area (close to the Gulf Coast), the soil moisture stayed at high levels most of the year.

The nine cells were divided into three groups of three cells each. The groupings corresponded to the amount of soil that had to be removed for elimination of surface contamination and establishment of the desired slope during clearing of the site. Cells 1-3 were on the area that had the greatest amount of soil removed during construction so the surface soil in these cells were composed of subsoil that was originally about 30-40 cm below the soil surface. Cells 4-6 were on an area where about 20-30 cm of soil was removed and Cells 7-9 were on an area where only the top 5-10 cm of soil was removed during construction. (The soil characteristics at the different depths are discussed in the Phase I Results and Discussion.) Each group of cells contained one cell to be loaded with creosote-containing wastes, one cell to be loaded with PCP-containing wastes, and one waste-free cell as a control.

Three-fourths of a cubic meter of chicken house bedding (a mixture of sawdust and chicken manure) was applied and rototilled into each cell. This corresponds to about 3.3% of the mixture (wet weight) in the zone of incorporation.

Waste (recycled) treating solution from the creosote and pentachlorophenol treating cylinders at the Wiggins site was used to load the cells. (See Table 14 for analyses of the waste treating solutions used.) The waste treating solution was transported across the plant site to the demonstration facility in steel tanks and applied to the appropriate cells by gravity drainage from the tanks through a hose. The wastes were applied in a criss-cross pattern to maximize uniformity of application. The wastes were applied to a 22-m by 4.6-m area in each cell since the first meter at each end of the cell and the 0.2-m area along each long side of the cell was difficult to till and used as a buffer zone. After each loading, the cells were rototilled immediately to mix the waste material into the soil.

The cells were loaded with waste treating solution three times (10/30/87, 4/20/88, and 8/4/88). The first loading was at 1666 ppm total PAH's in the creosote cells and 94 ppm pentachlorophenol in the PCP cells (PAH or PCP weight/soil weight, based on a 10-cm depth of incorporation in the soil). The second loading was at 1768 ppm total PAH's in the creosote cells and 186 ppm PCP in the PCP cells. The third loading was at 3954 ppm PAH's and 463 ppm pentachlorophenol. The calculated loading rates for PAH's and PCP at the three dates are shown in Table 14.

Table 14. Loading Rates in Soil Treatment Unit Cells

PENTACHLOROPHENOL LOADED CELLS	LOADING DATE		
	10/30/87	4/20/88	8/4/88
ANALYSIS OF APPLIED SOLUTION (mg/l)	78317.0	52150	52000
AMOUNT APPLIED PER CELL (kg)	1.6	3.2	7.9
CONCENTRATION IN ZONE OF INCORPORATION (mg/kg)	94.0	185.5	462.5
TOTAL APPLIED PER CELL (kg)	1.6	4.8	12.6
TOTAL CONCENTRATION EXPECTED (mg/kg)	94.0	279.5	742.1

Table 14. Loading Rates in Soil Treatment Unit Cells

CREOSOTE LOADED CELLS DATE	NAPH	2-MET	1-MET	BIPH	ACTHY	ACTHE	DIBEN	FLORE	PHEN	ANTHR	CARBA	FLUOR	PYRENE	1,2-BZ	CHRYS	BEN-a	Bghi	PCP	2 RING	3 RING	4 RING	5 RING	TOTALPAH
871030																							
ANALYSIS OF APPLIED SOLUTION (mg/l)	42000	36840	15728	8820	440	46154	31848	37892	101218	14036	8586	45768	28586	7312	7492	2162	700	5275	103388	240174	89158	2862	435582
AMOUNT APPLIED PER CELL (kg)	2.73	2.40	1.02	0.57	0.03	3.00	2.07	2.46	6.58	0.91	0.56	2.98	1.86	0.48	0.49	0.14	0.05	0.34	6.72	15.62	5.80	0.19	28.32
CONCENTRATION IN ZONE OF INCORPORATION (mg/kg)	160.6	140.9	60.2	33.7	1.7	176.5	121.8	144.9	387.1	53.7	32.8	175.0	109.3	28.0	28.7	8.3	2.7	20.2	395.4	918.5	341.0	10.9	1665.9
880420																							
ANALYSIS OF APPLIED SOLUTION (mg/l)	30400	29100	12500	8070	1590	28900	20600	24800	65500	11800	7020	34300	26600	7460	6480	2180	831	NA	80070	160210	74840	3011	318131
AMOUNT APPLIED PER CELL (kg)	2.87	2.75	1.18	0.76	0.15	2.73	1.95	2.34	6.19	1.12	0.66	3.24	2.51	0.70	0.61	0.21	0.08	0.00	7.57	15.14	7.07	0.28	30.06
CONCENTRATION IN ZONE OF INCORPORATION (mg/kg)	169.0	161.8	69.5	44.9	8.8	160.7	114.5	137.9	364.1	65.6	39.0	190.7	147.9	41.5	36.0	12.1	4.6	0.0	445.1	890.6	416.0	16.7	1768.4
880804																							
ANALYSIS OF APPLIED SOLUTION (mg/l)	31100	29700	13400	8150	1610	29800	21300	25100	66300	12200	7110	34500	25800	7630	6520	2270	799	NA	82350.0	163420.0	74450.0	3069.0	323289.0
AMOUNT APPLIED PER CELL (kg)	6.5	6.2	2.8	1.7	0.3	6.2	4.4	5.2	13.8	2.5	1.5	7.2	5.4	1.6	1.4	0.5	0.2	0.0	17.1	34.0	15.5	0.6	67.2
CONCENTRATION IN ZONE OF INCORPORATION (mg/kg)	380.3	363.2	163.9	99.7	19.7	364.4	260.5	307.0	810.8	149.2	87.0	421.9	315.5	93.3	79.7	27.8	9.8	0.0	1007.1	1998.5	910.5	37.5	3953.6
TOTAL APPLIED PER CELL (kg)	12.1	11.3	5.0	3.0	0.5	11.9	8.4	10.0	26.6	4.6	2.7	13.4	9.7	2.8	2.5	0.8	0.3	0.3	31.4	64.7	28.3	1.1	125.6
TOTAL CONCENTRATION EXPECTED (mg/kg)	710.0	665.9	293.5	178.3	30.2	701.6	496.8	589.7	1562.0	268.5	158.8	787.6	572.7	162.7	144.4	48.1	17.1	20.2	1847.6	3807.6	1667.5	65.2	7387.9

The cells were tilled approximately every 2-4 weeks during the study. Initial plans were to till once weekly but high rainfall during most of the year precluded tilling so often. The high clay content of the soil caused the soil to form large clumps if the soil was tilled while wet. When these clumps dried they were difficult to break up with the tilling equipment available. Therefore, no tilling was done while the soil was wet enough to form clumps. The tilling depth (incorporation zone) was about 10 cm.

Compounds applied to the cells were monitored with soil samples taken at three depths (0.3 m [Zone 1], 0.6 m [Zone 2], and 1.0 m [Zone 3]) in each subcell with water samples from the lysimeters and from the monitoring wells and with air samples taken above the cells immediately after loading (note volatilization study below). Compounds monitored were PCP, OCDD, and 17 PAH's.

Soil samples from Zones 1, 2, and 3 in each subcell were taken at intervals throughout the study. Each soil sample consisted of a mixture of six subsamples taken from random locations at the indicated depth in each subcell. All soil samples were analyzed for PCP, 17 PAH's, and OCDD. Soil samples from Zone 1 were also tested for pH and microbial populations in order to determine the proper operating conditions for the landfarm. Later in the study, it was decided to take soil samples from the incorporation zone (about 0-10 cm) as well as Zones 1, 2, and 3. Soil samples from the incorporation zone were taken once immediately before the third loading and at five dates after the third loading. These samples were analyzed similarly to Zone 1 samples.

A group from the University of Utah visited the soil treatment unit site to conduct a study of volatilization of waste materials from freshly loaded soil. Two one-meter square plots in Cell 1 were loaded with waste creosote treating solution and two plots in Cell 2 were loaded with waste pentachlorophenol treating solution. The plots were not tilled after loading in order to maximize the potential for volatilization of waste compounds. Each plot was covered with a plexiglass bubble and a steady stream of oxygen was passed through the bubble. The oxygen exiting the bubble was passed through an adsorbent to capture any volatilized materials.

The methodology and results of this volatilization study are reported in "Final Draft Report, Field Sampling/Training Activities at a Wood Preserving Land Treatment Facility, Wiggins, Mississippi. R. Ryan Dupont, Utah Water Research Laboratory, Utah State Laboratory, Utah State University, Logan, Utah."

SECTION 5

RESULTS AND DISCUSSION

PHASE I - SITE, SOIL, AND SLUDGE CHARACTERIZATION

The eight sites investigated represented very diverse soil, geologic, climatic, and environmental conditions. The sites ranged from near sea level in Gulfport, Mississippi and Wilmington, North Carolina to elevations above 1000 feet at Atlanta, Georgia. The study areas were located in six Major Land Resource Areas (MLRA) of the United States as shown in Table 15.

The sites encompassed several geomorphic landforms ranging from fluvial terraces to upland ridges. Soil parent materials varied from sandy Coastal Plain sediments and silty Peoria loess to granite gneiss residuum as shown in Table 16.

A brief discussion of the pertinent characteristics of each site is presented in the following paragraphs.

Grenada, MS

Moderately well-drained Loring soil comprises the site. Silt content exceeded 70% in the surface horizons and increased at deeper depths in the lower sola. Maximum clay content occurred in the Btx1 horizon at depths of 16-26 inches. The fragipan horizons (Btx1, Btx2) had very low hydraulic conductivity and tended to perch water above the fragipan during the wetter winter and spring months. These layers greatly reduced downward leachate movement. The surface horizon was strongly acid and pH levels increased with depth. Acidity (H) decreased in the deeper horizons as pH increased. Exchangeable Al levels reached a maximum level in the Btx1 horizon at depths of 16-26 inches, comprising 30.7% of the cation exchange capacity. Mg and Ca were the dominant metallic cations with levels increasing with depth. Electrical conductivity levels were low which indicated no salt toxicity problems. Maximum total S content of 0.018% occurred in the surface horizon. Water-holding capacity was high in the surface horizon. The clay fraction of the surface soil was dominated with kaolinite and the subsoil contained increasing mica (illite) and decreasing kaolinite.

Table 15: Site location in Major Land Resource Areas.

Site	MLRA
Grenada, MS	134 - Southern MS Valley Silty Uplands
Gulfport, MS	152A - Eastern Gulf Coast Flatwoods
Wiggins, MS	133A - Southern Coastal Plain
Columbus, MS	133A - Southern Coastal Plain
Atlanta, GA	136 - Southern Piedmont
Wilmington, NC	153A - Atlantic Coast Flatwoods
Meridian, MS	133A - Southern Coastal Plain
Chattanooga, TN	128 - Southern Appalachian Ridges and Valleys

Table 16: Overall field evaluation site soil composition.

Site	Soil	Sand[a]	Silt[a]	Clay[a]
Grenada, MS	Grenada silt loam	16.06	70.17	13.77
Gulfport, MS	Smithton	57.04	28.88	14.08
Wiggins, MS	McLaurin sandy loam	72.55	24.16	3.29
Columbus, MS	Latonia loamy sand	80.03	16.42	3.55
Atlanta, GA	Urban land	--	--	--
Wilmington, NC	Urban land	91.5	6.0	2.5
Meridian, MS	Stough sandy loam	60.2	31.4	8.4
Chattanooga, TN	Urban land complex	13.01	46.77	40.22

[a] These samples were taken from the surface to a depth of 5 inches.

Gulfport, MS

The site had 7 to 8 inches of mixed fill-soil overlying a poorly drained Smithton sandy loam. The site had slow runoff and moderately slow permeable subsoils. Maximum clay content (24.6%) occurred in the fill-soil capping but abruptly decreased to 3% in the subjacent, original surface horizon. Calcareous shells were common in the fill-soil and were present as deep as the 7- to 12-inch soil layer. The calcareous materials were part of the fill-soil placed over the natural soil. The water table is near the surface during the wetter months. The added calcareous materials resulted in high levels of exchangeable Ca to depths of 38 inches, which produced high base saturation levels and high pH levels (6.3 to 7.7). Low levels of Na were detected. Electrical conductivity values reflected the influence of the calcareous materials. Cation exchange capacity values were less than 6 me/100 g below depths of 12 inches. Total S levels were low with a maximum of 0.018% occurring in the A horizon at depths of 7 to 12 inches. The soil had relatively high available water-holding capacity. Kaolinite was the dominant clay mineral in the surface horizon and in the subsoil. The fill-soil capping contained small amounts of smectite.

Wiggins, MS

Deep, well-drained McLaurin sandy loam soils dominated this site. These soils had slow to medium runoff and moderate permeability. The soil was very strongly to strongly acid throughout the 60-inch solum. The soil was poly-genetic with two distinct clay maxima in the argillic horizon. Maximum clay content of 36.7% occurred at depths of 39 to 60 inches. The soil had low base saturation and cation exchange capacity, and electrical conductivity values reflected the low soluble salt content. The surface horizon had a high saturated conductivity value with variations in the subsoil due to the two clay maxima. The soil had low S contents with a maximum value occurring in the 39- to 60-inch horizon. The subsoil had low water-holding capacity. Kaolinite was the dominant clay mineral in the surface and subsoil with lesser amounts of vermiculite-chlorite integrade.

Columbus, MS

A deep, well-drained sandy Latonia soil with moderately rapid permeable subsoil and slow runoff comprised the study area. The soil had loamy sand textures to a depth of 40 inches where gravelly sands occur. A maximum clay content of 7.5% occurred at depths of 17 to 25 inches. The soil was medium to strongly acid throughout the profile. Higher Ca levels were present in the upper horizons due to prolonged additions of leachate from treated-wood products. The surface horizon soil had higher cation exchange capacity because of elevated organic matter contents from cultural additions. Electrical conductivity values reflected the low soluble-salt content with the highest levels in the surface horizon

caused by the added leachate. Low contents of Mg, K, and Na were present throughout the profile. The highest S content of 0.095 occurred in the surface horizon. Kaolinite was the dominant clay mineral in the surface and subsoil horizons.

Atlanta, GA

The site had been truncated and the soil solum removed by cutting, which exposed the subsoil C horizon and weathered saprolite parent material. The surface had accumulated organic carbon from additions of material in the pole yard. The partially weathered saprolite had high bulk density values and was firm in place but loose when disturbed. The saprolite had low saturated hydraulic conductivity. The loose upper horizon had sandy loam textures. Clay content was less than 6% in the material sampled. The material was very strongly acid in the lower depths. Calcium is the dominant exchangeable cation. Cation exchange capacities are very low which reflects the low clay content. Kaolinite was the dominant clay mineral.

Wilmington, NC

The site was comprised of reclaimed land with 1 to 3 feet of sandy fill material over poorly drained sediments. The water table appeared to be affected by tidal fluctuations of the adjacent Cape Fear River. The depth of sampling was limited by a water table at 21 inches and saturated sands below. The soil had sand textures throughout the profile with a maximum clay content of 2.5% occurring in the surface horizon. The profile was moderately alkaline to neutral. Organic carbon had accumulated in the surface horizons from added materials. Calcium was the dominant exchangeable cation with low contents of other bases. Cation exchange capacity was essentially due to the added humus material and value was less than 1 me/100 g at depths below 10 inches. The upper analyzed layers had higher electrical conductivities caused by added materials. The soil material had extremely high permeability with saturated hydraulic values of 34 inches/hr at depths below 10 inches. The material had low water-holding capacity below the surface. The small clay fraction was comprised of a complex mineral suite containing Kaolinite as the dominant material.

Meridian, MS

Somewhat poorly drained Stough soils comprised the study area. These soils were formed in thick beds of fluvial sediments and had slow runoff and moderately slow permeability. The soil had sandy loam upper horizons and loamy textured subsoils. Maximum clay content of 21.8% occurred at depths of 23 to 35 inches. Slightly firm, brittle horizons occurred at depths below 15 inches which tend to perch water during wet periods. The soil was strongly to

very strongly acid throughout the profile. Acidity and calcium dominated the cation exchange complex. Kaolinite dominated the clay fraction of the surface and subsoil.

Chattanooga, TN

The site was located in a soil area mapped as urban land. The surface layer (0-4 inches) was a compacted mixture of limestone gravel and silty clay. The subsoil was a thick argillic horizon of silty clay and silty clay loam textures with slightly firm consistency. The surface horizon was mildly alkaline due to the limestone gravel additions and the underlying profile was very strongly acid. The site was well drained with no evidence of free water at depths of 90 inches. The soil had high bulk density and low saturated hydraulic conductivity. Available water-holding capacity was low. Maximum clay content of 49.2% occurred at depths of 38 to 44 inches. Exchangeable Ca, base saturation, and electrical conductivity were influenced by the limestone gravel in the surface horizon. Exchangeable aluminum comprised a significant proportion of the cation exchange complex in the subsurface horizons. The soil had a complex clay mineral suite dominated by kaolinite.

The general soil type and the amounts of sand, clay, and silt for each location are summarized in Table 16.

Chemical Analysis of Wood-Treating Chemicals in the Soil

One of the main concerns in selecting a field evaluation site for this study was levels of background chemicals in the soil. Chemical analyses of the amount of pentachlorophenol, creosote, and octachlorodibenzo-p-dioxin at various depths are summarized in Tables 17-19. Grenada, Gulfport, and Columbus had no detectable levels of pentachlorophenol below 10 inches. The Wiggins site had pentachlorophenol down to 20 inches, while the other sites had detectable levels down to 60 inches or to ground water. The detection limit for pentachlorophenol in soil was 27 ppb. Soil from Grenada, Gulfport, Atlanta, Meridian, Wiggins, and Chattanooga had no detectable levels of PAH's below 10 inches, while those from Columbus and Wilmington had PAH's down to 20 inches or deeper. Octachlorodibenzo-p-dioxin levels at the soil surface (0-6 inches) varied from none detected to 2.13 ppm (Table 19). The detection limits for the individual PAH's, OCDD, and for PCP are given in Table 20.

Microbial plate counts for soils at each site are presented in Table 21. Counts of bacteria were done on potato dextrose agar (PDA) alone or with various additives. These data provide an approximate number of total soil bacteria and fungi, as well as the number of soil bacteria that can tolerate or utilize creosote or pentachlorophenol.

The nitrogen and phosphorus contents for the soil at each site are given in Table 22.

Table 17: Soil concentration of PCP at the proposed field evaluation sites.

Depth (inches)	Grenada	Gulfport	Wiggins	Columbus	Atlanta	Wilmington	Meridian	Chattanooga
	Pentachlorophenol concentration (ppm in soil)							
0-10	ND[a]	0.112	0.389	ND	20.64[b]	1.418	0.129[b]	0.288[b]
10-20	ND	ND	0.017	ND	0.088	0.218	0.090	0.099
20-30	ND	ND	ND	ND	0.130	0.209[c]	0.096	0.090
30-40	ND	ND	ND	ND	0.147	--	0.104	0.074
40-50	ND	ND	ND	ND	0.319	--	0.053	0.057
50-60	ND	ND	ND	ND	--	--	--	--

[a] ND - Not detected. Detection limits are given in Table 20.

[b] This value is the average of 4 values, two samples were taken at 0-6 inches, and two were taken from 6-10 inches.

[c] The maximum depth that soil could be collected at this site was 20 to 23 inches due to the high levels of groundwater.

Table 18: Soil concentration of PAH's at the proposed field evaluation sites.

Depth (inches)	Grenada	Gulfport	Wiggins	Columbus	Atlanta	Wilmington	Meridian	Chattanooga
	Total polycyclic aromatics in soil[a] (ppm)							
0-10	ND[b]	1.78	0.33	195.9[c]	110.81[d]	193.3	ND	121.76[g]
10-20	ND	ND	ND	27.45[e]	ND	40.55	ND	ND
20-30	ND	ND	ND	ND	ND	43.94[f]	ND	ND
30-40	ND	ND	ND	ND	ND	--	ND	ND
40-50	ND	ND	ND	ND	ND	--	ND	ND
50-60	ND	ND	ND	ND	ND	--	ND	--

[a] The total concentration of 16 polycyclic aromatic hydrocarbons (naphthalene, 2-methylnaphthalene, 1-methylnaphthalene, biphenyl, acenaphthylene, acenaphthene, dibenzofuran, fluorene, phenanthrene, anthracene, carbazole, fluoranthene, pyrene, 1,2-benzanthracene, chrysene, benzo(a)pyrene, benzo(ghi)perylene.

[b] ND = Not detected. Detection limits are given in Table 20.

[c] Sample taken between 0 to 6 inches.

[d] Sample taken between 6 to 16 inches.

[e] Sample taken between 16 to 26 inches.

[f] Analysis done between 20 to 23 inches (groundwater was at 23 inches and below).

[g] Average value of 4 samples (2 samples taken from 0 to 6 inches and 2 samples taken from 6 to 10 inches).

Table 19: Soil concentration of octachlorodibenzo-p-dioxin at the proposed land treatment sites (0 to 6 inches).

	Octachlorodibenzo-p-dioxin (ppm)[a]
Grenada	0.12 ± 0.22
Gulfport	0.37 ± 0.24
Wiggins	0.077 ± 0.19
Columbus	0.034 ± 0.22
Atlanta	2.13 ± 0.34
Wilmington	ND[b]
Meridian	ND
Chattanooga	0.36 ± 0.57

[a] These samples represent soil at 0 to 6 inches and are the average of a minimum of three replicates ± standard deviation.

[b] ND = Not detected. Detection limits are given in Table 20.

Table 20: Abbreviations and method detection limits of compounds analyzed in this study.

Compound	Abbreviation	Method Detection Limit Soil (µg/g)	Water (µg/l)
Bicyclics			
Naphthalene	NAPH	0.2 - 1	2 - 10
2-Methylnaphthalene	2-MET	0.3 - 1	3 - 10
1-Methylnaphthalene	1-MET	0.2 - 1	2 - 10
Biphenyl	BIPH	0.2 - 1	2 - 10
Tricyclics			
Acenaphthylene	ACTHY	0.3 - 1	3 - 10
Acenaphthene	ACTHE	0.2 - 1	2 - 10
Dibenzofuran	DIBEN	0.3 - 1	3 - 10
Fluorene	FLORE	0.2 - 1	3 - 10
Phenanthrene	PHEN	0.3 - 1	3 - 10
Anthracene	ANTHR	0.3 - 1	3 - 10
Carbazole	CARBA	0.5 - 2	4 - 10
Tetracyclics			
Fluoranthene	FLUOR	0.5 - 1	3 - 10
Pyrene	PYREN	0.5 - 1	3 - 10
1,2-Benzanthracene	12-BZ	0.6 - 2	5 - 10
Chrysene	CHRYS	0.6 - 3	6 - 10
Pentacyclics			
Benzo-a-perylene	BEN-A	0.6 - 5	10 - 12
Benzo-ghi-perylene	BGHI	0.6 - 10	10 - 30
Pentachlorophenol	PCP	0.03 - 3	1 - 15
Octachlorodibenzo-p-dioxin	OCDD	0.02 - 0.14	---

Table 21: Microbial plate counts at proposed field evaluation sites.[a]

Site	Soil Depth	Types of media (counts/gram)				
		PDA[b]	PDAA	PDA + creosote	PDA + penta-chlorophenol	PDA + creosote & pentachlorophenol
Atlanta	0-6"	900,000	60,000	700,000	450,000	450,000
Chattanooga	0-6"	473,000	23,000	203,000	30,000	6,000
Columbus	0-6"	290,000	120,000	220,000	20,000	10,000
Grenada	0-6"	1,000,000	180,000	600,000	110,000	125,000
Gulfport	0-6"	1,800,000	100,000	1,000,000	90,000	100,000
Meridian	0-6"	1,683,000	141,000	1,600,000	466,000	250,000
Wiggins	0-6"	1,200,000	80,000	500,000	80,000	80,000
Wilmington	0-6"	763,000	40,000	523,000	166,000	66,000

[a] Each figure represents an average of three replications. The values were obtained by adding 0.1 mg of soil diluted with 9.9 mg of sterile soil to each plate.

[b] Media preparation is described in Appendix B.

Table 22: Nitrogen and phosphorous at the eight selected sites.[a]

	Grenada	Gulfport	Wiggins	Columbus	Atlanta	Wilmington	Meridian	Chattanooga
	ppm							
Total Nitrogen	1709	1999	1150	1598	1501	1231	2990	2000
Total Phosphorous	310	292	255	338	254	597	315	237

[a] Based on dry weight.

Sludge Characterization

Each plant site had different types of sludges. Six of the plants had open lagoons of creosote and/or pentachlorophenol; one site had three lagoons which were segregated into pentachlorophenol, pentachlorophenol in a heavy oil, and creosote; two other plants had no lagoons but had areas of dried sludge and contaminated soil (see Table 23).

The water content, total organic and inorganic materials, pH, and total organic carbon are summarized in Table 24. Water contents of these samples varied from 26.6% to 74.5%. The total organic material ranged from 8.9% to 68.0%. The pH varied from 3.00 to 7.20. The more acidic sites contained large amounts of PCP. The total organic carbon varied from 4.0% to 49.7%. The wide variation in inorganic solids is not surprising since these sludges are stored in large open lagoons. The pH is related to the concentration of PCP in sludge and probably is also affected by the soil pH. The high levels of organic materials are mainly the heavy oils used to dissolve PCP for treating wood and the aliphatic and aromatic fraction found in creosote.

Total phenolics, oil and grease, nitrogen phosphorus, and chloride content of the sludges are summarized in Table 25. Concentrations of pentachlorophenol and polycyclic aromatic hydrocarbons in the sludges are given in Table 26. A more detailed list of the individual concentration of PAH's in each sludge is given in Table 27.

The results in Table 26 are obtained by capillary column gas chromatography, while the results in Table 27 are obtained using GC/MS. Gas chromatography/mass spectrometry was also used to identify some of the minor constituents in the sludges. The results are summarized in Table 28.

The trace metal content of the sludges are summarized in Table 29. The most common metals found at wood-treating plants are mixtures of copper, chromium, and arsenic salts used for preservation treatment or $ZnCl_2$ used as a fire retardant chemical for wood. None of the sludges from the various sites had high levels of chromium, arsenic or zinc.

Table 23: Characteristics of the eight sites used in this study.

Site location	Size & age	Preservative used	Number & type of lagoons
Grenada, MS	100 acres 78 years old	Both pentachlorophenol and creosote	Lagoons are closed; contaminated soil and sludge are present
Gulfport, MS	100 acres 80 years old	Both pentachlorophenol (65%) and creosote (35%)	Large lagoon of mixed preservatives and contaminated soil
Wiggins, MS	100 acres 15 years old	Both pentachlorophenol (60%) and creosote (40%)	Individual lagoons of 1) pentachlorophenol, 2) pentachlorophenol in heavy oil, and 3) creosote
Columbus, MS	--	Creosote (100%)	Contaminated soil and lagoon
Atlanta, GA	15 acres 63 years	Both pentachlorophenol (80%) and creosote (20%)	Contaminated soil and lagoon
Wilmington, NC[a]	--	Both pentachlorophenol and creosote	Lagoons are closed but contaminated soil is available
Meridian, MS	125 acres 61 years old	Both pentachlorophenol (25%) and creosote (75%)	Large lagoon and contaminated soil available
Chattanooga, TN	76 acres 62 years old	Creosote (100%)	Enclosed lagoons and contaminated soil

[a] This site has been an active land farming site for 1 1/2 years.

Table 24: Composition of the sludges.[a]

	Water content (%)	Total organic materials (%)	Inorganic solids (%)	pH	Total organic carbon (%)
Grenada	74.5	24.3	1.1	6.3	7.3
Gulfport	30.6	68.0	1.3	4.8	22.5
Wiggins #1[b]	36.0	40.5	23.3	3.0	37.8
Wiggins #2[c]	31.5	26.0	42.4	3.5	49.4
Wiggins #3[d]	36.5	27.8	35.6	5.7	36.0
Columbus	34.4	61.1	4.4	5.9	49.7
Atlanta	69.1	23.7	7.1	5.0	25.3
Wilmington	26.6	8.9	64.4	7.2	4.0
Meridian	48.2	50.0	1.7	4.0	31.9
Chattanooga	67.3	15.7	16.9	7.1	14.6

Table 25: Chemical composition of the sludges.[a]

Site	Total phenolics (ppm)	Oil and grease (%)	Nitrogen (ppm)	Phosphorous (ppm)	Inorganic chloride content (ppm)
Grenada	41	9.74	7562	236	267
Gulfport	97	44.03	2949	506	440
Wiggins #1[b]	45	15.86	1119	446	361
Wiggins #2[c]	130	22.57	1141	477	753
Wiggins #3[d]	171	17.90	640	261	825
Columbus	224	44.60	2951	270	49
Atlanta	120	14.17	1730	316	278
Wilmington	7	0.44	1283	435	1138
Meridian	114	35.34	3621	213	220
Chattanooga	3	3.68	2090	417	28

[a] All data reported on the starting weight of sludge.
[b] Lagoon contains mainly pentachlorophenol.
[c] Lagoon contains mainly pentachlorophenol in a heavy oil.
[d] Lagoon contains mainly creosote.

Table 26: Concentration of PCP, total PAH's and OCDD in each sludge sample.[a]

Site	Pentachlorophenol (ppm)	Polycyclic aromatic hydrocarbons[b] (ppm)	Octachloro-dibenzo-p-dioxin (ppm)
Grenada	6,699	96,078	23
Gulfport	5,656	101,023	215
Wiggins #1	29,022	20,463	114
Wiggins #2	30,060	47,075	125
Wiggins #3	1,893	114,127	21
Columbus	ND[c]	475,372	ND
Atlanta	51,974	119,546	160
Wilmington	ND	10,007	ND
Meridian	13,891	119,124	160
Chattanooga	ND	72,346	ND

[a] These values are the means of two replicates and are determined on a dry basis. All were determined by capillary column gas chromatography.
[b] Total of the 17 major polycyclic aromatic hydrocarbons found in creosote.
[c] ND = Not detected. Detection levels are given in Table 20.

Table 27: Concentration of PAH constituents in sludges from the selected sites[a] (μg/g dry weight).

	N	2Mn	1Mn	Bi	Ac	Ace	Di	Fl	Ph	An	Ca	Flu	Py	1,2B	Ch	Bz	Bzg
	(ppb)																
Grenada	67000	24150	13250	5850	5250	21500	17000	18000	43000	15000	3450	27000	19500	3250	5850	3600	5050
Gulfport	13500	14000	7450	3000	2635	10150	9600	10250	30000	7200	2100	17000	12500	2050	3650	1050	ND[b]
Wiggins #1	3400	2450	1400	535	215	1550	1300	1750	5000	2550	570	2150	1500	185	495	75	ND
Wiggins #2	10200	7450	4000	1900	1050	5550	6050	7450	21000	8150	2650	11500	7500	1300	2400	355	ND
Wiggins #3	17500	12000	6350	3500	2000	13000	1150	14000	34000	14500	4250	22500	19000	3850	6000	580	ND
Columbus	70500	29500	16500	10500	7650	31000	32500	34000	53000	23000	12500	49500	38000	12500	17000	3500	6850
Atlanta	39400	23000	11500	6600	2800	16500	16000	18000	45000	24500	9550	23000	15500	3400	5800	1100	8050
Wilmington	350	330	185	ND	ND	400	425	585	1550	1525	190	840	430	150	150	ND	ND
Meridian	16500	5350	2700	1650	1800	5150	6850	7350	29500	6550	2050	20000	11700	2200	4800	1350	550
Chattanooga	1200	815	585	445	ND	1230	1150	1415	5400	2200	870	3550	2100	200	200	ND	ND

N = Naphthalene
2Mn = 2-Methylnaphthalene
1Mn = 1-Methylnaphthalene
Bi = Biphenyl
Ac = Acenaphthylene
Ace = Acenaphthene
Di = Dibenzofuran
Fl = FLuorene
Ph = Phenanthrene
An = Anthracene
Ca = Carbazole
Flu = Fluorathene
Py = Pyrene
1,2B = 1,2-Benzanthracene
Ch = Chrysene
Bz = Benzo(a)pyrene
Bzg = Benzo(ghi)perylene

[a] These values were obtained by GC/MS.
[b] ND = Not detected. Detection limits are given in Table 20.

Table 28: Minor components present in sludge.

Molecular weight	Possible compounds	Site location and number of isomers									
		Gr	Gp	Wi#1	Wi#2	Wi#3	Co	At	Wm	Mr	Ch
156	dimethylnaphthalene, ethylnaphthalene	2	3	2	3	2	1	3	--	--	--
168	methyldiphenyl, methylacenaphthene, diphenylmethane	--	--	--	--	--	1	--	--	--	--
170	trimethylnaphthalene	--	1	2	--	--	--	--	--	--	--
182	dimethylbiphenyl, ethylbiphenyl, ethyldibenzofuran, dimethylacenaphthene	--	--	--	--	2	2	1	--	--	--
184	dibenzothiopene, tetramethylnaphthalene	1	--	--	--	--	1	1	--	1	--
192	methylphenanthrene, methylanthracene, phenylindene	3	3	--	3	2	3	3	--	3	--
204	phenylnaphthalene, vinylphenanthrene, vinylanthracene	--	--	--	--	1	1	--	--	1	--
216	methylfluoranthene, methylpyrene, benzofluorene	2	2	--	1	1	2	2	--	2	--
218	benzonaphthofuran	1	1	--	1	--	1	1	--	1	--
226	benzo(ghi)fluoranthene, cyclopenta(cd) pyrene	--	--	--	--	--	--	1	--	1	--
252	benzo(k)fluoranthene, perylene, benzo(e)pyrene, benzo(abj) fluoranthene, and others	1	1	--	--	--	2	2	--	--	--
230	tetrachlorophenol	--	--	1	1	1	--	1	--	--	--

At = Atlanta, GA
Ch = Chattanooga, TN
Co = Columbus, MS
Gr = Grenada, MS
Gp = Gulfport, MS
Mr = Meridian, MS
Wi = Wiggins, MS
Wm = Wilmington, NC

Table 29: Concentration of metals in each sludge sample.

Site	Arsenic g/g	Antimony g/g	Barium g/g	Beryllium g/g	Cadmium g/g	Chromium g/g	Cobalt g/g	Lead g/g	Mercury g/g	Nickel g/g	Selenium g/g	Vanadium g/g
Atlanta, GA	<.715	<1.50	<0.10	<0.100	<0.200	35.14	0.38	<2.00	0.012	5.82	<0.500	1.78
Chattanooga, TN	<0.500	<1.50	3.32	1.792	<0.200	26.48	<0.30	<2.00	0.008	27.26	0.612	3.64
Columbus, MS	<0.500	<1.50	<0.10	<0.100	0.251	13.11	<0.30	12.43	<0.001	14.97	<0.500	<0.50
Grenada, MS	<0.500	<1.50	<0.10	<0.100	<0.200	5.85	0.35	<2.00	<0.001	7.19	<0.500	<0.50
Gulfport, MS	0.647	<1.50	1.35	0.281	0.143	6.64	<0.30	<2.00	0.003	1.05	<0.500	4.87
Meridian, MS	<0.500	<1.50	<0.10	<0.100	0.160	1.16	<0.30	8.17	0.002	0.30	0.529	1.51
Wilmington, NC	2.491	<1.560	1.83	0.823	<0.200	20.60	<0.30	<2.00	0.003	7.66	<0.500	6.79
Wiggins, MS #1	0.562	<1.50	4.05	0.521	<0.200	6.65	5.84	<2.00	<0.001	4.85	<0.500	1.48
Wiggins, MS #2	<0.500	<1.50	0.14	0.493	<0.200	8.39	0.85	<2.00	<0.001	10.91	<0.500	<0.50
Wiggins, MS #3	<0.500	<1.50	<0.10	0.384	<0.200	25.34	2.32	<2.00	<0.001	17.00	<0.500	2.02

(a) Concentration of metals was determined by digestion method (302E, APHA Standard MTHDS, 16th Edition, pp. 148-149), and Inductively Coupled argon Plasma spectroscopy (ICP).

PHASE II - LABORATORY TRANSFORMATION/DEGRADATION STUDIES

Transformation/Degradation Using a Standard Creosote/PCP Mixture: Experiment 1

The transformation/degradation rates obtained from Experiment 1 are given in Tables 30-38. The microbiological data was reported in the earlier report on this project. Complete raw data for Experiment I are given in Tables 62-64 in Appendix F.

All PAH compounds analyzed were transformed in Gulfport soil with the exception of pyrene which had a relatively slow breakdown rate. All PAH compounds but anthracene were transformed in Columbus soil though at somewhat slower rates than Gulfport for most PAH's. Higher levels of acclimated organisms developed in the Gulfport and Columbus soils than in soils from the other sites, possibly accounting for the better transformation in these soils. Most of the lower molecular weight PAH compounds were readily transformed in soil from the other sites. Many of the higher molecular weight PAH compounds (fluoranthene, pyrene, 1,2-benzanthracene, chrysene, and benzo-a-pyrene) tended to transform slowly if at all. Pyrene and fluoranthene appeared to be the most recalcitrant.

PCP transformation occurred in Gulfport, Grenada, Chattanooga, Wilmington, and Meridian soils. PCP half-life was 64 days in Gulfport soil, but well over 200 days for the other soils. Columbus, Atlanta, and Wiggins soil exhibited no transformation of PCP (Table 38).

Results of this preliminary experiment indicated that all compounds studied could be transformed in soils at practically useful rates under the appropriate conditions. Microorganism counts of the type used in this experiment did not appear to be extremely accurate indicators of potential breakdown rates for particular compounds.

Since some of the soils exhibited no breakdown of particular PAH's, it would be desirable to test a range of loadings in subsequent experiments to see if lower loading rates might allow enhanced transformation in these soils.

Table 30: Kinetic data for PAH degradation/transformation in Atlanta soils.

Compounds	Initial Loading (ppm)	K (day-1)	T 1/2 (days)
Naphthalene	366.1	-0.181	4
2-Methylnaphthalene	304.2	-0.181	4
1-Methylnaphthalene	122.3	-0.178	4
Biphenyl	89.8	-0.171	4
Acenaphthylene	21.1	-0.164	4
Acenaphthene	510.9	-0.020	35
Dibenzofuran	287.4	-0.193	4
Fluorene	321.8	-0.254	3
Phenanthrene	1030.7	-0.024	29
Anthracene	61.3	-0.175	4
Carbazole	46.8	-0.174	4
Fluoranthene	463.9	NT[a]	NT
Pyrene	415.6	NT	NT
1,2 Benzanthracene	115.2	NT	NT
Chrysene	101.5	NT	NT
Benzo-a-pyrene	51.8	NT	NT
Benzo-ghi-perylene	20.9	-0.167	4

[a] NT = No transformation observed.

Table 31: Kinetic data for PAH degradation/transformation in Chattanooga soils.

Compounds	Initial Loading (ppm)	K (day-1)	T 1/2 (days)
Naphthalene	384.9	-0.132	5
2-Methylnaphthalene	323.0	-0.193	4
1-Methylnaphthalene	139.2	-0.187	4
Biphenyl	92.5	-0.181	4
Acenaphthylene	73.0	-0.009	77
Acenaphthene	520.6	-0.010	72
Dibenzofuran	299.5	-0.013	52
Fluorene	331.4	-0.015	47
Phenanthrene	964.7	-0.011	63
Anthracene	87.1	-0.008	91
Carbazole	23.6	NT[a]	NT
Fluoranthene	671.6	-0.001	990
Pyrene	522.9	NT	NT
1,2 Benzanthracene	145.2	-0.002	3655
Chrysene	187.6	NT	NT
Benzo-a-pyrene	122.3	NT	NT
Benzo-ghi-perylene	161.9	-0.008	84

[a] NT = No transformation observed.

Table 32: Kinetic data for PAH degradation/transformation in Columbus soils.

Compounds	K (day-1)	T 1/2 (days)
Naphthalene	-0.332	2
2-Methylnaphthalene	-0.328	2
1-Methylnaphthalene	-0.316	2
Biphenyl	-0.025	28
Acenaphthylene	-0.042	16
Acenaphthene	-0.014	50
Dibenzofuran	-0.063	11
Fluorene	-0.039	18
Phenanthrene	-0.061	11
Anthracene	NT[a]	NT
Carbazole	-0.009	81
Fluoranthene	-0.012	59
Pyrene	-0.012	58
1,2 Benzanthracene	-0.015	47
Chrysene	-0.014	49
Benzo-a-pyrene	-0.009	82
Benzo-ghi-perylene	-0.286	2

[a] NT = No transformation observed.

Table 33: Kinetic data for PAH degradation/transformation in Grenada soils.

Compounds	K (day-1)	T 1/2 (days)
Naphthalene	-0.191	4
2-Methylnaphthalene	-0.189	4
1-Methylnaphthalene	-0.181	4
Biphenyl	-0.178	4
Acenaphthylene	-0.235	3
Acenaphthene	-0.202	3
Dibenzofuran	-0.255	3
Fluorene	-0.258	3
Phenanthrene	-0.267	3
Anthracene	-0.241	3
Carbazole	-0.056	12
Fluoranthene	NT[a]	NT
Pyrene	-0.002	289
1,2 Benzanthracene	NT	NT
Chrysene	NT	NT
Benzo-a-pyrene	-0.006	116
Benzo-ghi-perylene	-0.166	4

[a] NT = No transformation observed.

Table 34: Kinetic data for PAH degradation/transformation in Gulfport soils.

Compounds	Initial Loading (ppm)	K (day-1)	T 1/2 (days)
Naphthalene	446.9	-0.193	4
2-Methylnaphthalene	291.3	-0.190	4
1-Methylnaphthalene	143.8	-0.183	4
Biphenyl	71.6	-0.179	4
Acenaphthylene	46.8	-0.170	4
Acenaphthene	477.2	-0.200	3
Dibenzofuran	227.4	-0.192	4
Fluorene	260.3	-0.192	4
Phenanthrene	1118.4	-0.203	3
Anthracene	ND[a]	--	--
Carbazole	69.9	-0.184	4
Fluoranthene	555.7	-0.024	29
Pyrene	479.6	-0.001	1155
1,2 Benzanthracene	60.1	-0.194	4
Chrysene	63.6	-0.189	4
Benzo-a-pyrene	ND	--	--
Benzo-ghi-perylene	ND	--	--

[a] ND = Not Detected. Detection levels are given in Table 20.

Table 35: Kinetic data for PAH degradation/transformation in Meridian soils.

Compounds	Initial Loading (ppm)	K (day-1)	T 1/2 (days)
Naphthalene	481.9	-0.185	4
2-Methylnaphthalene	369.2	-0.186	4
1-Methylnaphthalene	158.7	-0.179	4
Biphenyl	131.2	-0.186	4
Acenaphthylene	90.4	-0.174	4
Acenaphthene	619.2	-0.255	3
Dibenzofuran	442.0	-0.262	3
Fluorene	367.4	-0.258	3
Phenanthrene	1202.2	-0.217	3
Anthracene	ND[a]	ND	ND
Carbazole	48.9	-0.177	4
Fluoranthene	647.3	NT[b]	NT
Pyrene	591.0	NT	NT
1,2 Benzanthracene	93.8	NT	NT
Chrysene	121.6	NT	NT
Benzo-a-pyrene	34.4	NT	NT
Benzo-ghi-perylene	ND	ND	ND

[a] ND = Not detected. Detection limits are given in Table 20.
[b] NT = No transformation observed.

Table 36. Kinetic data for PAH degradation/transformation in Wiggins soils.

Compounds	Initial Loading (ppm)	K (day-1)	T 1/2 (days)
Naphthalene	413.8	-0.318	2
2-Methylnaphthalene	283.3	-0.313	2
1-Methylnaphthalene	141.2	-0.301	2
Biphenyl	69.9	-0.294	2
Acenaphthylene	51.3	-0.299	2
Acenaphthene	495.2	-0.338	2
Dibenzofuran	309.3	-0.319	2
Fluorene	264.9	-0.329	2
Phenanthrene	1172.4	-0.342	2
Anthracene	ND[a]	--	--
Carbazole	47.4	-0.305	2
Fluoranthene	564.0	NT[b]	NT
Pyrene	494.9	NT	NT
1,2 Benzanthracene	21.6	-0.006	117
Chrysene	51.7	NT	NT
Benzo-a-pyrene	ND	--	--
Benzo-ghi-perylene	ND	--	--

[a] ND = None detected. Detection limits are given in Table 20.

[b] NT = No transformation observed.

Table 37: Kinetic data for PAH degradation/transformation in Wilmington soils.

Compounds	Initial Loading (ppm)	K (day-1)	T 1/2 (days)
Naphthalene	404.7	-0.193	4
2-Methylnaphthalene	304.3	-0.196	4
1-Methylnaphthalene	140.3	-0.188	4
Biphenyl	93.9	-0.185	4
Acenaphthylene	87.7	-0.186	4
Acenaphthene	488.0	-0.013	52
Dibenzofuran	363.7	-0.137	5
Fluorene	305.2	-0.009	79
Phenanthrene	1078.2	-0.010	68
Anthracene	ND[a]	NT[b]	--
Carbazole	55.1	-0.180	4
Fluoranthene	582.1	-0.004	189
Pyrene	586.5	-0.001	1085
1,2 Benzanthracene	110.6	NT	NT
Chrysene	142.2	-0.004	158
Benzo-a-pyrene	61.5	-0.180	4
Benzo-ghi-perylene	49.1	-0.114	6

[a] ND = None detected. Detection limits are given in Table 20.

[b] NT = No transformation observed.

Table 38: Kinetic data for PCP degradation/transformation in site soils.

Site	Loading Dry Wt. (%)	K (day-1)	T 1/2 (days)
Gulfport (GU)	855.2	-0.0107	64
Grenada (GR)	--	-0.0024	289
Atlanta (AT)	1058.6	NT[a]	NT
Wiggins (WG)	944.7	NT	NT
Wilmington (WL)	900.8	-0.0022	320
Columbus (CO)	--	NT	NT
Chattanooga (CH)	792.9	-0.0027	259
Meridian (ME)	966.2	-0.0009	815

[a] NT = No transformation observed.

Transformation/Degradation of Site Specific Sludges: Experiment 2

Transformation/degradation kinetic data from this phase of the study are shown in Tables 39-46. Complete raw data for Experiment 2 are given in Appendix F, Tables 65-67.

The half-lives for total PAH's were similar in soils from all sites, except for the Chattanooga site. Half-lives in soils from this site tended to be somewhat higher than the other sites. The total PAH half-lives varied little for the different loading rates at each site.

The individual PAH compounds can be divided into three groups: those with half-lives of ten days or less, those with half-lives of one hundred days or less, and those with half lives of more than one hundred days. Naphthalene, 2-methylnaphthalene, 1-methylnaphthalene, biphenyl, acenaphthalene, acenaphthene, dibenzofuran, and fluorene exhibited half-lives of ten days or less in most cases; phenanthrene, anthracene, carbazole, and fluoranthene had half-lives between ten and one hundred days in most cases and pyrene, 1,2-benzanthracene, chrysene, benzo-a-pyrene, and benzo-ghi-perylene had half-lives greater than one hundred days. In several cases these last five showed essentially no breakdown within the time frame of the experiment.

Breakdown rates of individual PAH compounds were apparently related to molecular size and structure, as noted in previous studies. The zero to ten day half-life group contained compounds with two aromatic rings; the ten to one hundred day half-life group contained compounds with three aromatic rings; and the one hundred plus day half-life group contained compounds with four or more aromatic rings. Some of the larger, most recalcitrant compounds apparently were broken down readily in some situations. This gives hope that even the most persistent PAH's might yield to biological remediation techniques under the right conditions with appropriate microbial populations.

No relationship appeared to exist between microbial populations found in plate counts (data not shown) and rate of transformation/degradation. Although the rates at all eight sites were similar, the number of bacteria varied greatly.

Table 39: Half-lives and 95% confidence limits of PAH's and PCP in Atlanta soil loaded with site sludges at 0.33, 1.0, and 3.0% by soil dry weight.

Compounds	0.33% Loading			1.0% Loading			3.0% Loading		
	t 1/2 (days)	Lower limit	Upper limit	t 1/2 (days)	Lower limit	Upper limit	t 1/2 (days)	Lower limit	Upper limit
Naphthalene	3	3	3	1	1	1	6	2	NT
2-Methylnaphthalene	3	3	3	1	1	1	3	2	7
1-Methylnaphthalene	4	2	NT	1	1	1	3	2	7
Biphenyl	ND	ND	ND	1	1	1	3	2	16
Acenaphthylene	ND	ND	ND	1	1	1	8	2	NT
Acenaphthene	3	3	3	1	1	1	32	20	87
Dibenzofuran	3	3	3	1	1	1	7	2	NT
Fluorene	3	3	3	2	1	NT	22	17	31
Phenanthrene	38	32	45	12	8	22	26	19	41
Anthracene	57	38	115	35	15	NT	138	56	NT
Carbazole	4	2	NT	2	1	NT	8	2	NT
Fluoranthene	154	69	NT	35	23	79	243	74	NT
Pyrene	114	70	296	85	34	NT	NT	253	NT
1,2 Benzanthracene	357	111	NT	71	31	NT	NT	520	NT
Chrysene	289	109	NT	31	21	58	NT	146	NT
Benzo-a-pyrene	ND	ND	ND	15	9	43	9	2	NT
Benzo-ghi-perylene	ND	ND	ND	ND	ND	ND	ND	ND	ND
Pentachlorophenol	536	151	NT	226	40	NT	62	33	773
Total PAH's	85	63	130	20	14	37	56	38	113
OCDD	11	4	NT	NT	NT	NT	70	48	128

NT = No transformation.
ND = None detected. Detection limits are given in Table 20.

Table 40: Half-lives and 95% confidence limits of PAH's and PCP in Chattanooga soil loaded with site sludges at 0.33, 1.0, and 3.0% by soil dry weight.

Compounds	0.33% Loading			1.0% Loading			3.0% Loading		
	t 1/2 (days)	Lower limit	Upper limit	t 1/2 (days)	Lower limit	Upper limit	t 1/2 (days)	Lower limit	Upper limit
Naphthalene	128	84	274	82	58	138	2	1	4
2-Methylnaphthalene	77	33	NT	50	30	152	ND	ND	ND
1-Methylnaphthalene	70	31	NT	144	42	NT	ND	ND	ND
Biphenyl	2	2	2	36	25	60	ND	ND	ND
Acenaphthylene	434	116	NT	21	18	23	3	1	NT
Acenaphthene	24	15	60	161	32	NT	NT	4372	NT
Dibenzofuran	55	39	93	31	24	45	NT	3	NT
Fluorene	40	26	90	46	26	166	NT	NT	NT
Phenanthrene	72	38	664	19	16	21	NT	NT	NT
Anthracene	125	31	NT	NT	257	NT	NT	NT	NT
Carbazole	178	35	NT	NT	NT	NT	2	1	4
Fluoranthene	190	89	NT	17	14	25	71	43	202
Pyrene	913	81	NT	368	127	NT	50	36	81
1,2 Benzanthracene	392	89	NT	NT	227	NT	30	19	71
Chrysene	450	95	NT	NT	1655	NT	28	20	47
Benzo-a-pyrene	1371	104	NT	NT	364	NT	2	1	3
Benzo-ghi-perylene	NT	242	NT	NT	1948	NT	2	1	3
Pentachlorophenol	2418	843	NT	652	310	NT	135	92	255
Total PAH's	379	97	NT	NT	252	NT	372	144	NT
OCDD	309	109	372	151	105	268	2921	418	NT

NT - No transformation.
ND - None detected. Detection limits are given in Table 20.

Table 41: Half-lives and 95% confidence limits of PAH's and PCP in Columbus soil loaded with site sludges at 0.33, 1.0, and 3.0% by soil dry weight.

	0.33% Loading			1.0% Loading			3.0% Loading		
Compounds	t 1/2 (days)	Lower limit	Upper limit	t 1/2 (days)	Lower limit	Upper limit	t 1/2 (days)	Lower limit	Upper limit
Naphthalene	3	2	14	17	11	38	14	11	20
2-Methylnaphthalene	3	2	14	6	2	NT	25	19	34
1-Methylnaphthalene	3	2	14	2	2	3	39	29	60
Biphenyl	3	2	14	3	2	19	61	30	NT
Acenaphthylene	3	2	15	7	3	NT	127	69	822
Acenaphthene	3	2	6	28	15	187	128	100	178
Dibenzofuran	2	2	3	22	15	43	159	101	373
Fluorene	2	2	3	34	20	126	247	191	348
Phenanthrene	18	11	49	30	15	367	185	116	457
Anthracene	46	35	68	NT	91	NT	151	88	554
Carbazole	NT	3	NT	101	42	NT	100	59	349
Fluoranthene	52	29	247	2837	117	NT	106	66	265
Pyrene	228	101	NT	NT	124	NT	104	63	299
1,2 Benzanthracene	258	105	NT	NT	112	NT	292	65	NT
Chrysene	98	60	270	NT	128	NT	105	50	NT
Benzo-a-pyrene	NT	NT	NT	NT	97	NT	NT	NT	158
Benzo-ghi-perylene	ND	ND	ND	ND	ND	ND	NT	5	NT
Pentachlorophenol	1094	334	NT	NT	2188	NT	231	116	39108
Total PAH's	61	42	112	76	59	110	107	80	164
OCDD	NT	NT	NT	670	160	NT	1371	318	NT

NT = No transformation.
ND = None detected. Detection limits are given in Table 20.

Table 42: Half-lives and 95% confidence limits of PAH's and PCP in Grenada soil loaded with site sludges at 0.33, 1.0, and 3.0% by soil dry weight.

Compounds	0.33% Loading			1.0% Loading			3.0% Loading		
	t 1/2 (days)	Lower limit	Upper limit	t 1/2 (days)	Lower limit	Upper limit	t 1/2 (days)	Lower limit	Upper limit
Naphthalene	2	1	4	2	2	2	ND	ND	ND
2-Methylnaphthalene	2	1	4	2	2	2	ND	ND	ND
1-Methylnaphthalene	2	1	4	2	2	2	ND	ND	ND
Biphenyl	3	2	NT	2	2	2	1	1	NT
Acenaphthylene	NT	2	NT	2	2	2	ND	ND	ND
Acenaphthene	15	2	NT	2	2	2	ND	ND	ND
Dibenzofuran	44	23	555	2	2	2	169	52	NT
Fluorene	21	2	NT	2	2	2	ND	ND	ND
Phenanthrene	16	13	24	13	10	17	2	1	NT
Anthracene	37	25	65	31	19	76	1	1	NT
Carbazole	2	1	4	2	2	2	ND	ND	ND
Fluoranthene	49	38	69	36	24	73	11	10	14
Pyrene	52	39	78	46	26	183	19	16	23
1,2 Benzanthracene	NT	117	NT	96	51	934	28	19	50
Chrysene	NT	161	NT	108	56	1299	35	29	46
Benzo-a-pyrene	NT	284	NT	NT	98	NT	525	24	NT
Benzo-ghi-perylene	96	55	379	NT	NT	NT	ND	ND	ND
Pentachlorophenol	46	39	55	35	28	48	21	14	38
Total PAH's	67	52	94	44	31	76	38	25	77
OCDD	1356	132	NT	NT	351	NT	NT	317	NT

ND = None detected. Detection limits are given in Table 20.
NT = No transformation.

Table 43: Half-lives and 95% confidence limits of PAH's and PCP in Gulfport soil loaded with site sludges at 0.33, 1.0, and 3.0% by soil dry weight.

Compounds	0.33% Loading			1.0% Loading			3.0% Loading		
	t 1/2 (days)	Lower limit	Upper limit	t 1/2 (days)	Lower limit	Upper limit	t 1/2 (days)	Lower limit	Upper limit
Naphthalene	4	2	NT	ND	ND	ND	2	1	3
2-Methylnaphthalene	3	2	7	2	2	2	2	1	3
1-Methylnaphthalene	3	2	7	ND	ND	ND	2	1	3
Biphenyl	4	2	NT	ND	ND	ND	3	1	NT
Acenaphthylene	3	2	8	5	2	NT	2	1	3
Acenaphthene	35	27	53	31	18	109	2	1	3
Dibenzofuran	56	3	NT	ND	ND	ND	2	1	3
Fluorene	38	31	50	26	16	70	2	1	3
Phenanthrene	27	21	37	45	34	66	2	1	12
Anthracene	34	3	NT	90	75	114	3	1	74
Carbazole	3	2	6	2	2	2	4	1	NT
Fluoranthene	43	26	122	27	19	43	101	42	NT
Pyrene	43	28	91	64	36	262	NT	109	NT
1,2 Benzanthracene	18	4	NT	30	20	62	5	2	NT
Chrysene	75	34	NT	40	23	152	5	2	NT
Benzo-a-pyrene	ND	ND	ND	NT	148	NT	ND	ND	ND
Benzo-ghi-perylene	ND	ND	ND	ND	ND	ND	ND	ND	ND
Pentachlorophenol	24	17	38	49	23	NT	NT	776	NT
Total PAH's	37	28	55	40	31	54	34	27	47
OCDD	295	107	NT	212	69	NT	169	78	NT

NT = No transformation.
ND = None detected. Detection limits are given in Table 20.

Table 44: Half-lives and 95% confidence limits of PAH's and PCP in Meridian soil loaded with site sludges at 0.33, 1.0, and 3.0% by soil dry weight.

	0.33% Loading			1.0% Loading			3.0% Loading		
Compounds	t 1/2 (days)	Lower limit	Upper limit	t 1/2 (days)	Lower limit	Upper limit	t 1/2 (days)	Lower limit	Upper limit
Naphthalene	2	1	4	3	2	13	2	1	3
2-Methylnaphthalene	2	1	4	3	2	14	2	1	4
1-Methylnaphthalene	2	1	4	3	2	14	2	1	4
Biphenyl	6	2	NT	3	2	15	2	1	4
Acenaphthylene	6	2	NT	3	2	15	2	1	4
Acenaphthene	2	1	4	3	2	14	2	1	3
Dibenzofuran	2	1	4	3	2	14	2	1	3
Fluorene	2	1	4	3	2	13	2	1	4
Phenanthrene	14	2	NT	26	16	69	2	1	3
Anthracene	3	1	NT	9	2	NT	2	1	4
Carbazole	ND	ND	ND	3	2	14	2	1	4
Fluoranthene	55	29	444	148	59	NT	28	22	41
Pyrene	56	32	206	425	73	NT	63	47	94
1,2 Benzanthracene	130	58	NT	7	3	NT	2	1	3
Chrysene	ND	ND	ND	8	3	NT	2	1	4
Benzo-a-pyrene	ND	ND	ND	ND	ND	ND	ND	ND	ND
Benzo-ghi-perylene	ND	ND	ND	ND	ND	ND	ND	ND	ND
Pentachlorophenol	43	34	60	73	39	468	NT	NT	NT
Total PAH's	31	23	46	54	31	207	56	25	NT
OCDD	4	2	8	NT	326	NT	NT	NT	NT

NT - No transformation.
ND - None detected. Detection limits are given in Table 20.

Table 45: Half-lives and 95% confidence limits of PAH's and PCP in Wiggins soil loaded with site sludges at 0.33, 1.0, and 3.0% by soil dry weight.

Compounds	0.33% Loading			1.0% Loading			3.0% Loading		
	t 1/2 (days)	Lower limit	Upper limit	t 1/2 (days)	Lower limit	Upper limit	t 1/2 (days)	Lower limit	Upper limit
Naphthalene	3	2	7	3	1	NT	2	1	NT
2-Methylnaphthalene	3	2	7	3	1	NT	2	1	NT
1-Methylnaphthalene	3	2	8	2	1	4	3	1	NT
Biphenyl	3	2	8	2	1	4	2	2	2
Acenaphthylene	10	4	NT	2	1	4	2	2	2
Acenaphthene	3	2	6	4	1	NT	17	15	19
Dibenzofuran	3	2	5	21	13	61	28	24	34
Fluorene	3	2	6	17	11	37	23	22	25
Phenanthrene	3	2	6	18	11	45	20	18	23
Anthracene	3	2	6	57	32	245	51	38	76
Carbazole	3	2	7	65	30	NT	54	38	95
Fluoranthene	29	20	55	25	18	38	48	19	NT
Pyrene	4	2	26	51	31	139	426	115	NT
1,2 Benzanthracene	29	5	NT	113	41	NT	134	77	518
Chrysene	2	2	4	469	60	NT	2174	214	NT
Benzo-a-pyrene	2	2	4	NT	NT	NT	3	1	NT
Benzo-ghi-perylene	ND	ND	ND	2	1	4	ND	ND	ND
Pentachlorophenol	56	24	NT	50	30	168	39	23	122
Total PAH's	23	18	31	29	22	42	38	27	66
OCDD	790	313	NT	434	220	14575	179	86	NT

NT = No transformation.
ND = None detected. Detection limits are given in Table 20.

Table 46: Half-lives and 95% confidence limits of PAH's and PCP in Wilmington soil loaded with site sludges at 0.33, 1.0, and 3.0% by soil dry weight.

	0.33% Loading			1.0% Loading			3.0% Loading		
Compounds	t 1/2 (days)	Lower limit	Upper limit	t 1/2 (days)	Lower limit	Upper limit	t 1/2 (days)	Lower limit	Upper limit
Naphthalene	ND	ND	ND	ND	ND	ND	NA	NA	NA
2-Methylnaphthalene	ND	ND	ND	ND	ND	ND	NA	NA	NA
1-Methylnaphthalene	ND	ND	ND	ND	ND	ND	NA	NA	NA
Biphenyl	ND	ND	ND	ND	ND	ND	NA	NA	NA
Acenaphthylene	ND	ND	ND	ND	ND	ND	NA	NA	NA
Acenaphthene	ND	ND	ND	ND	ND	ND	NA	NA	NA
Dibenzofuran	ND	ND	ND	ND	ND	ND	NA	NA	NA
Fluorene	ND	ND	ND	1	1	1	NA	NA	NA
Phenanthrene	ND	ND	ND	3	1	NT	NA	NA	NA
Anthracene	1	1	1	1	1	NT	NA	NA	NA
Carbazole	ND	ND	ND	ND	ND	ND	NA	NA	NA
Fluoranthene	NT	22	NT	378	44	NT	NA	NA	NA
Pyrene	NT	40	NT	NT	33	NT	NA	NA	NA
1,2 Benzanthracene	112	17	NT	ND	ND	ND	NA	NA	NA
Chrysene	3	1	NT	ND	ND	ND	NA	NA	NA
Benzo-a-pyrene	ND	ND	ND	ND	ND	ND	NA	NA	NA
Benzo-ghi-perylene	ND	ND	ND	ND	ND	ND	NA	NA	NA
Pentachlorophenol	NT	NT	NT	278	156	1320	1561	90	NT
Total PAH's	225	21	NT	505	72	NT	NT	165	NT
OCDD	NT	NT	NT	NT	NT	NT	NT	NT	NT

NT = No transformation.
ND = None detected. Detection limits are given in Table 20.
NA = Not analyzed.

PCP transformation occurred in all the soils but was slow or non-existent in the Columbus, Atlanta, Wilmington, and Chattanooga soils. Grenada soil PCP half-lives ranged from one to two months, a quite practical range for operation of soil treatment systems. Rapid transformation rates were also exhibited in Meridian soil except at the highest loading rate. In Wiggins soil, PCP half-lives of one to two months were exhibited, which is still an appropriate range for soil treatment operations especially considering the site's deep south location where soil temperatures are high enough for good microbiological activity most of the year. PCP was transformed in Meridian and Gulfport soils fairly well. Although the Columbus, Chattanooga, and Atlanta soils did exhibit some transformation of PCP, the low rates would bring into question the practicality of treating PCP in soil at those locations. Over a period of time, however, it may be possible to build up populations of microorganisms suitable for rapid degradation of PCP. The relatively short time frame of these experiments was apparently insufficient for these soils. Bioaugmentation may be useful in this situation. It is likely in most soils with chronic exposure to PCP that suitable populations could be induced relatively quickly.

Dioxins are widely regarded as being somewhat recalcitrant to biological transformation. The OCDD results in this study are inconclusive. Although there was some apparent transformation of OCDD in some of the soils, the low concentrations of OCDD present in the experimental soils and the variability of the data preclude any definitive statement about the amenability of OCDD to treatment in soil systems.

Migration Studies

The migration study results are found in Tables 47-51. PAH's or PCP were found at levels slightly above background (compared to control cores) in soil core drainage waters (Tables 49-50) from four of the sites tested [Wilmington (WL), Columbus (CO), Atlanta (AT) and Chattanooga (CH)]. For each site, six cores were loaded with sludge and six were controls. To minimize chemical analyses, water from two cores were combined for chemical analysis. Polycyclic aromatic hydrocarbons were migrating from all Wilmington cores at 60 and 90 days. Lower levels of PAH's were also migrating from 2/3 of the control cores from Wilmington, albeit at lower concentrations. This result is not unexpected since Wilmington is a very sandy soil and would be expected to have a low adsorption capacity. Low levels of PAH's were in one series of control cores from Chattanooga at 60 days and two series of loaded cores from Atlanta at 90 days. No PAH's or PCP was found in soil core drainage water from cores taken from the other sites. The PCP levels were in the low parts per billion range except for one sampling date from the Wilmington cores that was about 349 ppb total PCP. The Columbus soil, which showed some PCP drainage, has a sandy texture. The Atlanta soil is a clay soil but exhibited a strong tendency to fracture into discrete clumps while taking the soil cores. This may

have provided channels for movement of the compounds. No PCP was found in water samples collected from soil cores from the other sites.

After 90 days, soil cores were sectioned. The results, shown in Tables 49-51, indicate that movement of the compounds tested was small or nonexistent except in Wilmington and Atlanta soil cores. The Grenada soil appeared to allow some movement of PAH's; however, no movement of PCP was observed. Apparently, movement of these compounds under the conditions and within the time frame of this experiment was small. This result was expected since soil organic matter (from added chicken manure) and clay binds these compounds relatively tightly.

PHASE III -FIELD DEMONSTRATION STUDY

Results of the field demonstration study indicate that PCP and creosote compounds are susceptible to rapid transformation in the demonstration site soil. The following discussion refers to data from Tables 52-54 in the main text (Zone 1 data only) and Tables 68-71 in Appendix F (Zones 1,2,3 and incorporation zone data). Table 14 in the main text gives the loading rates for the soil treatment unit.

SOIL CORE SAMPLES

Creosote Cells - Background Levels (10/26/87)

Background levels were taken before loading on October 26, 1987. PAH background levels were below detection limits in all Cells except Cell 9 (Tables 52-54 and Appendix F). Total PAH levels in Cell 9 Zone 1 soil were 164 to 167 ppm in Subcells 1 and 2. Subcell 2 had PAH's in Zone 2 soil at 42 ppm and Zone 3 soil at 81 ppm. Only three and four-ring PAH's were found, with phenanthrene, fluorene, and pyrene predominating at 40-60 ppm each; and acenaphthene, dibenzofuran, fluorene, anthracene, fluoranthene, 1,2-benzanthracene, and chrysene in 2-10 ppm concentrations.

PCP background levels were below detection limits in Cell 1. Cell 4 PCP levels were about 77 ppm in Subcell 1 Zone 1, 779 ppm in Zone 2, and 18 ppm in Zone 3. Cell 4 Subcell 2 levels were 4059 ppm in Zone 1, 14 ppm in Zone 2, and 1071 ppm in Zone 3. Cell 9 Subcell 1 levels were 29 ppm in Zone 1, 105 ppm in Zone 2, and 5 ppm in Zone 3. Cell 9 Subcell 2 PCP levels were 2372 ppm in Zone 1, 309 ppm in Zone 2, and 37 ppm in Zone 3.

OCDD was found only in Cell 9, Subcell 2. Zone 1 levels were about 1 ppm, Zone 2 about 0.2 ppm, and Zone 3 levels about 0.1 ppm.

Table 47. Polycyclic aromatic hydrocarbons in soil core leachate (ppb)

SITE	CORE TYPE	REP	DATE	NAPH	2-MET	1-MET	BIPH	ACTHY	ACTHE	DIBEN	FLORE	PHEN	ANTHR	CARBA	FLUOR	PYRENE	1,2-BZ	CHRYS	BEN-a	Bghi	2 RING	3 RING	4 RING	5 RING	TOTALPAH
WILMINGTON	LOADED	A	60.0	ND	ND	ND	ND	ND	ND	ND	ND	19.0	ND	ND	ND	ND	ND	ND	ND	ND	ND	19.0	ND	ND	19.0
		B	90.0	13.0	33.0	ND	18.0	20.0	19.0	43.0	ND	31.0	45.0	ND	ND	ND	ND	ND	ND	ND	64.0	158.0	ND	ND	222.0
		C	90.0	46.0	163.0	59.0	23.0	13.0	90.0	82.0	94.0	96.0	56.0	49.0	23.0	13.0	16.0	18.0	ND	ND	291.0	482.0	70.0	ND	843.0
	CONTROL	A	90.0	ND	ND	ND	ND	ND	ND	ND	ND	ND	66.0	ND	ND	ND	ND	ND	ND	ND	ND	66.0	ND	ND	66.0
		B	90.0	ND	ND	ND	ND	ND	ND	12.0	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	12.0	ND	ND	12.0
CHATTANOOGA	CONTROL	B	60.0	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	13.0	ND	ND	ND	ND	13.0	13.0
ATLANTA	LOADED	A	90.0	ND	ND	ND	ND	ND	ND	ND	ND	12.0	ND	ND	ND	ND	ND	ND	ND	ND	ND	12.0	ND	ND	12.0
		B	90.0	ND	ND	ND	ND	ND	ND	ND	ND	23.0	ND	ND	ND	ND	ND	ND	ND	ND	ND	23.0	ND	ND	23.0

Soil cores from the other sites had no detected PAH in the leachate at any date and are not shown
ND = Not Detected - See Table 20 for detection limits

Table 48. Pentachlorophenol in soil core leachate (ppb)

SITE	CORE TYPE	REP	DAYS 0	30	60	90
WILMINGTON	CONTROL	A	ND	ND	ND	ND
		B	ND	ND	ND	ND
		C	ND	ND	ND	ND
	LOADED	A	349	ND	ND	ND
		B	ND	ND	ND	ND
		C	ND	ND	ND	ND
ATLANTA	CONTROL	A	ND	ND	ND	ND
		B	ND	ND	ND	ND
		C	ND	ND	ND	ND
	LOADED	A	ND	ND	ND	ND
		B	ND	ND	ND	6.7
		C	ND	ND	ND	ND
COLUMBUS	CONTROL	A	ND	ND	ND	ND
		B	ND	ND	3.9	ND
		C	ND	ND	8.9	ND
	LOADED	A	ND	ND	6.4	ND
		B	7.7	ND	5.2	ND
		C	ND	ND	ND	ND

Soil cores from the other sites had no detected PCP in the leachate at any date and are not shown

ND = Not Detected - See Table 20 for detection limits

Table 49. Polycyclic aromatic hydrocarbons in soil core sections (ppm)

ATLANTA			PAH CONCENTRATIONS IN CORE SOIL																					
SAMPLE DEPTH	CORE TYPE	REP	NAPH	2-MET	1-MET	BIPH	ACTHY	ACTHE	DIBEN	FLORE	PHEN	ANTHR	CARBA	FLUOR	PYRENE	1,2-BZ	CHRYS	BEN-a	BghI	2 RING	3 RING	4 RING	5 RING	TOTALPAH
0-10cm	LOADED	A	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	4.0	5.0	ND	ND	ND	ND	ND	ND	9.0	ND	9.0
		B	ND	ND	ND	ND	ND	ND	ND	ND	12.0	18.0	ND	30.0	22.0	7.0	9.0	ND	ND	ND	30.0	68.0	ND	98.0
		C	ND	ND	ND	ND	ND	ND	ND	ND	ND	7.0	ND	7.0	10.0	ND	ND	ND	ND	ND	7.0	17.0	ND	24.0
	CONTROL	A	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
		B	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	3.0	ND	ND	ND	ND	ND	ND	3.0	ND	3.0
		C	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
10-20cm	LOADED	A	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
		B	ND	ND	ND	ND	ND	ND	ND	ND	31.0	51.0	7.0	36.0	32.0	10.0	11.0	ND	ND	ND	89.0	89.0	ND	178.0
		C	ND	ND	ND	ND	ND	ND	ND	ND	ND	8.0	ND	5.0	9.0	ND	ND	ND	ND	ND	8.0	14.0	ND	22.0
	CONTROL	A	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	3.0	3.0	ND	ND	ND	ND	ND	ND	6.0	ND	6.0
		B	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
		C	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
20-30cm	LOADED	A	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
		B	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
		C	ND	ND	ND	ND	ND	ND	ND	ND	ND	10.0	ND	7.0	8.0	ND	ND	ND	ND	ND	10.0	15.0	ND	25.0
	CONTROL	A	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
		B	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
		C	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND

NA = Not Analyzed

ND = Not Detected - See Table 20 for detection limits

Table 49. Polycyclic aromatic hydrocarbons in soil core sections (ppm)

CHATTANOOGA

SAMPLE DEPTH	CORE TYPE	REP	NAPH	2-MET	1-MET	BIPH	ACTHY	ACTHE	DIBEN	FLORE	PHEN	ANTHR	CARBA	FLUOR	PYRENE	1,2-BZ	CHRYS	BEN-a	BghI	2 RING	3 RING	4 RING	5 RING	TOTALPAH
			PAH CONCENTRATIONS IN CORE SOIL																					
0-10cm	LOADED	A	ND	15.0	11.0	10.0	ND	67.0	37.0	61.0	184.0	41.0	13.0	129.0	81.0	26.0	24.0	ND	ND	36.0	403.0	260.0	ND	699.0
		B	ND	ND	ND	ND	ND	14.0	5.0	ND	4.0	25.0	ND	279.0	198.0	70.0	69.0	10.0	ND	ND	48.0	616.0	10.0	674.0
		C	ND	ND	ND	4.0	3.0	72.0	3.0	12.0	8.0	40.0	ND	200.0	123.0	39.0	37.0	ND	ND	4.0	138.0	399.0	ND	541.0
	CONTROL	A	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
		B	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
		C	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
10-20cm	LOADED	A	5.0	68.0	46.0	45.0	4.0	253.0	179.0	244.0	709.0	115.0	60.0	395.0	247.0	95.0	87.0	20.0	ND	164.0	1564.0	824.0	20.0	2572.0
		B	ND	ND	ND	ND	ND	4.0	ND	ND	ND	10.0	ND	121.0	77.0	28.0	26.0	ND	ND	ND	14.0	252.0	ND	266.0
		C	ND	ND	ND	ND	ND	40.0	27.0	54.0	196.0	40.0	13.0	166.0	99.0	31.0	29.0	ND	ND	ND	370.0	325.0	ND	695.0
	CONTROL	A	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
		B	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
		C	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
20-30cm	LOADED	A	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
		B	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
		C	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
	CONTROL	A	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
		B	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
		C	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND

NA = Not Analyzed
ND = Not Detected - See Table 20 for detection limits

Table 49. Polycyclic aromatic hydrocarbons in soil core sections (ppm)

GRENADA

SAMPLE DEPTH	CORE TYPE	REP	DUPLICATE	NAPH	2-MET	1-MET	BIPH	ACTHY	ACTHE	DIBEN	FLORE	PHEN	ANTHR	CARBA	FLUOR	PYRENE	1,2-BZ	CHRYS	BEN-a	BpN	2 RING	3 RING	4 RING	5 RING	TOTALPAH
				PAH CONCENTRATIONS IN CORE SOIL																					
0-10cm	LOADED	A	A	ND	ND	ND	ND	3.4	ND	ND	ND	12.8	11.0	ND	72.3	70.5	31.8	48.4	38.3	19.6	ND	27.2	223.0	67.9	308.1
			B	ND	ND	ND	ND	4.0	ND	ND	ND	9.5	10.0	ND	30.5	34.9	25.2	45.5	64.0	32.9	ND	23.5	136.1	86.9	246.5
			(A+B)/2=	ND	ND	ND	ND	3.7	ND	ND	ND	11.2	10.5	ND	51.4	52.7	28.5	47.0	46.2	26.3	ND	25.4	179.6	72.4	277.3
		B	A	ND	ND	ND	ND	4.1	ND	ND	ND	3.4	8.5	ND	22.6	30.5	28.6	47.0	56.7	48.9	ND	16.0	128.7	105.6	250.3
			B	ND	ND	ND	ND	3.7	ND	ND	ND	11.8	7.6	ND	13.4	16.1	22.9	36.7	43.5	28.6	ND	23.1	91.1	72.1	186.3
			(A+B)/2=	ND	ND	ND	ND	3.9	ND	ND	ND	7.6	8.1	ND	18.0	24.3	25.8	41.9	50.1	36.8	ND	19.6	109.9	88.9	218.3
		C	A	ND	ND	ND	ND	4.2	ND	ND	ND	6.2	6.0	ND	15.0	23.9	21.7	43.4	56.6	36.9	ND	18.4	104.0	93.5	215.9
			B	ND	ND	ND	ND	4.3	ND	ND	ND	3.1	10.2	ND	17.7	27.3	24.5	53.6	60.8	49.8	ND	17.6	123.1	110.6	251.3
			(A+B)/2=	ND	ND	ND	ND	4.3	ND	ND	ND	5.7	8.1	ND	16.4	25.6	23.1	48.5	58.7	43.4	ND	18.0	113.6	102.1	233.6
	CONTROL	A	A	ND	ND	ND	ND	ND	ND	ND	ND	3.5	6.8	ND	41.2	47.8	34.4	57.0	26.4	23.6	ND	10.3	180.4	50.0	240.7
			B	ND	ND	ND	ND	ND	ND	ND	ND	3.8	6.4	ND	44.1	50.4	36.5	69.7	27.5	19.1	ND	10.2	200.7	46.6	257.5
			(A+B)/2=	ND	ND	ND	ND	ND	ND	ND	ND	3.7	6.6	ND	42.7	49.1	35.5	63.4	27.0	21.4	ND	10.3	190.6	48.3	249.1
		B	A	ND	ND	ND	ND	3.1	ND	ND	ND	1.6	2.6	ND	32.0	34.9	30.2	44.5	29.8	23.4	ND	7.3	141.6	53.2	202.1
			B	ND	ND	ND	ND	ND	ND	ND	ND	3.1	2.7	ND	18.0	21.7	18.9	22.6	5.2	ND	ND	5.8	81.2	5.2	92.2
			(A+B)/2=	ND	ND	ND	ND	1.6	ND	ND	ND	2.4	2.7	ND	25.0	28.3	24.6	33.6	17.5	11.7	ND	6.6	111.4	29.2	147.2
		C	A	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	26.1	30.3	33.3	30.8	8.4	ND	ND	ND	120.5	8.4	128.9
			B	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	19.4	20.4	24.1	27.0	11.1	6.7	ND	ND	90.9	17.8	108.7
			(A+B)/2=	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	22.8	25.4	28.7	28.9	9.8	3.4	ND	ND	105.7	13.1	118.8
10-20cm	LOADED	A	A	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	8.6	11.4	26.9	33.9	34.4	22.1	ND	ND	60.8	56.5	137.3
			B	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	10.3	13.9	16.3	20.4	10.9	ND	ND	ND	60.9	10.9	71.8
			(A+B)/2=	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	9.5	12.7	21.6	27.2	22.7	11.1	ND	ND	70.9	33.7	104.6
		B	A	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	8.2	ND	13.0	ND	ND	ND	8.2	13.0	21.2
			B	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	8.5	ND	ND	ND	ND	ND	8.5	ND	8.5
			(A+B)/2=	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	8.4	ND	6.5	ND	ND	ND	8.4	6.5	14.9
		C	A	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	3.6	5.8	12.4	9.2	11.4	7.0	ND	ND	31.0	18.4	49.4
			B	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	2.3	4.5	19.6	ND	6.1	ND	ND	ND	26.4	6.1	32.5
			(A+B)/2=	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	3.0	5.2	16.0	4.6	8.8	3.5	ND	ND	28.7	12.3	41.0
	CONTROL	A	A	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	6.7	ND	ND	ND	ND	ND	6.7	ND	6.7
			B	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	8.9	ND	ND	ND	ND	ND	8.9	ND	8.9
			(A+B)/2=	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	7.8	ND	ND	ND	ND	ND	7.8	ND	7.8
		B	A	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	6.7	ND	ND	ND	ND	ND	6.7	ND	6.7
			B	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	9.8	ND	ND	ND	ND	ND	9.8	ND	9.8
			(A+B)/2=	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	9.3	ND	ND	ND	ND	ND	9.3	ND	9.3
		C	A	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	11.7	ND	ND	ND	ND	ND	11.7	ND	11.7
			B	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	8.3	ND	ND	ND	ND	ND	8.3	ND	8.3
			(A+B)/2=	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	10.0	ND	ND	ND	ND	ND	10.0	ND	10.0
20-30cm	LOADED	A	A	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	5.5	7.6	14.1	15.9	14.5	11.7	ND	ND	43.1	26.2	69.3
			B	ND	ND	ND	ND	ND	ND	ND	ND	3.1	3.2	ND	19.4	20.1	15.4	19.2	11.0	8.3	ND	6.3	74.1	19.3	99.7
			(A+B)/2=	ND	ND	ND	ND	ND	ND	ND	ND	1.6	1.6	ND	12.5	13.9	14.8	17.6	12.8	10.0	ND	3.2	58.6	22.8	84.5
		B	A	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
			B	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
			(A+B)/2=	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
		C	A	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	3.0	ND	ND	ND	ND	ND	3.0	ND	3.0
			B	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	5.1	ND	ND	ND	ND	ND	5.1	ND	5.1
			(A+B)/2=	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	4.1	ND	ND	ND	ND	ND	4.1	ND	4.1
	CONTROL	A	A	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
		B	A	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
		C	A	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA

NA = Not Analyzed
ND = Not Detected - See Table 20 for detection limits

Table 49. Polycyclic aromatic hydrocarbons in soil core sections (ppm)

WIGGINS

PAH CONCENTRATIONS IN CORE SOIL

SAMPLE DEPTH	CORE TYPE	REP	DUPLICATE	NAPH	2-MET	1-MET	BIPH	ACTHY	ACTHE	DIBEN	FLORE	PHEN	ANTHR	CARBA	FLUOR	PYRENE	1,2-BZ	CHRYS	BEN-a	BghI	2 RING	3 RING	4 RING	5 RING	TOTALPAH
0-10cm	LOADED	A	A	ND	ND	ND	ND	ND	2.0	7.0	10.0	29.0	67.0	26.0	29.0	47.0	50.0	93.0	64.0	20.0	ND	143.0	219.0	84.0	446.0
			B	ND	ND	ND	ND	ND	3.0	7.0	10.0	27.0	74.0	26.0	23.0	36.0	35.0	61.0	28.0	ND	ND	147.0	157.0	26.0	332.0
			(A+B)/2=	ND	ND	ND	ND	ND	2.5	7.0	10.0	28.0	70.5	27.0	26.0	42.5	42.5	77.0	46.0	10.0	ND	145.0	188.0	56.0	389.0
		B	A	ND	3.0	ND	ND	ND	2.0	10.0	13.0	30.0	100.0	44.0	53.0	65.0	63.0	114.0	71.0	26.0	3.0	199.0	315.0	97.0	614.0
			B	ND	ND	ND	ND	ND	5.0	14.0	14.0	43.0	87.0	41.0	132.0	169.0	137.0	220.0	127.0	40.0	ND	204.0	678.0	167.0	1049.0
			(A+B)/2=	ND	1.5	ND	ND	ND	3.5	12.0	13.5	36.5	93.5	42.5	92.5	137.0	100.0	167.0	99.0	33.0	1.5	201.5	496.5	132.0	831.5
		C	A	ND	ND	ND	ND	2.0	2.0	7.0	7.0	23.0	50.0	20.0	53.0	84.0	59.0	114.0	58.0	26.0	ND	111.0	290.0	116.0	517.0
			B	ND	ND	ND	ND	2.0	2.0	10.0	8.0	24.0	50.0	21.0	42.0	123.0	86.0	145.0	85.0	27.0	ND	117.0	308.0	112.0	627.0
			(A+B)/2=	ND	ND	ND	ND	2.0	2.0	8.5	7.5	23.5	50.0	20.5	47.5	93.5	73.5	129.5	86.5	27.5	ND	114.0	344.0	114.0	572.0
	CONTROL	A	A	ND	ND	ND	ND	ND	ND	ND	ND	1.7	ND	ND	2.7	ND	5.6	ND	ND	ND	ND	1.7	8.3	ND	10.0
			B	ND	ND	ND	ND	ND	ND	ND	ND	2.2	ND	ND	2.9	ND	8.2	ND	ND	ND	ND	2.2	11.1	ND	13.3
			(A+B)/2=	ND	ND	ND	ND	ND	ND	ND	ND	2.0	ND	ND	2.8	ND	6.9	ND	ND	ND	ND	2.0	9.7	ND	11.7
		B	A	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	3.3	ND	6.7	ND	ND	ND	ND	ND	10.0	ND	10.0
			B	ND	ND	ND	ND	ND	ND	1.0	ND	ND	ND	ND	3.6	ND	8.1	ND	ND	ND	ND	1.0	9.7	ND	10.7
			(A+B)/2=	ND	ND	ND	ND	ND	ND	0.5	ND	ND	ND	ND	3.5	ND	8.4	ND	ND	ND	ND	0.5	9.9	ND	10.4
		C	A	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	3.1	26.4	21.4	23.5	25.2	8.4	ND	ND	74.4	33.6	108.0
			B	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	3.0	24.3	21.3	29.2	22.6	8.9	ND	ND	77.8	31.7	109.5
			(A+B)/2=	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	3.1	25.4	21.4	26.4	24.0	8.7	ND	ND	76.1	32.7	108.8
10-20 cm	LOADED	A	A	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	6.0	ND	ND	ND	ND	ND	6.0	ND	6.0
			B	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	7.0	ND	ND	ND	ND	ND	7.0	ND	7.0
			(A+B)/2=	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	6.5	ND	ND	ND	ND	ND	6.5	ND	6.5
		B	A	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	6.0	ND	ND	ND	ND	ND	6.0	ND	6.0
			B	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	11.0	ND	ND	ND	ND	ND	11.0	ND	11.0
			(A+B)/2=	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	8.5	ND	ND	ND	ND	ND	8.5	ND	8.5
		C	A	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	4.0	ND	ND	ND	ND	ND	4.0	ND	4.0
			B	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	4.0	ND	ND	ND	ND	ND	4.0	ND	4.0
			(A+B)/2=	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	4.0	ND	ND	ND	ND	ND	4.0	ND	4.0
	CONTROL	A	A	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	4.5	ND	ND	ND	ND	ND	4.5	ND	4.5
			B	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	2.6	ND	7.1	ND	ND	ND	ND	ND	9.7	ND	9.7
			(A+B)/2=	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	1.3	ND	5.8	ND	ND	ND	ND	ND	7.1	ND	7.1
		B	A	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	5.1	ND	ND	ND	ND	ND	5.1	ND	5.1
			B	ND	ND	ND	ND	ND	ND	ND	ND	ND	4.0	ND	ND	ND	4.0	ND	ND	ND	ND	4.0	4.0	ND	8.0
			(A+B)/2=	ND	ND	ND	ND	ND	ND	ND	ND	ND	2.0	ND	ND	ND	4.6	ND	ND	ND	ND	2.0	4.6	ND	6.6
		C	A	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	3.5	ND	ND	ND	ND	ND	3.5	ND	3.5
			B	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	4.7	ND	ND	ND	ND	ND	4.7	ND	4.7
			(A+B)/2=	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	4.1	ND	ND	ND	ND	ND	4.1	ND	4.1
20-30cm	LOADED	A	A	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	8.0	ND	ND	ND	ND	ND	8.0	ND	8.0
			B	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	10.0	ND	ND	ND	ND	ND	10.0	ND	10.0
			(A+B)/2=	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	9.0	ND	ND	ND	ND	ND	9.0	ND	9.0
		B	A	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	11.0	ND	ND	ND	ND	ND	11.0	ND	11.0
			B	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	9.0	ND	ND	ND	ND	ND	9.0	ND	9.0
			(A+B)/2=	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	10.0	ND	ND	ND	ND	ND	10.0	ND	10.0
		C	A	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	7.0	ND	ND	ND	ND	ND	7.0	ND	7.0
			B	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	7.0	ND	ND	ND	ND	ND	7.0	ND	7.0
			(A+B)/2=	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	7.0	ND	ND	ND	ND	ND	7.0	ND	7.0
	CONTROL	A	A	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
		B	A	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
		C	A	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA

NA = Not Analyzed

ND = Not Detected - See Table 20 for detection limits

Table 40. Polycyclic aromatic hydrocarbons in soil core sections (ppm)

WILMINGTON

PAH CONCENTRATIONS IN CORE SOIL

SAMPLE DEPTH	CORE TYPE	REP	NAPH	2-MET	1-MET	BIPH	ACTHY	ACTHE	DIBEN	FLORE	PHEN	ANTHR	CARBA	FLUOR	PYRENE	1,2-BZ	CHRYS	BEN-a	BgH	2 RING	3 RING	4 RING	5 RING	TOTALPAH
0-10cm	LOADED	A	ND	ND	ND	ND	ND	ND	ND	ND	10.0	ND	ND	28.0	89.0	13.0	14.0	ND	ND	ND	10.0	144.0	ND	154.0
		B	ND	ND	ND	ND	ND	4.0	3.0	8.0	27.0	15.0	ND	159.0	163.0	38.0	37.0	ND	ND	ND	55.0	397.0	ND	452.0
		C	ND	ND	ND	ND	ND	4.0	3.0	6.0	30.0	9.0	ND	272.0	172.0	45.0	39.0	ND	ND	ND	51.0	528.0	ND	579.0
	CONTROL	A	ND	ND	ND	ND	ND	ND	ND	ND	2.0	ND	ND	4.0	5.0	4.0	5.0	ND	ND	ND	2.0	18.0	ND	20.0
		B	ND	ND	ND	ND	ND	ND	ND	ND	2.0	ND	ND	5.0	6.0	5.0	5.0	ND	ND	ND	2.0	21.0	ND	23.0
		C	ND	ND	ND	ND	ND	ND	ND	ND	3.0	ND	ND	6.0	9.0	3.0	5.0	ND	ND	ND	3.0	23.0	ND	26.0
10-20cm	LOADED	A	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	7.0	ND	ND	ND	ND	ND	ND	ND	7.0	ND	7.0
		B	ND	ND	ND	ND	ND	ND	ND	ND	6.0	ND	ND	13.0	17.0	12.0	6.0	ND	ND	ND	6.0	48.0	ND	53.0
		C	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
	CONTROL	A	ND	ND	ND	ND	ND	ND	ND	ND	2.0	ND	ND	5.0	5.0	3.0	5.0	ND	ND	ND	2.0	18.0	ND	20.0
		B	ND	ND	ND	ND	ND	ND	ND	ND	2.0	ND	ND	8.0	8.0	6.0	6.0	ND	ND	ND	2.0	28.0	ND	28.0
		C	ND	ND	ND	ND	ND	ND	ND	ND	3.0	ND	ND	9.0	9.0	5.0	6.0	ND	ND	ND	3.0	29.0	ND	32.0
20-30cm	LOADED	A	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
		B	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
		C	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
	CONTROL	A	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
		B	1.0	ND	ND	ND	ND	ND	ND	ND	2.0	ND	ND	3.0	4.0	4.0	3.0	ND	ND	1.0	2.0	14.0	ND	17.0
		C	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
30-40cm	LOADED	A	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
		B	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	6.0	4.0	ND	ND	ND	ND	ND	ND	10.0	ND	10.0
		C	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
	CONTROL	A	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
		B	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	3.0	ND	ND	ND	ND	ND	ND	3.0	ND	3.0
		C	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	3.0	6.0	4.0	3.0	ND	ND	ND	ND	16.0	ND	16.0
40-50cm	LOADED	A	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
		B	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
		C	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
	CONTROL	A	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
		B	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
		C	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
50-60cm	LOADED	A	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
		B	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
		C	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
	CONTROL	A	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
		B	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	3.0	ND	ND	ND	ND	ND	ND	3.0	ND	3.0
		C	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	4.0	ND	ND	ND	ND	ND	ND	4.0	ND	4.0

NA = Not Analyzed

ND = Not Detected - See Table 39 for detection limits

Table 50. Pentachlorophenol in soil core sections (ppm)

CORE SOURCE	SAMPLE DEPTH	PCP CONCENTRATIONS IN CORE SOIL					
		LOADED CORES			CONTROL CORES		
		REP A	REP B	REP C	REP A	REP B	REP C
ATLANTA	0-10cm	6.2	13.1	4.6	ND	2.8	ND
	10-20cm	1.4	46.6	8.1	33	8.3	ND
	20-30cm	5	2.1	7.4	ND	ND	ND
	30-40cm	NA	NA	1.4	NA	NA	NA
	40-50cm	NA	NA	ND	NA	NA	NA
	50-60cm	NA	NA	ND	NA	NA	NA
CHATTANOOGA	0-10cm	50.2	148	77.2	ND	ND	ND
	10-20cm	187	58.3	70.5	ND	ND	ND
	20-30cm	6.4	3.5	3.8	ND	ND	ND
	30-40cm	NA	NA	NA	NA	NA	NA
	40-50cm	NA	NA	NA	NA	NA	NA
	50-60cm	NA	NA	NA	NA	NA	NA
WILMINGTON	0-10cm	18.2	30.9	32.4	ND	ND	ND
	10-20cm	15.7	44.1	7.8	ND	ND	ND
	20-30cm	65.7	4.8	8.4	ND	ND	ND
	30-40cm	18.1	2.5	4.8	NA	ND	ND
	40-50cm	1.5	ND	1	NA	ND	ND
	50-60cm	ND	ND	ND	NA	ND	ND

NA = Not analyzed
ND = Not Detected - See Table 20 for detection limits

Table 50. Pentachlorophenol in soil core sections (ppm)

			PCP CONCENTRATIONS IN CORE SOIL					
			LOADED CORES			CONTROL CORES		
CORE SOURCE	SAMPLE DEPTH	DUPLICATE	REP A	REP B	REP C	REP A	REP B	REP C
WIGGINS	0-10cm	A	63	95.4	65.6	22.8	ND	69.8
		B	62.9	116.5	108.7	11.8	ND	759.7
		(A+B)/2=	63	106	87.2	17.3	ND	414.8
	10-20cm	A	ND	ND	ND	ND	ND	ND
		B	ND	ND	ND	ND	ND	ND
		(A+B)/2=	ND	ND	ND	ND	ND	ND
	20-30cm	A	ND	ND	ND	NA	NA	NA
		B	ND	ND	ND	NA	NA	NA
		(A+B)/2=	ND	ND	ND	NA	NA	NA
	30-40cm	A	NA	NA	NA	NA	NA	NA
		B	NA	NA	NA	NA	NA	NA
		(A+B)/2=	NA	NA	NA	NA	NA	NA
	40-50cm	A	NA	NA	NA	NA	NA	NA
		B	NA	NA	NA	NA	NA	NA
		(A+B)/2=	NA	NA	NA	NA	NA	NA
	50-60cm	A	NA	NA	NA	NA	NA	NA
		B	NA	NA	NA	NA	NA	NA
		(A+B)/2=	NA	NA	NA	NA	NA	NA
GRENADA	0-10cm	A	19.5	21.2	22.9	1.4	2.2	6.1
		B	18	15.7	22.8	1.1	1.8	2.5
		(A+B)/2=	18.8	18.5	22.9	1.3	2	4.3
	10-20cm	A	ND	ND	ND	ND	ND	ND
		B	ND	ND	ND	ND	ND	ND
		(A+B)/2=	ND	ND	ND	ND	ND	ND
	20-30cm	A	ND	ND	ND	NA	NA	NA
		B	ND	ND	ND	NA	NA	NA
		(A+B)/2=	ND	ND	ND	NA	NA	NA
	30-40cm	A	NA	NA	NA	NA	NA	NA
		B	NA	NA	NA	NA	NA	NA
		(A+B)/2=	NA	NA	NA	NA	NA	NA
	40-50cm	A	NA	NA	NA	NA	NA	NA
		B	NA	NA	NA	NA	NA	NA
		(A+B)/2=	NA	NA	NA	NA	NA	NA
	50-60cm	A	NA	NA	NA	NA	NA	NA
		B	NA	NA	NA	NA	NA	NA
		(A+B)/2=	NA	NA	NA	NA	NA	NA

NA = Not Analyzed

ND = Not Detected - See Table 20 for detection limits

Table 51. Octachlorodibenzo-p-dioxin in soil core sections (ppm)

CORE SOURCE	SAMPLE DEPTH	DUPLICATE	OCDD CONCENTRATIONS IN CORE SOIL LOADED CORES REP A	REP B	REP C	CONTROL CORES REP A	REP B	REP C
CHATTANOOGA	0-10cm		0.25	0.37	0.31	ND	ND	ND
	10-20cm		0.46	0.25	ND	ND	ND	ND
	20-30cm		ND	ND	ND	ND	ND	ND
	30-40cm		NA	NA	NA	NA	NA	NA
	40-50cm		NA	NA	NA	NA	NA	NA
	50-60cm		NA	NA	NA	NA	NA	NA
GRENADA	0-10cm	A	0.94	0.69	0.78	ND	0.21	0.33
		B	0.94	0.78	0.77	ND	0.24	0.39
		(A+B)/2=	0.94	0.74	0.78	ND	0.23	0.36
	10-20cm	A	ND	ND	ND	ND	ND	ND
		B	ND	ND	ND	ND	ND	ND
		(A+B)/2=	ND	ND	ND	ND	ND	ND
	20-30cm	A	NA	NA	ND	NA	NA	NA
		B	NA	NA	ND	NA	NA	NA
		(A+B)/2=	NA	NA	ND	NA	NA	NA
	30-40cm	A	NA	NA	NA	NA	NA	NA
		B	NA	NA	NA	NA	NA	NA
		(A+B)/2=	NA	NA	NA	NA	NA	NA
	40-50cm	A	NA	NA	NA	NA	NA	NA
		B	NA	NA	NA	NA	NA	NA
		(A+B)/2=	NA	NA	NA	NA	NA	NA
	50-60cm	A	NA	NA	NA	NA	NA	NA
		B	NA	NA	NA	NA	NA	NA
		(A+B)/2=	NA	NA	NA	NA	NA	NA
WIGGINS	0-10cm	A	2.88	3	2.89	2.78	ND	3.97
		B	2.78	3.26	3.25	3.03	ND	6.3
		(A+B)/2=	2.83	3.13	2.97	ND	ND	5.14
	10-20cm	A	ND	ND	ND	ND	ND	ND
		B	ND	ND	ND	ND	ND	ND
		(A+B)/2=	ND	ND	ND	ND	ND	ND
	20-30cm	A	ND	ND	ND	NA	NA	NA
		B	ND	ND	ND	NA	NA	NA
		(A+B)/2=	ND	ND	ND	NA	NA	NA
	30-40cm	A	NA	NA	NA	NA	NA	NA
		B	NA	NA	NA	NA	NA	NA
		(A+B)/2=	NA	NA	NA	NA	NA	NA
	40-50cm	A	NA	NA	NA	NA	NA	NA
		B	NA	NA	NA	NA	NA	NA
		(A+B)/2=	NA	NA	NA	NA	NA	NA
	50-60cm	A	NA	NA	NA	NA	NA	NA
		B	NA	NA	NA	NA	NA	NA
		(A+B)/2=	NA	NA	NA	NA	NA	NA

NA = Not Analyzed
ND = Not Detected - See Table 20 for detection limits

Table 52. Wiggins Soil Treatment Unit - PAH, PCP, and OCDD in zone 1 soil, creosote loaded cells (ppm)

DATE	CELL	NAPH	2-MET	1-MET	BIPH	ACTHY	ACTHE	DIBEN	FLORE	PHEN	ANTHR	CARBA	FLUOR	PYRENE	1,2-BZ	CHRYS	BEN-a	BghI	2 RING	3 RING	4 RING	5 RING	TOTALPAH	PCP	OCDD
10/23/87	1	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
11/10/87	1	ND	2.9	5.6	5.3	1	74.6	53.9	105	421.9	57.8	37	261.4	155.7	22.3	21.6	3.5	ND	13.8	751.2	461	3.5	1229.4	42.6	0.5
2/26/88	1	ND	ND	ND	ND	ND	18.5	5.5	16.3	35.5	19	3.3	114	98.8	19.5	23.3	ND	ND	ND	98	255.5	ND	353.5	17.7	0.3
5/10/88	1	ND	5.5	5	3	0.5	68	54.5	77.5	284.3	53.3	20.8	205.5	176	46.3	49.8	11	1.5	13.5	558.8	477.5	12.5	1062.3	48.6	1.8
6/15/89	1	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
8/11/89	1	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
5/18/90	1	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	1	3	3	19	10	4	ND	ND	26	14	40	ND	ND
10/23/87	4	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	2068.2	ND
11/10/87	4	ND	ND	1.5	1.5	0.3	28.2	19.3	35.9	113.3	20.2	10.5	78.9	60	18.2	21.5	4.5	ND	3	227.7	178.5	4.5	413.6	250.4	0.2
2/26/88	4	ND	ND	3.8	0.2	1.2	54.4	24.7	40.6	87.6	30.4	4.8	140.3	118.9	28.6	29.5	8.7	ND	3.9	243.5	317.2	8.7	573.3	1402.5	ND
5/10/88	4	ND	ND	0.1	ND	0.4	13	3.1	5.5	16	15.1	1.6	106.4	94.8	27.9	41.5	13.3	3.8	0.1	54.6	272.5	17	344.2	437.1	1.7
6/15/89	4	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	750	0.6
8/11/89	4	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	327.5	1.9
5/18/90	4	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	2	4	3	23	10	ND	ND	ND	32	10	42	ND	ND
10/23/87	9	ND	ND	ND	ND	ND	1.5	2	4.3	41.4	5.5	ND	52.9	41.2	8.6	7.7	ND	ND	ND	54.7	110.4	ND	165.1	1200.3	0.5
11/10/87	9	0.6	3.5	4.5	3.3	1.3	75.5	44.5	93.6	295.3	52.3	24	227.5	180.3	40.5	33.5	7.5	ND	12	586.5	481.8	7.5	1087.8	64.6	0.6
2/26/88	9	ND	ND	ND	ND	ND	17.6	5	14.3	34.3	19.5	0.6	139.8	105	27.5	25.5	8.3	ND	ND	91.5	297.8	8.3	397.5	43.4	0.9
5/10/88	9	ND	ND	ND	ND	ND	0.5	ND	0.5	4.3	4	ND	42.5	33.3	16.8	15.5	4.3	ND	ND	9.3	108	4.3	121.5	23.2	0.5
6/15/89	9	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	2.5	ND	ND	ND	ND	ND	ND	2.5	ND	2.5	ND	ND
8/11/89	9	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	0.5	0.4
5/18/90	9	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	1	6	ND	18	2	ND	ND	ND	25	2	27	ND	NA

ND = Not Detected - See Table 20 for detection limits
NA = Not Analyzed
Loading Dates 10/30/87, 4/20/88, 8/4/88

Table 53. Wiggins Soil Treatment Unit - PAH, PCP, and OCDD in zone 1 soil, pentachlorophenol loaded cells (ppm)

DATE	CELL	NAPH	2-MET	1-MET	BIPH	ACTHY	ACTHE	DIBEN	FLORE	PHEN	ANTHR	CARBA	FLUOR	PYRENE	1,2-BZ	CHRYS	BEN-a	Bghi	2 RING	3 RING	4 RING	5 RING	TOTALPAH	PCP	OCDD
10/25/87	2	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
11/12/87	2	ND	ND	ND	ND	ND	1.8	1.3	2.4	13.5	10.4	1.1	4.6	3.7	ND	ND	ND	ND	ND	30.4	8.3	ND	38.7	153.1	ND
2/26/88	2	ND	ND	ND	1.8	ND	ND	ND	ND	3.3	0.8	ND	5.3	2	ND	2.8	ND	ND	1.8	4	10	ND	15.8	27.7	ND
5/10/88	2	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	5.8	21	1.5	2	ND	ND	ND	ND	30.3	ND	30.3	262.3	0.6
6/15/89	2	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	1.5	ND
8/11/89	2	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	1.3	0.3
5/18/90	2	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	3	4	ND	ND	ND	ND	ND	ND	7	ND	7	ND	ND
10/25/87	5	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	39.9	0.1
11/12/87	5	ND	ND	ND	2.8	ND	ND	ND	ND	3.2	1	ND	1	1	1.8	ND	ND	ND	2.8	4.1	3.8	ND	10.7	365.1	0.3
2/26/88	5	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	2	2.5	ND	ND	ND	ND	ND	ND	4.5	ND	4.5	269.4	0.2
5/10/88	5	ND	ND	ND	ND	ND	ND	ND	0.5	6.8	0.8	ND	7	7.5	ND	ND	ND	ND	ND	8	14.5	ND	22.5	457.9	0.7
6/15/89	5	ND	ND	ND	ND	ND	ND	ND	ND	3.5	5	ND	2.5	1.5	ND	ND	ND	ND	ND	8.5	4	ND	12.5	12.2	ND
8/11/89	5	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	3	4	ND	ND	ND	ND	ND	ND	7	ND	7	47	0.2
5/18/90	5	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
10/25/87	7	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
11/12/87	7	ND	ND	ND	ND	ND	0.4	ND	ND	3.7	ND	ND	4.1	ND	ND	3.5	ND	ND	ND	4.1	7.6	ND	11.6	52.6	0.1
2/26/88	7	ND	0.3	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	0.3	ND	ND	ND	0.3	42.8	0.1
5/10/88	7	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	11.6	0.1
6/15/89	7	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	0.9	ND
8/11/89	7	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	4	ND	ND	ND	ND	ND	ND	4	ND	4	3.2	0.2
5/18/90	7	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	3	ND	3	ND	ND	ND	ND	6	ND	6	ND	ND

ND = Not Detected - See Table 20 for detection limits
NA = Not Analyzed
Loading Dates 10/30/87, 4/20/88, 8/4/88

Table 54. Wiggins Soil Treatment Unit - PAH, PCP, and OCDD in zone 1 soil, control cells (ppm)

DATE	CELL	NAPH	2-MET	1-MET	BIPH	ACTHY	ACTHE	DIBEN	FLORE	PHEN	ANTHR	CARBA	FLUOR	PYRENE	1,2-BZ	CHRYS	BEN-a	Bghi	2 RING	3 RING	4 RING	5 RING	TOTALPAH	PCP	OCDD
10/25/87	3	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
11/12/87	3	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	77	0.1
2/26/88	3	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	2	ND	ND	ND	ND	2	ND	2	3.3	ND
5/10/88	3	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	54.4	0.1
6/15/89	3	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
8/11/89	3	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
5/18/90	3	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	NA
10/25/87	6	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	77.8	0.1
11/12/87	6	ND	ND	ND	ND	ND	ND	ND	ND	0.3	1.3	ND	0.3	1.1	0.8	ND	ND	ND	ND	1.6	2.3	ND	3.9	425.8	0.2
2/26/88	6	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	1.3	1.5	ND	ND	ND	ND	ND	ND	2.8	ND	2.8	46.8	0.1
5/10/88	6	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	0.5	1.3	ND	ND	ND	ND	ND	ND	1.8	ND	1.8	66.4	0.3
6/15/89	6	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
8/11/89	6	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	5.4	0.1
5/18/90	6	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
10/25/87	8	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
11/12/87	8	ND	ND	ND	ND	ND	ND	ND	ND	0.9	ND	ND	3.8	2.3	ND	1.4	ND	ND	ND	0.9	7.4	ND	8.3	2.4	ND
2/26/88	8	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	0.6	ND
5/10/88	8	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	0.5	ND	ND	ND	ND	ND	ND	0.5	ND	0.5	ND	0.6
6/15/89	8	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	4	ND
8/11/89	8	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	0.3
5/18/90	8	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	NA

ND - Not Detected - See Table 20 for detection limits
NA - Not Analyzed
Loading Dates 10/30/87, 4/20/88, 8/4/88

The background levels of PAH's in the three creosote-loaded cells were low enough to cause little concern, but the PCP background levels were very high in Cells 4 and 9. The PCP from the sludge pit might be the source of these high PCP levels. The variability of the PCP analysis results (especially the duplicate analyses) indicate that the PCP was not distributed uniformly through the soil but was in concentrated deposits. These high levels and variability were also found in control Cells 3 and 6, and PCP Cell 5. The lysimeter results (discussed below) also suffered from high and variable levels of PCP. Interestingly, the high PCP background levels in soil were not associated with high levels of OCDD.

Creosote Cells - 10/30/87 Loading

The three creosote cells (Cells 1, 4, and 9) were loaded with 28 kg per cell total PAH's (in waste treating solution) on 10/30/87, giving the calculated concentration of the individual PAH's in the incorporation zone noted in Table 14. Calculated total PAH's in the incorporation was 1666 ppm.

Creosote Cells - 11/13/87 Sampling

Cell 1 sampling results indicated a concentration of 1339 ppm total PAH's in Zone 1 Subcell 1 and 1120 ppm total PAH's in Zone 1 Subcell 2. These PAH's were mostly the three and four-ring compounds. Three and four-ring PAH's were found in Zone 2 of Subcell 1 at 50 ppm, and a trace (0.6 ppm) of pyrene was found in Zone 3. Three and four-ring PAH's were found in Zones 2 (27 ppm) and 3 (26 ppm) of Subcell 2.

Cell 4 sampling results indicated a concentration of 607 ppm total PAH's in Zone 1 Subcell 1 and 220 ppm total PAH's in Zone 1 Subcell 2; again, mostly three and four-ring compounds were found. Three and four-ring PAH's were found in Zone 2 of Subcell 1 at 60 ppm. No PAH's were found in Zone 3 of Subcell 1 or Zones 2 and 3 of Subcell 2.

Cell 9 sampling results indicated a concentration of 774 ppm total PAH's in Zone 1 Subcell 1 and 1402 ppm total PAH's in Zone 1 Subcell 2. No PAH's were found above detection limits in Zones 2 or 3 in either subcell.

The three and four-ring PAH's apparently moved downward in small amounts in Cells 1 and 4 during the two weeks between loading and sampling. The two and five-ring PAH's apparently did not move downward. This result may be due to rapid transformation, volatilization or fixation, or just that these components were applied in such small amounts that the levels moving down were below detection limits. The lack of detectable levels of PAH's in Zones 2 and 3 of Cell 9 is interesting, particularly since Cell 9 had much more of the original topsoil left than Cells 1 and 4 where

the original topsoil was mostly removed during site preparation. Cell 9 had high levels of organic matter in Zone 1 soil (Table 55), and this may have reduced downward movement of PAH's.

Creosote Cells - 2/26/88 Sampling

Cell 1 sampling results indicated a concentration of 340 ppm total PAH's in Zone 1 Subcell 1 and 367 ppm total PAH's in Zone 1 Subcell 2. No PAH's were found in Zones 2 and 3 of Subcell 1, but four-ring PAH's were found in Zones 2 and 3 of Subcell 2 at 5-7 ppm. No two or five-ring PAH's were found in Zones 1, 2 or 3.

Cell 4 sampling results indicated a concentration of 687 pm total PAH's in Zone 1 Subcell 1 and 460 ppm total PAH's in Zone 1 Subcell 2. Four-ring PAH's were found in Zones 2 and 3 of Subcell 1 at 4-6 ppm, but no PAH's were found in Zones 2 and 3 of Subcell 2.

Cell 9 sampling results indicated a concentration of 216 ppm total PAH's in Zone 1 Subcell 1 and 579 ppm total PAH's in Zone 1 Subcell 2. No PAH's were found above detection limits in Zones 2 or 3 of Subcell 1 but four-ring PAH's were found in Zone 2 Subcell 2 at 18 ppm and Zone 3 Subcell 2 at 8 ppm.

After loading, three and four-ring PAH's apparently moved rapidly downward in the soil in Cell 1, but moved more slowly in Cells 4 and 9. PAH's were found in Cell 1 Zones 2 and 3 in both subcells at 14 days after loading (11/13/87 sampling), but only in Subcell 1 Zone 2 in Cell 4; and in Cell 9, PAH's were not found in either Zone 2 or 3 in either subcell. By the 2/26/88 sampling, no PAH's were found in Cell 1 Subcell 1 Zones 2 and 3, but PAH's remained in Cell 1 Subcell 2 Zones 2 and 3. PAH levels in Zone 1 soil of both Cell 1 subcells had been reduced about 75%. PAH's in Cell 4 Zone 1 soil had apparently increased in both subcells between the 11/13/87 and 2/26/88 sampling. The apparent increase was primarily found in the four-ring compounds, especially fluoranthene and pyrene. The PAH's in Cell 4 Subcell 1 Zone 2 had decreased by 2/26/88 but PAH's were found in Zone 3 for the first time. No PAH's were found in Cell 4 Subcell 2 Zones 2 and 3 at the 2/26/88 sampling. PAH's in Zone 1 soil of Cell 9 Subcell 1 had decreased about 66% by the 2/26/88 sampling and no PAH's were found in Zones 2 and 3. PAH's in Zone 1 soil of Cell 9 Subcell 2 had decreased about 60% by the 2/26/88 sampling, but PAH's were again found in Zones 2 and 3 of Subcell 2. These PAH levels in Cell 9 Subcell 2 Zones 2 and 3 were less than the background levels, but PAH levels in these zones, measured 14 days after loading, were below detection limits, so some downward movement may have occurred between sampling events.

Table 55: Nutrients and pH of treatment unit soil after first loading.

Cell	Total Kjeldahl Nitrogen (ppm)	Total Organic Carbon (ppm)	Total Phosphorus (ppm)	pH
Date 11/13/87				
1	408.4	6748.5	611.9	7.05
2	714.5	8486.7	933.0	7.01
3	561.2	8224.9	923.1	6.74
4	102.0	6997.0	301.8	6.52
5	1173.4	17184.2	1785.8	7.22
6	563.1	7754.9	782.6	6.44
7	255.7	5973.0	541.7	6.81
8	251.4	5933.2	601.9	6.91
9	615.3	11775.9	822.7	7.04

It appears that both transformation and migration of PAH's were taking place during this period in the creosote cells. The three-ring PAH's were apparently readily transformed, but the four-ring compounds were more persistent. Cell 4 evidently had no transformation occurring, but Cells 1 and 9 showed good transformation rates. The explanation for the difference in results between Cell 4 and Cells 1 and 9 is not obvious, but the higher PCP background levels in Cell 4 may have inhibited transformation of PAH's. PCP levels in Cells 1 and 9 were below 100 ppm, but PCP levels in Cell 4 were as high as 2600 ppm. The high PCP background levels found in Cell 9 were not seen at later sampling dates, but the high background levels seen in Cell 4 persisted until the end of the study.

Creosote Cells - 4/20/88 Loading

Two of the three creosote cells (Cells 1 and 4) were loaded with 30 kg per cell total PAH's (in waste treating solution) on 4/20/88, giving the calculated concentration of the individual PAH's in the incorporation zone noted in Table 14. Calculated total PAH concentration was 1768 ppm. Cell 9 was not loaded.

Creosote Cells - 5/10/88 Sampling

Cell 1 sampling results indicated 295 ppm, 252 ppm, and 367 ppm total PAH's in Zones 1, 2, and 3, respectively, in Subcell 1. In Cell 1 Subcell 2 total PAH's were 1830 ppm, 93 ppm, and 79 ppm in Zones 1, 2, and 3, respectively.

In Cell 4, total PAH's in Subcell 1 Zones 1, 2, and 3 were 306 ppm, 7 ppm, and 5 ppm, respectively. In Cell 4 Subcell 2 total PAH's were 382 ppm in Zone 1. No PAH's were found in Zones 2 and 3 of Subcell 2.

Cell 9 sampling results indicated total PAH levels of 114 ppm, 5 ppm, and nondetectable in Zones 1, 2, and 3 of Subcell 1. Total PAH's in Zones 1, 2, and 3 of Subcell 2 were 130 ppm, nondetectable, and 47 ppm, respectively. The Zone 1 Subcell 1 levels were about 28% of the levels at the 2/26/88 sampling, and Subcell 2 Zone 1 levels were about 41% of the 2/26/88 sampling, indicating good transformation rates. The three-ring compounds were the most readily transformed. The small amounts of PAH's found in Subcell 2 Zone 2 and 3 were four-ring compounds.

Creosote Cells - 7/29/88 Sampling (Incorporation Zone)

Total PAH's in the incorporation zone soil of Cells 1 and 4 were 123 ppm and 142 ppm, respectively. PAH's in the incorporation zone of Cell 9 were below detection limits (see Table 71 in Appendix F).

Creosote Cells - 8/4/88 Loading

The three creosote cells (Cells 1, 4, and 9) were loaded with 67 kg per cell total PAH's (in waste treating solution) on 8/4/88, giving the calculated concentration of the individual PAH's in the incorporation zone noted in Table 14. Calculated total PAH was 3954 ppm.

Creosote Cells - 10/7/88 Sampling (Incorporation Zone)

Total PAH's in the incorporation zone soil of Cells 1, 4, and 9 were 475 ppm, 1017 ppm, and 87 ppm, respectively.

Creosote Cells - 6/15/89 Sampling

No PAH's were found in Cells 1 and 4 in Zones 1, 2, or 3 at this sampling date. PAH's were found in Cell 9 only in Subcell 2 Zones 1 and 2 with total PAH levels of 5ppm and 44 ppm, respectively.

Creosote Cells - 7/13/89 Sampling (Incorporation Zone)

Total PAH's in the incorporation zone soil of Cell 1 Subcells 1 and 2 were 156 ppm and 376 ppm, respectively. Total PAH's in the incorporation zone soil of Cell 4 Subcells 1 and 2 were 130 ppm and 522 ppm, respectively. Total PAH's in the incorporation zone soil of Cell 9 Subcells 1 and 2 were 67 ppm and 1175 ppm, respectively.

Creosote Cells - 8/11/89 Sampling

The only PAH found in Cell 1 at this sampling date was 6 ppm pyrene in Subcell 2 Zone 2. No PAH's were found in Zones 1 and 2 of Cells 4 or 9. Cell 9 had total PAH's of 5 ppm in Subcell 2 Zone 1 and 44 ppm in Subcell 2 Zone 2. Zone 3 was not sampled at this date. The zone of incorporation soil was sampled and total PAH's in Cell 1 Subcells 1 and 2 were 137 ppm and 400 ppm, respectively. Total PAH's in the incorporation zone soil of Cell 4 Subcells 1 and 2 were 75 ppm and 153 ppm, respectively. Total PAH's in the incorporation zone soil of Cell 9 Subcells 1 and 2 were 6 ppm and 7 ppm, respectively.

Creosote Cells - 9/8/89 Sampling (Incorporation Zone)

Total PAH's in the incorporation zone soil of Cell 1 Subcells 1 and 2 were 136 ppm and 122 ppm, respectively. Total PAH's in the incorporation zone soil of Cell 4 Subcells 1 and 2 were 159 ppm and 73 ppm, respectively. No PAH's were found in Cell 9 soil.

Creosote Cells - 10/27/89 Sampling (Incorporation Zone)

Total PAH's in the incorporation zone soil of Cell 1 Subcells 1 and 2 were 78 ppm and 92 ppm, respectively. Total PAH's in the incorporation zone soil of Cell 4 Subcells 1 and 2 were 51 ppm and 94 ppm, respectively. No PAH's were found in Cell 9 soil.

Pentachlorophenol Cells - Background Levels

PCP background levels in the PCP loaded cells (2, 5, and 7) were above detection limits only in Cell 5 (Table 53). PCP levels of 12 ppm were found in Subcell 1 Zone 1 of Cell 5. PCP at 68 ppm was found in Subcell 2 Zone 1, 21 ppm in Zone 2 and 31 ppm in Zone 3. These background levels were much less than were found in creosote loaded Cells 4 and 9 and control Cell 6.

No PAH's were found in the penta cells before loading. OCDD was found only in Cell 5 Subcell 2 Zone 1 soil at 0.1 ppm. See Tables 68-70 in Appendix F.

Pentachlorophenol Cells - 10/30/87 Loading

The three pentachlorophenol cells (Cells 2, 5, and 7) were loaded with 1.6 kg per cell PCP (in waste treating solution) on 10/30/87, giving the calculated concentration of PCP in the incorporation zone of 94 ppm (Table 14).

Pentachlorophenol Cells - 11/13/87 Sampling

Cell 2 sampling results indicated PCP at 98 ppm in Subcell 1 Zone 1, with no PCP found in Zones 2 and 3 of Subcell 1. PCP in Subcell 2 Zone 1 was 208 ppm, in Zone 2 was 16 ppm, and Zone 3 was 12 ppm.

Cell 5 sampling results indicated PCP in Subcell 1 Zone 1 at 145 ppm, 7 ppm in Zone 2 and below detection limits in Zone 3. PCP was found at 585 ppm in Subcell 2 Zone 1, 30 ppm in Zone 2, and 3 ppm in Zone 3.

Cell 7 sampling results indicated PCP in Subcell 1 Zone 1 at 39 ppm, Zone 2 at 37 ppm, and Zone 3 at 2 ppm. PCP was found at 66 ppm in Subcell 2 Zone 1, 6 ppm in Zone 2, and 2 ppm in Zone 3. It should be noted that the cells which contained background levels of PCP but which were not loaded with PCP (Cells 4, 6, and 9), were also remediated during the study. The concentration changes in Cell 4 were erratic but Cells 6 and 9, in general, showed major reduction in the levels of PCP.

No OCDD was found in Cell 2. OCDD was found in Cell 5 Subcell 2 Zone 1 at 0.8 ppm. OCDD was also found in Cell 7 Subcells 1 and 2 Zones 1 and 2 at 0.1 ppm.

Some movement of PCP apparently occurred in the time between the first loading and the first sampling date after loading, since PCP was found in Cells 2 and 7 in Zones 2 and 3 where no PCP had been indicated in the background sampling. OCDD levels would be expected to increase due to OCDD supplied from the waste treating solution. The lack of OCDD in Cell 2 indicates some mechanism to transform or remove OCDD was operating or, more likely, that levels were below detection limits. Levels of OCDD in Cell 5 remained constant or decreased slightly after loading, while the levels in Cell 7 increased after loading. It should be kept in mind that the OCDD levels are low and close to the detection limit.

Pentachlorophenol Cells - 2/26/88 Sampling

Cell 2 sampling results indicated PCP at less than 1 ppm in Subcell 1 Zone 1, and below detection limits in Zones 2 and 3. PCP in Subcell 2 was 55 ppm in Zone 1 and below detection limits in Zones 2 and 3.

Cell 5 sampling results indicated PCP at 15 ppm in Subcell 1 Zone 1 and below detection limits in Zones 2 and 3. PCP in Subcell 2 was 524 ppm in Zone 1, 32 ppm in Zone 2, and 93 ppm in Zone 3.

Cell 7 sampling results indicated PCP at 70 ppm in Subcell 1 Zone 1 and below detection limits in Zones 2 and 3. PCP was found at 15 ppm in Subcell 2 Zone 1 and about 1 ppm in Zones 2 and 3.

OCDD levels of 0.1 ppm were noted in Cell 5 Zone 1, where OCDD was below detection limits at the previous sampling date. In Cell 5 Subcell 2, OCDD apparently had moved downward in the soil into Zones 2 and 3. In Cell 7, OCDD was found only in Zone 1. The OCDD earlier found in Zone 2 of Cell 7 had dropped below detection limits. The OCDD analysis for Cell 2 at this date is not available.

The variability of the PCP levels make interpretation of the results difficult. It appears that some transformation and migration was taking place, but the relative contribution of each process to the results is difficult to assess. The PCP from the sludge pit evidently left areas of high PCP concentrations scattered across the cells of the soil treatment unit. When the randomly chosen sample locations coincided with an area of high PCP, the resulting high analyses confounded the results, especially in Cell 5. This same variability of PCP concentrations was found in Cells 4, 6, and 9. However, Cell 1 apparently had good transformation of PCP, with PCP levels in Subcell 1 Zone 1 reduced to less than 1% of the 11/13/87 measured value, and Subcell 2 Zone 1 levels reduced to 25% of 11/13/87 levels. Cell 5 Subcell 1 and Cell 7 Subcell 2 also indicated good transformation, but there was an apparent increase in PCP levels in Cell 5 Subcell 2 and Cell 7 Subcell 1.

Pentachlorophenol Cells - 4/20/88 Loading

Two of the the three pentachlorophenol cells (cells 2 and 5) were loaded with 3.15 kg per cell PCP (in waste treating solution) on 4/20/88, giving the calculated concentration of PCP in the incorporation zone of 186 ppm (Table 14).

Pentachlorophenol Cells - 5/10/88 Sampling

Cell 2 sampling results indicated 149 ppm, 3 ppm, and undetectable levels of PCP in Zones 1, 2, and 3, respectively, of Subcell 1. Cell 2 Subcell 2 results were 376 ppm, 5 ppm, and 1 ppm PCP in Zones 1, 2, and 3 of Subcell 2.

Cell 5 results were 97 ppm, 3 ppm, and 6 ppm PCP in Zones 1, 2, and 3, respectively, of Subcell 1. Subcell 2 results were 819 ppm, less than 1 ppm, and undetectable levels in Zones 1, 2, and 3.

Cell 7 results were 4 ppm PCP in Subcell 1 Zone 1, and undetectable levels in Zones 2 and 3 of Subcell 1. Subcell 2 results were 19 ppm in Zone 1 and undetectable levels of PCP in Zones 2 and 3. PCP levels had decreased from the 10/30/87 loading except in Subcell 2 Zone 1.

OCDD levels in Cell 2 Zone 1 soil had increased to 0.4 ppm for Subcell 1 and 0.7 ppm for Subcell 2. No OCDD was found in Zone 2 and 3 soil in Cell 2. OCDD in Cell 5 Zone 1 soil increased to 0.4 ppm for Subcell 1 to 0.9 ppm for Subcell 2. No OCDD was found in Zones 2 and 3 of Subcell 1 or 2. The OCDD previously found in Zones 2 and 3 of Subcell 2 had fallen below detection limits. OCDD in Cell 7 was essentially unchanged from the previous sampling.

Pentachlorophenol Cells - 7/29/88 Sampling (Incorporation Zone)

PCP in the zone of incorporation in Cell 2 was 19 ppm. Cell 5 PCP was 20 ppm. Cell 7 PCP was below detection limits (Table 71 in Appendix F).

Pentachlorophenol Cells - 8/4/88 Loading

The three pentachlorophenol cells (Cells 2, 5, and 7) were loaded with 7.9 kg per cell PCP (in waste treating solution) on 8/4/88, giving the calculated concentration of PCP in the incorporation zone of 463 ppm (Table 14).

Pentachlorophenol Cells - 10/7/88 Sampling (Incorporation Zone)

PCP in the zone of incorporation in Cell 2 was 273 ppm. Cell 5 PCP was 480 ppm. Cell 7 PCP was 46 ppm.

Pentachlorophenol Cells - 6/15/89 Sampling

Cell 2 results indicated less than 1 ppm PCP in Zone 1 of Subcell 1, and 2 ppm PCP in Zone 1 Subcell 2. No PCP was found in Zones 2 and 3 of either subcell.

Cell 5 results indicated 24 ppm PCP in Zone 1 of Subcell 2. No PCP was found in other locations in the cell.

Cell 7 results indicated 2 ppm PCP in Zone 1 and 27 ppm PCP in Zone 3 of Subcell 2. No PCP was found in other locations in the cell. These results indicate that PCP transformation was taking place in all three PCP loaded cells.

OCDD was not found in the penta loaded cells at any depth at this sampling date. It appears that some mechanism was removing OCDD from the system. This may be related to the increased disappearance of PCP noted during this part of the study.

Pentachlorophenol Cells - 7/13/89 Sampling (Incorporation Zone)

PCP in the zone of incorporation in Cell 2 Subcell 1 was 3 ppm; Subcell 2 PCP was 40 ppm. Cell 5 Subcell 1 PCP was 29 ppm; Subcell 2 PCP was 4 ppm. Cell 7 Subcell 1 PCP was 72 ppm; Subcell 2 PCP was 8 ppm (Table 71 in Appendix F).

Pentachlorophenol Cells - 8/11/89 Sampling (Incorporation Zone)

PCP in the zone of incorporation in Cell 2 Subcell 1 was 5 ppm; Subcell 2 PCP was 26 ppm. Cell 5 subcell 1 PCP was 13 ppm; Subcell 2 PCP was below detection limits. Cell 7 Subcell 1 PCP was 8 ppm; Subcell 2 PCP was 2 ppm.

Pentachlorophenol Cells - 8/11/89 Sampling

Only Zones 1 and 2 were sampled at this time.

Cell 2 results indicated about 1 ppm PCP in Zone 1 of both Subcells. No PCP was found in Zone 2 of either subcell.

Cell 5 results indicated 39 ppm and 98 ppm PCP in Zones 1 and 2, respectively, of Subcell 1. PCP levels of 55 ppm and 3 ppm were found in Zones 1 and 2 of Subcell 2.

Cell 7 results indicated 3 ppm PCP in Zone 1 and 120 ppm PCP in Zone 2 of Subcell 1. In Subcell 2 Zone 1 PCP levels were 4 ppm and Zone 2 levels were 3 ppm.

OCDD was noted in all three penta loaded cells at this loading.

The variability of PCP analysis results is indicated by the apparent increase in PCP levels in Cells 5 and 7.

Pentachlorophenol Cells - 9/8/89 Sampling (Incorporation Zone)

PCP in the zone of incorporation in Cell 2 Subcell 1 was 2 ppm; Subcell 2 PCP was 7 ppm. Cell 5 Subcell 1 PCP was 55 ppm; Subcell 2 PCP was 14 ppm. Cell 7 Subcell 1 PCP was 39 ppm; Subcell 2 PCP was 4 ppm.

Pentachlorophenol Cells -10/27/89 Sampling (Incorporation Zone)

PCP in the zone of incorporation in Cell 2 Subcell 1 was 3 ppm; Subcell 2 PCP was 22 ppm. Cell 5 Subcell 1 PCP was 4 ppm; Subcell 2 PCP was 2 ppm. Cell 7 Subcell 1 PCP was 2 ppm; Subcell 2 PCP was 30 ppm.

Table 14 shows the total expected (calculated) levels of PAH's and PCP in the cells after all the loadings. It may be noted that remediation of PAH's was outstandingly successful, with Cells 4 and 9 showing no PAH's above detection limits at the 8/11/89 sampling date, and Cell 1 showing only 6 ppm pyrene in Subcell 2 Zone 2 soil. There evidently was no accumulation of PAH's in the soil under the conditions prevailing during this study. The PCP results could not be said to be as markedly successful as the PAH results, due primarily to the variability of the PCP data. Nevertheless, the PCP levels remaining at the 8/11/89 sampling date were well below the levels found during the course of the study, and it appears that acceptable transformation was taking place.

MICROORGANISMS IN CELL SOIL

Microorganism counts in the soil core samples from the cells (data not shown) increased rapidly after addition of the chicken manure and loading, and the counts stayed between 2 and 10 million organisms per gram of soil throughout the course of the experiment. The control cells tended to have slightly lower levels of microorganisms than the PAH or PCP cells, but all cells maintained high levels throughout the course of the experiment.

SOIL PORE LIQUID SAMPLES

The background levels of PAH's found in the lysimeters was minimal (Table 56). Only in Cell 9 were PAH's found in lysimeter samples before loading. Acenaphthene and fluorene were found in lysimeter 3 of Subcell 2 at 17 and 29 ppb, respectively. After the first loading (10/30/87) three and four-ring PAH's were found in lysimeter 3 of Cell 1 Subcell 1 at the 1/13/88 and 3/23/88 sampling date. PAH's were not found in any other lysimeter samples throughout the course of the study.

PCP was found in many of the lysimeters before loading the cells (Table 57). PCP levels as high as 69,000 ppb were found. The PCP levels showed a generally consistent pattern of decrease during the course of the study except in Cell 2 Subcell 2 lysimeter 1 and Cell 4 Subcell 2 lysimeter 3, where PCP levels varied considerably.

There seems to be little correlation between PCP and PAH levels in lysimeter samples and the cell loading activities. The difficulty of interpreting the results is compounded by the fact that most of the lysimeters did not yield enough sample for analysis (>50ml) during most of the study period. The soil in which the lysimeters were set seemed to be impermeable enough to greatly limit water movement down through the soil and into the lysimeters. It is apparent, however, that movement of PAH's in the soil pore liquid was negligible. The movement of PCP is more difficult to determine due to the high background levels.

Groundwater

The data from the three groundwater monitoring wells is shown in Table 58. Background levels of PCP and PAHs in the groundwater are not available, but the first sample (8/23/88), taken after all three loadings, indicated no detectable amounts of PCP or PAHs in either the upgradient or downgradient wells. At the second sample (12/2/88), very low levels of PCP and PAH's were found in one downgradient well, and low levels of PAH's in the other downgradient well. At the next sampling date (6/19/89), low levels of PCP were indicated in the upgradient well and one downgradient well. At the last sampling date (9/1/89), no PCP or PAH's were found in the wells. Considering the very low levels of contamination found in the groundwater, the fact that the highest levels were found in the upgradient well, and the location of the soil treatment unit on an active wood treating site, it seems unlikely that the soil treatment unit was the cause of the PAH's and PCP found in the monitoring wells.

GENERAL DISCUSSION

The results of these experiments indicate that PAH's and PCP can be transformed at practically useful rates in soil. Although the variability of the data is relatively large in some cases, the general trend is clear. Based on treatability data in the soils tested, soil treatment of creosote and PCP wood treating wastes appears to provide a viable management alternative. The agreement of laboratory and field study data on transformation and migration is very encouraging and certainly indicates that soil treatment of these compounds can be used in many wood treating site cleanup

Table 56. Wiggins Soil Treatment Unit - PAH in lysimeters (ppb)

			LYSIMETER				INDIVIDUAL PAHS								INDIVIDUAL PAHS						RING GROUPS				
DATE	CELL	SUBCELL	DEPTH	NAPH	2-MET	1-MET	BIPH	ACTHY	ACTHE	DIBEN	FLORE	PHEN	ANTHR	CARBA	FLUOR	PYRENE	1,2-BZ	CHRYS	BEN-a	BghI	2 RING	3 RING	4 RING	5 RING	TOTALPAH
10/22/87	9	2	L3	ND	ND	ND	ND	ND	17	ND	29	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	46	ND	ND	46
1/13/88	1	1	L3	ND	ND	ND	ND	ND	142.7	21.6	28.1	13	28.1	15.1	54.1	63.8	ND	ND	ND	ND	ND	248.6	117.9	ND	366.5
3/23/88	1	1	L3	ND	ND	ND	ND	ND	ND	ND	17.3	ND	ND	ND	23.3	20	ND	ND	ND	ND	ND	17.3	43.3	ND	60.6

ND = Not Detected - See Table 20 for detection limits

Table 57. Wiggins Soil Treatment Unit - Pentachlorophenol in lysimeters (ppb)

		LYSIMETER	SAMPLING DATE									
CELL	SUBCELL	DEPTH	9/22/87	10/21/87	1/13/88	3/23/88	5/12/88	7/28/88	11/11/88	5/22/89	8/9/89	5/18/90
1	1	L1	6261.1	NS	27.6	NS	17.5	NS	NS	ND	ND	ND
		L3	NS	NS	265	320	112	ND	ND	NS	ND	ND
	2	L1	2754.1	2454.1	2019.3	ND	NS	NS	NS	ND	NS	ND
		L3	2215.3	1191.3	469.3	ND	ND	ND	ND	ND	ND	ND
2	1	L1	1008.9	NS	NS	NS	ND	NS	NS	NS	NS	NS
		L3	NS	NS	NS	NS	NS	2.9	NS	NS	NS	ND
	2	L1	311.9	310.4	1724.4	1850	NS	NS	NS	NS	NS	NS
3	1	L1	NS	NS	NS	ND	ND	53.2	ND	NS	NS	NS
		L2	1385.5	NS	NS	NS	NS	NS	NS	NS	NS	NS
	2	L1	4211.6	5329.3	1356.5	255	19.2	72.4	ND	ND	NS	ND
		L2	15392.8	6303.6	NS	2550	1080	362	195	ND	NS	NS
		L3	15912.2	1737.2	670.3	NS	NS	ND	NS	NS	23.3	ND
4	1	L2	3486.7	4006.8	496.6	NS	NS	NS	NS	NS	NS	NS
	2	L1	NS	NS	NS	NS	NS	4220	NS	NS	NS	NS
		L2	NS	22371.1	NS	NS	NS	NS	NS	NS	NS	NS
		L3	69204.1	NS	808.8	2673.8	4800	4440	1100	ND	5900	ND
5	1	L2	105.2	ND	NS	89.6	NS	NS	NS	NS	NS	NS
		L3	96.9	ND	NS	NS	NS	NS	NS	NS	NS	NS
	2	L3	115.7	NS	NS	48.9	ND	ND	NS	NS	NS	ND
6	1	L1	NS	NS	NS	NS	NS	NS	NS	NS	125	NS
	2	L1	41.2	NS	NS	425	4.6	ND	ND	ND	NS	ND
		L2	71.3	NS	NS	73	6.3	ND	66.6	ND	226	NS
7	1	L1	2377.3	NS	NS	NS	NS	NS	NS	NS	NS	NS
		L2	103.3	ND	67.5	NS	NS	NS	NS	NS	NS	NS
		L3	76	ND	NS	NS	NS	NS	NS	NS	NS	NS
8	1	L1	98.9	ND	NS	NS	6.1	NS	NS	NS	NS	ND
		L3	540.3	NS	NS	NS	NS	NS	NS	NS	NS	NS
9	1	L1	875.9	ND	NS	NS	NS	NS	NS	NS	NS	NS
		L2	3369.2	NS	NS	NS	NS	NS	NS	NS	NS	NS
		L3	1057.8	ND	NS	NS	NS	NS	NS	NS	NS	ND
	2	L2	83.1	ND	NS	NS	NS	NS	NS	NS	NS	NS
		L3	1243.4	ND	NS	NS	NS	NS	NS	NS	NS	NS

ND = Not Detected - See Table 20 for detection limits
NS = No Sample available
LYSIMETER/DATE COMBINATIONS NOT SHOWN HAD NO SAMPLE AVAILABLE

scenarios. Those soils with high sand content would need to be monitored very carefully, but the other soils considered in this study appear to be well suited for soil treatment. The data variability does support the need for conducting site-specific treatability studies to discern the appropriate operation and management scenario for a given site.

Further study of treatment of PCP and the higher molecular weight PAH's is needed to determine the most advantageous environmental conditions and management techniques for more rapid transformation of these compounds. Many of these compounds were readily transformed in some cases. Therefore, further study may reveal reliable techniques for enhancing soil treatment as a practically useful management alternative for these recalcitrant compounds. Since the environmental problems confronting the wood treating industry are almost unlimited and since the resources available to solve these problems are quite limited, soil treatment is very attractive as a reliable, safe, economical remediation technique.

Table 58: Pentachlorophenol and total PAH's in Wiggins LTDU monitoring wells (lg/L).

Date	Compounds	Downgradient Well	Upgradient Well A	Downgradient Well B
8/23/88	PCP	0	0	0
	PAH	0	0	0
12/02/88	PCP	0	0.148	0
	PAH	0	0.085	0.539
6/19/89	PCP	0.622	0.043	0
	PAH	0	0	0
9/01/89	PCP	0	0	NS
	PAH	0	0	NS

NS = No sample available.

SECTION 6

SUMMARY

Eight wood-treating plant sites were chosen to study the effectiveness of land treatment toward remediation of wood treating wastes. The morphological, chemical, and microbiological parameters of the soil at each site were characterized. Typical wood-treating waste sludges from each site were chemically analyzed. Soil samples were taken from each site to study the rate of microbiological breakdown of wood-treating waste components. In a preliminary experiment, a synthetic waste was mixed with each soil at 1% of the dry weight of the soil in order to ascertain waste breakdown rates using the same waste for all soils. In a second experiment, waste sludge from each site was mixed with soil from each site at four loading rates (0.0%, 0.33, 1.0, and 3.0% by weight). Chicken manure was added to the soils at 4% weight. The soils were tested at thirty-day intervals to determine microbe populations and amounts of waste compounds remaining. Degradation rates were calculated for PCP, OCDD, and seventeen PAH's.

The general conclusions from this study are that PAH's and PCP are readily degraded in soil systems. PAH's were transformed readily in all the soils tested, but PCP was transformed much more quickly in soils with long-term exposure to PCP. Lower molecular weight PAH's and PCP were usually transformed more quickly than higher molecular weight PAH's and PCP. Application of PAH's and PCP containing wastes to soil greatly increases the population of PAH's and PCP adapted microorganisms in the soil. The results of this study indicate that land treatment is an effective alternative for remediation of PAH's and PCP containing wood treating wastes.

REFERENCES

Adams, J. and C. Giam. 1984. Polynuclear Azaarenes in Wood Preservative Wastewater. Environ. Sci. Technol. 18(5):391-394.

Ahlborg, V. G., J. E. Lindgren, and M. Mercier. 1974. Metabolism of Pentachlorophenol. Arch. Toxicol. 32(4)271-281.

Alliot, H. 1975. Chlorodioxins in Pentachlorophenol. British Wood Pres. Assoc. News Sheet. London.

Allison, L. E. 1935. Organic soil carbon by reduction of chromic acid. Soil Sci. 40:311-320.

Anderson, K. J., E. G. Leighty, and M. T. Takahashi. 1972. Evaluation of Herbicides for Possible Mutagenic Properties. J. Agr. Food Chem. 20:649-656.

Aprill, Wayne, Ronald C. Sims, Judith L. Sims, and John Matthews. Assessing Detoxification and Degradation of Wood Preserving and Petroleum Wastes in Contaminated Soil. Waste Management and Research, Vol. 8. 1990. pp. 45-65.

Barr, A. J., J. H. Goodnight, and J. P. Sall. 1979. SAS Users Guide. SAS Institute, Raleigh, NC, 494 pp.

Becker, G. 1977. Experience and Experiments with Creosote for Crossties. Proc. Am. Wood-Pres. Assoc. 73:16-25.

Bevenue, A. and H. Beckman. 1967. Pentachlorophenol: A Discussion of Its Properties and Its Occurrence as a Residue in Human and Animal Tissues. Residue Rev. 19:83-134.

Blake, G. R. 1965. Bulk density: Core method. In C. A. Black (Ed.) Methods of Soil Analysis, Part I, Agronomy 9:375-377. Amer. Soc. of Agron., Madison, WI.

Braun, W. H. and M. W. Sauerhoff. 1976. The Pharmacokinetic Profile of Pentachlorophenol in Monkeys. Toxicol. Appl. Pharmacol. 38:525-533.

Briggs, G. G. 1975. The Behavior of the Nitrification Inhibitor "N-Serve" in Broadcast and Incorporated Application to Soil. J. Sci. Food Agric. 26:1083-1092.

Brown, K. W. and Associates. 1980. Hazardous Waste Land Treatment. SW-874, U. S. Environmental Protection Agency, Washington, DC.

_____ and K. C. Donnelly. 1984. Mutagenic Activity of Runoff and Leachage Water from Hazardous Waste Land Treatment. Environ. Pollut. (Series A) 35:229-246.

Bulman, T. L., S. Lesage, P. J. A. Fowles, and M. D. Webber. 1985. The Persistence of Polynuclear Aromatic Hydrocarbons in Soil. PACE Report No. 85-2, Petroleum Assoc. for Conservation of the Canadian Environ. Ottawa, Ontario.

Burdell, C. A. 1984. Overview of the Wood Preserving Industry, pp. 7-14. IN: Hazardous Waste Treatment and Disposal in the Wood Preserving Industry, Atlanta, GA.

Buselmaier, W., G. Roehrborn, and P. Propping. 1973. Comparative Investigations on the Mutagenicity of Pesticides in Mammalian Test Systems. Mutat. Research 21(1):25-26.

Buser, H. R. 1975. Polychlorinated Dibenzo-p-dioxins, Separation and Identification of Isomers by Gas Chromatography - Mass Spectrometry. J. Chromtog. 114:95-108.

_____. 1976. High Resolution Gas Chromatography of Polychlorinated Dibenzo-p-dioxins and Dibenzofurans. Anal. Chem. 48:1553.

Butterfield, D. J. and J. D. Devay. 1975. An Improved Soil Assay for Verticillim dahliae. Proc. Am. Phytopathol. Soc. 2:111 (Abstract).

_____ and J. D. Devay. 1977. Reassessment of Soil Assay for Verticillim dahliae. Phytopathology 67:1073-1078.

Carrol, D. 1970. Clay minerals: A guide to their X-ray Identification. The Geological Society of America. Special paper 126. Boulder, CO. 80 p.

Cerniglia, C. E. and D. T. Gibson. 1979. Oxidation of Benzo(a)-pyrene by the Filamentous Fungus Cunninghamelia elegans. J. Biol. Chem. 254(23):12174-12180.

_____ and S. A. Crow. 1981. Metabolism of Aromatic Hydrocarbons by Yeasts. Arch. Microbiol. 129:9-13.

_____. 1984. Microbial Metabolism of Polycyclic Aromatic Hydrocarbons, pp. 30-71. IN: A. I. Laskin, Ed. Adv. in Appli. Microbiol., Vol. 30, Academic Press, New York, NY.

Choi, J. and S. Aomine. 1972. Effects of the Soil on the Activity of Pentachlorophenol. Soil Sci. Plant Nutr. 18(6):255-260.

_____. 1974. Adsorption of Pentachlorophenol by Soils. Soil Sci. Plant Nutr. 20(2):135-144.

_____. 1974a. Mechanisms of Pentachlorophenol Adsorption by Soils. Soil Sci. Plant Nutr. 20(4):371-379.

Chu, J. P. and E. J. Kirsch. 1972. Metabolism of Pentachlorophenol by an Axenic Bacterial Culture. Appl. Microbiol. 23(5):1033-1035.

_____. 1973. Utilization of Halophenols by a Pentachlorophenol Metabolizing Bacterium. Dev. Ind. Microbiol. 14:264-273.

Crosby, D. G. 1981. Environmental Chemistry of Pentachlorophenol. Pure Appl. Chem. 53:1052-1080.

Cserjesi, A. J. 1972. Detoxification of Chlorinated Phenols. Int. Biodeterior. Bull. 8(4):135-138.

Day, P. R. 1965. Particle fractionation and particle size analysis. In C. A. Black (Ed.) Methods of Soil Analysis, Part I. Agronomy 9:552-562. Amer. Soc. of Agron., Madison, WI.

Deichmann, W. B., W. Machle, K. V. Kitzmiller, and G. Thomas. 1942. Acute and Chronic Effects of Pentachlorophenol and Sodium Pentachlorophenate upon Experimental Animals. J. Pharm. Exptl. Therap. 76:104.

_____ and L. J. Schafer. 1942. Spectrophotometric Estimation of Pentachlorophenol in Tissues and Water. Ind. Eng. Chem., Anal. Ed. 14(4):310-312.

Demidenko, N. M. 1966. Toxicological Properties of Pentachlorophenol. Gig. Toksikol. Pestits, Klin. Otravleni. (4):234-239.

_____. 1969. Maximum Permissible Atmospheric Concentration of Pentachlorophenol. Gig. Tr. Prof. Zabol. 13(9):58-60. (CA 72:47095M).

Dixon, J. B. and S. B. Weed. 1978. Minerals in Soil Environments. Soil Sci. Soc. of Amer., Madison, WI.

Dodge, R. H. and D. T. Gibson. 1980. Fungal Metabolism of Benzo(a)anthracene. p. 138. IN: Abstracts of the 1980 American Society for Microbiologists Annual Meeting. ASM, Washington, DC.

Dow Chemical Co. 1969. Toxicity Summary for Dowicide 7.

Dreisbach, R. H. 1963. Handbook for Poisoning: Diagnosis and Treatment. p. 256.

Edgehill, R. U. and R. K. Finn. 1983. Microbial Treatment of Soil to Remove Pentachlorophenol. Appl. and Env. Micobiol., Vol. 45, No. 3. pp. 1122-1125.

Edgehill, R. U. and R. K. Finn. 1982. Isolation, Characterization and Growth Kinetics of Bacteria Metabolizing Pentachlorophenol. Eur. J. Appl. Microbiol. Biotechnol. 16:179-184.

Edwards, N. T. 1983. Polycyclic Aromatic Hydrocarbons (PAH's) in the Terrestrial Environment--a Review. J. Environ. Qual. 12:427-441.

EPRI. 1984. Development and Validation of a Terrestrial Microcosm Test System for Accessing Ecological Effects of Utility Wastes, Final Report. EA-XXXX-RP1224-5.

ERT, Inc. 1985b. The Land Treatability of Creosote Wastes (second draft). Document No. PD481-400a, Environmental Research and Technology, Concord, MA.

Evans, W. C., H. N. Fernley, and E. Griffiths. 1965. Oxidative Metabolism of Phenanthrene and Anthracene by Soil Pseudomonads. Biochem. J. 95:791-831.

Fed. Proc. 1943. Fed. Am. Soc. Exp. Biol. 2:76.

Fernley, H. N. and W. C. Evans. 1958. Oxidative Metabolism of Polycyclic Hydrocarbons by Soil Pseudomonads. Nature 182:373-375.

Gabrilevskaya, L. N. and V. P. Laskina. 1964. Maximum Permissible Concentrations of PCP and Na-Pentachlorophenate in Water Reservoirs. Sanit. Okhrana Vodoemov. ot. Zagryazneniya Prom. Stochnymi Vodami. (6):251-272. (CA 62:15304d).

Gaines, T. H. 1969. Acute Toxicity of Pesticides. Toxicol. Appl. Pharmacol. 14(3):515-534.

Gardner, W. S., R. F. Lee, K. R. Tenore, and L. W. Smith. 1979. Degradation of Selected Polycyclic Aromatic Hydrocarbons in Coastal Sediments: Importance of Microbes and Polychaete Worms. Water, Air, Soil Pollution 11, 339.

Gibson, D. T. 1972. The Microbial Oxidation of Aromatic Hydrocarbons. Crit. Rev. Microbiol. 1(2):199-223.

_____, V. Mahadevan, D. M. Jerina, H. Yagi, and H. J. C. Yeh. 1975. Oxidation of the Carcinogens Benzo(a)pyrene and Benzo(a)anthracene to Dihydrodiols by a Bacterium. Science 189:295-297.

Groenewegen, D. and H. Stolp. 1976. Microbial Breakdown of Polycyclic Aromatic Hydrocarbons. Tbl. Bakt. Hyg. I. Abt.: Orig. B162,225.

_____. 1981. Microbial Breakdown of Polycyclic Aromatic Hydrocarbons, pp. 233-240. IN: M. R. Overcash, ed. Decomposition of Toxic and Nontoxic Organic Compounds in Soils. Ann Arbor Science Publishers, Inc., Ann Arbor, MI.

Harrison, D. L. 1959. The Toxicity of Wood Preservatives to Stock, Part I: Pentachlorophenol. New Zealand Vet. J. 7:89-98. (CA 55:23814e).

Herbes, S. E. and L. R. Schwall. 1978. Microbial Transformations of Polycyclic Aromatic Hydrocarbons in Pristine and Petroleum-Contaminated Sediments. Appl. Environ. Microbiol. 35,306.

_____, G. R. Southworth, D. L. Shaeffer, W. H. Griest, and M. P. Masbarinec. 1980. Critical Pathways of Polycyclic Aromatic Hydrocarbons in Aquatic Environments, pp. 113-128. IN: H. Witschi, ed. The Scientific Bases of Toxicity Assessment, Elsevier, Holland.

Hetrick, L. A. 1952. The Comparative Toxicity of Some Organic Insecticides as Termite Soil Poisons. J. Econ. Entomol. 45(2):235-237.

Hilton, H. W. and Q. H. Yuen. 1963. Adsorption of Several Pre-Emergence Herbicides by Hawaiian Sugar Cane Soils. J. Agric. Food Chem. 11(3):230-234.

_____, and N. S. Nomura. 1970. Distribution of Residues from Atrazine, Ametryne, and Pentachlorophenol in Sugar cane. J. Agric. Food Chem. 18(2)217-220.

Hinkle, D. K. 1973. Fetotoxic Effects of Pentachlorophenol in the Golden Syrian Hamster. Tox. and Appl. Pharmacol. 25(3):455 (Abstract).

Huddleston, R. L., C. A. Bleckmann, and J. R. Wolfe. 1986. Land Treatment Biological Degradation Processes, pp. 41-61. IN: R. C. Loehr and J. R. Malina, Jr., eds. Land Treatment: A Hazardous Waste Management Alternative. Water Resources Symp. No. 13, Center for Research in Water Resources, Univ. of Texas at Austin, TX.

Ide, A., Y. Niki, F. Sakamoto, I. Watanabe, and H. Watanabe. 1972. Decomposition of Pentachlorophenol in Paddy Soil. Agric. Biol. Chem. 36(11):937-1844.

Jackson, M. L. 1956. Soil Chemical Analysis - advanced course. Publ. by author, Univ. of Wisconsin, Madison.

Jaworski, E. G. 1955. Tracer Studies With 1-^{14}C-Pentachlorophenol in Cotton. Proc. 10th Annu. Cotton Defol. Conf. pp. 36-40.

Johnson, R. L., P. J. Gehring, R. J. Kociba, and B. A. Schwetz. 1973. Chlorinated Dibenzodioxins and Pentachlorophenol. Environ. Health Perspect. 5:171-175.

Karickhoff, S. W., D. S. Brown, and T. A. Scott. 1979. Sorption of Octanol/Water Distribution Coefficients, Water Solubilities, and Sediment/Water Partition Coefficients for Hydrophobic Organic Pollutants. EPA-600/4-79-032. U.S. Environmental Protection Agency.

Kaufman, D. D. 1978. Degradation of Pentachlorophenol in Soil and by Soil Microorganisms. IN: Pentachlorophenol, R. K. Rao, Ed. Plenum Press, New York. pp. 27-40.

Kehoe, R. A., W. Deichmann-Gruebler, and K. V. Kitzmiller. 1939. Toxic Effects upon Rabbits of Pentachlorophenol and Sodium Pentachlorophenate. J. Indust. Hyg. & Toxicol. 21:160-172.

Kirsch, E. J. and J. E. Etzel. 1973. Microbial Decomposition of Pentachlorophenol. J. Water Pollut. Control Fed. 45(2):359-364.

Klute, A. 1965. Laboratory measurement of hydraulic conductivity of saturated soil. In C. A. Black (Ed.) Methods of Soil Analysis, Part I. Agron. 9:214-215. Amer. Soc. of Agron., Madison, WI.

Koss, G. and W. Koransky. 1978. Pentachlorophenol: Chemistry, Pharmacology, and Environmental Toxicology, K. R. Rao, Ed. Plenum Press, New York.

Kuwatsuka, S. and M. Igarashi. 1975. Degradation of Penta in Soils: II. The Relationship Between the Degradation of Penta and the Properties of Soils, and the Identification of the Degradation Products of Penta. Soil Sci. Plant Nutr. 21(4):405-414.

Larsen, R. V., L. E. Kirsh, S. M. Shaw, J. G. Christian, and G. S. Born. 1972. Excretion and Tissue Distribution of Uniformly Labeled ^{14}C-Pentachlorophenol in Rats. J. Pharm. Sci. 61:2004-2006.

_____, G. S. Born, W. V. Kessler, S. M. Shaw, and D. C. Von Sickle. 1975. Placental Transfer and Teratology of Pentachlorophenol in Rats. Environ. Lett. 10(2):121-128.

Lewis, D. L., H. P. Kollig, and Robert E. Hodson. Nutrient Limitation and Adaptation of Microbial Populations to Chemical Transformations. Applied and Environmental Microbiology, Vol. 51, No. 3. March 1986. pp. 598-603.

Lorenz, L. R. and L. R. Gjovik. 1972. Analyzing Creosote by Gas Chromatography: Relationship to Creosote Specifications. Proc. Amer. Wood Pres. Assoc. 68:32-42.

Loustalot, A. J. and R. Ferrer. 1950. The Effect of Some Environmental Factors on the Persistence of Sodium Pentachlorophenate in the Soil. Proc. Am. Assoc. Hortic. Sci. 56:294-298.

Matsunaka, S. and S. Kuwatsuka. 1975. Environmental Problems Related to Herbicidal Use in Japan. Environ. Qual. Safety. 4:149-159.

Means, J. C., G. S. Wood, J. J. Hassett, and W. L. Banwart. 1979. Sorption of Polynuclear Aromatic Hydrocarbons by Sediments and Soils. Environ. Sci. Technol. 14:1524-1528.

Medvedev, V. A. and V. D. Davidov. 1972. Transformation of Individual Organic Products of the Coke Industry in Chemozem Soil. Pochrovedenie. 11:22-28.

Miller, C. S. and M. M. Aboul-Ela. 1969. Fate of Pentachlorophenol in Cotton. J. Agric. Food Chem. 17(6):1244-1246.

Mississippi State University. 1984. Methylene Chloride Soxhlet Recoveries for OCDD and PCP in Soil. Report for MFPUL Environmental Group, Mississippi State, MS.

McKenna, E. J. and R. D. Heath. 1976. Biodegradation of Polynuclear Aromatic Hydrocarbon Pollutants by Soil and Water Microorganisms. Water Resources Center, University of Illinois at Urbana-Champaign. Research Report No. 113, UILU-WRC-76-0113.

Murthy, N. B. K., D. D. Kaufman, and G. F. Fries. 1979. Degradation of Pentachlorophenol in Aerobic and Anaerobic Soil. J. of Environ. Sci. Health, B14:1-14.

Noakes, D. N. and D. M. Sanderson. 1969. A Method for Determining the Dermal Toxicity of Pesticides. British J. of Indust. Med. 26:59-64.

Ochrymowych, J., Western Electric. 1978. Personal communication.

Overcash, M. R. and D. Pal. 1979. Design of Land Treatment Systems for Industrial Wastes - Theory and Practice. Ann Arbor Science Publishers, Inc., Ann Arbor, MI. 684 pp.

_____, J. B. Weber, and M. C. Miles. 1982. Behavior of Organic Priority Pollutants in the Terrestrial System: Di(N-Butyl) Phthalate Ester, Toluene, and 2,4-Dinitrophenol. Office of Water Research and Technology. U. S. Department of the Interior, Washington, DC.

Peech, M. 1965. Exchange acidity. In C. A. Black (Ed.) Methods of Soil Analysis, Part I, Agronomy 9:914-926. Amer. Soc. of Agron., Madison, WI.

Phung, T., L. Barker, D. Ross, and D. Bauer. 1978. Land Cultivation of Industrial Wastes and Municipal Solid Wastes: State-Of-The-Art Study. Volume 1. Technical Summary and Literature Review. EPA-600/2-78-140a, U. S. Environmental Protection Agency, Washington, DC.

Pleskova, A. and K. Bencze. 1959. Toxic Properties of Pentachlorophenol. Pracovni Lekerstvi, 11:348-354.

Reichhold Chemicals. 1974. Report of May 28, 1974.

Renberg, L. 1974. Ion Exchange Technique for the Determination of Chlorinated Phenols and Phenoxy Acids in Organic Tissue, Soil, and Water. Anal. Chem. 46(3):459-461.

Richards, L. A. 1949. Methods of Measuring Soil Moisture. Soil Sci. 68:95-112.

Rogoff, M. H. 1961. Oxidation of Aromatic Compounds by Bacteria. Adv. Appl. Microbial. 3:193-221.

Schwetz, B. A. and P. J. Gehring. 1973. The Effect of Tetrachlorophenol and Pentachlorophenol on Rat Embryonal and Fetal Development. Toxicol. Appl. Pharmacol. 25(3):455. (Abstract).

_____, P. A. Keeler, and P. J. Gehring. 1974. The Effect of Purified and Commercial Grade Pentachlorophenol on Rat Embryonal and Fetal Development. Toxicol. Appl. Pharmacol. 28(1):151-161.

Shabad, L. M., Y. L. Cohan, A. P. Ilnitsky, A. Y. Khesina, N. P. Shcerbak, and G. A. Smirnov. 1971. The Carcinogenic Hydrocarbon Benzo(a)pyrene in the Soil. J. Natl. Cancer Inst. 47(6):1179-1191.

Sims, R. C. 1982. Land Treatment of Polynuclear Aromatic Compounds. Ph.D. Dissertation. Dept. Biol. Agr. Eng., North Carolina State Univ., Raleigh, NC.

_____, and M. R. Overcash. 1983. Fate of Polynuclear Aromatic Compounds (PNAs) in Soil-Plant Systems. Residue Rev. 88:1-68.

_____, J. L. Sims, D. L. Sorensen, and L. L. Hastings. 1987. Waste/Soil Treatability Studies for Four Complex Industrial Wastes: Methodologies and Results. Vol. 1. Project # CR-810979.

Sisler, F. D. and C. E. Zobell. 1947. Microbial Utilization of Carcinogenic Hydrocarbons. Science 106:521-522.

Soil Survey Staff. 1951. Soil Survey Manual. Agric. Handb. No. 18, USDA. U. S. Govt. Printing Office, Washington, D.C.

Sudhakar-Barik and N. Sethunathan. 1978. Metabolism of Nitrophenols in Flooded Soils. J. Environ. Qual. 7:349-352.

Suzuki, T. and K. Nose. 1971. Decomposition of Pentachlorophenol in Farm Soil. (Part 2). Penta Metabolism by a Microorganism Isolated from Soil. Noyaku Seisan Gijutsu, Japan, 26:21-24.

Tausson, V. O. 1950. Basic Principles of Plant Bioenergetics (collected works). p. 73. In: N. A. Maximov, (Ed.), National Academy of Sciences, USSR.

Topp, Edward, R. L. Crawford, and R. Hanson. Influence of Readily Metabolizable Carbon on Pentachlorophenol Metabolism by a Pentachlorophenol-Degrading Flavobacterium sp. Applied and Environmental Microbiology, Vol. 54, No. 10. Oct. 1988. pp. 2452-2459.

Tortensson, L. and J. Stenstrom. 1986. "Basic" Respiration Rate as a Tool for Prediction of Pesticide Persistence in Soil. Toxicity Assessment 1:57-72.

United States Department of Agriculture. 1972. Soil Survey Laboratory Methods and Procedures for Collecting Soil Samples. Soil Survey Investigations Report No. 1. U. S. Govt. Printing Office, Washington, DC.

_____. 1980. The Biologic and Economic Assessment of Pentachlorophenol, Inorganic Arsenicals, Creosote. USDA, Number 1658-11. Washington, DC.

U.S. EPA. 1975. Production, Distribution, Use, and Environmental Impact Potential of Selected Pesticides. U. S. Environ. Prot. Agency 540/1-74-001. 439 pp.

_____. 1978. Report of the Ad Hoc Study Group on Pentachlorophenol Contaminants. Environmental Health Advisory Committee. Science Advisory Board, Washington, DC.

_____. 1983. 40CFR Parts 261, 264, 265, and 775. Federal Register. 48(65).

_____. 1984. Creosote - Special Review Position Document 213. U. S. Environmental Protection Agency, Washington, DC.

_____. 1986a. Test Methods for Evaluating Solid Waste. 1B. SW-846. Third Edition.

_____. 1986b. Permit Guidance Manual on Hazardous Waste Land Treatment Demonstrations. Final Draft. EPA-530/SW86-032. Office of Solid Waste and Emergency Response, U.S. Environmental Protection Agency, Washington, DC.

Versar, Inc. 1979. Water-Related Environmental Fate of 129 Priority Pollutants. Vol. 1 and 2, EPA 440/4-79-029. U. S. Environmental Protection Agency, Washington, DC.

Verschueren, D. 1977. Handbook of Environmental Data on Organic Chemicals Van Nostrand/Reinhold Co., New York. p. 659.

Vogel, E. and J. L. R. Chandler. 1974. Mutagenicity Testing of Cyclamate and Some Pesticides in Drosophila melanogaster. Experientia 30(6):621-623.

Warcup, J. H. 1950. The Soil Plate Method for Isolation of Fungi from Soil. Nature 166:117-118.

Ward, C. H., M. B. Thomson, P. B. Bedient, and M. D. Lee. 1986. Transport and Fate Processes in the Subsurface, pp. 19-39. IN: R. C. Loehr and J. F. Malina, Jr., Eds. Land Treatment: A Hazardous Waste Management Alternative. Water Resources Symp. No. 13, Center for Research in Water Resources, Univ. of Texas at Austin, TX.

Watanabe, I. 1973. Isolation of Pentachlorophenol Decomposing Bacteria from Soil. Soil Sci. Plant Nutr. Tokyo. 19(2):109-116.

Williams, R. T. 1959. Detoxification Mechanisms. 2nd Ed., John Wiley and Sons, Inc., New York, NY. 796 pp.

Young, H. C. and J. C. Carroll. 1951. The Decomposition of Pentachlorophenol When Applied as a Residual Pre-Emergence Herbicide. Agron. J. 43:504-507.

Yuan, T. L. 1959. Determination of Exchangeable Hydrogen in Soils by a Titration Method. Soil Sci. 88:164-167.

APPENDIX A

ANALYTICAL METHODOLOGY

EXTRACTION OF PCP, PAH's AND OCDD FROM SOIL

Soil (10 g) was mixed with dry sodium sulfate (10 g). (The sodium sulfate had been dried at 400°C for four hours and stored in a desiccator.) The sample was placed in an extraction thimble and 1 ml of an internal standard in methylene chloride was added. The internal standard mixture for high levels consisted of 5,000 ppm of diphenylmethane, 1000 ppm of tribromophenol, and 21 ppm of octachloronaphthalene. For low levels, a 1 to 10 dilution of the internal standard was used. The extraction thimble was placed in the Soxhlet unit along with 300 ml of pesticide grade methylene chloride and boiling chips.

The soil in the Soxhlet unit was extracted for 16 hours with a minimum recycle rate of 5/hour. The extraction units were cooled and transferred to a Kuderna-Danish unit and condensed to a volume of approximately 3 ml.

The condensed extract was diluted to exactly 5 ml and aliquots were taken for OCDD and PCP and PAH analyses. The remaining solution was stored in a freezer at -27° in a teflon-lined, screw-cap vial.

CLEAN-UP AND DETERMINATION OF PAH's AND PCP IN SOIL EXTRACTS

Silica gel was activated at 130°C for 16 hours (100-120 mesh Davison Chemical Grade 923 or equivalent) in a beaker covered with foil. The silica gel was stored in an air-tight desiccator and redried every two weeks. The columns (10mm i.d.) were packed using 9 grams of activated silica gel. The silica gel was packed into the column with gentle tapping. The column was pre-eluted with 20 ml of pentane (pesticide grade or HPLC grade). The pentane was allowed to elute until the solvent was just above the silica gel. The silica gel was not allowed to dry before sample addition.

An aliquot of the methylene chloride extract was put in a sample tube. The exact amount depended on the loading amount of creosote or the analysis of previous sample. Three ml of sample was added if the loading rate was less than 0.632% (wt/wt) of creosote on soil or if the previous sample contained less than 6,000 ppm total PAH's.

Diazomethane solution (0.1 ml) was added to the sample tube and mixed with a vortex mixer. An aliquot was added to the column. If a 1-ml aliquot on column was used, 2 ml of methylene chloride was added to the column. A 1 to 3 ml aliquot of 40% methylene chloride/60% pentane was added three times to ensure that all the sample is absorbed on the column. Columns were eluted with 50 ml of the 40/60 mixture and the eluant was collected. The eluant was concentrated to 5 ml by evaporation

using a gentle stream of dry air or nitrogen and analyzed using gas chromatography conditions shown below for PAH's.

A 1-ml sample was removed for PCP analysis and stored in a glass teflon-lined crimp-top vial. This sample had to be diluted for GC/ECD analysis. The exact dilution depended on the anticipated concentration of PCP.

Tracor 540 Gas Chromatograph Parameters for PAH Analysis

Column: J and W DB-5 fused silica capillary
Length: 30 meters
Film thickness: 1.00 μm
Inside diameter: 0.32 mm
Injector temperature: 325°C
Oven temperature program: 4 minutes to 40°C, then 6°C per minute for 15 minutes to 325°C
Carrier gas: Helium; Pressure: 12 psi
FID temperature: 325°C
Hydrogen flow: 60 cc/min
Air flow: 400 cc/min
Nitrogen makeup: 40 cc/min
Injection: 2 μl splitless, vent after 1.5 min.
Amplifier range: x1

Tracor 540 GC Parameter for PCP Analysis

Column: 6 ft x 2 mm i.d. glass packed with 3% SP-2250 on 100/120 mesh Supelcoport
Carrier gas: Ar/CH_4 at 10 cc/min
Injector: 250°C
Oven: 220°C
Detector: 350°C
ECD detector makeup gas: 95% argon/5% methane at 60 cc/min.

CLEAN-UP AND DETERMINATION OF OCTACHLORODIBENZO-P-DIOXIN IN SOIL (MSU 1984)

The analysis of OCDD in soil presented two significant problems which had to be solved in order to obtain reliable results. First, an extraction procedure had to be used which would be highly efficient in removing OCDD from the sample matrix. This was especially important, since the anticipated concentration of OCDD in the soil was in the parts-per-billion range. Second, the majority of the compounds which co-extracted with OCDD were likely to be several orders of magnitude higher in concentration than OCDD. A clean-up technique had to be used which allowed the concentration of OCDD with minimal chemical interference.

Method Summary

Methylene chloride Soxhlet extraction was found to be very efficient in the removal of OCDD from a soil matrix (U. S. EPA 1983). Thus, an aliquot of soil extract from the PAH analysis, which uses the same extraction procedure, was considered to be adequate and would save analysis time. For our purposes, the removal of the majority of chemical interferences could be accomplished by a modification of two column clean-up techniques recommended by EPA for 2,3,7,8-TCDD analysis (U. S. EPA 1983). An elution profile and recovery were determined for this modified column clean-up and were found to be quite adequate (Mississippi State 1984).

Materials and Supplies:

Basic alumina, type WB-5, Activity Grade I, Sigma Chemical Co. or equivalent.

Silica gel, 100/200 mesh, Fisher Scientific Co. or equivalent.

5 ml disposable pipet, Scientific Products Co.

Silane treated glass wood, Supelco, Inc.

9" disposable Pasteur pipets, Scientific Products Co.

10 ml graduated cylinder, Pyrex.

Small funnel with a cut latex bulb attachment.

Disposable 1 ml serological pipet, Scientific Products Co.

Compressed air with regulator and manifold.

Water bath.

Benzene (Burdick and Jackson distilled in glass).

OCDD for standards, Analabs.

Gas chromatograph equipped with ECD and a 6-ft x 2-mm i.d. glass column packed with 3% SP-2250 on 100/120 mesh Supelcoport.

Procedure:

Before use, the silica gel and basic alumina were activated for 16-24 hours at 130°C in a foil-covered glass container.

A small plug of glass wool was placed in the bottom of a 5-ml pipet.

A funnel with a cut latex bulb attached was placed on the pipet and 2 ml of basic alumina (bottom) and 2 ml of silica gel (top) were added to the pipet.

The column was pre-rinsed with two 4-ml portions of Benzene which was then discarded.

A 10-ml volumetric flask was placed under the column. Before clean-up, the methylene chloride extract was exchanged with benzene by blowing down the methylene chloride to dryness with dry air in a 50°C water bath and adding 1 ml of benzene.

The benzene extract was placed on the column.

After the sample extract had flowed into the silica gel layer, 4 ml of benzene was added to the column.

All of the eluate was collected until the column stopped dripping.

The eluate was diluted to 10 ml with benzene and a 1 μl sample was injected on the Tracor 540 GC/ECD using the following conditions:

Oven: 280°C; Injector: 330°C; Detector: 350°C

Five types of internal checks were used to monitor the accuracy of the soil extraction and analytical procedures.

Blanks

This control was used to monitor the glassware, solvents, and the solid supports (silica gel and alumina) background levels. The blank was processed exactly the same way as the samples except no soil was used during the Soxhlet extraction. Diphenymethane, 2,4,6-tribromophenol, and octachloronaphthalene were added to the extracts as an internal standard.

Spike Samples

Standard solutions of PAH's, PCP, and OCDD were prepared using the best standards available (purity = 99% or better) in methylene chloride. A sample of the standard solution was added to the soil before Soxhlet extraction. The sample was extracted and cleaned up using the normal procedures. The values of the spike sample were used to determine the recovery values for the individual compounds. Diphenylmethane, 2,4,6-tribromophenol, octachloronaphthalene were used an internal standards. All

standards were prepared using a Mettler 5-place analytical balance. Each time a standard was prepared, the weight, date, and standard number were recorded, and the balance was checked with standard weights (Class S - National Bureau Standards).

Standard Solutions for Gas Chromatography Calibration

A standard solution of PAH's containing the 16 compounds of interest was prepared. The solution contained an internal standard (diphenylmethane). Standard solutions were also made for the PCP and octachlorodibenzo-p-dioxin and analysis with the corresponding internal standards 2,4,6-tribromophenol and octachloronaphthalene. A minimum of three concentration levels was used for each compound.

Blind Samples

Blind samples containing EPA standard reference materials (Quality Assurance Branch EMSL-Cincinnati, U. S. EPA) were diluted by the Quality Control Officer (Dr. Hamid Borazjani) and analyzed.

GC/MS Analysis

A part of each sludge sample after homogenizing (approximately 1 gram) was weighed to three significant figures, mixed with an equal weight of anhydrous sodium sulfate, and extracted for 16 hours with 300 ml of methylene chloride in a Soxhlet extractor. The volume of methylene chloride from each sample was adjusted to 100 ml with a volumetric flask. Prior to GC/MS analysis, a 1.00 ml aliquot of each extract was transferred to a screw cap test tube and stored at approximately 4°C. The sample weight range and dilution volume were based on prior knowledge of concentrations determined by GC/FID analysis.

A Carlo Erba GC fitted with a J. and W. DB-5 capillary column [0.25 m film thickness and 30 m (1) by 0.25 mm (i.d.)]. After sample injection, the GC was operated at 70°C for 2 minutes and then programmed to 280° to 320°C at 12 deg/min. The GC oven temperature was kept at 320°C for 20 minutes. The injector and transfer line temperatures were 320° and 280°C, respectively.

The mass spectrometer (Kratos MS80RFA) was operated in the electron impact mode (70 eV) with a source temperature of 250°C. After a 6.0-minute delay for elution of the solvent peak, mass spectral data were acquired with a scan rate of 1 sec/dec for 54.0 minutes. Two standard solutions (10 μg/ml and 200 μg/ml) containing known concentrations of selected analytes were used to establish instrument response factors. The concentration of each compound in solution was reported by the DS-90 data system and the concentration in sludge was calculated as follows:

$$C\ \mu g/g = \frac{100\ ml \times c\ \ g/ml}{W}$$

Here, C = concentration of each compound in sludge (μg/g); 100 = dilution volume, c = concentration of each compound in the sample extract, and W = dry weight of the sludge sample in grams.

Table 59 and Table 60 list the EPA Method numbers for the soil and sludge analysis methods and Table 20 gives the detection limits for the compounds analyzed.

Table 59: Analytical procedures for soil and water (U. S. EPA 1986a).

Process	Method Number	Compounds	Comments
Extraction of soil samples	3540	All	Use 10 g of soil
Extraction of water samples	3520	All	Use 1000 ml of water
Clean up	3630	All	Done after methylation of phenols
Analysis	8100	PAH's	For polynuclear aromatic hydrocarbons
Analysis	8040	OCDD+PCP	For chlorinated phenols after methylation and octachlordibenzo-p-dioxin; using an ECD detector
Analysis	8270	ALL	Check for all compounds
Anaysis	8280		Used for low-level dioxins (penta, hexa, and hepta dioxins)

Table 60: Analytical procedures for sludges.

Process	Procedure
Water content	ASTM D-95-70
Organic content	Heating at 600°C for 2 hours in an oxidative atmosphere
Non-volatile products	Heating at 600°C for 2 hours in an oxidative atmosphere
Organic carbon	Determined by CO_2 evolution
Total phenolics	Method 222E Standard Methods for Examination of Water and Wastewater
Oil and grease	Method 5030 Standard Methods for Examination of Water and Waterwater
Nitrogen	Micro Kjeldahl followed by digestion with 5% hydrogen peroxide and sulfuric acid; nitrogen was determined colorimetrically using nessierization
Phosphorous	Determined after digestion colorimetrically using the Fisbe-Subarrow method
Inorganic chloride	Determined using a chloride specific ion electrode

APPENDIX B

MICROBIOLOGICAL PROCEDURES

The media used for this study were potato dextrose agar PDA, (Difco Laboratories, Detroit, Michigan), 39 g in one liter of deionized water; PDA amended with 5 mg/L of technical-grade pentachlorophenol [PDA-P] (Vulcan Materials Company, Wichita, Kansas); PDA amended with 10 mg/L of whole creosote [PDA-C]; PDA amended with a combination of 5 mg/L of pentachlorophenol and 10 mg/L of whole creosote [PDA-CP]; PDA amended with antibiotics--120 mg/L of streptomycin sulfate (Nutritional Biochemical, Cleveland, Ohio) and 30 mg/L of chlorotetracycline hydrochloride (Nutritional Biochemical, Cleveland, Ohio) [PDAA]; and actinomyces broth (Difco Laboratories, Detroit, Michigan) [ACA], 57 g in one liter of deionized water amended with 15 g of Difco agar and 30 mg/L of Pimaricin. The PDA was adjusted to pH 6.9-7.1, autoclaved for 20 minutes at 15 psi and 121°C, then cooled to 55°C. Creosote and pentachlorophenol dissolved in methyl alcohol and the antibiotics were added to the cooled liquid medium before pouring into petri dishes. Twenty-five ml of PDA, PDA-C, PDA-P, PDA-CP, PDAA, and ACA were poured into disposable petri plates and were allowed to solidify.

For colony counts, triplicate samples of loaded and non-loaded soils were air-dried for 24 to 28 hours under a sterilized transfer hood. The air-dried soil was screened with a 400 mesh sieve. Serial dilutions were made with sterilized screened soil. Three 20-mg soil samples were taken from treated and non-treated soil for each medium at each sampling date. A modified Anderson sampler (Butterfield et al., 1975, 1977; Warcup, 1950) was used to distribute the soil on the agar. Three 20-mg samples were distributed over each medium for each treatment. Colonies were counted after 24 to 48 hours of incubation at 28°C. A Darkfield Quebec Colony Counter (AO Scientific Instrument, Keene, New Hampshire) was used to count the number of colonies on each plate.

The number of counts recovered on PDA plates provided an estimate of the total number of bacteria per gram of dry soil. On creosote-containing plates, it represented the approximate number of bacteria per gram of dry soil that were acclimated to creosote; on PCP-containing plates, it represented the approximate number of bacteria per gram of dry soil that was acclimated to pentachlorophenol; on PDA-CP plates, it represented the approximate number of bacteria per gram of dry soil that was acclimated to both creosote and pentachlorophenol; on PDAA plates, it represented the approximate number of fungi per gram of dry soil; and on ACA plates, it represented the approximate number of actinomycetes per gram of dry soil.

APPENDIX C

SITE AND SOIL CHARACTERIZATION

EXPERIMENTAL PROCEDURES

Soil profiles were examined at each site in freshly excavated pits. They were described and sampled using standard methods (Soil Survey Staff, 1951). Soil morphological descriptions included horizonation, Munsell color, texture, horizon boundaries, consistency, coarse fragments, root distribution, concretions and pedological features. Each horizon was sampled for laboratory analyses. Bulk density was determined on major horizons using the non-disturbed core method (Blake, 1965). Saturated hydraulic conductivity was determined on non-disturbed cores using theconstant heat method (Klute, 1965). Soil moisture retention was determined on non-disturbed cores using a pressure membrane apparatus (Richards, 1949).

Soil samples were air-dried in the laboratory, crushed with a wooden rolling pin, and sieved through a 10-mesh sieve to remove fragments larger than 2 mm (USDA, 1972). Particle size distribution was determined by the hydrometer method and sieving (Day, 1965). Organic matter was determined by a wet combustion procedure (Allison, 1935). Extractable acidity was determined by the barium chloride-triethanolamine method (Peech, 1965). Exchangeable aluminum was determined in KCl extractions following the procedure of Yuan (1959). Exchangeable cations were extracted with neutral 1 N NH_4OAc and determined by atomic absorption spectrophotometry (USDA 1972). Soil pH was measured in water and 1 N KCl using a 1:1 soil-to-liquid ratio. Electrical conductivity was determined in saturated paste extracts using a Wheatstone conductivity cell. Total sulfur was determined on soil samples ground to pass a 60-mesh sieve in a LECO Sulfur Analyzer using an induction furnace and I.R. detection.

The clay fraction (<2 mm) was separated by centrifugal sedimentation using Calgon as a dispersing agent. Clays were K-saturated, Mg-saturated, and glycerol-solvated for x-ray diffraction analysis. The clay fraction was analyzed with a Norelco Geiger counter spectrophotometer using Cu K radiation and a Ni filter. Minerals were identified based on comparison of diffraction spacings and frequencies to standard minerals as indicated by Jackson (1956), Carrol (1970), and Dixon and Weed (1978). Relative estimates of the amounts of clay minerals present were based on peak area measurements with corrections for Lorentz polarization at peaks greater or equal to 14A. The results of this phase of the study were reported in the earlier report.

APPENDIX D

RATIONALE FOR THE ADDITION OF CHICKEN MANURE TO SOIL IN THE DEGRADATION/TRANSFORMATION STUDIES

During the course of this series of experiments, the data generated reemphasized the importance of soil organic matter in facilitating the microbial transformation of applied organic wastes. Since the ultimate goal of these studies was to establish an operating land treatment test facility, the decision was made to maximize the operating effectiveness and efficiency of the facility by amending the experimental soils with an animal manure. This amendment accomplished several objectives. The manure furnished: (1) a carbon source for potential cometabolism, which has been found in at least some instances to be an important component of the transformation process; (2) both major and minor nutrients; and (3) a wide variety of microbes that were potentially important biodegraders. Also, added organic matter should markedly decrease mobility of hazardous constituents in organic applied wastes, which is highly desirable in a landtreatment operation. Although other animal manures might serve as well, chicken manure was chosen for study because it is readily available in many parts of the United States. A typical analysis of the chicken manure used in this study is given below:

Total organic carbon	= 8.97%
Total nitrogen	= 1.35%
Total phosphorus	= 0.12%

Bacteria counts in four of the soils were compared before and after manure addition. No PCP or creosote was added to the soil (0% controls) and the bacteria counts were determined in soil 30 days after manure loading. The results (Table 61) indicate a large increase in both the total bacteria and the acclimated bacteria in the soil with added chicken manure.

Table 61: Bacteria levels in four soils at 0% loading before and after addition of chicken manure[a].

Site	Total bacteria counts (million counts/gram of soil)		Acclimated bacteria counts[b] (million counts/gram of soil)	
	Before addition	After addition	Before addition	After addition
Gulfport	1.13	4.50-7.20	0.07	0.50-0.61
Wiggins	0.41	3.10-4.50	0.12	0.64-2.30
Columbus	1.25	2.80-3.10	0.25	0.14-0.35
Meridian	1.10	3.10-4.20	0.09	0.48-0.92

[a] These soils were 0%-loaded, and counts were taken 30 days after addition of chicken manure.

[b] Bacteria acclimated to PCP and PAH's.

APPENDIX E

STATISTICAL PROCEDURES

A linear regression based on first-order kinetics was used to calculate estimates of transformation/degradation rates and 95% confidence limits. The half-life of each compound was calculated from the first-order degradation rate. If the slope of the first-order regression was non-negative, indicating that no treatment by degradation was observed, or if degradation could not be quantified due to initial low concentration (near or below detection limit), no degradation information was reported in the tables.

APPENDIX F

RAW DATA FROM EXPERIMENT 1, EXPERIMENT 2, AND FROM THE OPERATION OF THE WIGGINS SOIL TREATMENT UNIT

Table 62. Experiment I: PAH in Site Soil (ppm)
ATLANTA

DATE	DUPLICATE	NAPH	2-MET	1-MET	BIPH	ACTHY	ACTHE	DIBEN	FLORE	PHEN	ANTHR	CARBA	FLUOR	PYRENE	1,2-BZ	CHRYS	BENZ-a	BzFl	2 RING	3 RING	4 RING	5 RING	TOTALPAH
0	A	375.4	310.3	131.4	90.9	25.1	517.5	305.4	324.8	1030.1	61.5	42.4	327.0	418.4	113.7	100.4	50.6	25.9	908.0	2305.8	989.5	76.5	4290.8
	B	356.8	298.1	113.2	88.9	17.2	504.3	269.3	318.8	1031.2	61.1	51.1	600.7	412.7	116.6	102.5	52.9	15.9	857.0	2253.0	1232.5	68.8	4411.3
	*(A+B)/2=	366.1	304.2	122.3	89.9	21.2	510.9	287.4	321.8	1030.7	61.3	46.8	463.9	415.6	115.2	101.5	51.8	20.9	882.5	2279.9	1096.0	72.7	4331.1
30	A	ND	35.8	32.3	10.7	12.2	103.7	164.7	182.8	620.2	32.3	12.6	509.0	325.0	79.1	76.7	37.7	ND	78.8	1348.5	989.8	37.7	2454.8
	B	ND	42.3	33.9	12.5	17.6	117.7	217.2	201.6	661.0	37.6	ND	614.4	417.9	110.1	102.6	44.8	ND	88.7	1452.7	1245.0	44.8	2831.2
	*(A+B)/2=	ND	39.1	33.1	11.6	14.9	110.7	201.0	192.2	640.6	35.0	6.3	561.7	371.5	94.6	89.7	41.3	ND	83.8	1400.6	1117.4	41.3	2643.0
60	A	ND	ND	ND	ND	ND	100.3	ND	100.8	523.3	ND	ND	621.1	559.9	147.0	131.1	57.5	ND	ND	724.4	1669.1	57.5	2451.0
	B	ND	ND	ND	ND	ND	92.3	ND	72.1	440.9	ND	ND	650.8	552.2	134.7	126.2	55.6	ND	ND	605.3	1663.9	55.6	2324.8
	*(A+B)/2=	ND	ND	ND	ND	ND	96.3	ND	86.5	482.1	ND	ND	636.0	561.1	140.9	128.7	56.6	ND	ND	664.9	1666.5	56.6	2387.9
90	A	ND	ND	ND	ND	ND	78.6	ND	ND	230.7	ND	ND	695.3	573.3	139.2	140.5	57.3	ND	ND	309.3	1748.3	57.3	2114.9
	B	ND	ND	ND	ND	ND	50.8	ND	ND	174.2	ND	ND	706.9	457.4	98.9	96.0	42.0	ND	ND	225.0	1359.2	42.0	1626.2
	*(A+B)/2=	ND	ND	ND	ND	ND	64.7	ND	ND	202.5	ND	ND	801.1	515.4	119.1	118.3	49.7	ND	ND	267.2	1553.8	49.7	1870.6
120	A	ND	ND	ND	ND	ND	51.6	ND	ND	109.4	ND	ND	889.7	599.4	158.4	159.6	62.6	ND	ND	161.0	1807.1	62.6	2030.7
	B	ND	ND	ND	ND	ND	15.8	ND	ND	129.3	ND	ND	854.1	583.4	136.7	150.9	68.2	ND	ND	145.1	1724.1	68.2	1937.4
	*(A+B)/2=	ND	ND	ND	ND	ND	33.7	ND	ND	119.4	ND	ND	871.9	591.4	147.1	155.3	65.4	ND	ND	153.1	1766.6	65.4	1984.1
150	A	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	860.0	646.0	150.0	208.0	ND	ND	ND	ND	1862.0	ND	1862.0
	B	ND	ND	ND	ND	ND	ND	ND	ND	52.0	ND	ND	1029.0	719.0	178.0	201.0	ND	ND	ND	52.0	2127.0	ND	2179.0
	*(A+B)/2=	ND	ND	ND	ND	ND	ND	ND	ND	26.0	ND	ND	944.5	682.5	164.0	203.5	ND	ND	ND	26.0	1994.5	ND	2020.5

ND = Not Detected - see Table 20 for detection limits

Table 62. Experiment I: PAH in Site Soil (ppm)
CHATTANOOGA

DATE	DUPLICATE	NAPH	2-MET	1-MET	BIPH	ACTHY	ACTHE	DIBEN	FLORE	PHEN	ANTHR	CARBA	FLUOR	PYRENE	1,2-BZ	CHRYS	BEN-a	Bghi	2 RING	3 RING	4 RING	5 RING	TOTALPAH
0	A	358.0	308.7	140.5	88.1	71.4	515.9	291.3	338.9	948.0	85.5	19.5	635.6	572.8	133.9	172.7	122.6	187.0	895.3	2270.5	1515.0	309.6	4990.4
	B	411.8	337.3	137.8	96.9	74.6	525.2	307.7	323.8	981.4	88.6	27.7	707.6	472.9	156.4	202.4	122.0	136.8	983.8	2329.0	1539.3	258.8	5110.9
	*(A+B)/2=	384.9	323.0	139.2	92.5	73.0	520.6	299.5	331.4	964.7	87.1	23.6	671.6	522.9	145.2	187.6	122.3	161.9	939.6	2299.8	1527.2	284.2	5050.7
30	A	ND	131.4	113.4	48.4	83.1	468.0	292.4	287.4	956.8	83.6	19.5	689.3	618.6	163.5	218.5	137.7	170.5	293.2	2190.8	1689.9	308.2	4482.1
	B	ND	102.7	101.9	38.1	60.8	439.6	305.1	274.3	928.2	84.0	21.8	605.2	463.0	166.2	236.4	140.3	144.7	242.7	2113.8	1550.8	285.0	4192.3
	*(A+B)/2=	ND	117.1	107.7	43.3	72.0	453.8	298.8	280.9	942.5	83.8	20.7	687.3	540.8	164.9	227.5	139.0	157.6	268.0	2152.3	1620.4	296.6	4337.2
60	A	ND	12.7	44.5	ND	49.5	427.8	183.0	254.7	875.5	52.4	ND	759.8	513.3	187.1	235.4	101.1	87.0	87.2	1842.9	1715.6	268.1	3863.8
	B	ND	2.7	105.2	12.3	79.1	430.2	190.6	249.7	922.8	76.2	ND	686.6	605.8	152.2	202.0	142.2	78.9	120.2	1948.6	1646.6	221.1	3936.5
	*(A+B)/2=	ND	7.7	74.9	6.2	64.3	429.0	186.8	252.2	899.2	64.3	ND	723.2	559.6	169.7	228.7	161.7	83.0	88.7	1895.8	1681.1	244.6	3910.2
90	A	ND	ND	ND	ND	28.0	278.8	68.7	91.8	398.8	32.4	29.6	652.8	850.8	105.2	244.9	104.6	51.5	ND	928.0	1553.7	158.1	2637.8
	B	ND	ND	ND	ND	27.8	233.3	62.4	85.1	254.0	27.2	22.3	524.5	452.7	88.4	163.6	87.2	37.3	ND	681.9	1229.2	124.5	2035.6
	*(A+B)/2=	ND	ND	ND	ND	27.8	256.1	65.6	73.5	326.3	29.8	26.0	588.7	501.8	96.8	204.3	95.9	44.4	ND	805.0	1391.4	140.3	2336.7
120	A	ND	ND	ND	ND	33.7	158.6	84.5	68.4	352.5	49.4	70.7	661.7	556.8	218.2	346.0	199.6	98.3	ND	827.8	1794.7	297.9	2920.4
	B	ND	ND	ND	ND	27.0	150.2	86.8	75.9	200.7	43.5	36.2	652.7	571.3	150.2	250.2	110.2	77.0	ND	710.4	1624.4	187.2	2522.0
	*(A+B)/2=	ND	ND	ND	ND	30.3	154.4	85.7	72.2	316.6	46.4	53.4	657.2	570.1	184.2	298.1	154.9	87.7	ND	769.1	1709.6	242.6	2721.2

ND = Not Detected - See Table 20 for detection limits

Table 62. Experiment I: PAH in site soil (ppm)
GULFPORT

DATE	DUPLICATE	NAPH	2-MET	1-MET	BIPH	ACTHY	ACTHE	DIBEN	FLORE	PHEN	ANTHR	CARBA	FLUOR	PYRENE	1,2-BZ	CHRYS	BEN-a	BghI	2 RING	3 RING	4 RING	5 RING	TOTALPAH
0	A	453.7	295.0	147.0	71.8	46.5	474.8	226.1	259.6	1113.8	ND	00.5	561.5	478.2	56.1	62.4	ND	ND	967.5	2209.3	1158.2	ND	4335.0
	B	440.1	287.6	140.5	71.4	47.0	479.5	228.7	260.9	1123.0	ND	51.2	549.8	481.0	64.0	64.7	ND	ND	939.6	2190.3	1159.5	ND	4289.4
	(A+B)/2=	446.9	291.3	143.8	71.6	46.8	477.2	227.4	260.3	1118.4	ND	69.9	555.7	479.6	60.1	63.6	ND	ND	953.6	2199.8	1158.9	ND	4312.2
30	A	ND	ND	ND	ND	3.9	157.7	47.2	71.1	382.1	ND	49.2	573.4	475.2	18.5	31.6	ND	ND	ND	721.2	1098.7	ND	1819.9
	B	ND	ND	ND	ND	3.6	162.8	45.3	66.7	364.9	3.5	41.1	522.2	420.8	11.2	20.4	ND	ND	ND	687.9	974.6	ND	1662.5
	(A+B)/2=	ND	ND	ND	ND	3.8	166.3	46.3	68.9	373.5	1.8	45.2	547.8	448.0	14.9	26.0	ND	ND	ND	704.6	1036.7	ND	1741.2
60	A	ND	ND	ND	ND	21.3	187.4	72.2	36.6	54.8	31.7	23.6	861.9	808.5	175.8	126.2	96.4	39.7	ND	427.6	1972.4	136.1	2536.1
	B	ND	ND	ND	ND	ND	259.9	93.1	34.4	41.1	41.1	36.0	993.5	1066.7	220.9	165.0	115.3	41.9	ND	505.6	2445.1	157.2	3107.9
	(A+B)/2=	ND	ND	ND	ND	10.7	223.7	82.7	35.5	48.0	36.4	29.8	927.7	937.1	198.4	145.6	105.9	40.8	ND	466.6	2208.8	146.7	2822.0
90	A	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	1203.3	894.4	188.0	175.8	88.9	ND	ND	ND	2481.5	88.9	2518.4
	B	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	1125.7	817.8	152.8	161.3	88.1	ND	ND	ND	2257.6	88.1	2312.7
	(A+B)/2=	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	1164.5	856.1	170.4	168.6	88.0	ND	ND	ND	2369.6	88.0	2415.6
120	A	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	802.7	620.6	119.9	104.4	86.6	ND	ND	ND	1427.6	86.6	1514.2
	B	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	849.2	1040.3	119.7	220.1	105.3	ND	ND	ND	2229.3	105.3	2334.6
	(A+B)/2=	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	676.0	830.5	119.8	202.3	96.0	ND	ND	ND	1828.5	96.0	1924.4

ND = Not Detected - See Table 20 for detection limits

Table 62. Experiment I: PAH in Site Soil (ppm)
MERIDIAN

DATE	DUPLICATE	NAPH	2-MET	1-MET	BIPH	ACTHY	ACTHE	DIBEN	FLORE	PHEN	ANTHR	CARBA	FLUOR	PYRENE	1,2-BZ	CHRYS	BEN-a	Bghi	2 RING	3 RING	4 RING	5 RING	TOTALPAH
0	A	397.6	315.6	140.8	139.5	58.9	560.9	352.6	328.7	1058.9	ND	38.6	564.3	536.2	77.4	116.6	19.6	ND	993.5	2408.6	1294.5	19.6	4716.2
	B	566.2	422.8	175.4	122.9	121.9	677.4	531.3	406.1	1335.5	ND	59.1	730.2	645.8	110.2	126.6	49.1	ND	1287.3	3131.3	1612.8	49.1	6080.5
	*(A+B)/2=	481.9	369.2	158.1	131.2	90.4	619.2	442.0	367.4	1202.2	ND	48.9	647.3	591.0	93.8	121.6	34.4	ND	1140.4	2770.0	1453.7	34.4	5398.4
30	A	ND	24.8	24.0	69.0	ND	77.1	347.2	195.3	1103.6	ND	ND	625.5	437.9	75.8	130.9	22.5	ND	117.8	1724.2	1270.1	22.5	3134.6
	B	ND	26.5	22.2	65.8	ND	70.0	357.4	189.8	1016.8	ND	ND	635.7	515.0	84.5	110.7	22.5	ND	114.5	1634.0	1345.9	22.5	3116.9
	*(A+B)/2=	ND	25.7	23.1	67.4	ND	73.6	352.3	193.1	1060.2	ND	ND	630.6	476.5	80.2	120.8	22.5	ND	116.2	1679.1	1308.0	22.5	3125.8
60	A	ND	ND	ND	ND	ND	118.1	290.8	216.6	1222.4	ND	ND	878.3	624.9	159.7	57.8	50.9	ND	ND	1847.9	1718.7	50.9	3617.5
	B	ND	ND	ND	ND	ND	115.2	241.3	181.5	1345.3	ND	ND	1029.7	890.8	169.9	60.4	46.8	ND	ND	1884.3	2150.8	46.8	4081.9
	*(A+B)/2=	ND	ND	ND	ND	ND	116.7	266.1	199.1	1284.4	ND	ND	953.0	757.9	164.8	59.1	48.9	ND	ND	1866.1	1934.8	48.9	3849.7
90	A	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	1020.7	640.0	116.4	133.1	43.8	ND	ND	ND	1910.2	43.8	1954.0
	B	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	1306.0	811.7	147.9	170.3	52.3	ND	ND	ND	2435.9	52.3	2488.2
	*(A+B)/2=	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	1163.4	725.9	132.2	151.7	48.1	ND	ND	ND	2173.1	48.1	2221.1

ND = Not Detected - See Table 20 for detection limits

Table 62. Experiment I: PAH in Site Soil (ppm)
WEEKS

DATE	DUPLICATE	NAPH	2-MET	1-MET	BIPH	ACTHY	ACTHE	DIBEN	FLORE	PHEN	ANTHR	CARBA	FLUOR	PYRENE	1,2-BZ	CHRYS	BEN-a	BghI	2 RING	3 RING	4 RING	5 RING	TOTALPAH
0	A	413.4	276.9	137.4	67.1	50.5	481.7	307.4	258.1	1160.0	ND	38.5	538.9	461.4	4.9	47.4	ND	ND	894.8	2296.2	1052.6	ND	4243.6
	B	414.2	289.6	144.9	72.6	52.1	508.6	311.1	271.7	1184.7	ND	56.9	509.0	528.4	38.2	56.0	ND	ND	921.3	2365.1	1211.6	ND	4518.0
	*(A+B)/2=	413.8	283.3	141.2	69.9	51.3	495.2	309.3	264.9	1172.4	ND	47.7	554.0	494.9	21.6	51.7	ND	ND	908.1	2340.7	1132.1	ND	4380.8
30	A	ND	ND	ND	ND	ND	315.9	83.8	163.2	606.3	5.4	ND	554.7	493.4	15.5	70.1	ND	ND	ND	1174.6	1133.7	ND	2308.3
	B	ND	ND	ND	ND	ND	329.3	92.5	173.8	660.3	5.1	24.5	562.5	472.1	8.0	105.8	ND	ND	ND	1275.5	1148.4	ND	2423.9
	*(A+B)/2=	ND	ND	ND	ND	ND	322.6	88.2	168.5	628.3	5.3	12.3	558.6	482.8	11.8	88.0	ND	ND	ND	1225.1	1141.1	ND	2366.1
60	A	ND	5.9	6.2	6.5	41.9	459.2	171.0	267.4	481.5	82.7	72.9	678.8	658.3	124.0	95.0	64.5	18.3	18.6	1576.6	1556.1	82.8	3234.1
	B	ND	10.7	13.1	5.2	71.0	784.8	269.0	335.6	840.0	143.6	122.9	1197.7	1182.6	166.2	119.4	51.1	20.3	29.0	2566.9	2666.9	71.4	5333.2
	*(A+B)/2=	ND	8.3	9.7	5.9	56.5	622.0	220.0	301.5	660.8	113.2	97.9	938.3	920.4	145.1	107.2	57.8	19.3	23.8	2071.8	2111.0	77.1	4283.7
90	A	ND	ND	ND	ND	ND	364.8	94.2	263.8	202.3	107.9	ND	1052.1	984.0	176.6	150.1	ND	ND	ND	1033.0	2362.8	ND	3395.8
	B	ND	ND	ND	ND	ND	364.8	94.2	263.8	202.3	107.9	ND	1052.1	984.0	176.6	150.1	ND	ND	ND	1033.0	2362.8	ND	3395.8
	*(A+B)/2=	ND	ND	ND	ND	ND	364.8	94.2	263.8	202.3	107.9	ND	1052.1	984.0	176.6	150.1	ND	ND	ND	1033.0	2362.8	ND	3395.8
120	A	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	604.9	692.5	79.4	109.9	ND	ND	ND	ND	1486.7	ND	1486.7
	B	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	1020.7	408.6	100.1	123.1	ND	ND	ND	ND	1652.5	ND	1652.5
	*(A+B)/2=	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	812.8	550.6	89.8	116.5	ND	ND	ND	ND	1569.6	ND	1569.6

ND = Not Detected - See Table 20 for detection limits

Table 62. Experiment I: PAH in Site Soil (ppm)
WILMINGTON

DATE	DUPLICATE	NAPH	2-MET	1-MET	BIPH	ACTHY	ACTHE	DIBEN	FLORE	PHEN	ANTHR	CARBA	FLUOR	PYRENE	1,2-BZ	CHRYS	BEN-a	Byhl	2 RING	3 RING	4 RING	5 RING	TOTALPAH
0	A	398.5	304.5	140.8	95.4	98.2	535.8	400.4	337.5	1218.0	ND	53.9	591.2	573.3	107.8	150.5	63.6	50.9	939.2	2643.8	1422.8	114.4	5120.2
	B	410.9	304.1	139.8	92.4	77.2	440.2	326.9	272.9	930.3	ND	56.4	572.9	599.6	113.3	133.9	59.4	47.4	947.2	2111.9	1419.7	106.7	4585.5
	*(A+B)/2=	404.7	304.3	140.3	93.9	87.7	488.0	363.7	305.2	1078.2	ND	55.1	582.1	586.5	110.6	142.2	61.5	49.1	943.2	2377.8	1421.3	110.6	4852.8
30	A	214.0	245.4	113.8	87.7	84.8	371.6	319.6	263.3	1165.0	ND	48.9	576.7	532.1	103.5	139.6	52.7	46.4	662.0	2253.2	1351.9	99.0	4366.1
	B	210.5	245.2	120.1	85.3	78.6	363.1	338.4	267.8	985.6	ND	42.7	559.0	493.0	98.4	135.6	39.1	34.5	661.2	2076.2	1286.0	73.6	4096.9
	*(A+B)/2=	212.3	245.8	117.0	86.5	81.7	367.4	329.0	265.6	1075.3	ND	45.8	567.9	512.6	100.9	137.6	45.9	40.4	661.6	2164.7	1318.9	86.3	4231.5
60	A	108.7	350.2	104.2	94.3	105.9	392.6	422.5	328.7	1401.0	ND	50.2	773.7	657.8	114.1	193.2	63.2	ND	657.4	2598.9	1738.8	63.2	5158.3
	B	104.2	207.2	105.5	92.6	98.7	372.2	509.1	344.3	1146.0	ND	132.0	740.0	642.4	107.9	187.5	63.1	ND	509.5	2602.3	1677.8	63.1	4852.7
	*(A+B)/2=	106.4	278.7	104.9	93.5	102.3	382.4	465.8	336.5	1273.5	ND	91.1	756.9	650.1	111.0	190.4	63.2	ND	583.5	2650.6	1708.3	63.2	5005.5
90	A	ND	45.5	41.4	48.5	ND	305.2	291.7	304.6	1217.2	73.9	149.6	622.4	615.3	118.8	215.5	73.4	ND	135.4	2342.2	1772.0	73.4	4323.0
	B	ND	37.3	40.0	48.1	60.8	258.8	283.4	291.9	1173.7	91.9	134.6	782.8	567.4	123.1	130.4	66.2	ND	125.4	2295.1	1603.7	66.2	4090.4
	*(A+B)/2=	ND	41.4	40.7	48.3	30.4	282.0	287.6	298.3	1195.5	82.9	142.1	802.6	591.4	121.0	173.0	69.8	ND	130.4	2318.7	1687.9	69.8	4206.7

ND = Not Detected - See Table 20 for detection limits

Table 63. Experiment I: PCP in site soil (ppm)

SITE	DUPLICATE	0	30	60	90	120	150
GULFPORT	A	855.1	864.4	1292.8	1600.2	1569.7	609.0
	B	855.2	854.7	1210.4	1575.5	1596.6	668.2
	(A+B)/2=	855.2	859.6	1251.6	1587.9	1583.2	638.6
ATLANTA	A	1056.9	908.3	1321.7	1354.0	1309.3	1046.3
	B	1060.3	976.8	1299.3	1121.2	1202.8	1095.3
	(A+B)/2=	1058.6	942.6	1310.5	1237.6	1256.1	1070.8
WIGGINS	A	928.9	903.9	1207.8	1609.3	1573.7	NA
	B	960.4	915.5	1194.5	1608.4	1621.9	NA
	(A+B)/2=	944.7	909.7	1201.2	1608.9	1597.8	NA
CHATTANOOGA	A	822.6	806.5	777.8	607.4	623.7	942.6
	B	763.1	742.5	800.8	552.1	603.6	953.7
	(A+B)/2=	792.9	774.5	789.3	579.8	613.7	948.2
WILMINGTON	A	930.4	879.9	1273.9	1223.6	1207.7	1053.1
	B	871.1	843.9	1213.3	1226.3	1209.4	1052.1
	(A+B)/2=	900.8	861.9	1243.6	1225.0	1208.6	1052.6
MERIDIAN	A	1011.2	925.3	1379.6	1290.6	1292.0	NA
	B	921.1	893.7	1410.0	1275.1	1366.9	NA
	(A+B)/2=	966.2	909.5	1394.8	1282.9	1329.5	NA

NA = Not Analyzed

Table 64. Experiment I: OCDD in Site Soils (ppm)

SITE	DUPLICATE	DAYS AFTER INITIAL LOADING 0	30	60	90	120	150
GULFPORT	A	1.01	1.30	1.29	2.23	2.90	3.39
	B	1.04	1.09	1.25	2.06	3.07	3.65
	(A+B)/2=	1.03	1.20	1.27	2.15	2.99	3.52
ATLANTA	A	2.67	2.46	3.73	3.30	5.91	6.05
	B	2.79	2.74	3.75	2.56	5.38	6.03
	(A+B)/2=	2.73	2.60	3.74	2.93	5.65	6.04
WIGGINS	A	0.82	0.75	1.05	1.78	2.41	NA
	B	0.83	0.79	0.93	1.78	2.64	NA
	(A+B)/2=	0.83	0.77	0.99	1.78	2.53	NA
CHATTANOOGA	A	1.88	1.76	2.48	2.08	2.06	1.90
	B	1.75	1.67	2.35	1.90	1.98	1.85
	(A+B)/2=	1.82	1.72	2.42	1.99	2.02	1.88
WILMINGTON	A	1.86	1.79	2.50	2.49	3.87	4.79
	B	1.76	1.73	2.37	2.52	3.98	4.82
	(A+B)/2=	1.81	1.76	2.44	2.51	3.93	4.81
MERIDIAN	A	0.75	0.91	2.24	2.12	NA	NA
	B	1.19	1.11	2.35	2.14	NA	NA
	(A+B)/2=	0.97	1.01	2.30	2.13	NA	NA

NA = Not Analyzed
ND = Not Detected - See Table 20 for detection limits

Table 65. Experiment II - Polycyclic aromatic hydrocarbons in site soil (ppm)
MILLIMA

LOID	DATE	DUPLICATE	NAPH	2-MET	1-MET	BIPH	ACTHY	ACTHE	DIBEN	FLORE	PHEN	ANTHR	CARBA	FLUOR	PYRENE	1,2-BZ	CHRYS	BEN-a	Bghi	2 RING	3 RING	4 RING	5 RING	TOTALPAH
0.3	0	A	13.0	ND	ND	ND	ND	9.0	6.0	12.0	45.0	22.0	ND	59.0	68.0	15.0	25.0	ND	ND	13.0	94.0	167.0	ND	274.0
		B	13.0	7.0	4.0	ND	ND	11.0	11.0	17.0	66.0	56.0	17.0	67.0	83.0	24.0	34.0	ND	ND	24.0	178.0	208.0	ND	410.0
REP 1		CAVED/2=	13.0	3.5	2.0	ND	ND	10.0	8.5	14.5	55.5	39.0	8.5	63.0	75.5	19.5	29.5	ND	ND	18.5	136.0	187.5	ND	342.0
	0	A	13.0	5.0	ND	ND	ND	9.0	7.0	13.0	56.0	25.0	ND	73.0	88.0	25.0	37.0	ND	ND	18.0	110.0	225.0	ND	353.0
		B	14.0	6.0	ND	ND	ND	11.0	10.0	18.0	60.0	47.0	17.0	95.0	112.0	36.0	47.0	ND	ND	20.0	171.0	290.0	ND	481.0
REP 2		CAVED/2=	13.5	5.5	ND	ND	ND	10.0	8.5	15.5	62.0	36.0	8.5	85.0	100.0	30.5	42.0	ND	ND	19.0	140.5	257.5	ND	417.0
	0	A	15.0	7.0	5.0	ND	ND	9.0	8.0	13.0	58.0	21.0	ND	69.0	83.0	20.0	31.0	ND	ND	27.0	109.0	203.0	ND	339.0
		B	13.0	6.0	ND	ND	ND	10.0	9.0	14.0	67.0	27.0	ND	122.0	134.0	35.0	50.0	ND	ND	19.0	127.0	341.0	ND	487.0
REP 3		CAVED/2=	14.0	6.5	2.5	ND	ND	9.5	8.5	13.5	62.5	24.0	ND	95.5	108.5	27.5	40.5	ND	ND	23.0	118.0	272.0	ND	413.0
0.3	30	A	ND	ND	ND	ND	ND	ND	3.0	4.0	19.0	21.0	7.0	49.0	51.0	10.0	29.0	ND	ND	ND	54.0	139.0	ND	193.0
		B	1.0	1.0	1.0	ND	ND	2.0	3.0	3.0	12.0	19.0	6.0	70.0	69.0	24.0	54.0	16.0	ND	3.0	45.0	217.0	16.0	281.0
REP 1		CAVED/2=	0.5	0.5	0.5	ND	ND	1.0	3.0	3.5	15.5	20.0	6.5	59.5	60.0	17.0	41.5	8.0	ND	1.5	49.5	178.0	8.0	237.0
	30	A	3.0	2.0	2.0	ND	ND	3.0	3.0	3.0	12.0	15.0	5.0	68.0	64.0	21.0	50.0	19.0	ND	7.0	41.0	203.0	19.0	270.0
		B	2.0	2.0	2.0	ND	ND	6.0	6.0	11.0	57.0	47.0	22.0	89.0	82.0	24.0	55.0	19.0	ND	6.0	149.0	250.0	19.0	424.0
REP 2		CAVED/2=	2.5	2.0	2.0	ND	ND	4.5	4.5	7.0	34.5	31.0	13.5	78.5	73.0	22.5	52.5	19.0	ND	6.5	95.0	226.5	19.0	347.0
	30	A	2.0	2.0	2.0	ND	ND	2.0	3.0	4.0	20.0	24.0	11.0	51.0	52.0	19.0	49.0	15.0	ND	6.0	64.0	164.0	15.0	249.0
		B	2.0	1.0	1.0	ND	2.0	2.0	3.0	4.0	26.0	24.0	11.0	62.0	60.0	22.0	50.0	18.0	ND	4.0	72.0	194.0	18.0	288.0
REP 3		CAVED/2=	2.0	1.5	1.5	ND	1.0	2.0	3.0	4.0	23.0	24.0	11.0	56.5	56.0	20.0	46.5	16.5	ND	5.0	68.0	179.0	16.5	268.5
0.3	60	A	18.0	10.0	7.0	3.0	2.0	9.0	11.0	14.0	56.0	28.0	15.0	74.0	86.0	24.0	63.0	41.0	ND	38.0	135.0	247.0	41.0	461.0
		B	21.0	13.0	8.0	3.0	2.0	12.0	13.0	18.0	66.0	61.0	24.0	74.0	83.0	29.0	68.0	55.0	ND	45.0	196.0	254.0	55.0	550.0
REP 1		CAVED/2=	19.5	11.5	7.5	3.0	2.0	10.5	12.0	16.0	61.0	44.5	19.5	74.0	84.5	26.5	65.5	48.0	ND	41.5	165.5	250.5	48.0	505.5
	60	A	22.0	13.0	8.0	1.0	2.0	10.0	12.0	14.0	47.0	24.0	13.0	64.0	55.0	23.0	54.0	37.0	ND	44.0	122.0	196.0	37.0	399.0
		B	24.1	9.0	37.0	2.0	11.0	12.0	15.0	55.0	39.0	21.0	81.0	71.0	34.0	70.0	55.0	ND	ND	72.1	234.0	230.0	ND	536.1
REP 2		CAVED/2=	23.1	11.0	22.5	1.5	6.5	11.0	13.5	34.5	43.0	22.5	47.0	67.5	44.5	46.5	54.5	18.5	ND	58.1	178.0	213.0	18.5	467.6
	60	A	24.0	13.0	9.0	4.0	2.0	10.0	11.0	13.0	52.0	206.0	11.0	63.0	54.0	20.0	50.0	36.0	ND	50.0	305.0	187.0	36.0	578.0
		B	23.0	13.0	8.0	4.0	2.0	11.0	11.0	14.0	54.0	24.0	14.0	97.0	79.0	30.0	68.0	43.0	ND	48.0	130.0	274.0	43.0	495.0
REP 3		CAVED/2=	23.5	13.0	8.5	4.0	2.0	10.5	11.0	13.5	53.0	115.0	12.5	80.0	66.5	25.0	59.0	39.5	ND	49.0	217.5	230.5	39.5	536.5
0.3	90	A	ND	ND	ND	ND	ND	ND	ND	ND	15.0	12.0	ND	73.0	69.0	28.0	42.0	ND	ND	ND	27.0	212.0	ND	239.0
		B	ND	ND	ND	ND	ND	ND	ND	ND	9.0	16.0	ND	35.0	38.0	16.0	25.0	7.0	ND	ND	25.0	114.0	7.0	146.0
REP 1		CAVED/2=	ND	ND	ND	ND	ND	ND	ND	ND	12.0	14.0	ND	54.0	53.5	22.0	33.5	3.5	ND	ND	26.0	163.0	3.5	192.5
	90	A	ND	ND	ND	ND	ND	ND	ND	ND	9.0	9.0	ND	38.0	43.0	17.0	21.0	ND	ND	ND	18.0	119.0	ND	137.0
		B	ND	ND	ND	ND	ND	ND	ND	ND	10.0	10.0	ND	47.0	56.0	23.0	33.0	12.0	ND	ND	20.0	159.0	12.0	191.0
REP 2		CAVED/2=	ND	ND	ND	ND	ND	ND	ND	ND	9.5	9.5	ND	42.5	49.5	20.0	27.0	6.0	ND	ND	19.0	139.0	6.0	164.0
	90	A	ND	ND	ND	ND	ND	ND	ND	ND	8.0	6.0	ND	41.0	41.0	19.0	26.0	10.0	ND	ND	14.0	127.0	10.0	151.0
		B	ND	ND	ND	ND	ND	ND	ND	ND	18.0	13.0	ND	91.0	78.0	25.0	32.0	ND	ND	ND	31.0	226.0	ND	257.0
REP 3		CAVED/2=	ND	ND	ND	ND	ND	ND	ND	ND	13.0	9.5	ND	66.0	59.5	22.0	29.0	5.0	ND	ND	22.5	176.5	5.0	204.0

ND = Not Detected - See Table 20 for detection limits

Table 65. Experiment II - Polycyclic aromatic hydrocarbons in site soil (ppb)

MISCELL LEVEL	TIME	CONCENTRATION	NAPH	2-MET	1-MET	BIPH	ACTHY	ACTHE	DIBEN	FLORE	PHEN	ANTHR	CARBA	FLUOR	PYRENE	1,2-BZ	CHRYS	BEN-a	Bzfl	2 RING	3 RING	4 RING	5 RING	TOTALPAH
3.0	0	A	138.0	93.9	42.0	19.3	20.1	143.7	114.5	165.6	405.5	266.3	151.0	291.9	193.3	43.7	75.9	23.4	ND	294.8	1346.7	604.8	23.4	2269.7
		B	165.9	91.5	43.5	13.3	14.7	111.2	86.7	133.3	340.9	165.5	39.6	126.4	92.4	9.3	11.6	8.2	ND	314.2	891.9	239.7	8.2	1454.0
REP 1		CONCD/2=	152.4	92.7	43.2	16.3	17.4	127.5	100.6	149.5	413.2	215.9	95.3	209.2	142.9	26.5	43.8	15.8	ND	304.5	1119.3	422.3	15.8	1861.9
	0	A	99.9	65.2	33.2	8.5	18.6	109.3	73.0	103.9	301.1	139.5	68.0	193.5	130.7	28.2	58.2	9.8	ND	206.8	813.4	418.6	9.8	1448.6
		B	140.9	73.9	37.6	8.4	15.5	101.8	70.5	117.3	182.0	89.4	12.0	57.5	36.9	ND	ND	ND	ND	260.8	588.5	94.4	ND	943.7
REP 2		CONCD/2=	120.4	69.6	35.4	8.5	17.1	105.6	71.8	110.6	241.6	114.5	40.0	125.5	87.8	14.1	29.1	4.9	ND	233.8	701.0	256.5	4.9	1196.2
	0	A	102.0	55.5	29.4	18.4	13.5	82.9	53.2	90.8	244.1	103.6	34.6	204.4	139.2	27.6	68.2	3.8	ND	205.3	622.7	439.4	3.8	1271.2
		B	123.9	65.4	32.2	20.7	14.6	92.7	83.0	92.3	151.5	56.8	5.7	85.5	59.5	2.7	5.6	8.7	ND	242.2	436.6	153.3	8.7	900.8
REP 3		CONCD/2=	113.0	60.5	30.8	19.6	14.1	87.8	68.1	91.6	197.8	80.2	20.2	145.0	99.4	15.2	36.9	6.3	ND	223.8	559.7	236.4	6.3	1086.0
3.0	30	A	ND	ND	ND	29.0	ND	103.0	86.0	122.0	309.0	216.0	ND	213.0	170.0	34.0	61.0	ND	ND	29.0	916.0	478.0	ND	1423.0
		B	ND	ND	ND	26.0	ND	79.0	96.0	93.0	309.0	144.0	ND	177.0	149.0	30.0	52.0	ND	ND	26.0	721.0	408.0	ND	1155.0
REP 1		CONCD/2=	ND	ND	ND	27.5	ND	91.0	91.0	107.5	349.0	180.0	ND	195.0	159.5	32.0	56.5	ND	ND	27.5	818.5	443.0	ND	1289.0
	30	A	ND	ND	ND	18.0	ND	82.0	69.0	93.0	307.0	166.0	ND	192.0	158.0	39.0	60.0	ND	ND	18.0	717.0	443.0	ND	1184.0
		B	ND	ND	ND	18.0	ND	76.0	64.0	89.0	284.0	158.0	ND	169.0	144.0	33.0	56.0	ND	ND	18.0	671.0	402.0	ND	1091.0
REP 2		CONCD/2=	ND	ND	ND	18.0	ND	79.0	66.5	91.0	295.5	162.0	ND	180.5	151.0	36.0	58.0	ND	ND	18.0	694.0	425.5	ND	1137.5
	30	A	ND	ND	ND	18.0	15.0	60.0	52.0	72.0	252.0	109.0	ND	162.0	135.0	26.0	47.0	ND	ND	18.0	560.0	370.0	ND	948.0
		B	ND	ND	ND	17.0	15.0	66.0	77.0	77.0	266.0	122.0	ND	165.0	139.0	34.0	55.0	ND	ND	17.0	623.0	393.0	ND	1033.0
REP 3		CONCD/2=	ND	ND	ND	17.5	15.0	63.0	64.5	74.5	259.0	115.5	ND	163.5	137.0	30.0	51.0	ND	ND	17.5	591.5	381.5	ND	990.5
3.0	60	A	ND	ND	ND	ND	ND	43.1	ND	13.9	72.3	116.9	ND	175.1	150.0	29.1	49.6	ND	ND	ND	246.2	403.8	ND	650.0
		B	ND	ND	ND	ND	10.9	51.2	ND	26.0	79.5	140.2	ND	196.9	164.3	41.8	62.2	ND	ND	ND	307.8	465.2	ND	773.0
REP 1		CONCD/2=	ND	ND	ND	ND	5.5	47.2	ND	20.0	73.9	128.6	ND	186.0	157.2	35.5	55.9	ND	ND	ND	277.0	434.5	ND	711.5
	60	A	ND	ND	ND	ND	ND	40.8	ND	14.9	36.2	88.1	ND	160.3	133.5	29.3	56.3	ND	ND	ND	180.0	379.4	ND	559.4
		B	ND	ND	ND	12.5	ND	47.8	ND	16.8	59.7	120.9	ND	184.1	146.2	35.6	54.1	ND	ND	12.5	245.2	420.0	ND	677.7
REP 2		CONCD/2=	ND	ND	ND	6.3	ND	44.3	ND	15.9	48.0	104.5	ND	172.2	139.9	32.5	55.2	ND	ND	6.3	212.6	399.7	ND	618.6
	60	A	ND	ND	ND	ND	ND	18.8	ND	13.8	52.1	104.8	ND	175.4	156.0	43.4	71.5	ND	ND	ND	189.5	446.3	ND	635.8
		B	ND	ND	ND	ND	ND	ND	ND	8.1	22.7	51.0	ND	110.8	101.9	18.7	40.2	ND	ND	ND	81.8	271.6	ND	353.4
REP 3		CONCD/2=	ND	ND	ND	ND	ND	9.4	ND	11.0	37.4	77.9	ND	143.1	129.0	31.1	55.9	ND	ND	ND	135.7	359.0	ND	494.6
3.0	90	A	ND	ND	ND	ND	11.0	39.0	11.0	14.0	27.0	118.0	ND	141.0	116.0	20.0	42.0	ND	ND	ND	220.0	319.0	ND	539.0
		B	ND	ND	ND	ND	ND	46.0	ND	17.0	84.0	185.0	ND	227.0	179.0	37.0	58.0	ND	ND	ND	332.0	501.0	ND	833.0
REP 1		CONCD/2=	ND	ND	ND	ND	5.5	42.5	5.5	15.5	55.5	151.5	ND	184.0	147.5	28.5	50.0	ND	ND	ND	276.0	410.0	ND	686.0
	90	A	ND	ND	ND	ND	ND	25.0	ND	15.0	26.0	69.0	ND	194.0	151.0	35.0	57.0	ND	ND	ND	135.0	437.0	ND	572.0
		B	5.0	ND	ND	5.0	10.0	31.0	20.0	5.0	28.0	85.0	21.0	136.0	113.0	24.0	28.0	11.0	ND	10.0	200.0	301.0	11.0	522.0
REP 2		CONCD/2=	2.5	ND	ND	2.5	5.0	28.0	10.0	10.0	27.0	77.0	10.5	165.0	132.0	29.5	42.5	5.5	ND	5.0	167.5	369.0	5.5	547.0
	90	A	7.0	ND	ND	ND	ND	9.0	17.0	5.0	24.0	63.0	25.0	64.0	101.0	25.0	28.0	14.0	ND	7.0	143.0	218.0	14.0	382.0
		B	5.0	ND	ND	ND	ND	ND	15.0	5.0	21.0	48.0	21.0	51.0	93.0	21.0	25.0	15.0	ND	5.0	110.0	190.0	15.0	320.0
REP 3		CONCD/2=	6.0	ND	ND	ND	ND	4.5	16.0	5.0	22.5	55.5	23.0	57.5	97.0	23.0	26.5	14.5	ND	6.0	126.5	204.0	14.5	351.0

ND = Not Detected - See Table 20 for detection limits

Table 65. Experiment II - Polycyclic aromatic hydrocarbons in site soil (ppb)

MT/SMTM LOAD	DATE	DUPLICATE	NAPH	2-MET	1-MET	BIPH	ACTHY	ACTHE	DIBEN	FLORE	PHEN	ANTHR	CARBA	FLUOR	PYRENE	1,2-BZ	CHRYS	BEN-a	BghI	2 RING	3 RING	4 RING	5 RING	TOTALPAH
1.0	30	A	ND	ND	ND	ND	ND	8.0	ND	ND	24.0	31.0	ND	101.0	77.0	21.0	66.0	18.0	ND	ND	63.0	265.0	18.0	346.0
		B	ND	ND	ND	ND	ND	9.0	ND	2.0	22.0	30.0	ND	116.0	90.0	12.0	68.0	18.0	ND	ND	63.0	286.0	18.0	367.0
REP 1		CMBD/2=	ND	ND	ND	ND	ND	8.5	ND	1.0	23.0	30.5	ND	108.5	83.5	16.5	67.0	18.0	ND	ND	63.0	275.5	18.0	356.5
	30	A	ND	ND	ND	ND	ND	14.0	ND	6.0	16.0	25.0	ND	95.0	76.0	28.0	61.0	15.0	ND	ND	61.0	260.0	15.0	336.0
		B	ND	2.0	ND	ND	ND	17.0	ND	9.0	30.0	43.0	ND	112.0	83.0	28.0	55.0	15.0	ND	2.0	99.0	278.0	15.0	394.0
REP 2		CMBD/2=	ND	1.0	ND	ND	ND	15.5	ND	7.5	23.0	34.0	ND	103.5	79.5	28.0	58.0	15.0	ND	1.0	80.0	269.0	15.0	365.0
	30	A	ND	ND	ND	ND	ND	ND	ND	4.0	32.0	35.0	ND	65.0	61.0	19.0	48.0	15.0	ND	ND	71.0	193.0	15.0	279.0
		B	ND	ND	ND	ND	ND	ND	ND	5.0	29.0	54.0	ND	104.0	99.0	32.0	60.0	16.0	ND	ND	88.0	295.0	16.0	399.0
REP 3		CMBD/2=	ND	ND	ND	ND	ND	ND	ND	4.5	30.5	44.5	ND	84.5	80.0	25.5	54.0	15.5	ND	ND	79.5	244.0	15.5	399.0
1.0	60	A	40.0	22.0	14.0	7.0	2.0	21.0	23.0	27.0	89.0	44.0	21.0	96.0	77.0	32.0	71.0	27.0	ND	83.0	227.0	276.0	27.0	613.0
		B	53.0	29.0	19.0	9.0	3.0	28.0	30.0	34.0	111.0	58.0	31.0	126.0	95.0	41.0	80.0	34.0	ND	110.0	295.0	342.0	34.0	781.0
REP 1		CMBD/2=	46.5	25.5	16.5	8.0	2.5	24.5	26.5	30.5	100.0	51.0	26.0	111.0	86.0	36.5	75.5	30.5	ND	96.5	261.0	309.0	30.5	697.0
	60	A	50.0	27.0	17.0	8.0	2.0	26.0	28.0	33.0	102.0	51.0	27.0	92.0	72.0	29.0	67.0	27.0	ND	102.0	269.0	260.0	27.0	658.0
		B	46.0	27.0	16.0	8.0	2.0	25.0	27.0	33.0	104.0	62.0	32.0	90.0	71.0	31.0	66.0	73.0	ND	97.0	285.0	258.0	73.0	713.0
REP 2		CMBD/2=	48.0	27.0	16.5	8.0	2.0	25.5	27.5	33.0	103.0	56.5	29.5	91.0	71.5	30.0	66.5	50.0	ND	99.5	277.0	299.0	50.0	685.5
	60	A	35.0	20.0	13.0	6.0	2.0	18.0	19.0	23.0	72.0	31.0	17.0	74.0	58.0	25.0	56.0	24.0	ND	74.0	182.0	213.0	24.0	493.0
		B	30.0	17.0	11.0	5.0	2.0	18.0	18.0	22.0	74.0	30.0	16.0	86.0	81.0	31.0	66.0	28.0	ND	63.0	180.0	264.0	28.0	535.0
REP 3		CMBD/2=	32.5	18.5	12.0	5.5	2.0	18.0	18.5	22.5	73.0	30.5	16.5	80.0	69.5	28.0	61.0	26.0	ND	68.5	181.0	238.5	26.0	514.0
1.0	90	A	ND	ND	ND	ND	ND	ND	ND	3.0	18.0	31.0	9.0	54.0	73.0	20.0	44.0	11.0	ND	ND	61.0	199.0	11.0	271.0
		B	ND	ND	ND	ND	ND	ND	ND	5.0	20.0	43.0	15.0	57.0	76.0	29.0	39.0	11.0	ND	ND	83.0	201.0	11.0	295.0
REP 1		CMBD/2=	ND	ND	ND	ND	ND	ND	ND	4.0	19.0	37.0	12.0	55.5	74.5	28.5	41.5	11.0	ND	ND	72.0	200.0	11.0	283.0
	90	A	ND	ND	ND	ND	ND	ND	ND	ND	12.0	20.0	ND	41.0	48.0	17.0	25.0	ND	ND	ND	32.0	131.0	ND	163.0
		B	ND	ND	ND	ND	ND	ND	ND	ND	8.0	14.0	ND	48.0	54.0	22.0	36.0	10.0	ND	ND	22.0	160.0	10.0	192.0
REP 2		CMBD/2=	ND	ND	ND	ND	ND	ND	ND	ND	10.0	17.0	ND	44.5	51.0	19.5	30.5	5.0	ND	ND	27.0	145.5	5.0	177.5
	90	A	ND	ND	ND	ND	ND	ND	ND	ND	17.0	18.0	ND	56.0	56.0	25.0	34.0	11.0	ND	ND	35.0	171.0	11.0	217.0
		B	ND	ND	ND	ND	ND	ND	ND	5.0	29.0	29.0	9.0	54.0	52.0	21.0	29.0	11.0	ND	ND	72.0	156.0	11.0	239.0
REP 3		CMBD/2=	ND	ND	ND	ND	ND	ND	ND	2.5	23.0	23.5	4.5	55.0	54.0	23.0	31.5	11.0	ND	ND	53.5	163.5	11.0	228.0

ND = Not Detected - See Table 20 for detection limits

Table 65. Experiment II - Polycyclic aromatic hydrocarbons in site soil (ppm)
CHRYSANDON

LOND	DATE	DUPLICATE	NAPH	2-MET	1-MET	BIPH	ACTHY	ACTHE	DIBEN	FLORE	PHEN	ANTHR	CARBA	FLUOR	PYRENE	1,2-BZ	CHRYS	BEN-a	BghI	2 RING	3 RING	4 RING	5 RING	TOTALPAH
0.3	0	A	7.0	3.0	1.0	1.0	4.0	6.0	7.0	12.0	82.0	100.0	30.0	269.0	233.0	84.0	198.0	88.0	84.0	12.0	241.0	784.0	172.0	1209.0
		B	4.0	2.0	1.0	1.0	4.0	7.0	7.0	10.0	81.0	42.0	13.0	270.0	236.0	91.0	200.0	116.0	116.0	8.0	164.0	797.0	232.0	1201.0
REP 1		GMEO/2=	5.5	2.5	1.0	1.0	4.0	6.5	7.0	11.0	81.5	71.0	21.5	269.5	234.5	87.5	199.0	102.0	100.0	10.0	202.5	790.5	202.0	1205.0
	0	A	6.0	3.0	1.0	1.0	3.0	5.0	6.0	8.0	54.0	5.0	13.0	204.0	191.0	78.0	183.0	96.0	91.0	11.0	94.0	656.0	187.0	948.0
		B	6.0	3.0	1.0	1.0	4.0	6.0	6.0	7.0	57.0	20.0	8.0	244.0	226.0	97.0	218.0	109.0	100.0	11.0	108.0	785.0	209.0	1113.0
REP 2		GMEO/2=	6.0	3.0	1.0	1.0	3.5	5.5	6.0	7.5	55.5	12.5	10.5	224.0	208.5	87.5	200.5	102.5	95.5	11.0	101.0	720.5	198.0	1030.5
	0	A	7.0	3.0	2.0	1.0	4.0	6.0	6.0	7.0	51.0	22.0	7.0	234.0	219.0	99.0	220.0	121.0	120.0	13.0	103.0	772.0	241.0	1129.0
		B	6.0	3.0	1.0	1.0	4.0	5.0	6.0	7.0	50.0	21.0	7.0	228.0	215.0	100.0	227.0	120.0	125.0	11.0	100.0	770.0	245.0	1126.0
REP 3		GMEO/2=	6.5	3.0	1.5	1.0	4.0	5.5	6.0	7.0	50.5	21.5	7.0	231.0	217.0	99.5	223.5	120.5	122.5	12.0	101.5	771.0	243.0	1127.5
0.3	30	A	3.0	ND	ND	ND	5.0	ND	ND	5.0	33.0	13.0	ND	168.0	172.0	133.0	180.0	109.0	65.0	3.0	56.0	653.0	174.0	886.0
		B	ND	ND	ND	ND	8.0	ND	ND	ND	40.0	43.0	10.0	235.0	231.0	185.0	263.0	155.0	81.0	ND	101.0	914.0	236.0	1251.0
REP 1		GMEO/2=	1.5	ND	ND	ND	6.5	ND	ND	2.5	36.5	28.0	5.0	201.5	201.5	159.0	221.5	132.0	73.0	1.5	78.5	783.5	205.0	1068.5
	30	A	2.0	ND	ND	ND	8.0	ND	ND	ND	36.0	20.0	ND	213.0	213.0	169.0	236.0	124.0	78.0	2.0	64.0	831.0	202.0	1099.0
		B	3.0	ND	ND	ND	7.0	ND	ND	6.0	31.0	22.0	4.0	177.0	181.0	147.0	202.0	119.0	73.0	3.0	70.0	707.0	192.0	972.0
REP 2		GMEO/2=	2.5	ND	ND	ND	7.5	ND	ND	3.0	33.5	21.0	2.0	195.0	197.0	158.0	219.0	121.5	75.5	2.5	67.0	769.0	197.0	1035.5
	30	A	3.0	ND	ND	ND	6.0	ND	ND	ND	31.0	19.0	ND	187.0	183.0	135.0	187.0	102.0	56.0	3.0	56.0	692.0	158.0	909.0
		B	5.0	ND	ND	ND	4.0	ND	ND	4.0	39.0	61.0	12.0	191.0	196.0	134.0	196.0	99.0	60.0	5.0	120.0	717.0	159.0	1001.0
REP 3		GMEO/2=	4.0	ND	ND	ND	5.0	ND	ND	2.0	35.0	40.0	6.0	189.0	189.5	134.5	191.5	100.5	58.0	4.0	68.0	704.5	158.5	955.0
0.3	60	A	5.0	2.0	1.0	ND	3.0	2.0	3.0	3.0	37.0	25.0	8.0	188.0	184.0	72.0	167.0	89.0	107.0	8.0	81.0	611.0	196.0	896.0
		B	4.0	2.0	1.0	ND	3.0	1.0	3.0	2.0	26.0	23.0	9.0	149.0	149.0	57.0	133.0	78.0	105.0	7.0	67.0	488.0	183.0	745.0
REP 1		GMEO/2=	4.5	2.0	1.0	ND	3.0	1.5	3.0	2.5	31.5	24.0	8.5	168.5	166.5	64.5	150.0	83.5	106.0	7.5	74.0	549.5	189.5	820.5
	60	A	4.0	1.0	1.0	ND	4.0	1.0	2.0	2.0	28.0	18.0	6.0	188.0	179.0	77.0	181.0	114.0	157.0	6.0	61.0	625.0	271.0	963.0
		B	4.0	1.0	ND	ND	4.0	ND	3.0	3.0	32.0	29.0	10.0	218.0	221.0	116.0	265.0	140.0	182.0	5.0	81.0	820.0	322.0	1228.0
REP 2		GMEO/2=	4.0	1.0	0.5	ND	4.0	0.5	2.5	2.5	30.0	23.5	8.0	203.0	200.0	96.5	223.0	127.0	169.5	5.5	71.0	722.5	296.5	1095.5
	60	A	5.0	2.0	ND	ND	4.0	1.0	3.0	2.0	39.0	19.0	11.0	241.0	216.0	110.0	245.0	136.0	191.0	7.0	79.0	812.0	327.0	1225.0
		B	4.0	2.0	1.0	ND	3.0	2.0	4.0	6.0	47.0	51.0	16.0	182.0	168.0	68.0	159.0	82.0	99.0	7.0	129.0	577.0	181.0	894.0
REP 3		GMEO/2=	4.5	2.0	0.5	ND	3.5	1.5	3.5	4.0	43.0	35.0	13.5	211.5	192.0	89.0	202.0	109.0	145.0	7.0	104.0	694.5	254.0	1059.5
0.3	90	A	3.0	ND	ND	ND	6.0	ND	ND	ND	34.0	19.0	ND	214.0	213.0	156.0	275.0	164.0	102.0	3.0	59.0	858.0	266.0	1186.0
		B	4.0	ND	ND	ND	10.0	4.0	ND	3.0	49.0	32.0	6.0	244.0	247.0	252.0	331.0	146.0	120.0	4.0	104.0	1074.0	266.0	1448.0
REP 1		GMEO/2=	3.5	ND	ND	ND	8.0	2.0	ND	1.5	41.5	25.5	3.0	229.0	230.0	204.0	303.0	155.0	111.0	3.5	81.5	966.0	266.0	1317.0
	90	A	3.0	ND	ND	ND	6.0	ND	ND	3.0	33.0	16.0	6.0	135.0	129.0	131.0	176.0	107.0	59.0	3.0	64.0	571.0	166.0	804.0
		B	5.0	3.0	ND	ND	8.0	ND	5.0	18.0	70.0	330.0	76.0	189.0	194.0	206.0	285.0	157.0	99.0	8.0	507.0	874.0	256.0	1645.0
REP 2		GMEO/2=	4.0	1.5	ND	ND	7.0	ND	2.5	10.5	51.5	173.0	41.0	162.0	161.5	168.5	230.5	132.0	79.0	5.5	285.5	722.5	211.0	1224.5
	90	A	4.0	ND	ND	ND	10.0	ND	ND	2.0	32.0	37.0	7.0	201.0	206.0	225.0	205.0	171.0	104.0	4.0	88.0	917.0	275.0	1284.0
		B	5.0	ND	ND	ND	8.0	ND	ND	3.0	35.0	29.0	7.0	279.0	251.0	216.0	288.0	166.0	105.0	5.0	82.0	1034.0	271.0	1392.0
REP 3		GMEO/2=	4.5	ND	ND	ND	9.0	ND	ND	2.5	33.5	33.0	7.0	240.0	228.5	220.5	206.5	168.5	104.5	4.5	85.0	975.5	273.0	1338.0

ND = Not Detected - See Table 20 for detection limits

Table 63. Experiment II - Polycyclic aromatic hydrocarbons in site soil (ppm)

LOID	DATE	DUPLICATE	NAPH	2-MET	1-MET	BIPH	ACTHY	ACTHE	DIBEN	FLORE	PHEN	ANTHR	CARBA	FLUOR	PYRENE	1,2-BZ	CHRYS	BEN-a	Bghi	2 RING	3 RING	4 RING	5 RING	TOTLPAH
1.0	0	A	8.0	4.9	1.9	2.4	10.1	11.8	11.4	15.2	84.0	28.0	10.7	248.5	268.6	121.4	212.1	96.7	86.0	17.2	171.2	850.6	182.7	1221.7
		B	9.8	7.9	4.7	2.3	12.1	13.0	11.3	13.9	79.3	27.6	9.0	270.6	297.4	135.0	232.3	98.3	85.5	24.7	166.2	935.3	183.8	1310.0
REP 1		CAVED/2=	8.9	6.4	3.3	2.4	11.1	12.4	11.4	14.6	81.7	27.8	9.9	259.6	283.0	128.2	222.2	97.5	85.8	21.0	168.7	893.0	183.3	1265.9
	0	A	5.6	5.4	3.3	2.6	9.6	12.4	12.1	17.4	88.5	36.7	11.6	238.8	261.5	109.7	190.6	85.1	80.4	16.9	188.3	800.6	165.5	1171.3
		B	16.5	7.3	5.1	2.7	9.6	14.1	12.9	17.7	95.1	29.2	12.0	257.2	273.6	113.2	201.8	77.6	64.1	31.6	190.6	845.8	141.7	1209.7
REP 2		CAVED/2=	11.1	6.4	4.2	2.7	9.6	13.3	12.5	17.6	91.8	33.0	11.8	248.0	267.6	111.5	196.2	81.4	72.3	24.3	189.5	823.2	153.6	1190.5
	0	A	7.4	14.2	3.3	8.6	9.5	16.1	16.3	20.2	108.9	30.5	21.4	265.3	280.8	110.0	217.5	79.8	73.0	33.5	222.9	881.6	152.8	1290.8
		B	9.2	5.4	2.8	2.2	10.4	13.2	13.2	15.7	85.7	33.0	12.3	266.8	271.7	122.2	223.6	82.6	79.0	19.6	183.5	884.3	161.6	1249.0
REP 3		CAVED/2=	8.3	9.8	3.1	5.4	10.0	14.7	14.8	18.0	97.3	31.8	16.9	266.1	276.3	120.1	220.6	81.2	76.0	26.6	203.2	883.0	157.2	1269.9
1.0	30	A	5.0	2.0	1.0	1.0	8.0	2.0	3.0	3.0	30.0	23.0	9.0	212.0	228.0	141.0	311.0	337.0	235.0	9.0	78.0	892.0	572.0	1551.0
		B	5.0	2.0	1.0	1.0	4.0	2.0	4.0	3.0	37.0	19.0	9.0	218.0	93.0	93.0	208.0	79.0	73.0	9.0	78.0	612.0	152.0	851.0
REP 1		CAVED/2=	5.0	2.0	1.0	1.0	6.0	2.0	3.5	3.0	33.5	21.0	9.0	215.0	160.5	117.0	259.5	208.0	154.0	9.0	78.0	752.0	362.0	1201.0
	30	A	6.0	2.0	1.0	1.0	4.0	3.0	5.0	4.0	36.0	26.0	11.0	222.0	237.0	97.0	207.0	91.0	8.0	10.0	89.0	763.0	99.0	961.0
		B	6.0	2.0	1.0	1.0	4.0	2.0	4.0	3.0	38.0	20.0	8.0	225.0	232.0	93.0	202.0	82.0	70.0	10.0	79.0	752.0	152.0	993.0
REP 2		CAVED/2=	6.0	2.0	1.0	1.0	4.0	2.5	4.5	3.5	37.0	23.0	9.5	223.5	234.5	95.0	204.5	86.5	39.0	10.0	84.0	757.5	125.5	977.0
	30	A	6.0	3.0	1.0	1.0	4.0	3.0	5.0	5.0	38.0	30.0	12.0	236.0	249.0	98.0	206.0	87.0	80.0	11.0	97.0	789.0	167.0	1054.0
		B	6.0	2.0	1.0	1.0	3.0	3.0	5.0	7.0	49.0	50.0	21.0	221.0	224.0	92.0	221.0	74.0	45.0	10.0	138.0	758.0	119.0	1025.0
REP 3		CAVED/2=	6.0	2.5	1.0	1.0	3.5	3.0	5.0	6.0	43.5	40.0	16.5	228.5	236.5	95.0	213.5	80.5	62.5	10.5	117.5	773.5	143.0	1044.5
1.0	60	A	5.0	2.0	1.0	ND	4.0	2.0	4.0	4.0	42.0	27.0	12.0	208.0	222.0	85.0	198.0	108.0	103.0	8.0	95.0	713.0	211.0	1027.0
		B	4.0	1.0	1.0	ND	4.0	2.0	3.0	2.0	27.0	14.0	5.0	200.0	226.0	89.0	212.0	107.0	117.0	6.0	57.0	727.0	224.0	1014.0
REP 1		CAVED/2=	4.5	1.5	1.0	ND	4.0	2.0	3.5	3.0	34.5	20.5	8.5	204.0	224.0	87.0	203.0	107.5	110.0	7.0	76.0	720.0	217.5	1020.5
	60	A	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
		B	5.0	2.0	1.0	ND	4.0	2.0	3.0	2.0	28.0	14.0	6.0	193.0	217.0	88.0	86.0	87.0	71.0	8.0	59.0	584.0	158.0	809.0
REP 2		CAVED/2=	2.5	1.0	0.5	ND	2.0	1.0	1.5	1.0	14.0	7.0	3.0	96.5	108.5	44.0	43.0	43.5	35.5	4.0	29.5	292.0	79.0	404.5
	60	A	4.0	1.0	1.0	ND	5.0	1.0	3.0	3.0	29.0	35.0	8.0	177.0	214.0	94.0	219.0	119.0	123.0	6.0	84.0	704.0	242.0	1036.0
		B	4.0	1.0	1.0	1.0	4.0	2.0	3.0	2.0	29.0	14.0	6.0	203.0	200.0	72.0	158.0	84.0	73.0	7.0	60.0	633.0	157.0	857.0
REP 3		CAVED/2=	4.0	1.0	1.0	0.5	4.5	1.5	3.0	2.5	29.0	24.5	7.0	190.0	207.0	83.0	188.5	101.5	98.0	6.5	72.0	668.5	199.5	946.5
1.0	90	A	4.0	2.0	1.0	ND	10.0	2.0	4.0	5.0	42.0	149.0	20.0	227.0	280.0	186.0	417.0	275.0	303.0	7.0	232.0	1110.0	578.0	1927.0
		B	4.0	1.0	1.0	1.0	12.0	2.0	4.0	4.0	43.0	29.0	11.0	253.0	324.0	220.0	518.0	332.0	367.0	7.0	105.0	1315.0	699.0	2126.0
REP 1		CAVED/2=	4.0	1.5	1.0	0.5	11.0	2.0	4.0	4.5	42.5	89.0	15.5	240.0	302.0	203.0	467.5	303.5	335.0	7.0	168.5	1212.5	638.5	2026.5
	90	A	5.0	2.0	1.0	1.0	5.0	ND	3.0	2.0	29.0	14.0	5.0	197.0	236.0	107.0	236.0	95.0	90.0	9.0	58.0	776.0	185.0	1028.0
		B	4.0	2.0	1.0	ND	4.0	2.0	4.0	3.0	42.0	19.0	8.0	216.0	233.0	89.0	197.0	91.0	89.0	7.0	82.0	735.0	180.0	1004.0
REP 2		CAVED/2=	4.5	2.0	1.0	0.5	4.5	1.0	3.5	2.5	35.5	16.5	6.5	206.5	234.5	98.0	216.5	93.0	89.5	8.0	70.0	755.5	182.5	1016.0
	90	A	4.0	2.0	1.0	ND	6.0	2.0	3.0	3.0	36.0	23.0	7.0	195.0	233.0	124.0	276.0	128.0	157.0	7.0	80.0	828.0	285.0	1200.0
		B	4.0	2.0	1.0	1.0	6.0	2.0	3.0	3.0	27.0	34.0	8.0	394.0	216.0	131.0	308.0	176.0	171.0	8.0	83.0	1049.0	347.0	1487.0
REP 3		CAVED/2=	4.0	2.0	1.0	0.5	6.0	2.0	3.0	3.0	31.5	28.5	7.5	294.5	224.5	127.5	292.0	152.0	164.0	7.5	81.5	938.5	316.0	1343.5

ND = Not Detected - See Table 20 for detection limits

Table 65. Experiment II - Polycyclic aromatic hydrocarbons in site soil (ppm)
CONTINUED

LOAD	DATE	DUPLICATE	NAPH	2-MET	1-MET	BIPH	ACTHY	ACTHE	DIBEN	FLORE	PHEN	ANTHR	CARBA	FLUOR	PYRENE	1,2-BZ	CHRYS	BEN-a	BghI	2 RING	3 RING	4 RING	5 RING	TOTALPAH
3.0	0	A	12.5	ND	ND	ND	15.6	24.4	26.0	21.4	156.3	35.2	21.1	290.7	312.3	126.6	239.6	109.1	87.3	12.5	300.0	969.2	196.4	1478.1
		B	18.1	ND	ND	ND	ND	26.3	25.7	26.2	149.0	32.7	20.1	298.9	322.1	125.6	237.1	103.2	58.9	18.1	280.0	983.7	162.1	1443.9
REP 1		CMBD/2=	15.3	ND	ND	ND	7.8	25.4	25.9	23.8	152.7	34.0	20.6	294.8	317.2	126.1	238.4	106.2	73.1	15.3	290.0	976.5	179.3	1461.0
	0	A	21.7	11.3	ND	ND	11.6	32.1	32.9	36.2	176.8	75.9	29.5	346.7	355.4	135.8	263.4	115.9	78.6	33.0	395.0	1101.3	194.5	1723.8
		B	25.5	13.2	ND	ND	ND	29.5	31.2	35.8	161.3	44.8	20.2	297.2	313.8	124.1	230.0	95.6	61.5	38.7	322.8	965.1	157.1	1483.7
REP 2		CMBD/2=	23.6	12.3	ND	ND	5.8	30.8	32.1	36.0	169.1	60.4	24.9	322.0	334.6	130.0	246.7	105.8	70.1	35.9	358.9	1033.2	175.8	1603.8
	0	A	31.8	18.0	ND	ND	16.8	41.3	36.5	45.1	211.5	34.7	19.0	352.1	363.2	134.5	240.1	117.7	68.9	49.8	404.9	1089.9	186.6	1731.2
		B	24.4	15.7	ND	ND	ND	29.3	29.7	36.3	165.5	44.0	20.1	302.7	328.1	120.0	231.7	90.7	53.4	40.1	324.9	982.5	144.1	1491.6
REP 3		CMBD/2=	28.1	16.9	ND	ND	8.4	35.3	33.1	40.7	180.5	39.4	19.6	327.4	345.7	127.3	235.9	104.2	61.2	45.0	364.9	1036.2	165.4	1611.4
3.0	30	A	ND	ND	ND	ND	ND	30.0	16.0	46.0	182.0	28.0	ND	342.0	301.0	139.0	200.0	121.0	59.0	ND	302.0	982.0	180.0	1464.0
		B	ND	ND	ND	ND	ND	23.0	ND	29.0	146.0	25.0	ND	202.0	257.0	135.0	194.0	107.0	55.0	ND	223.0	868.0	162.0	1253.0
REP 1		CMBD/2=	ND	ND	ND	ND	ND	26.5	8.0	37.5	164.0	26.5	ND	312.0	279.0	137.0	197.0	114.0	57.0	ND	262.5	925.0	171.0	1358.5
	30	A	ND	ND	ND	ND	ND	18.0	ND	28.0	142.0	27.0	ND	293.0	265.0	84.0	132.0	59.0	ND	ND	215.0	774.0	58.0	1047.0
		B	ND	ND	ND	ND	ND	17.0	ND	27.0	174.0	38.0	ND	336.0	297.0	143.0	202.0	127.0	67.0	ND	256.0	978.0	194.0	1428.0
REP 2		CMBD/2=	ND	ND	ND	ND	ND	17.5	ND	27.5	158.0	32.5	ND	314.5	281.0	113.5	167.0	92.5	33.5	ND	235.5	876.0	126.0	1237.5
	30	A	ND	ND	ND	ND	ND	18.0	20.0	38.0	201.0	65.0	ND	359.0	309.0	159.0	231.0	99.0	66.0	ND	342.0	1058.0	165.0	1565.0
		B	ND	ND	ND	ND	ND	21.0	19.0	31.0	189.0	38.0	ND	376.0	323.0	160.0	242.0	125.0	54.0	ND	298.0	1101.0	179.0	1578.0
REP 3		CMBD/2=	ND	ND	ND	ND	ND	19.5	19.5	34.5	195.0	51.5	ND	367.5	316.0	159.5	236.5	112.0	60.0	ND	320.0	1079.5	172.0	1571.5
3.0	60	A	ND	ND	ND	ND	ND	15.0	ND	25.0	156.0	52.0	ND	323.0	309.0	204.0	303.0	49.0	ND	ND	248.0	1139.0	49.0	1436.0
		B	ND	ND	ND	ND	ND	18.0	ND	27.0	170.0	30.0	ND	392.0	361.0	243.0	340.0	249.0	ND	ND	245.0	1336.0	249.0	1830.0
REP 1		CMBD/2=	ND	ND	ND	ND	ND	16.5	ND	26.0	163.0	41.0	ND	357.5	335.0	223.5	321.5	149.0	ND	ND	246.5	1237.5	149.0	1633.0
	60	A	ND	ND	ND	ND	ND	ND	ND	ND	75.0	32.0	ND	327.0	303.0	192.0	277.0	134.0	ND	ND	107.0	1099.0	134.0	1340.0
		B	ND	ND	ND	ND	ND	ND	ND	ND	86.0	23.0	ND	358.0	337.0	227.0	322.0	143.0	ND	ND	109.0	1244.0	143.0	1496.0
REP 2		CMBD/2=	ND	ND	ND	ND	ND	ND	ND	ND	80.5	27.5	ND	342.5	320.0	209.5	293.5	138.5	ND	ND	108.0	1171.5	138.5	1418.0
	60	A	ND	ND	ND	ND	ND	ND	ND	ND	144.0	42.0	ND	399.0	357.0	252.0	354.0	290.0	134.0	ND	186.0	1362.0	424.0	1972.0
		B	ND	ND	ND	ND	ND	ND	ND	ND	112.0	35.0	ND	365.0	338.0	234.0	309.0	149.0	33.0	ND	147.0	1246.0	182.0	1575.0
REP 3		CMBD/2=	ND	ND	ND	ND	ND	ND	ND	ND	128.0	30.5	ND	302.0	347.5	243.0	331.5	219.5	63.5	ND	166.5	1304.0	303.0	1773.5
3.0	90	A	ND	ND	ND	ND	ND	10.0	ND	ND	22.0	ND	ND	154.0	141.0	101.0	141.0	82.0	ND	ND	32.0	537.0	82.0	651.0
		B	ND	ND	ND	ND	ND	7.0	ND	ND	16.0	ND	ND	131.0	129.0	119.0	164.0	88.0	67.0	ND	23.0	543.0	155.0	721.0
REP 1		CMBD/2=	ND	ND	ND	ND	ND	8.5	ND	ND	19.0	ND	ND	142.5	135.0	110.0	152.5	85.0	33.5	ND	27.5	540.0	118.5	686.0
	90	A	ND	ND	ND	ND	ND	7.0	ND	ND	25.0	ND	ND	168.0	161.0	133.0	192.0	114.0	48.0	ND	32.0	654.0	162.0	848.0
		B	ND	ND	ND	ND	ND	ND	ND	ND	90.0	37.0	ND	403.0	379.0	270.0	326.0	199.0	178.0	ND	127.0	1378.0	377.0	1882.0
REP 2		CMBD/2=	ND	ND	ND	ND	ND	3.5	ND	ND	57.5	18.5	ND	285.5	270.0	201.5	259.0	156.5	113.0	ND	79.5	1016.0	269.5	1365.0
	90	A	ND	ND	ND	ND	ND	ND	ND	ND	63.0	21.0	ND	395.0	356.0	208.0	252.0	130.0	64.0	ND	84.0	1211.0	194.0	1489.0
		B	ND	ND	ND	ND	ND	ND	ND	ND	47.0	ND	ND	318.0	292.0	204.0	281.0	ND	ND	ND	47.0	1095.0	ND	1142.0
REP 3		CMBD/2=	ND	ND	ND	ND	ND	ND	ND	ND	55.0	10.5	ND	356.5	324.0	206.0	266.5	65.0	32.0	ND	65.5	1153.0	97.0	1315.5

ND = Not Detected - See Table 20 for detection limits

Table 65. Experiment II - Polycyclic aromatic hydrocarbons in site soil (ppm)
COLUMBUS

LOAD	DATE	DUPLICATE	NAPH	2-MET	1-MET	BIPH	ACTHY	ACTHE	DIBEN	FLORE	PHEN	ANTHR	CARBA	FLUOR	PYRENE	1,2-BZ	CHRYS	BEN-a	BghI	2 RING	3 RING	4 RING	5 RING	TOTALPAH
0.3	0	A	15.0	12.0	8.0	5.0	4.0	25.0	44.0	47.0	189.0	60.0	27.0	110.0	91.0	14.0	26.0	4.0	ND	40.0	396.0	241.0	4.0	681.0
		B	22.0	13.0	11.0	5.0	3.0	24.0	39.0	44.0	184.0	74.0	30.0	116.0	95.0	23.0	30.0	3.0	ND	51.0	398.0	264.0	3.0	716.0
REP 1		CMBD/2=	18.5	12.5	9.5	5.0	3.5	24.5	41.5	45.5	186.5	67.0	28.5	113.0	93.0	18.5	28.0	3.5	ND	45.5	397.0	252.5	3.5	698.5
	0	A	9.0	10.0	8.0	5.0	4.0	22.0	24.0	39.0	154.0	27.0	18.0	92.0	72.0	15.0	22.0	5.0	ND	32.0	288.0	201.0	5.0	526.0
		B	ND	5.0	8.0	4.0	6.0	27.0	42.0	51.0	225.0	44.0	25.0	139.0	112.0	22.0	28.0	7.0	ND	17.0	420.0	301.0	7.0	745.0
REP 2		CMBD/2=	4.5	7.5	8.0	4.5	5.0	24.5	33.0	45.0	189.5	35.5	21.5	115.5	92.0	18.5	25.0	6.0	ND	24.5	354.0	251.0	6.0	635.5
	0	A	9.0	12.0	9.0	7.0	4.0	27.0	39.0	44.0	176.0	37.0	15.0	106.0	88.0	16.0	26.0	6.0	ND	37.0	342.0	236.0	6.0	621.0
		B	10.0	8.0	6.0	4.0	4.0	25.0	37.0	42.0	175.0	33.0	26.0	105.0	84.0	16.0	25.0	7.0	ND	28.0	342.0	230.0	7.0	607.0
REP 3		CMBD/2=	9.5	10.0	7.5	5.5	4.0	26.0	38.0	43.0	175.5	35.0	20.5	105.5	86.0	16.0	25.5	6.5	ND	32.5	342.0	233.0	6.5	614.0
0.3	30	A	ND	ND	ND	ND	ND	5.0	8.0	5.0	5.0	26.0	ND	92.0	75.0	14.0	16.0	3.0	ND	ND	49.0	197.0	3.0	249.0
		B	ND	ND	ND	ND	ND	3.0	5.0	5.0	6.0	30.0	ND	126.0	101.0	18.0	29.0	5.0	ND	ND	49.0	274.0	5.0	328.0
REP 1		CMBD/2=	ND	ND	ND	ND	ND	4.0	6.5	5.0	5.5	28.0	ND	109.0	88.0	16.0	22.5	4.0	ND	ND	49.0	235.5	4.0	288.5
	30	A	ND	ND	ND	ND	ND	7.0	2.0	3.0	4.0	20.0	ND	93.0	77.0	13.0	20.0	3.0	ND	ND	36.0	203.0	3.0	242.0
		B	ND	ND	ND	ND	ND	6.0	2.0	3.0	6.0	22.0	ND	176.0	29.0	23.0	38.0	7.0	ND	ND	39.0	266.0	7.0	312.0
REP 2		CMBD/2=	ND	ND	ND	ND	ND	6.5	2.0	3.0	5.0	21.0	ND	134.5	53.0	18.0	29.0	5.0	ND	ND	37.5	234.5	5.0	277.0
	30	A	ND	ND	ND	ND	ND	ND	6.0	3.0	8.0	42.0	ND	103.0	85.0	14.0	21.0	3.0	ND	ND	59.0	223.0	3.0	285.0
		B	ND	ND	ND	ND	ND	ND	3.0	3.0	3.0	8.0	ND	134.0	108.0	21.0	24.0	4.0	ND	ND	17.0	287.0	4.0	308.0
REP 3		CMBD/2=	ND	ND	ND	ND	ND	ND	4.5	3.0	5.5	25.0	ND	118.5	96.5	17.5	22.5	3.5	ND	ND	38.0	255.0	3.5	296.5
0.3	90	A	ND	ND	ND	ND	ND	ND	ND	ND	3.3	9.2	2.8	19.0	57.7	10.5	10.8	5.6	ND	ND	15.3	98.1	5.6	119.0
		B	ND	ND	ND	ND	ND	ND	ND	ND	3.6	10.7	4.7	14.0	65.3	11.2	9.0	9.4	ND	ND	19.0	99.5	9.4	127.9
REP 1		CMBD/2=	ND	ND	ND	ND	ND	ND	ND	ND	3.5	9.9	3.7	16.5	61.5	10.8	9.9	7.5	ND	ND	17.2	98.8	7.5	123.4
	90	A	ND	ND	ND	ND	ND	ND	ND	ND	4.3	15.4	5.3	82.0	71.6	19.6	18.9	6.9	ND	ND	25.0	192.1	6.9	224.0
		B	ND	ND	ND	ND	ND	ND	ND	ND	2.5	7.7	2.1	85.2	70.5	20.6	20.5	6.6	ND	ND	12.3	196.8	6.6	215.7
REP 2		CMBD/2=	ND	ND	ND	ND	ND	ND	ND	ND	3.4	11.6	3.7	83.6	71.1	20.1	19.7	6.8	ND	ND	18.7	194.4	6.8	219.9
	90	A	ND	ND	ND	ND	ND	ND	ND	ND	3.3	9.7	3.8	38.1	71.7	16.8	16.5	6.3	ND	ND	16.8	143.1	6.3	166.1
		B	ND	ND	ND	ND	ND	ND	ND	ND	3.8	13.9	4.8	35.9	70.6	13.1	15.3	5.3	ND	ND	22.5	134.9	5.3	162.7
REP 3		CMBD/2=	ND	ND	ND	ND	ND	ND	ND	ND	3.6	11.8	4.3	37.0	71.1	15.0	15.9	5.8	ND	ND	19.6	139.0	5.8	164.4

Table 65. Experiment II - Polycyclic aromatic hydrocarbons in site soil (ppb)
COLUMBUS

LOTO	DATE	DUPLICATE	NAPH	2-MET	1-MET	BIPH	ACTHY	ACTHE	DIBEN	FLORE	PHEN	ANTHR	CARBA	FLUOR	PYRENE	1,2-BZ	CHRYS	BEN-a	BghI	2 RING	3 RING	4 RING	5 RING	TOTALPAH
1.0	0	A	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
		B	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
REP 1		CMBD/2=	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
	0	A	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
		B	133.0	80.0	32.0	23.0	13.0	105.0	125.0	158.0	533.0	114.0	88.0	339.0	247.0	64.0	74.0	20.0	ND	268.0	1136.0	724.0	20.0	2148.0
REP 2		CMBD/2=	66.5	40.0	16.0	11.5	6.5	52.5	62.5	79.0	266.5	57.0	44.0	169.5	123.5	32.0	37.0	10.0	ND	134.0	568.0	362.0	10.0	1074.0
	0	A	119.0	71.0	30.0	21.0	10.0	107.0	123.0	156.0	553.0	100.0	91.0	340.0	239.0	78.0	66.0	20.0	ND	241.0	1140.0	723.0	20.0	2124.0
		B	135.0	79.0	34.0	22.0	13.0	102.0	123.0	151.0	505.0	106.0	85.0	319.0	235.0	59.0	69.0	19.0	ND	270.0	1085.0	682.0	19.0	2056.0
REP 3		CMBD/2=	127.0	75.0	32.0	21.5	11.5	104.5	123.0	153.5	529.0	103.0	88.0	329.5	237.0	68.5	67.5	19.5	ND	255.5	1112.5	702.5	19.5	2090.0
1.0	30	A	3.3	6.7	11.2	15.8	9.2	87.1	102.9	153.5	599.2	125.5	66.8	331.9	266.3	76.4	70.5	26.2	10.5	36.9	1144.2	745.1	36.7	1962.9
		B	4.7	7.9	11.3	16.4	9.5	88.5	107.8	160.4	623.8	100.7	93.5	330.6	264.1	82.9	75.4	26.4	11.0	40.4	1264.1	752.9	37.4	2094.9
REP 1		CMBD/2=	4.0	7.3	11.3	16.1	9.3	87.8	105.4	157.0	611.5	153.1	80.2	331.3	265.2	79.6	72.9	26.3	10.8	38.6	1204.2	749.0	37.1	2028.9
	30	A	4.4	5.0	5.9	12.4	7.9	75.6	93.6	147.2	581.7	165.0	83.0	313.7	250.8	73.8	67.7	26.4	10.0	27.7	1154.0	706.1	36.4	1924.2
		B	4.1	4.7	6.3	13.5	8.5	83.5	103.6	157.7	627.8	154.0	81.7	337.2	266.9	77.2	67.8	25.3	9.5	28.7	1216.8	749.1	34.8	2029.3
REP 2		CMBD/2=	4.3	4.8	6.1	13.0	8.2	79.6	98.6	152.5	604.8	159.5	82.3	325.5	258.9	75.5	67.7	25.8	9.8	28.2	1185.4	727.6	35.6	1976.7
	30	A	2.8	5.1	2.3	7.0	6.4	55.7	80.9	130.2	500.4	130.3	62.7	342.3	276.7	81.1	75.9	30.4	11.4	17.2	1046.5	776.0	41.8	1881.5
		B	2.4	4.8	2.1	6.2	5.8	50.5	72.1	115.8	519.6	105.4	55.9	298.3	236.5	63.2	60.6	27.4	9.3	15.5	925.2	658.7	36.8	1636.1
REP 3		CMBD/2=	2.6	4.9	2.2	6.6	6.1	53.1	76.5	123.0	550.0	117.8	59.3	320.3	256.6	72.2	68.2	28.9	10.4	16.3	985.9	717.3	39.3	1758.8
1.0	90	A	ND	ND	ND	ND	3.0	49.6	9.7	50.0	190.1	101.3	37.0	277.9	215.4	60.3	52.7	19.5	8.9	ND	448.7	606.2	28.4	1083.3
		B	2.8	3.1	ND	ND	3.2	40.4	12.9	59.3	213.9	196.1	72.8	200.7	220.0	61.1	58.0	20.3	6.3	5.9	606.5	619.8	26.5	1258.7
REP 1		CMBD/2=	1.4	1.6	ND	ND	3.1	49.0	11.3	54.6	206.0	148.7	54.9	279.3	217.7	60.7	55.4	19.9	7.6	3.0	527.6	613.0	27.4	1171.0
	90	A	1.6	ND	ND	ND	1.5	6.6	4.4	10.5	18.2	59.5	19.0	234.5	187.6	54.5	49.1	17.2	7.4	1.6	119.8	525.6	24.6	671.6
		B	ND	ND	ND	ND	2.3	7.1	5.4	12.5	22.0	67.5	21.9	280.6	227.6	66.6	77.1	61.8	34.6	ND	138.8	652.0	96.4	887.2
REP 2		CMBD/2=	0.8	ND	ND	ND	1.9	6.9	4.9	11.5	20.1	63.5	20.5	257.6	207.6	60.5	63.1	39.5	21.0	0.8	129.3	588.8	60.5	779.4
	90	A	2.7	4.0	ND	2.0	ND	3.1	10.8	28.8	56.6	209.2	68.2	218.0	176.0	49.9	49.1	25.9	8.0	8.7	376.6	491.9	33.9	911.1
		B	ND	ND	ND	ND	ND	3.0	6.2	15.3	31.7	95.9	29.5	259.0	208.7	61.5	53.7	2.2	8.4	ND	181.5	582.9	10.5	775.0
REP 3		CMBD/2=	1.3	2.0	ND	1.0	ND	3.0	8.5	22.0	44.2	152.5	49.8	238.5	192.4	55.7	50.9	14.0	8.2	4.3	279.0	537.4	22.2	843.0

ND = Not Detected - See Table 20 for detection limits

Table 65. Experiment II - Polycyclic aromatic hydrocarbons in site soil (ppb)
COLUMBUS

LOID	DATE	DUPLICATE	NAPH	2-MET	1-MET	BIPH	ACENY	ACENE	DIBEN	FLORE	PHEN	ANTHR	CARBA	FLUOR	PYRENE	1,2-BZ	CHRYS	BEN-a	BghI	2 RING	3 RING	4 RING	5 RING	TOTALPAH
3.0	0	A	629.0	278.0	123.0	70.0	44.0	416.0	410.0	452.0	1365.0	317.0	213.0	799.0	684.0	160.0	183.0	38.0	ND	1100.0	3217.0	1826.0	38.0	6181.0
		B	782.0	200.0	106.0	78.0	40.0	427.0	443.0	479.0	1510.0	473.0	294.0	824.0	691.0	134.0	183.0	ND	ND	1246.0	3666.0	1832.0	ND	6744.0
REP 1		AVERAGE	705.5	279.0	114.5	74.0	42.0	421.5	426.5	465.5	1437.5	395.0	253.5	811.5	687.5	147.0	183.0	19.0	ND	1173.0	3441.5	1829.0	19.0	6462.5
	0	A	673.0	267.0	109.0	72.0	44.0	412.0	403.0	525.0	1411.0	394.0	248.0	818.0	606.0	140.0	208.0	62.0	ND	1121.0	3437.0	1852.0	62.0	6472.0
		B	718.0	200.0	107.0	78.0	45.0	432.0	426.0	465.0	1471.0	326.0	223.0	829.0	708.0	159.0	195.0	69.0	10.0	1183.0	3388.0	1891.0	79.0	6541.0
REP 2		AVERAGE	695.5	273.5	108.0	75.0	44.5	422.0	414.5	495.0	1441.0	360.0	235.5	823.5	697.0	149.5	201.5	65.5	5.0	1152.0	3412.5	1871.5	70.5	6506.5
	0	A	706.0	303.0	125.0	81.0	45.0	434.0	400.0	406.0	1534.0	394.0	268.0	844.0	700.0	155.0	190.0	64.0	32.0	1295.0	3581.0	1889.0	96.0	6861.0
		B	827.0	317.0	155.0	77.0	44.0	449.0	423.0	517.0	1579.0	416.0	255.0	861.0	719.0	124.0	164.0	33.0	24.0	1376.0	3683.0	1868.0	57.0	6984.0
REP 3		AVERAGE	806.5	310.0	140.0	79.0	44.5	441.5	426.5	501.5	1556.5	400.0	261.5	852.5	709.5	139.5	177.0	48.5	28.0	1335.5	3632.0	1878.5	76.5	6922.5
3.0	30	A	293.0	199.0	105.0	60.0	34.0	373.0	372.0	507.0	1472.0	403.0	231.0	789.0	659.0	125.0	273.0	38.0	ND	657.0	3394.0	1846.0	38.0	5935.0
		B	16.0	ND	72.0	ND	ND	306.0	196.0	309.0	1502.0	350.0	ND	864.0	357.0	21.0	73.0	ND	ND	88.0	2663.0	1315.0	ND	4066.0
REP 1		AVERAGE	154.5	99.5	88.5	30.0	17.0	340.5	284.0	408.0	1487.0	376.5	115.5	826.5	508.0	73.0	173.0	19.0	ND	372.5	3028.5	1580.5	19.0	5000.5
	30	A	74.0	117.0	97.0	50.0	36.0	378.0	306.0	446.0	1374.0	408.0	238.0	808.0	666.0	124.0	224.0	31.0	ND	338.0	3266.0	1822.0	31.0	5457.0
		B	71.0	146.0	77.0	57.0	39.0	379.0	287.0	433.0	1492.0	393.0	252.0	855.0	708.0	139.0	187.0	44.0	ND	351.0	3265.0	1889.0	44.0	5549.0
REP 2		AVERAGE	72.5	131.5	87.0	53.5	37.5	378.5	336.5	439.5	1428.0	400.5	245.0	831.5	687.0	131.5	205.5	37.5	ND	344.5	3265.5	1855.5	37.5	5503.0
	30	A	39.0	50.0	63.0	47.0	38.0	364.0	289.0	450.0	1400.0	331.0	222.0	829.0	679.0	149.0	178.0	ND	ND	239.0	3174.0	1835.0	ND	5248.0
		B	ND	85.0	69.0	43.0	35.0	342.0	235.0	419.0	1419.0	354.0	188.0	858.0	730.0	118.0	167.0	43.0	ND	197.0	2992.0	1873.0	43.0	5105.0
REP 3		AVERAGE	19.5	87.5	66.0	45.0	36.5	353.0	262.0	434.5	1449.5	342.5	205.0	843.5	704.5	133.5	172.5	21.5	ND	218.0	3083.0	1854.0	21.5	5176.5
30.0	60	A	23.0	77.4	50.1	57.3	34.4	248.9	245.8	360.9	1245.4	348.8	190.2	661.6	554.8	177.4	207.7	66.6	ND	215.8	2674.4	1601.5	66.6	4558.3
		B	19.1	86.7	57.7	60.4	31.9	310.7	293.5	420.4	1467.5	412.8	213.2	798.9	668.4	218.5	254.4	88.3	ND	223.9	3150.0	1940.2	88.3	5402.4
REP 1		AVERAGE	21.1	82.1	57.9	58.9	33.2	279.8	269.7	390.7	1356.5	380.8	201.7	730.3	611.6	198.0	231.1	77.5	ND	219.9	2912.2	1770.9	77.5	4980.4
	60	A	12.6	30.9	27.8	40.9	23.3	234.4	229.6	351.5	1200.1	327.2	170.9	709.1	596.7	195.7	226.3	77.4	ND	112.2	2617.0	1727.8	77.4	4534.4
		B	39.8	34.9	51.8	31.5	300.7	292.7	420.6	1494.2	401.1	212.4	818.6	688.3	221.0	256.7	87.0	ND	ND	158.0	3940.3	1253.0	ND	5351.3
REP 2		AVERAGE	26.2	32.9	39.8	36.2	162.0	263.6	325.1	922.9	840.6	269.8	494.8	698.7	408.9	226.2	156.7	38.7	ND	135.1	3278.7	1490.4	38.7	4942.9
	60	A	11.3	25.6	23.4	40.2	27.5	261.2	266.3	397.6	1474.1	410.0	218.8	826.2	694.5	231.3	270.3	99.4	ND	100.5	3055.5	2022.3	99.4	5277.7
		B	13.6	28.8	25.5	45.3	30.4	298.5	304.9	443.1	1616.4	458.8	242.2	881.4	741.3	238.5	274.7	100.3	ND	113.2	3394.3	2135.9	100.3	5749.7
REP 3		AVERAGE	12.5	27.2	24.5	42.8	29.0	279.9	285.6	420.4	1545.3	434.4	230.5	853.8	717.9	234.9	272.5	99.9	ND	106.9	3224.9	2079.1	99.9	5510.7
3.0	90	A	8.7	44.8	43.1	56.4	29.6	302.4	306.8	395.1	1184.2	251.6	129.1	569.8	459.4	136.1	112.6	70.5	20.5	152.9	2998.8	1277.9	91.0	4120.6
		B	10.0	47.1	43.1	55.8	28.1	297.6	285.7	300.9	1047.4	277.7	132.5	475.9	383.4	109.6	99.8	51.0	16.2	156.0	2449.9	1068.7	67.2	3741.7
REP 1		AVERAGE	9.3	46.0	43.1	56.1	28.9	300.0	296.3	348.0	1115.8	264.6	130.8	522.9	421.4	122.9	106.2	60.7	18.4	154.4	2524.3	1173.3	79.1	3931.2
	90	A	7.8	16.4	26.5	5.6	23.8	263.0	274.6	358.6	1007.8	223.1	111.3	460.5	370.3	105.2	89.4	53.4	14.2	56.3	2262.2	1025.4	67.6	3411.5
		B	10.0	19.1	24.8	6.3	25.1	273.8	298.2	405.0	1158.2	352.8	164.5	527.9	426.9	126.1	115.1	99.3	17.2	60.2	2677.6	1196.0	76.5	4010.4
REP 2		AVERAGE	8.9	17.8	25.7	5.9	24.5	268.4	286.4	381.8	1083.0	288.0	137.9	494.2	398.6	115.7	102.2	56.4	15.7	58.3	2469.9	1110.7	72.1	3710.9
	90	A	8.1	15.0	16.9	36.6	21.8	244.9	254.2	357.0	955.0	257.3	116.0	385.3	305.2	84.5	74.5	42.0	14.2	76.6	2206.1	849.6	56.2	3188.5
		B	6.9	14.0	17.8	38.7	22.0	254.8	261.5	362.0	811.2	170.3	72.8	276.0	214.7	51.3	48.8	27.8	8.1	77.4	1954.7	590.8	35.9	2658.8
REP 3		AVERAGE	7.5	14.5	17.3	37.7	21.9	249.9	257.9	359.5	883.1	213.8	94.4	330.7	260.0	67.9	61.7	34.9	11.1	77.0	2080.4	720.2	46.0	2923.7

ND = Not Detected - See Table 20 for detection limits

Table 65. Experiment II - Polycyclic aromatic hydrocarbons in site soil (ppm)
GRANTON

LOTO	DATE	DUPLICATE	NAPH	2-MET	1-MET	BIPH	ACTHY	ACTHE	DIBEN	FLORE	PHEN	ANTHR	CARBA	FLUOR	PYRENE	1,2-BZ	CHRYS	BEN-a	BghI	2 RING	3 RING	4 RING	5 RING	TOTALPAH
0.3	0	A	14.7	10.1	4.6	ND	ND	13.5	10.2	13.0	45.8	10.9	6.9	44.3	50.6	7.0	16.0	12.4	22.6	29.5	100.2	117.9	35.0	282.6
		B	11.3	11.8	4.3	2.4	2.9	12.6	11.1	12.8	44.5	9.6	5.2	42.1	46.9	10.4	16.4	10.3	32.2	29.9	98.6	123.7	42.5	294.6
REP 1		GMEO/2=	13.0	11.0	4.5	1.2	1.4	13.0	10.6	12.9	45.1	10.2	6.1	43.2	48.7	12.7	16.2	11.3	27.4	29.7	99.4	120.8	38.7	288.6
	0	A	9.1	10.2	4.0	ND	2.8	13.1	12.3	14.0	50.3	10.5	5.9	54.2	52.7	11.0	19.7	10.6	24.4	23.3	109.0	137.6	35.0	304.9
		B	ND	ND	ND	ND	ND	ND	ND	ND	2.6	3.2	ND	24.4	35.8	14.0	19.7	11.4	15.4	ND	5.8	94.0	26.8	126.5
REP 2		GMEO/2=	4.5	5.1	2.0	ND	1.4	6.6	6.2	7.0	26.4	6.9	3.0	39.3	44.3	12.5	19.7	11.0	19.9	11.6	57.4	115.8	30.9	215.7
	0	A	8.9	7.5	3.0	1.7	2.7	11.2	13.9	11.3	39.5	10.9	4.3	45.8	52.1	23.2	26.0	12.6	22.2	21.1	93.9	147.1	34.8	296.8
		B	10.6	9.0	3.5	1.9	2.6	12.3	10.6	11.9	41.0	8.5	4.7	40.1	47.2	17.5	16.9	9.0	21.4	24.9	91.5	121.7	30.4	268.5
REP 3		GMEO/2=	9.8	8.3	3.2	1.8	2.6	11.7	12.2	11.6	40.3	9.7	4.5	43.0	49.6	20.3	21.4	10.8	21.8	23.0	92.7	134.4	32.6	282.7
0.3	30	A	ND	ND	ND	ND	ND	ND	2.5	ND	4.9	7.6	4.0	27.5	41.4	11.8	24.8	12.0	23.5	ND	19.0	105.5	35.5	159.9
		B	ND	ND	ND	ND	ND	ND	2.7	ND	5.9	4.3	3.4	31.9	39.5	12.5	24.2	13.8	25.4	ND	16.3	108.1	39.2	163.6
REP 1		GMEO/2=	ND	ND	ND	ND	ND	ND	2.6	ND	5.4	6.0	3.7	29.7	40.5	12.1	24.5	12.9	24.5	ND	17.6	106.8	37.3	161.8
	30	A	ND	ND	ND	ND	ND	ND	2.9	ND	5.2	3.6	ND	27.4	26.0	11.2	23.4	11.6	25.2	ND	11.7	88.0	36.8	136.5
		B	ND	ND	ND	ND	ND	ND	2.6	ND	5.2	3.4	3.1	26.9	37.4	11.0	23.7	11.3	23.6	ND	14.3	99.0	34.9	148.2
REP 2		GMEO/2=	ND	ND	ND	ND	ND	ND	2.7	ND	5.2	3.5	1.6	27.1	31.7	11.1	23.6	11.5	24.4	ND	13.0	93.5	35.9	142.4
	30	A	ND	ND	ND	ND	ND	ND	2.6	ND	5.1	3.6	ND	25.6	26.6	10.5	21.6	12.2	22.0	ND	11.3	84.3	34.2	129.7
		B	ND	ND	ND	ND	ND	ND	3.5	ND	4.7	12.6	6.0	25.6	30.5	10.9	23.7	12.2	23.3	ND	26.8	90.6	35.5	152.9
REP 3		GMEO/2=	ND	ND	ND	ND	ND	ND	3.0	ND	4.9	8.1	3.0	25.6	28.5	10.7	22.7	12.2	22.7	ND	19.0	87.5	34.8	141.3
0.3	60	A	ND	ND	ND	ND	0.9	0.8	4.1	ND	3.1	2.8	ND	12.3	15.8	14.1	18.1	9.0	14.7	ND	11.7	60.3	23.7	95.7
		B	ND	ND	ND	ND	1.3	0.8	4.5	3.6	2.3	3.1	ND	16.4	20.6	15.5	19.0	10.9	15.4	ND	15.6	71.5	26.3	113.4
REP 1		GMEO/2=	ND	ND	ND	ND	1.1	0.8	4.3	1.8	2.7	3.0	ND	14.4	18.2	14.8	18.6	10.0	15.1	ND	13.7	65.9	25.0	104.6
	60	A	ND	ND	ND	ND	1.3	ND	3.3	ND	2.6	2.9	ND	16.1	20.1	18.0	18.9	12.7	15.4	ND	10.1	73.1	28.1	111.3
		B	ND	ND	ND	ND	1.1	0.7	2.8	2.7	2.1	2.7	ND	20.1	21.8	17.5	19.4	11.9	14.7	ND	12.1	78.8	26.6	117.5
REP 2		GMEO/2=	ND	ND	ND	ND	1.2	0.4	3.1	1.4	2.4	2.8	ND	18.1	21.0	17.8	19.2	12.3	15.1	ND	11.1	76.0	27.4	114.4
	60	A	ND	ND	ND	ND	1.2	0.9	3.2	ND	3.3	2.5	ND	15.4	18.3	13.7	17.0	10.0	14.3	ND	11.1	64.4	24.3	99.8
		B	ND	ND	ND	ND	1.3	1.0	3.9	2.2	4.0	2.8	ND	29.0	32.4	18.9	22.4	12.7	14.1	ND	15.2	102.7	26.8	144.7
REP 3		GMEO/2=	ND	ND	ND	ND	1.3	1.0	3.6	1.1	3.7	2.7	ND	22.2	25.4	16.3	19.7	11.4	14.2	ND	13.2	83.6	25.6	122.3
0.3	90	A	ND	ND	ND	ND	ND	ND	ND	ND	3.8	2.1	ND	18.8	20.7	13.2	12.7	10.0	27.6	ND	5.9	65.3	37.6	108.8
		B	ND	ND	ND	ND	ND	ND	ND	ND	2.2	2.0	ND	16.2	19.1	13.2	13.7	11.3	21.6	ND	4.1	62.3	32.9	99.3
REP 1		GMEO/2=	ND	ND	ND	ND	ND	ND	ND	ND	3.0	2.0	ND	17.5	19.9	13.2	13.2	10.6	24.6	ND	5.0	63.8	35.2	104.1
	90	A	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	13.1	16.3	11.4	10.5	9.0	17.7	ND	ND	51.2	26.7	77.9
		B	ND	ND	ND	ND	ND	ND	ND	ND	2.4	3.3	ND	22.6	27.1	15.9	17.3	13.0	28.4	ND	5.7	82.9	41.4	130.1
REP 2		GMEO/2=	ND	ND	ND	ND	ND	ND	ND	ND	1.2	1.6	ND	17.8	21.7	13.6	13.9	11.0	23.1	ND	2.8	67.1	34.0	104.0
	90	A	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	14.6	19.9	13.5	14.8	12.9	28.8	ND	ND	62.9	41.7	104.5
		B	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	15.0	16.2	10.0	12.6	10.4	22.3	ND	ND	53.8	32.7	86.5
REP 3		GMEO/2=	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	14.8	18.1	11.7	13.7	11.7	23.6	ND	ND	58.3	37.2	95.5

ND = Not Detected - See Table 20 for detection limits

Table 65. Experiment II - Polycyclic aromatic hydrocarbons in site soil (ppm)

GREENHOUSE LOAD	DATE	DUPLICATE	NAPH	2-MET	1-MET	BIPH	ACTHY	ACTHE	DIBEN	FLORE	PHEN	ANTHR	CARBA	FLUOR	PYRENE	1,2-BZ	CHRYS	BEN-a	Bghi	2 RING	3 RING	4 RING	5 RING	TOTALPAH
1.0	0	A	8.6	10.5	4.6	2.8	4.9	30.6	21.8	38.4	153.2	27.8	15.6	103.4	95.4	32.0	33.0	17.1	17.9	26.5	292.3	263.7	35.0	617.6
		B	18.6	17.4	7.3	4.4	5.9	34.7	24.7	39.7	142.9	25.9	13.8	94.4	90.3	32.3	32.2	16.6	20.3	47.6	287.5	249.3	36.9	621.3
REP 1		GMEO/2=	13.6	13.9	5.9	3.6	5.4	32.6	23.3	39.1	148.1	26.8	14.7	98.9	92.9	32.1	32.6	16.9	19.1	37.1	289.9	256.5	36.0	619.5
	0	A	28.7	23.3	9.8	4.2	5.6	32.9	26.3	34.4	112.1	19.4	9.2	70.7	69.0	24.2	26.9	13.9	16.1	66.0	239.9	190.8	30.0	526.7
		B	33.8	26.4	10.6	5.5	5.4	33.3	27.1	34.6	106.7	17.9	8.8	65.1	61.8	23.8	23.6	11.5	15.5	76.3	233.7	174.3	27.0	511.2
REP 2		GMEO/2=	31.3	24.8	10.2	4.9	5.5	33.1	26.7	34.5	109.4	18.6	9.0	67.9	65.4	24.0	25.2	12.7	15.8	71.2	236.8	182.6	28.5	519.0
	0	A	37.7	27.6	10.9	5.0	5.9	33.7	27.0	33.9	105.8	17.9	9.2	65.4	57.1	22.8	22.7	11.7	14.9	81.2	233.4	168.0	26.6	509.2
		B	34.2	25.1	10.0	5.0	5.5	32.2	26.1	32.0	99.7	17.0	8.4	63.0	58.7	22.4	29.7	10.3	14.2	74.3	220.9	173.7	24.5	493.5
REP 3		GMEO/2=	35.9	26.3	10.5	5.0	5.7	33.0	26.5	33.0	102.7	17.5	8.8	64.2	57.9	22.6	26.2	11.0	14.6	77.7	227.2	170.9	25.6	501.4
1.0	60	A	ND	ND	ND	ND	ND	ND	ND	ND	3.8	3.6	ND	19.9	22.1	16.2	18.3	15.2	22.8	ND	7.4	76.5	38.0	121.9
		B	ND	ND	ND	ND	ND	ND	ND	ND	2.2	2.7	ND	15.1	17.5	12.9	13.0	9.0	20.8	ND	4.9	58.5	29.8	93.2
REP 1		GMEO/2=	ND	ND	ND	ND	ND	ND	ND	ND	3.0	3.2	ND	17.5	19.8	14.6	15.7	12.1	21.8	ND	6.2	67.5	33.9	107.6
	60	A	ND	ND	ND	ND	ND	ND	ND	ND	4.5	9.1	ND	29.4	35.9	19.0	20.8	13.6	24.4	ND	13.6	105.1	38.0	156.7
		B	ND	ND	ND	ND	ND	ND	ND	ND	5.3	5.3	ND	19.3	24.5	13.7	18.4	12.7	24.0	ND	10.6	75.9	36.7	123.2
REP 2		GMEO/2=	ND	ND	ND	ND	ND	ND	ND	ND	4.9	7.2	ND	24.4	30.2	16.4	19.6	13.2	24.2	ND	12.1	90.5	37.4	140.0
	60	A	ND	ND	ND	ND	ND	ND	ND	ND	8.0	10.0	ND	29.2	40.6	18.2	22.9	18.1	29.8	ND	18.0	110.9	47.9	176.8
		B	ND	ND	ND	ND	ND	ND	ND	ND	6.0	3.1	ND	32.7	37.6	21.4	21.1	18.4	24.6	ND	9.1	112.8	43.0	164.9
REP 3		GMEO/2=	ND	ND	ND	ND	ND	ND	ND	ND	7.0	6.6	ND	31.0	39.1	19.8	22.0	18.3	27.2	ND	13.6	111.9	45.5	170.9
1.0	90	A	ND	ND	ND	ND	ND	ND	ND	ND	4.5	10.2	ND	21.6	24.6	17.9	19.3	13.5	32.6	ND	14.7	83.4	46.1	144.2
		B	ND	ND	ND	ND	ND	ND	ND	ND	7.9	5.9	ND	44.0	49.6	21.5	27.7	18.8	41.5	ND	13.8	142.8	60.3	216.9
REP 1		GMEO/2=	ND	ND	ND	ND	ND	ND	ND	ND	6.2	8.1	ND	32.8	37.1	19.7	23.5	16.2	37.1	ND	14.3	113.1	53.2	180.6
	90	A	ND	ND	ND	ND	ND	ND	ND	ND	2.1	2.9	ND	20.1	21.2	12.8	14.2	11.6	33.5	ND	5.0	68.3	45.1	118.4
		B	ND	ND	ND	ND	ND	ND	ND	ND	3.9	3.3	ND	23.2	27.5	21.8	20.3	20.0	33.4	ND	7.2	92.8	53.4	153.4
REP 2		GMEO/2=	ND	ND	ND	ND	ND	ND	ND	ND	3.0	3.1	ND	21.7	24.4	17.3	17.3	15.8	33.5	ND	6.1	80.6	49.3	135.9
	90	A	ND	ND	ND	ND	ND	ND	ND	ND	2.6	3.2	ND	19.9	23.9	15.9	15.6	13.8	33.9	ND	5.8	75.3	47.7	128.8
		B	8.9	13.3	15.4	18.5	20.8	21.5	22.3	27.2	32.1	30.4	39.9	68.5	65.1	42.3	44.8	36.8	41.6	56.1	194.2	220.7	78.4	549.4
REP 3		GMEO/2=	4.5	6.7	7.7	9.3	10.4	10.8	11.2	13.6	17.4	16.8	20.0	44.2	44.5	29.1	30.2	25.3	37.8	28.1	100.0	148.0	63.1	339.1

ND = Not Detected - See Table 20 for detection limits

Table 65. Experiment II - Polycyclic aromatic hydrocarbons in site soil (ppb)
GRENOBLE

LOAD	DATE	DUPLICATE	NAPH	2-MET	1-MET	BIPH	ACTHY	ACTHE	DIBEN	FLORE	PHEN	ANTHR	CARBA	FLUOR	PYRENE	1,2-BZ	CHRYS	BEN-e	Byhi	2 RING	3 RING	4 RING	5 RING	TOTALPAH
3.0	30	A	ND	ND	ND	6.3	ND	ND	17.0	ND	5.9	5.5	ND	156.8	144.8	31.6	38.0	20.0	ND	6.3	28.4	371.2	20.0	426.0
		B	ND	ND	ND	7.0	ND	ND	20.1	ND	8.0	10.0	ND	135.2	124.3	30.3	34.5	ND	ND	7.0	38.1	324.3	ND	369.4
REP 1		CAVED/2=	ND	ND	ND	6.7	ND	ND	18.5	ND	7.0	7.8	ND	146.0	134.6	30.9	36.3	10.0	ND	6.7	33.3	347.7	10.0	397.7
	30	A	ND	ND	ND	7.6	ND	ND	19.0	ND	7.1	5.6	ND	159.1	138.7	32.1	36.5	26.0	ND	7.6	31.7	366.4	26.0	431.6
		B	ND	ND	ND	5.5	ND	ND	27.0	ND	8.4	7.9	ND	169.6	150.5	35.8	43.9	22.9	ND	5.5	43.4	399.8	22.9	471.5
REP 2		CAVED/2=	ND	ND	ND	6.5	ND	ND	23.0	ND	7.8	6.7	ND	164.4	144.6	33.9	40.2	24.4	ND	6.5	37.5	383.1	24.4	451.6
	30	A	ND	ND	ND	ND	ND	ND	16.1	ND	9.4	9.6	ND	187.2	165.0	40.3	45.8	21.0	ND	ND	35.1	438.3	21.0	494.5
		B	ND	ND	ND	ND	ND	ND	19.4	ND	8.3	6.1	ND	143.6	125.3	29.4	30.9	12.6	ND	ND	33.7	329.2	12.6	375.5
REP 3		CAVED/2=	ND	ND	ND	ND	ND	ND	17.7	ND	8.8	7.9	ND	165.4	145.2	34.9	38.4	16.8	ND	ND	34.4	383.8	16.8	435.0
3.0	60	A	ND	ND	ND	ND	ND	ND	16.6	ND	ND	ND	ND	20.6	37.5	13.7	21.1	15.8	ND	ND	16.6	92.9	15.8	125.3
		B	ND	ND	ND	ND	ND	ND	14.8	ND	ND	ND	ND	32.6	41.9	12.2	20.1	15.2	ND	ND	14.8	106.8	15.2	136.8
REP 1		CAVED/2=	ND	ND	ND	ND	ND	ND	15.7	ND	ND	ND	ND	26.6	39.7	13.0	20.6	15.5	ND	ND	15.7	99.9	15.5	131.1
	60	A	ND	ND	ND	ND	ND	ND	15.1	ND	7.3	5.3	ND	19.9	46.5	14.2	19.6	22.9	ND	ND	27.7	100.2	22.9	150.8
		B	ND	ND	ND	ND	ND	ND	19.3	ND	6.3	8.6	ND	41.6	55.4	16.6	20.9	16.9	ND	ND	34.2	134.5	16.9	185.6
REP 2		CAVED/2=	ND	ND	ND	ND	ND	ND	17.2	ND	6.8	7.0	ND	30.8	51.0	15.4	20.3	19.9	ND	ND	31.0	117.4	19.9	168.2
	60	A	ND	ND	ND	ND	ND	ND	18.7	ND	ND	ND	ND	16.0	52.1	15.0	17.5	ND	ND	ND	18.7	100.6	ND	119.3
		B	ND	ND	ND	ND	ND	ND	20.0	ND	ND	ND	ND	24.1	45.0	23.5	28.3	23.6	ND	ND	20.0	120.9	23.6	164.5
REP 3		CAVED/2=	ND	ND	ND	ND	ND	ND	19.4	ND	ND	ND	ND	20.1	48.6	19.3	22.9	11.8	ND	ND	19.4	110.8	11.8	141.9
3.0	90	A	ND	ND	ND	ND	ND	ND	13.9	ND	7.2	8.0	ND	33.7	22.0	5.9	23.5	18.5	29.2	ND	29.1	85.1	47.7	161.9
		B	ND	ND	ND	ND	ND	ND	14.3	ND	ND	ND	ND	22.8	20.2	5.1	12.7	16.7	39.6	ND	14.3	60.8	56.3	131.4
REP 1		CAVED/2=	ND	ND	ND	ND	ND	ND	14.1	ND	3.6	4.0	ND	28.3	21.1	5.5	18.1	17.6	34.4	ND	21.7	73.0	52.0	146.7
	90	A	ND	ND	ND	ND	ND	ND	13.6	ND	ND	ND	ND	17.2	19.5	9.5	19.5	19.7	33.0	ND	13.6	65.7	52.7	132.0
		B	ND	ND	ND	ND	ND	ND	12.8	ND	ND	ND	ND	15.5	18.0	3.8	21.8	10.7	29.0	ND	12.8	59.1	39.7	111.6
REP 2		CAVED/2=	ND	ND	ND	ND	ND	ND	13.2	ND	ND	ND	ND	16.4	18.8	6.7	20.7	15.2	31.0	ND	13.2	62.4	46.2	121.8
	90	A	ND	ND	ND	ND	ND	ND	12.6	ND	ND	ND	ND	20.9	16.6	ND	20.4	20.7	31.8	ND	12.6	57.9	52.5	123.0
		B	ND	ND	ND	ND	ND	ND	14.9	ND	11.2	34.5	ND	27.6	22.7	7.1	33.1	23.2	15.2	ND	60.6	90.5	38.4	189.5
REP 3		CAVED/2=	ND	ND	ND	ND	ND	ND	13.8	ND	5.6	17.3	ND	24.3	19.7	3.6	26.8	22.0	23.5	ND	36.6	74.2	45.5	156.3

ND = Not Detected - See Table 20 for detection limits

Table 65. Experiment II - Polycyclic aromatic hydrocarbons in site soil (ppm)
CULTIVAT

LOAD	DATE	DUPLICATE	NAPH	2-MET	1-MET	BIPH	ACTHY	ACTHE	DIBEN	FLORE	PHEN	ANTHR	CARBA	FLUOR	PYRENE	1,2-BZ	CHRYS	BEN-a	BghI	2 RING	3 RING	4 RING	5 RING	TOTALPAH
0.3	0	A	5.0	8.0	5.0	1.0	2.0	17.0	12.0	10.0	54.0	7.0	7.0	27.0	23.0	6.0	7.0	ND	ND	19.0	117.0	63.0	ND	199.0
		B	7.0	10.0	6.0	1.0	2.0	17.0	11.0	19.0	60.0	9.0	7.0	30.0	25.0	7.0	6.0	ND	ND	24.0	125.0	68.0	ND	217.0
REP 1		CAVED/2=	6.0	9.0	5.5	1.0	2.0	17.0	11.5	18.5	57.0	8.0	7.0	28.5	24.0	6.5	6.5	ND	ND	21.5	121.0	65.5	ND	208.0
	0	A	9.0	10.0	7.0	2.0	2.0	22.0	14.0	24.0	69.0	10.0	8.0	34.0	29.0	7.0	9.0	ND	ND	28.0	149.0	79.0	ND	256.0
		B	4.0	7.0	4.0	1.0	3.0	22.0	17.0	32.0	113.0	14.0	7.0	52.0	42.0	15.0	9.0	ND	ND	16.0	208.0	118.0	ND	342.0
REP 2		CAVED/2=	6.5	8.5	5.5	1.5	2.5	22.0	15.5	20.0	91.0	12.0	7.5	43.0	35.5	11.0	9.0	ND	ND	22.0	178.5	98.5	ND	299.0
	0	A	15.0	25.0	13.0	5.0	4.0	40.0	27.0	44.0	151.0	21.0	23.0	72.0	57.0	17.0	16.0	ND	ND	58.0	310.0	162.0	ND	530.0
		B	10.0	15.0	7.0	2.0	2.0	21.0	15.0	22.0	67.0	10.0	9.0	33.0	28.0	10.0	5.0	ND	ND	34.0	146.0	76.0	ND	256.0
REP 3		CAVED/2=	12.5	20.0	10.0	3.5	3.0	30.5	21.0	33.0	109.0	15.5	16.0	52.5	42.5	13.5	10.5	ND	ND	46.0	228.0	119.0	ND	393.0
0.3	30	A	ND	ND	ND	ND	ND	9.4	ND	21.5	26.8	ND	ND	55.3	69.4	13.9	31.9	ND	ND	ND	57.7	170.5	ND	228.2
		B	ND	ND	ND	ND	ND	6.3	ND	11.3	12.7	ND	ND	24.2	30.2	6.7	11.9	ND	ND	ND	30.3	73.0	ND	103.3
REP 1		CAVED/2=	ND	ND	ND	ND	ND	7.9	ND	16.4	19.8	ND	ND	39.8	49.8	10.3	21.9	ND	ND	ND	44.0	121.8	ND	165.8
	30	A	ND	ND	ND	ND	ND	5.5	6.7	10.2	12.4	ND	3.6	31.6	29.7	5.6	12.6	ND	ND	ND	38.4	79.5	ND	117.9
		B	ND	ND	ND	ND	ND	11.9	ND	24.3	28.9	ND	ND	69.3	66.4	15.2	35.2	ND	ND	ND	65.1	186.1	ND	251.2
REP 2		CAVED/2=	ND	ND	ND	ND	ND	8.7	3.4	17.3	20.7	ND	1.8	50.5	48.1	10.4	23.9	ND	ND	ND	51.8	132.8	ND	184.6
	30	A	ND	ND	ND	ND	ND	ND	ND	ND	14.4	ND	ND	38.0	36.6	7.3	15.1	ND	ND	ND	14.4	97.0	ND	111.4
		B	ND	ND	ND	ND	ND	8.8	ND	19.0	26.3	ND	ND	71.1	69.0	12.8	25.4	ND	ND	ND	54.1	178.3	ND	232.4
REP 3		CAVED/2=	ND	ND	ND	ND	ND	4.4	ND	9.5	20.4	ND	ND	54.6	52.8	10.1	20.3	ND	ND	ND	34.3	137.7	ND	171.9
0.3	60	A	ND	ND	ND	ND	ND	4.9	ND	6.2	8.5	ND	ND	6.3	11.3	ND	9.8	ND	ND	ND	19.6	27.4	ND	47.0
		B	ND	ND	ND	ND	ND	6.3	ND	6.8	9.0	ND	ND	5.5	10.6	ND	9.9	ND	ND	ND	22.1	26.0	ND	48.1
REP 1		CAVED/2=	ND	ND	ND	ND	ND	5.6	ND	6.5	8.8	ND	ND	5.9	11.0	ND	9.9	ND	ND	ND	20.9	26.7	ND	47.6
	60	A	ND	ND	ND	ND	ND	5.1	ND	8.5	9.9	ND	ND	6.6	16.9	4.2	12.0	ND	ND	ND	23.5	39.7	ND	63.2
		B	2.2	ND	ND	1.9	ND	4.2	5.8	9.4	11.6	ND	ND	14.3	18.8	4.8	11.9	ND	ND	4.1	31.0	49.8	ND	84.9
REP 2		CAVED/2=	1.1	ND	ND	1.0	ND	4.7	2.9	9.0	10.8	ND	ND	10.5	17.9	4.5	12.0	ND	ND	2.1	27.3	44.8	ND	74.1
	60	A	ND	ND	ND	ND	ND	6.0	ND	7.7	11.3	ND	ND	13.1	18.4	4.0	11.5	ND	ND	ND	25.0	47.0	ND	72.0
		B	2.2	ND	ND	1.9	ND	5.6	ND	6.8	9.1	ND	ND	13.4	13.3	3.1	10.3	ND	ND	4.1	21.5	40.1	ND	65.7
REP 3		CAVED/2=	1.1	ND	ND	1.0	ND	5.8	ND	7.3	10.2	ND	ND	13.3	15.9	3.6	10.9	ND	ND	2.1	23.3	43.6	ND	68.9
0.3	90	A	ND	ND	ND	ND	ND	3.6	3.1	5.0	6.1	ND	ND	11.2	6.9	1.8	2.4	4.6	ND	ND	17.8	22.3	4.6	44.7
		B	ND	ND	ND	ND	ND	3.4	6.5	4.8	7.7	2.0	ND	10.7	6.8	2.1	2.8	5.3	ND	ND	24.4	22.4	5.3	52.1
REP 1		CAVED/2=	ND	ND	ND	ND	ND	3.5	4.8	4.9	6.9	1.0	ND	11.0	6.9	2.0	2.6	5.0	ND	ND	21.1	22.4	5.0	48.4
	90	A	ND	ND	ND	ND	ND	2.9	4.3	5.6	7.0	2.4	ND	15.3	13.0	4.9	5.5	6.0	ND	ND	22.2	38.7	6.0	66.9
		B	ND	ND	ND	ND	ND	3.5	3.0	5.5	11.6	ND	ND	15.2	12.1	5.5	6.1	6.4	ND	ND	23.6	38.9	6.4	68.9
REP 2		CAVED/2=	ND	ND	ND	ND	ND	3.2	3.7	5.6	9.3	1.2	ND	15.3	12.6	5.2	5.8	6.2	ND	ND	22.9	38.8	6.2	67.9
	90	A	ND	ND	ND	ND	ND	3.1	4.0	4.4	8.2	2.3	ND	15.0	11.6	4.8	5.3	26.6	ND	ND	22.0	36.7	26.6	85.3
		B	ND	ND	ND	ND	ND	4.0	6.9	5.0	7.8	3.1	ND	17.0	11.6	4.1	5.1	3.5	ND	ND	26.8	37.8	3.5	68.1
REP 3		CAVED/2=	ND	ND	ND	ND	ND	3.6	5.5	4.7	8.0	2.7	ND	16.0	11.6	4.5	5.2	15.1	ND	ND	24.4	37.3	15.1	76.7

ND = Not Detected - See Table 20 for detection limits

Table 65. Experiment II - Polycyclic aromatic hydrocarbons in site soil (ppm)
CULLFORT

LOND	DATE	DUPLICATE	NAPH	2-MET	1-MET	BIPH	ACTHY	ACTHE	DIBEN	FLORE	PHEN	ANTHR	CARBA	FLUOR	PYRENE	1,2-BZ	CHRYS	BEN-a	BghI	2 RING	3 RING	4 RING	5 RING	TOTALPAH
1.0	30	A	ND	5.7	ND	ND	8.1	19.6	ND	32.8	41.3	8.6	12.3	115.2	99.4	19.9	28.3	4.1	ND	5.7	122.7	262.8	4.1	395.3
		B	ND	4.2	ND	ND	7.3	17.4	ND	32.7	19.2	5.7	9.2	99.6	89.6	17.3	22.8	6.6	ND	4.2	91.5	229.3	6.6	331.6
REP 1		GMEDIAN=	ND	5.0	ND	ND	7.7	18.5	ND	32.8	30.3	7.2	10.8	107.4	94.5	18.6	25.6	5.4	ND	5.0	107.1	246.1	5.4	363.5
	30	A	ND	5.1	ND	ND	8.3	23.7	ND	44.1	35.6	6.5	9.2	100.4	88.2	16.9	21.8	5.1	ND	5.1	127.4	227.3	5.1	364.9
		B	ND	4.8	ND	ND	9.3	27.7	ND	50.8	41.8	8.0	12.6	123.0	108.1	21.3	29.2	6.1	ND	4.8	150.2	281.6	6.1	442.7
REP 2		GMEDIAN=	ND	5.0	ND	ND	8.8	25.7	ND	47.5	38.7	7.3	10.9	111.7	98.2	19.1	25.5	5.6	ND	5.0	138.8	254.5	5.6	403.8
	30	A	ND	2.9	ND	ND	5.6	14.7	5.2	26.5	27.0	6.0	9.1	115.1	87.7	17.1	23.7	4.8	ND	2.9	94.1	248.6	4.8	345.4
		B	ND	ND	ND	ND	5.3	14.7	3.2	29.4	31.9	7.1	9.7	133.3	104.1	20.5	25.5	6.0	ND	ND	101.3	283.4	6.0	390.7
REP 3		GMEDIAN=	ND	1.5	ND	ND	5.5	14.7	4.2	28.0	29.5	6.6	9.4	124.2	95.9	18.8	24.6	5.4	ND	1.5	97.7	263.5	5.4	368.1
1.0	90	A	ND	ND	ND	ND	2.0	4.2	3.9	6.3	12.4	4.5	ND	22.2	46.4	3.9	5.5	9.8	ND	ND	33.3	78.0	9.8	121.1
		B	ND	ND	ND	ND	2.7	5.6	2.8	7.9	14.8	4.5	ND	21.4	55.4	4.1	5.9	5.1	ND	ND	38.3	86.8	5.1	130.2
REP 1		GMEDIAN=	ND	ND	ND	ND	2.4	4.9	3.4	7.1	13.6	4.5	ND	21.8	50.9	4.0	5.7	7.5	ND	ND	35.8	82.4	7.5	125.6
	90	A	ND	ND	ND	ND	3.2	9.2	4.0	14.4	16.7	4.6	ND	19.1	40.9	3.6	12.2	6.1	ND	ND	52.1	73.8	6.1	134.0
		B	ND	ND	ND	ND	ND	7.9	3.2	10.8	13.9	4.0	ND	15.6	32.2	2.7	4.4	3.2	ND	ND	39.8	54.9	3.2	97.9
REP 2		GMEDIAN=	ND	ND	ND	ND	1.6	8.6	3.6	12.6	15.3	4.3	ND	17.4	36.6	3.2	8.3	4.7	ND	ND	46.0	65.4	4.7	116.0
	90	A	ND	ND	ND	ND	ND	3.0	2.9	3.8	10.0	4.2	ND	24.2	59.3	5.4	12.6	6.1	ND	ND	23.9	101.5	6.1	131.5
		B	ND	ND	ND	ND	ND	3.0	5.1	4.3	14.0	4.7	ND	47.1	75.8	9.9	16.9	6.2	ND	ND	31.1	149.7	6.2	187.0
REP 3		GMEDIAN=	ND	ND	ND	ND	ND	3.0	4.0	4.1	12.0	4.5	ND	35.7	67.6	7.7	14.8	6.2	ND	ND	27.5	125.6	6.2	159.3

ND = Not Detected - See Table 20 for detection limits

Table 65. Experiment II - Polycyclic aromatic hydrocarbons in site soil (ppb)
OULSTORT

LOND	DATE	DUPLICATE	NAPH	2-MET	1-MET	BIPH	ACNAV	ACNHE	DIBEN	FLORE	PHEN	ANTHR	CARBA	FLUOR	PYRENE	1,2-BZ	CHRYS	BEN-a	BghI	2 RING	3 RING	4 RING	5 RING	TOTALPAH
3.0	0	A	82.5	120.9	66.2	10.8	24.7	123.3	104.8	179.0	457.6	63.0	38.7	180.4	151.8	20.1	42.5	ND	ND	288.4	992.7	394.8	ND	1675.9
		B	89.2	141.7	68.3	21.0	27.5	133.0	106.5	173.1	458.4	65.3	69.6	187.6	154.4	27.3	39.6	ND	ND	320.2	1033.4	408.9	ND	1762.5
REP 1		GMEAN/2=	85.9	131.3	67.3	19.9	26.1	128.2	105.7	176.5	458.0	64.6	54.2	184.0	153.1	23.7	41.1	ND	ND	304.3	1013.1	401.9	ND	1719.2
	0	A	85.3	142.0	70.5	18.6	33.2	140.3	113.1	181.2	498.8	74.4	78.2	199.0	159.5	21.3	41.4	ND	ND	316.4	1109.2	421.2	ND	1846.8
		B	116.0	128.8	66.4	21.9	28.4	168.4	129.8	210.8	576.0	83.1	88.9	234.4	194.8	38.6	54.2	ND	ND	333.1	1285.4	522.0	ND	2140.5
REP 2		GMEAN/2=	100.7	135.4	68.5	20.3	30.8	154.4	121.5	196.0	532.4	78.8	83.6	216.7	177.2	30.0	47.8	ND	ND	324.8	1197.3	471.6	ND	1993.7
	0	A	121.0	170.8	81.7	28.8	37.5	151.7	131.3	189.3	534.1	78.3	94.0	221.4	176.7	33.3	49.6	ND	ND	402.3	1216.2	481.0	ND	2099.5
		B	101.0	154.2	78.1	24.9	38.2	156.6	128.3	207.9	555.3	74.6	89.7	217.9	171.1	30.5	46.2	ND	ND	358.2	1250.6	465.7	ND	2074.5
REP 3		GMEAN/2=	111.0	162.5	79.9	26.9	37.9	154.2	129.8	198.6	544.7	76.5	91.9	219.7	173.9	31.9	47.9	ND	ND	380.3	1233.4	473.4	ND	2087.0
3.0	30	A	ND	ND	ND	ND	15.5	15.6	10.9	8.7	20.1	26.2	ND	260.3	211.7	23.8	42.1	9.4	ND	ND	97.0	537.9	9.4	644.3
		B	ND	ND	ND	ND	17.8	16.0	11.6	18.9	27.2	25.0	ND	258.4	199.4	27.9	42.3	8.8	ND	ND	116.5	528.0	8.8	653.3
REP 1		GMEAN/2=	ND	ND	ND	ND	16.7	15.8	11.3	13.8	23.7	25.6	ND	259.4	205.6	25.9	42.2	9.1	ND	ND	106.8	533.0	9.1	648.8
	30	A	ND	ND	ND	ND	14.2	20.8	14.6	40.9	44.0	35.7	ND	301.9	240.8	33.1	47.1	9.3	ND	ND	170.2	622.9	9.3	802.4
		B	ND	ND	ND	ND	17.1	20.3	14.6	41.5	50.3	43.6	ND	331.3	252.4	31.1	47.6	9.9	ND	ND	187.4	662.4	9.9	859.7
REP 2		GMEAN/2=	ND	ND	ND	ND	15.7	20.6	14.6	41.2	47.2	39.7	ND	316.6	246.6	32.1	47.4	9.6	ND	ND	178.8	642.7	9.6	831.1
	30	A	ND	ND	ND	ND	10.4	16.2	12.0	25.9	14.0	24.6	ND	246.4	199.9	23.3	40.7	5.9	ND	ND	103.1	510.3	5.9	619.3
		B	ND	ND	ND	ND	15.1	18.5	12.6	24.7	23.7	23.3	ND	276.2	213.4	40.1	10.7	ND	ND	ND	117.9	540.4	ND	658.3
REP 3		GMEAN/2=	ND	ND	ND	ND	12.8	17.4	12.3	25.3	18.9	24.0	ND	261.3	206.7	31.7	25.7	3.0	ND	ND	110.5	525.4	3.0	638.8
3.0	60	A	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	27.0	193.0	219.0	11.0	19.0	ND	ND	ND	27.0	442.0	ND	469.0
		B	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	139.0	175.0	ND	ND	ND	ND	ND	ND	314.0	ND	314.0
REP 1		GMEAN/2=	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	13.5	166.0	197.0	5.5	9.5	ND	ND	ND	13.5	378.0	ND	391.5
	60	A	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	22.0	224.0	248.0	ND	ND	ND	ND	ND	22.0	472.0	ND	494.0
		B	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
REP 2		GMEAN/2=	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	11.0	112.0	124.0	ND	ND	ND	ND	ND	11.0	236.0	ND	247.0
	60	A	ND	ND	ND	7.0	ND	ND	ND	ND	ND	ND	ND	145.0	232.0	13.0	37.0	ND	ND	7.0	ND	427.0	ND	434.0
		B	ND	ND	ND	ND	ND	ND	ND	ND	31.0	64.0	ND	129.0	202.0	32.0	22.0	ND	ND	ND	95.0	385.0	ND	480.0
REP 3		GMEAN/2=	ND	ND	ND	3.5	ND	ND	ND	ND	15.5	32.0	ND	137.0	217.0	22.5	29.5	ND	ND	3.5	47.5	406.0	ND	457.0
3.0	90	A	ND	ND	ND	ND	ND	11.2	9.2	16.9	31.8	9.0	ND	31.9	118.2	9.8	22.9	21.7	ND	ND	78.1	182.8	21.7	282.6
		B	ND	ND	ND	ND	6.1	11.1	9.4	15.9	29.0	9.1	ND	34.2	116.5	11.5	23.9	21.3	ND	ND	80.6	186.1	21.3	288.0
REP 1		GMEAN/2=	ND	ND	ND	ND	3.1	11.2	9.3	16.4	30.4	9.1	ND	33.1	117.4	10.7	23.4	21.5	ND	ND	79.4	184.5	21.5	285.3
	90	A	ND	ND	ND	ND	ND	9.7	10.7	24.0	33.0	12.1	ND	54.7	147.5	15.1	28.5	18.0	ND	ND	89.5	245.8	18.0	353.3
		B	ND	ND	ND	ND	ND	9.2	9.0	14.4	32.8	11.5	ND	37.8	129.7	12.3	23.7	21.7	ND	ND	76.9	203.5	21.7	302.1
REP 2		GMEAN/2=	ND	ND	ND	ND	ND	9.5	9.9	19.2	32.9	11.8	ND	46.3	138.6	13.7	26.1	19.9	ND	ND	83.2	224.7	19.9	327.7
	90	A	ND	ND	ND	ND	ND	6.6	8.0	8.9	22.8	8.7	ND	62.1	141.4	15.7	27.1	19.5	ND	ND	55.0	246.3	19.5	320.8
		B	ND	ND	ND	ND	ND	5.0	9.3	8.4	23.0	7.9	ND	67.5	152.4	17.5	26.6	21.0	ND	ND	53.6	264.0	21.0	338.6
REP 3		GMEAN/2=	ND	ND	ND	ND	ND	5.8	8.7	8.7	22.9	8.3	ND	64.8	146.9	16.6	26.9	20.3	ND	ND	54.3	255.2	20.3	329.7

ND = Not Detected - See Table 20 for detection limits

Table 65. Experiment II - Polycyclic aromatic hydrocarbons in site soil (ppb)
MORTON

LOND	DATE	DUPLICATE	NAPH	2-MET	1-MET	BIPH	ACTHY	ACTHE	DIBEN	FLORE	PHEN	ANTHR	CARBA	FLUOR	PYRENE	1,2-BZ	CHRYS	BEN-a	Bghi	2 RING	3 RING	4 RING	5 RING	TOTALPAH
0.3	0	A	13.8	3.0	1.9	3.5	ND	7.7	13.6	13.3	68.8	5.4	ND	40.8	23.5	14.3	ND	ND	ND	22.2	108.8	78.6	ND	209.6
		B	14.0	4.0	4.9	2.5	2.3	8.0	13.6	13.4	63.8	8.2	ND	30.1	24.0	6.2	ND	ND	ND	25.4	109.3	60.3	ND	195.0
REP 1		CMBD/2=	13.9	3.5	3.4	3.0	1.2	7.9	13.6	13.4	66.3	6.8	ND	35.5	23.8	10.3	ND	ND	ND	23.8	109.1	69.5	ND	202.3
	0	A	12.1	ND	ND	ND	ND	6.8	10.2	12.3	63.7	6.0	ND	31.2	27.3	6.8	ND	ND	ND	12.1	99.0	65.3	ND	176.4
		B	10.7	3.0	2.9	ND	ND	5.9	15.7	11.0	56.1	6.8	ND	24.0	21.3	9.3	ND	ND	ND	16.6	95.5	54.6	ND	166.7
REP 2		CMBD/2=	11.4	1.5	1.5	ND	ND	6.4	13.0	11.7	59.9	6.4	ND	27.6	24.3	8.1	ND	ND	ND	14.4	97.3	60.0	ND	171.6
	0	A	9.3	2.5	2.5	ND	ND	6.0	11.4	12.6	64.9	5.8	ND	35.0	25.7	7.5	ND	ND	ND	14.3	100.7	68.2	ND	183.2
		B	10.5	2.8	3.1	ND	ND	5.4	9.6	9.9	56.5	4.3	ND	28.0	30.4	6.9	ND	ND	ND	16.4	85.7	65.3	ND	167.4
REP 3		CMBD/2=	9.9	2.7	2.8	ND	ND	5.7	10.5	11.3	60.7	5.1	ND	31.5	28.1	7.2	ND	ND	ND	15.4	93.2	66.8	ND	175.3
0.3	30	A	ND	ND	ND	ND	ND	ND	ND	ND	6.7	ND	ND	31.8	12.0	9.2	10.2	ND	ND	ND	6.7	63.2	ND	69.9
		B	ND	ND	ND	ND	ND	ND	ND	ND	6.1	ND	ND	32.7	13.1	10.3	12.4	ND	ND	ND	6.1	68.5	ND	74.6
REP 1		CMBD/2=	ND	ND	ND	ND	ND	ND	ND	ND	6.4	ND	ND	32.3	12.6	9.8	11.3	ND	ND	ND	6.4	65.9	ND	72.3
	30	A	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	23.3	16.1	11.9	10.7	ND	ND	ND	ND	62.0	ND	62.0
		B	ND	ND	ND	ND	ND	ND	ND	ND	10.9	ND	ND	33.5	17.5	10.1	ND	ND	ND	ND	10.9	61.1	ND	72.0
REP 2		CMBD/2=	ND	ND	ND	ND	ND	ND	ND	ND	5.5	ND	ND	28.4	16.8	11.0	5.4	ND	ND	ND	5.5	61.6	ND	67.0
	30	A	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	33.2	14.8	7.6	12.0	ND	ND	ND	ND	67.6	ND	67.6
		B	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
REP 3		CMBD/2=	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	16.6	7.4	3.8	6.0	ND	ND	ND	ND	33.8	ND	33.8
0.3	60	A	ND	ND	ND	ND	ND	ND	ND	ND	2.5	3.7	ND	24.0	19.0	7.3	14.4	ND	ND	ND	6.2	64.7	ND	70.9
		B	ND	ND	ND	ND	ND	ND	ND	ND	5.4	ND	ND	17.1	15.9	5.6	11.9	ND	ND	ND	5.4	50.5	ND	55.9
REP 1		CMBD/2=	ND	ND	ND	ND	ND	ND	ND	ND	4.0	1.9	ND	20.6	17.5	6.5	13.2	ND	ND	ND	5.8	57.6	ND	63.4
	60	A	ND	ND	ND	ND	ND	ND	ND	ND	2.5	ND	ND	10.0	9.0	6.5	7.2	ND	ND	ND	2.5	32.7	ND	35.2
		B	ND	ND	ND	ND	ND	ND	ND	ND	2.4	ND	ND	6.6	5.1	6.6	9.8	ND	ND	ND	2.4	28.1	ND	30.5
REP 2		CMBD/2=	ND	ND	ND	ND	ND	ND	ND	ND	2.5	ND	ND	8.3	7.1	6.6	8.5	ND	ND	ND	2.5	30.4	ND	32.9
	60	A	ND	ND	ND	ND	ND	ND	ND	ND	2.3	ND	ND	14.4	12.2	5.4	9.1	ND	ND	ND	2.3	41.1	ND	43.4
		B	ND	ND	ND	ND	ND	ND	ND	ND	2.5	ND	ND	22.9	15.5	5.3	6.6	ND	ND	ND	2.5	50.3	ND	52.8
REP 3		CMBD/2=	ND	ND	ND	ND	ND	ND	ND	ND	2.4	ND	ND	18.7	13.9	5.4	7.9	ND	ND	ND	2.4	45.7	ND	48.1

ND = Not Detected - See Table 20 for detection limits

Table 65. Experiment II - Polycyclic aromatic hydrocarbons in site soil (ppm)
MORIDIAN

LOND	DATE	DUPLICATE	NAPH	2-MET	1-MET	BIPH	ACNY	ACNE	DIBEN	FLORE	PHEN	ANTHR	CARBA	FLUOR	PYRENE	1,2-BZ	CHRYS	BEN-a	BghI	2 RING	3 RING	4 RING	5 RING	TOTALPAH
1.0	0	A	24.7	7.9	5.6	8.7	ND	13.3	22.4	28.0	130.6	10.8	6.2	78.7	41.5	14.8	16.4	ND	ND	46.9	211.3	151.4	ND	409.6
		B	32.6	9.3	4.9	2.5	3.8	14.3	19.7	26.8	133.7	10.4	10.1	77.7	52.5	13.0	13.8	ND	ND	49.3	218.8	157.0	ND	425.1
REP 1		GMEO/2=	28.7	8.6	5.3	5.6	1.9	13.8	21.1	27.4	132.2	10.6	8.2	78.2	47.0	13.9	15.1	ND	ND	48.1	215.0	154.2	ND	417.3
	0	A	30.3	10.3	4.8	1.9	3.2	16.0	18.7	27.9	128.5	11.4	12.6	70.7	42.2	15.9	13.6	ND	ND	47.3	218.3	142.4	ND	408.0
		B	27.6	8.6	5.0	1.7	2.8	14.3	17.6	26.3	124.1	9.5	6.3	63.4	39.8	8.3	6.4	ND	ND	42.9	200.9	117.9	ND	361.7
REP 2		GMEO/2=	29.0	9.5	4.9	1.8	3.0	15.2	18.2	27.1	126.3	10.5	9.5	67.1	41.0	12.1	10.0	ND	ND	45.1	209.6	130.2	ND	384.9
	0	A	28.9	10.1	5.5	1.9	3.0	17.7	24.6	34.7	169.6	15.2	15.3	94.0	58.3	19.0	17.8	ND	ND	46.4	280.1	189.1	ND	515.6
		B	42.1	12.0	6.3	6.5	3.5	20.0	23.1	34.1	159.5	14.4	10.2	84.8	66.8	12.5	15.8	ND	ND	66.9	264.8	179.9	ND	511.6
REP 3		GMEO/2=	35.5	11.1	5.9	4.2	3.3	18.9	23.9	34.4	164.6	14.8	12.8	89.4	62.6	15.8	16.8	ND	ND	55.7	272.5	184.5	ND	513.6
1.0	30	A	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	59.0	40.6	8.4	10.6	2.5	ND	ND	ND	118.6	2.5	121.1
		B	ND	ND	ND	ND	ND	ND	ND	ND	19.3	4.3	ND	81.3	54.9	14.5	21.0	ND	ND	ND	29.6	171.7	ND	195.3
REP 1		GMEO/2=	ND	ND	ND	ND	ND	ND	ND	ND	9.7	2.2	ND	70.2	47.8	11.5	15.8	1.3	ND	ND	11.8	145.2	1.3	158.2
	30	A	ND	ND	ND	ND	ND	ND	ND	ND	39.5	3.9	ND	99.4	63.9	9.9	12.3	ND	ND	ND	43.4	185.5	ND	228.9
		B	ND	ND	ND	ND	ND	ND	ND	ND	14.2	3.9	ND	97.1	64.6	7.4	9.9	ND	ND	ND	18.1	179.0	ND	197.1
REP 2		GMEO/2=	ND	ND	ND	ND	ND	ND	ND	ND	25.9	3.9	ND	98.3	64.3	8.7	11.1	ND	ND	ND	30.8	182.3	ND	213.0
	30	A	ND	ND	ND	ND	ND	ND	ND	ND	11.1	ND	ND	74.6	46.6	12.8	20.4	ND	ND	ND	11.1	154.4	ND	165.5
		B	ND	ND	ND	ND	ND	ND	ND	ND	18.2	ND	ND	94.7	59.4	14.4	20.4	ND	ND	ND	18.2	188.9	ND	207.1
REP 3		GMEO/2=	ND	ND	ND	ND	ND	ND	ND	ND	14.7	ND	ND	84.7	53.0	13.6	20.4	ND	ND	ND	14.7	171.7	ND	186.3
1.0	60	A	210.0	273.0	216.0	253.0	245.0	253.0	286.0	300.0	196.0	273.0	337.0	312.0	342.0	287.0	265.0	214.0	217.0	952.0	1890.0	1206.0	431.0	4479.0
		B	259.0	333.0	259.0	301.0	288.0	294.0	335.0	346.0	218.0	308.0	377.0	329.0	372.0	326.0	288.0	240.0	231.0	1152.0	2166.0	1315.0	471.0	5104.0
REP 1		GMEO/2=	234.5	303.0	237.5	277.0	266.5	273.5	310.5	323.0	207.0	290.5	357.0	320.5	357.0	306.5	276.5	227.0	224.0	1052.0	2028.0	1260.5	451.0	4791.5
	60	A	232.0	303.0	242.0	276.0	261.0	268.0	297.0	309.0	191.0	271.0	270.0	294.0	333.0	284.0	259.0	214.0	222.0	1053.0	1867.0	1170.0	436.0	4526.0
		B	276.0	338.0	269.0	303.0	288.0	291.0	335.0	337.0	211.0	299.0	363.0	326.0	368.0	318.0	279.0	234.0	235.0	1186.0	2124.0	1291.0	469.0	5070.0
REP 2		GMEO/2=	234.0	320.5	255.5	289.5	274.5	279.5	316.0	323.0	201.0	285.0	316.5	310.0	350.5	301.0	269.0	224.0	228.5	1119.5	1955.5	1230.5	452.5	4798.0
	60	A	178.0	268.0	213.0	259.0	250.0	258.0	292.0	309.0	216.0	285.0	355.0	357.0	391.0	316.0	271.0	224.0	229.0	918.0	1965.0	1335.0	453.0	4671.0
		B	245.0	317.0	246.0	284.0	269.0	275.0	304.0	323.0	228.0	298.0	372.0	382.0	412.0	339.0	283.0	233.0	100.0	1092.0	2069.0	1416.0	333.0	4910.0
REP 3		GMEO/2=	211.5	292.5	229.5	271.5	259.5	266.5	298.0	316.0	222.0	291.5	363.5	369.5	401.5	327.5	277.0	228.5	164.5	1005.0	2017.0	1375.5	393.0	4790.5
1.0	90	A	ND	ND	ND	ND	ND	ND	ND	ND	22.9	18.4	ND	144.8	96.0	9.0	20.7	4.0	ND	ND	41.3	270.5	4.0	315.8
		B	ND	ND	ND	ND	ND	ND	ND	ND	5.4	3.1	ND	40.4	43.2	9.2	20.6	3.1	ND	ND	8.5	113.4	3.1	125.0
REP 1		GMEO/2=	ND	ND	ND	ND	ND	ND	ND	ND	14.2	10.8	ND	92.6	69.6	9.1	20.7	3.6	ND	ND	24.9	192.0	3.6	220.4
	90	A	ND	ND	ND	ND	ND	ND	ND	ND	5.6	ND	ND	44.6	29.4	ND	ND	ND	ND	ND	5.6	74.0	ND	79.6
		B	ND	ND	ND	ND	ND	ND	ND	ND	5.9	ND	ND	16.9	13.4	ND	ND	ND	ND	ND	5.9	30.3	ND	36.2
REP 2		GMEO/2=	ND	ND	ND	ND	ND	ND	ND	ND	5.8	ND	ND	30.8	21.4	ND	ND	ND	ND	ND	5.8	52.2	ND	57.9
	90	A	ND	ND	ND	ND	ND	ND	ND	ND	13.3	4.0	ND	59.1	64.8	5.9	19.2	ND	ND	ND	17.3	149.0	ND	166.3
		B	ND	ND	ND	ND	ND	ND	ND	ND	9.0	7.3	ND	46.2	49.2	7.4	19.1	ND	ND	ND	16.3	121.9	ND	138.2
REP 3		GMEO/2=	ND	ND	ND	ND	ND	ND	ND	ND	11.2	5.7	ND	52.7	57.0	6.7	19.2	ND	ND	ND	16.8	135.5	ND	152.3

ND = Not Detected - See Table 20 for detection limits

Table 65. Experiment II - Polycyclic aromatic hydrocarbons in site soil (ppb)
HORIZON

LOND	DATE	DUPLICATE	NAPH	2-MET	1-MET	BIPH	ACTHY	ACTHE	DIBEN	FLORE	PHEN	ANTHR	CARBA	FLUOR	PYRENE	1,2-BZ	CHRYS	DEN-a	Bghi	2 RING	3 RING	4 RING	5 RING	TOTALPAH
3.0	0	A	145.3	36.7	20.2	4.9	9.9	57.6	96.1	104.8	513.9	47.8	33.6	278.9	201.0	24.7	57.4	ND	ND	207.1	863.7	562.0	ND	1632.8
		B	134.0	40.6	17.3	6.2	13.5	54.9	88.9	98.4	477.4	62.6	48.0	309.5	202.6	30.3	31.0	ND	ND	198.1	848.7	573.4	ND	1615.2
REP 1		CM+BD/2=	139.7	38.7	18.8	5.6	11.7	56.3	92.5	101.6	495.7	55.2	40.8	294.2	201.8	27.5	44.2	ND	ND	202.6	853.7	567.7	ND	1624.0
	0	A	21.9	22.6	15.2	3.6	6.9	61.7	85.1	123.3	614.5	82.9	54.7	367.6	236.5	22.9	56.4	ND	ND	63.3	1029.1	683.4	ND	1775.8
		B	64.3	32.4	22.5	6.0	10.8	59.7	110.9	100.6	483.4	48.4	41.3	255.3	183.6	24.8	50.4	ND	ND	125.2	855.1	514.1	ND	1494.4
REP 2		CM+BD/2=	43.1	27.5	18.9	4.8	8.9	60.7	98.0	112.0	549.0	65.7	48.0	311.5	210.1	23.9	53.4	ND	ND	94.3	942.1	598.8	ND	1635.1
	0	A	29.8	26.9	11.6	4.7	11.8	54.3	99.7	107.2	555.5	55.0	33.0	305.7	234.0	26.4	46.5	ND	ND	73.0	916.5	612.6	ND	1602.1
		B	128.0	37.2	21.3	5.9	10.9	58.6	117.8	104.9	510.8	48.3	43.0	294.2	194.6	26.0	49.6	ND	ND	192.4	894.3	564.4	ND	1651.1
REP 3		CM+BD/2=	78.9	32.1	16.5	5.3	11.4	56.5	108.8	106.1	533.2	51.7	38.0	300.0	214.3	26.2	48.1	ND	ND	132.7	905.4	588.5	ND	1626.6
3.0	30	A	ND	ND	ND	ND	ND	15.2	23.3	6.0	82.5	ND	ND	250.9	154.2	25.3	59.6	11.2	ND	ND	127.0	490.0	11.2	628.2
		B	ND	ND	ND	ND	ND	15.0	27.3	5.5	51.9	ND	ND	236.0	141.7	15.2	48.1	14.0	ND	ND	99.7	441.0	14.0	554.7
REP 1		CM+BD/2=	ND	ND	ND	ND	ND	15.1	25.3	5.8	67.2	ND	ND	243.5	148.0	20.3	53.9	12.6	ND	ND	113.4	465.5	12.6	591.5
	30	A	ND	ND	ND	ND	ND	8.0	13.2	88.0	24.3	ND	ND	211.0	126.1	15.0	40.6	ND	ND	ND	133.5	392.7	ND	526.2
		B	ND	ND	ND	ND	ND	7.0	13.7	7.2	11.1	ND	ND	200.9	115.6	10.6	35.0	ND	ND	ND	39.0	362.1	ND	401.1
REP 2		CM+BD/2=	ND	ND	ND	ND	ND	7.5	13.5	47.6	17.7	ND	ND	206.0	120.9	12.8	37.8	ND	ND	ND	86.3	377.4	ND	463.7
	30	A	ND	ND	ND	ND	ND	8.7	146.0	ND	14.2	ND	ND	198.0	103.4	6.8	47.6	ND	ND	ND	168.9	345.8	ND	514.7
		B	ND	ND	ND	ND	ND	9.4	24.4	ND	22.3	ND	ND	209.6	126.6	19.6	48.1	ND	ND	ND	56.1	403.9	ND	460.0
REP 3		CM+BD/2=	ND	ND	ND	ND	ND	9.1	85.2	ND	18.3	ND	ND	198.8	115.0	13.2	47.9	ND	ND	ND	112.5	374.9	ND	487.4
3.0	60	A	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	80.0	122.2	ND	ND	ND	ND	ND	ND	202.2	ND	202.2
		B	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	54.8	93.7	ND	ND	ND	ND	ND	ND	148.5	ND	148.5
REP 1		CM+BD/2=	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	67.4	108.0	ND	ND	ND	ND	ND	ND	175.4	ND	175.4
	60	A	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	82.9	110.6	ND	ND	ND	ND	ND	ND	193.5	ND	193.5
		B	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	76.6	107.6	ND	ND	ND	ND	ND	ND	184.2	ND	184.2
REP 2		CM+BD/2=	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	79.8	109.1	ND	ND	ND	ND	ND	ND	188.9	ND	188.9
	60	A	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	54.0	99.7	ND	ND	ND	ND	ND	ND	153.7	ND	153.7
		B	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	71.0	110.8	ND	ND	ND	ND	ND	ND	181.8	ND	181.8
REP 3		CM+BD/2=	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	62.5	105.3	ND	ND	ND	ND	ND	ND	167.8	ND	167.8
3.0	90	A	ND	ND	ND	ND	ND	18.1	24.7	9.7	110.7	18.7	ND	285.1	333.5	8.5	273.0	ND	ND	ND	181.9	900.1	ND	1082.0
		B	ND	ND	ND	ND	ND	14.7	25.9	7.2	54.1	11.6	ND	177.4	228.4	12.1	22.1	ND	ND	ND	113.5	440.0	ND	553.5
REP 1		CM+BD/2=	ND	ND	ND	ND	ND	16.4	25.3	8.5	82.4	15.2	ND	231.3	281.0	10.3	147.6	ND	ND	ND	147.7	670.1	ND	817.8
	90	A	ND	ND	ND	ND	ND	8.8	22.1	5.5	16.0	ND	ND	138.5	208.2	17.2	34.0	ND	ND	ND	52.4	477.9	ND	530.3
		B	ND	ND	ND	ND	ND	6.7	21.7	ND	9.2	ND	ND	111.3	241.1	11.5	17.2	ND	ND	ND	37.6	391.1	ND	418.7
REP 2		CM+BD/2=	ND	ND	ND	ND	ND	7.8	21.9	2.8	12.6	ND	ND	124.9	264.7	14.4	25.6	ND	ND	ND	45.0	429.5	ND	474.5
	90	A	ND	ND	ND	ND	ND	ND	26.2	ND	22.8	ND	ND	213.8	352.8	18.6	30.5	ND	ND	ND	49.0	615.7	ND	664.7
		B	ND	ND	ND	ND	ND	ND	32.9	ND	31.9	ND	ND	376.8	559.6	42.5	100.5	ND	ND	ND	64.8	1079.4	ND	1144.2
REP 3		CM+BD/2=	ND	ND	ND	ND	ND	ND	29.6	ND	27.4	ND	ND	295.3	456.2	30.6	65.5	ND	ND	ND	56.9	847.6	ND	904.5

ND = Not Detected - See Table 20 for detection limits

Table 15. Experiment II - Polycyclic aromatic hydrocarbons in site soil (ppm)
WEEKS

LOID	DATE	DUPLICATE	NAPH	2-MET	1-MET	BIPH	ACTHY	ACTHE	DIBDN	FLORE	PHEN	ANTHR	CARBA	FLUOR	PYRENE	1,2-BZ	CHRYS	BEN-a	BghI	2 RING	3 RING	4 RING	5 RING	TOTALPAH
0.3	0	A	8.0	7.3	3.6	3.1	1.4	12.6	12.2	18.3	56.3	13.1	7.6	36.4	31.1	5.2	5.6	ND	ND	22.0	121.5	78.3	ND	221.8
		B	4.5	4.1	2.3	2.3	ND	10.7	9.7	17.3	50.0	9.9	3.9	45.9	33.6	3.9	6.2	ND	ND	13.2	109.5	89.6	ND	212.3
REP 1		GMEO/2=	6.3	5.7	3.0	2.7	0.7	11.7	11.0	17.8	57.2	11.5	5.8	41.2	32.4	4.6	5.9	ND	ND	17.6	115.5	84.0	ND	217.1
	0	A	8.4	6.1	2.9	1.4	ND	11.5	9.1	16.5	55.8	13.0	6.6	31.0	29.4	6.8	4.7	ND	ND	18.8	112.5	71.9	ND	203.2
		B	6.4	5.7	3.1	3.0	ND	10.4	10.2	16.1	61.5	18.4	6.6	37.9	33.6	10.6	8.8	ND	ND	18.2	123.2	90.9	ND	232.3
REP 2		GMEO/2=	7.4	5.9	3.0	2.2	ND	11.0	9.7	16.3	50.7	15.7	6.6	34.5	31.5	8.7	6.8	ND	ND	18.5	117.9	81.4	ND	217.8
	0	A	6.6	6.0	2.0	2.3	ND	12.5	22.7	20.4	65.9	19.3	8.3	34.9	30.6	3.1	6.8	ND	ND	16.9	149.1	75.4	ND	241.4
		B	5.6	4.3	1.9	2.5	ND	8.7	6.9	11.9	35.4	5.8	3.3	20.0	21.9	4.2	4.0	ND	ND	14.3	72.0	50.1	ND	136.4
REP 3		GMEO/2=	6.1	5.2	2.0	2.4	ND	10.6	14.8	16.2	50.7	12.6	5.8	27.5	26.3	3.7	5.4	ND	ND	15.6	110.6	62.8	ND	188.9
0.3	30	A	ND	ND	ND	ND	ND	ND	ND	ND	5.0	7.0	3.0	10.0	13.0	7.0	4.0	ND	ND	ND	15.0	34.0	ND	49.0
		B	ND	ND	ND	ND	ND	ND	ND	ND	3.0	ND	ND	13.0	12.0	5.0	3.0	ND	ND	ND	3.0	33.0	ND	36.0
REP 1		GMEO/2=	ND	ND	ND	ND	ND	ND	ND	ND	4.0	3.5	1.5	11.5	12.5	6.0	3.5	ND	ND	ND	9.0	33.5	ND	42.5
	30	A	ND	ND	ND	ND	ND	3.0	6.0	5.0	15.0	16.0	12.0	9.0	17.0	8.0	9.0	ND	ND	ND	57.0	43.0	ND	100.0
		B	ND	ND	ND	ND	ND	ND	ND	ND	3.0	ND	ND	7.0	14.0	5.0	ND	ND	ND	ND	3.0	26.0	ND	29.0
REP 2		GMEO/2=	ND	ND	ND	ND	ND	1.5	3.0	2.5	9.0	8.0	6.0	8.0	15.5	6.5	4.5	ND	ND	ND	30.0	34.5	ND	64.5
	30	A	ND	ND	ND	ND	ND	ND	5.0	ND	2.0	3.0	ND	4.0	14.0	4.0	ND	ND	ND	ND	10.0	22.0	ND	32.0
		B	ND	ND	ND	ND	ND	ND	ND	ND	2.0	4.0	ND	5.0	11.0	3.0	11.0	ND	ND	ND	6.0	30.0	ND	36.0
REP 3		GMEO/2=	ND	ND	ND	ND	ND	ND	2.5	ND	2.0	3.5	ND	4.5	12.5	3.5	5.5	ND	ND	ND	8.0	26.0	ND	34.0
0.3	90	A	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	7.5	ND	7.4	ND	ND	ND	ND	ND	14.9	ND	14.9
		B	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	4.2	ND	4.8	ND	ND	ND	ND	ND	9.0	ND	9.0
REP 1		GMEO/2=	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	5.9	ND	6.1	ND	ND	ND	ND	ND	12.0	ND	12.0
	90	A	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	4.9	4.1	6.5	ND	ND	ND	ND	ND	15.5	ND	15.5
		B	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	5.9	ND	6.9	ND	ND	ND	ND	ND	12.8	ND	12.8
REP 2		GMEO/2=	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	5.4	2.1	6.7	ND	ND	ND	ND	ND	14.2	ND	14.2
	90	A	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	3.5	ND	4.7	ND	ND	ND	ND	8.2	ND	8.2
		B	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	6.0	ND	ND	ND	ND	ND	6.0	ND	6.0
REP 3		GMEO/2=	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	1.8	3.0	2.4	ND	ND	ND	ND	7.1	ND	7.1

ND = Not Detected - See Table 20 for detection limits

Table 65. Experiment II - Polycyclic aromatic hydrocarbons in site soil (ppm)
MIDDLING

LOAD	DATE	DUPLICATE	NAPH	2-MET	1-MET	BIPH	ACENY	ACENE	DIBEN	FLORE	PHEN	ANTHR	CARBA	FLUOR	PYRENE	1,2-BZ	CHRYS	DEN-a	BghI	2 RING	3 RING	4 RING	5 RING	TOTALPAH
1.0	0	A	23.3	21.1	8.8	5.3	3.2	38.1	33.5	52.8	172.5	37.5	19.0	102.8	81.5	18.3	17.1	2.2	4.1	58.5	356.5	219.6	6.3	640.9
		B	17.9	14.8	6.0	4.2	3.5	36.8	34.6	60.5	224.4	62.3	33.1	131.7	102.9	21.8	21.6	7.7	16.5	42.8	455.2	278.0	24.2	800.2
REP 1		CMBD/2=	20.6	18.0	7.4	4.8	3.3	37.4	34.0	56.7	198.4	49.9	26.0	117.3	92.2	20.0	19.3	5.0	10.3	50.7	405.8	248.8	15.3	720.6
	0	A	35.3	26.7	9.2	6.2	4.6	40.3	34.7	53.4	176.2	30.6	17.5	108.1	85.7	18.7	19.3	6.5	5.6	77.4	357.3	231.8	12.1	678.5
		B	25.1	23.4	9.1	6.0	4.7	44.1	39.5	63.0	214.9	51.4	28.1	129.2	102.1	25.3	23.6	5.6	5.6	63.7	445.7	280.2	11.1	800.6
REP 2		CMBD/2=	30.2	25.0	9.2	6.1	4.6	42.2	37.1	58.2	195.6	41.0	22.8	118.6	93.9	22.0	21.5	6.1	5.6	70.5	401.5	256.0	11.6	739.6
	0	A	26.6	23.8	9.4	5.3	4.6	34.6	29.4	45.1	148.1	29.3	14.6	89.8	70.9	16.9	15.2	4.8	5.3	65.0	306.6	192.8	10.1	574.4
		B	22.3	20.2	7.6	4.8	3.5	35.0	37.3	51.8	180.8	35.8	18.0	108.9	85.9	18.9	17.0	5.3	6.0	54.9	362.3	230.7	11.2	659.1
REP 3		CMBD/2=	24.4	22.0	8.5	5.0	4.1	34.8	33.3	49.0	164.5	32.5	16.3	99.4	78.4	17.9	16.1	5.0	5.6	59.9	334.4	211.8	10.6	616.8
1.0	30	A	ND	ND	ND	ND	ND	ND	ND	ND	16.6	19.2	7.9	67.5	50.6	22.3	24.7	ND	ND	ND	43.7	205.1	ND	248.8
		B	8.9	6.2	1.4	ND	ND	8.1	7.2	12.7	21.9	8.0	85.5	106.3	22.3	23.8	12.4	ND	ND	16.5	143.4	164.8	ND	324.7
REP 1		CMBD/2=	4.5	3.1	0.7	ND	ND	4.1	3.6	6.4	19.3	13.6	46.7	86.9	56.4	23.1	18.6	ND	ND	8.3	93.6	185.0	ND	286.8
	30	A	ND	ND	ND	ND	ND	3.0	1.2	6.9	21.1	11.6	7.3	85.3	101.6	20.9	20.8	8.4	ND	ND	51.1	228.6	8.4	288.1
		B	ND	ND	ND	ND	ND	3.0	7.1	9.9	26.9	31.2	14.7	83.1	89.1	19.6	24.3	7.6	ND	ND	92.8	216.1	7.6	316.5
REP 2		CMBD/2=	ND	ND	ND	ND	ND	3.0	4.1	8.4	24.0	21.4	11.0	84.2	95.4	20.3	22.6	8.0	ND	ND	72.0	222.4	8.0	302.3
	30	A	ND	ND	ND	ND	ND	ND	3.3	2.8	8.2	10.5	5.2	62.8	80.8	19.2	20.2	9.4	ND	ND	30.0	183.0	9.4	222.4
		B	ND	ND	ND	ND	ND	ND	4.5	3.5	9.9	24.7	15.9	51.9	75.9	16.7	17.3	6.9	ND	ND	58.5	161.8	6.9	227.2
REP 3		CMBD/2=	ND	ND	ND	ND	ND	ND	3.9	3.2	9.1	17.6	10.6	57.4	78.4	18.0	18.8	8.2	ND	ND	44.3	172.4	8.2	224.8
1.0	60	A	ND	ND	ND	ND	ND	5.6	7.8	9.2	36.9	26.2	14.0	43.1	48.3	17.8	14.7	8.3	ND	ND	99.7	123.9	8.3	231.9
		B	ND	ND	ND	ND	ND	2.0	5.8	4.5	13.3	19.2	7.6	19.1	33.6	8.3	13.1	7.2	ND	ND	52.4	74.1	7.2	133.7
REP 1		CMBD/2=	ND	ND	ND	ND	ND	3.8	6.8	6.9	25.1	22.7	10.8	31.1	41.0	13.1	13.9	7.8	ND	ND	76.1	99.0	7.8	182.8
	60	A	ND	ND	ND	ND	ND	ND	ND	ND	7.9	8.3	4.0	13.7	27.5	7.6	11.0	6.6	ND	ND	20.2	59.8	6.6	86.6
		B	5.5	2.4	ND	ND	ND	3.1	5.3	6.1	18.8	17.7	9.8	34.8	8.3	12.8	8.9	ND	ND	7.9	60.8	64.8	ND	133.5
REP 2		CMBD/2=	2.8	1.2	ND	ND	ND	1.6	2.7	3.1	13.4	13.0	6.9	24.3	17.9	10.2	10.0	3.3	ND	4.0	40.5	62.3	3.3	110.1
	60	A	ND	ND	ND	ND	ND	ND	5.1	4.9	16.1	8.6	10.8	17.4	37.0	19.5	21.8	8.7	ND	ND	45.5	95.7	8.7	149.9
		B	ND	ND	ND	ND	ND	ND	5.8	5.8	20.8	41.0	27.0	18.1	53.8	30.2	40.1	19.5	ND	ND	100.4	142.2	19.5	262.1
REP 3		CMBD/2=	ND	ND	ND	ND	ND	ND	5.5	5.4	18.5	24.8	18.9	17.8	45.4	24.9	31.0	14.1	ND	ND	73.0	119.0	14.1	206.0
1.0	90	A	11.0	5.0	ND	ND	ND	13.0	18.0	25.0	74.0	80.0	33.0	52.0	157.0	16.0	38.0	16.0	ND	16.0	243.0	263.0	16.0	538.0
		B	8.0	3.0	ND	ND	ND	6.0	10.0	10.0	35.0	24.0	11.0	32.0	114.0	10.0	29.0	13.0	ND	11.0	96.0	185.0	13.0	305.0
REP 1		CMBD/2=	9.5	4.0	ND	ND	ND	9.5	14.0	17.5	54.5	52.0	22.0	42.0	135.5	13.0	33.5	14.5	ND	13.5	169.5	224.0	14.5	421.5
	90	A	ND	ND	ND	ND	ND	7.0	13.0	18.0	59.0	56.0	23.0	63.0	251.0	43.0	74.0	18.0	ND	ND	176.0	431.0	18.0	625.0
		B	ND	ND	ND	ND	ND	5.0	ND	13.0	44.0	37.0	11.0	41.0	206.0	39.0	58.0	15.0	ND	ND	110.0	344.0	15.0	469.0
REP 2		CMBD/2=	ND	ND	ND	ND	ND	6.0	6.5	15.5	51.5	46.5	17.0	52.0	228.5	41.0	66.0	16.5	ND	ND	143.0	387.5	16.5	547.0
	90	A	ND	ND	ND	ND	ND	7.0	8.0	14.0	51.0	47.0	17.0	56.0	210.0	32.0	52.0	17.0	ND	ND	144.0	350.0	17.0	511.0
		B	ND	ND	ND	ND	ND	10.0	13.0	19.0	63.0	75.0	34.0	79.0	208.0	29.0	62.0	19.0	ND	ND	214.0	378.0	19.0	611.0
REP 3		CMBD/2=	ND	ND	ND	ND	ND	8.5	10.5	16.5	57.0	61.0	23.5	67.5	209.0	30.5	57.0	18.0	ND	ND	179.0	364.0	18.0	561.0

ND = Not Detected - See Table 20 for detection limits

Table 65. Experiment II - Polycyclic aromatic hydrocarbons in site soil (ppb)
WOODINS

LOAD	DATE	DUPLICATE	NAPH	2-MET	1-MET	BIPH	ACNAP	ACNTE	DIBDH	FLORE	PHEN	ANTHR	CARBA	FLUOR	PYRENE	1,2-BZ	CHRYS	BEN-a	BghI	2 RING	3 RING	4 RING	5 RING	TOTALPAH
3.0	0	A	111.5	93.8	34.3	23.1	12.0	133.6	131.6	172.5	544.9	176.3	90.9	321.8	245.8	57.4	65.3	19.8	ND	262.7	1261.7	690.2	19.8	2234.3
		B	90.2	76.2	27.4	20.5	9.7	115.2	112.7	145.3	460.7	122.1	65.9	276.2	210.3	49.2	48.4	16.7	ND	214.2	1031.7	584.1	16.7	1846.7
REP 1		CAVED/2=	100.9	85.0	30.8	21.8	10.8	124.4	122.2	158.9	502.8	149.2	78.4	299.0	228.1	53.3	56.8	18.2	ND	238.4	1146.7	637.2	18.2	2040.5
	0	A	94.6	77.3	28.3	21.1	10.7	115.8	108.8	146.3	461.9	118.0	61.9	280.9	219.5	52.3	52.2	15.4	ND	221.3	1023.3	604.9	15.4	1865.0
		B	66.9	76.0	27.6	24.0	10.9	126.9	118.6	159.9	518.1	120.9	68.2	311.9	238.4	48.6	47.1	16.0	ND	194.4	1123.4	646.0	16.0	1979.9
REP 2		CAVED/2=	80.7	76.6	27.9	22.6	10.8	121.4	113.7	153.1	490.0	119.5	65.0	296.4	229.0	50.4	49.7	15.7	ND	207.8	1073.4	625.4	15.7	1922.4
	0	A	79.9	71.9	26.2	21.6	11.6	122.1	117.4	156.2	500.7	119.2	67.7	290.5	224.1	47.8	45.4	15.7	ND	199.6	1095.0	607.7	15.7	1918.0
		B	122.9	95.6	35.7	23.9	14.7	134.2	124.6	164.2	523.0	110.6	70.2	309.6	236.3	44.9	49.3	17.7	ND	278.1	1141.6	640.0	17.7	2077.4
REP 3		CAVED/2=	101.4	83.8	30.9	22.8	13.2	128.2	121.0	160.2	511.9	114.9	69.0	300.1	230.2	46.3	47.3	16.7	ND	238.9	1118.3	623.9	16.7	1997.7
3.0	60	A	ND	ND	ND	ND	ND	19.7	29.4	31.7	94.2	52.3	26.4	108.8	201.2	35.9	51.9	14.2	ND	ND	253.7	397.8	14.2	665.7
		B	ND	ND	ND	ND	ND	7.0	23.8	17.5	44.9	53.2	26.3	60.7	184.8	37.0	49.3	ND	ND	ND	172.7	331.8	ND	504.5
REP 1		CAVED/2=	ND	ND	ND	ND	ND	13.4	26.6	24.6	69.6	52.8	26.4	84.8	193.0	36.5	50.6	7.1	ND	ND	213.2	364.8	7.1	585.1
	60	A	ND	ND	ND	ND	ND	14.4	26.8	31.4	60.1	52.4	37.3	70.3	189.3	28.4	44.7	ND	ND	ND	222.4	332.7	ND	555.1
		B	ND	ND	ND	ND	ND	6.0	19.4	19.1	48.1	53.8	32.7	75.1	180.9	36.2	49.8	ND	ND	ND	179.1	342.0	ND	521.1
REP 2		CAVED/2=	ND	ND	ND	ND	ND	10.2	23.1	25.3	54.1	53.1	35.8	72.7	185.1	32.3	47.3	ND	ND	ND	200.8	337.4	ND	538.1
	60	A	ND	ND	ND	ND	ND	ND	24.3	15.5	49.7	58.3	31.7	302.9	220.4	38.3	48.1	ND	ND	ND	179.5	609.7	ND	789.2
		B	16.3	8.5	6.9	ND	ND	19.8	39.8	40.1	90.7	66.2	43.3	337.3	281.6	44.6	57.2	ND	ND	31.7	299.9	720.7	ND	1052.3
REP 3		CAVED/2=	8.2	4.3	3.5	ND	ND	9.9	32.1	27.8	70.2	62.3	37.5	320.1	251.0	41.5	52.7	ND	ND	15.9	239.7	665.2	ND	920.8

ND = Not Detected - See Table 20 for detection limits

Table 65. Experiment II - Polycyclic aromatic hydrocarbons in site soil (ppm)
WILMINGTON

LOAD	DATE	DUPLICATE	NAPH	2-MET	1-MET	BIPH	ACTHY	ACTHE	DIBEN	FLORE	PHEN	ANTHR	CARBA	FLUOR	PYRENE	1,2-BZ	CHRYS	BEN-a	Bghi	2 RING	3 RING	4 RING	5 RING	TOTALPAH
0.3	0	A	ND	ND	ND	ND	ND	ND	ND	ND	ND	7.5	ND	17.2	14.8	10.8	10.9	ND	ND	ND	7.5	53.7	ND	61.2
		B	ND	ND	ND	ND	ND	ND	ND	ND	ND	6.4	ND	9.9	13.6	11.1	11.6	ND	ND	ND	6.4	46.2	ND	52.6
REP 1		CMBD/2=	ND	ND	ND	ND	ND	ND	ND	ND	ND	7.0	ND	13.6	14.2	11.0	11.3	ND	ND	ND	7.0	50.0	ND	56.9
	0	A	ND	ND	ND	ND	ND	ND	ND	ND	10.8	7.2	ND	8.9	10.7	11.1	10.3	ND	ND	ND	18.0	41.0	ND	59.0
		B	ND	ND	ND	ND	ND	ND	ND	ND	7.5	3.7	ND	22.9	17.2	12.9	16.7	ND	ND	ND	11.2	69.7	ND	80.9
REP 2		CMBD/2=	ND	ND	ND	ND	ND	ND	ND	ND	9.2	5.5	ND	15.9	14.0	12.0	13.5	ND	ND	ND	14.6	55.4	ND	70.0
	0	A	ND	ND	ND	ND	ND	ND	ND	ND	7.5	3.6	ND	36.4	25.4	17.1	18.7	ND	ND	ND	11.1	97.6	ND	108.7
		B	ND	ND	ND	ND	ND	ND	ND	ND	ND	6.0	ND	5.2	12.0	10.6	9.1	ND	ND	ND	6.0	36.9	ND	42.9
REP 3		CMBD/2=	ND	ND	ND	ND	ND	ND	ND	ND	3.8	4.8	ND	20.8	18.7	13.9	13.9	ND	ND	ND	8.6	67.3	ND	75.8
0.3	30	A	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	13.0	15.0	14.0	16.0	ND	ND	ND	ND	58.0	ND	58.0
		B	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	7.0	14.0	5.0	ND	ND	ND	ND	ND	26.0	ND	26.0
REP 1		CMBD/2=	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	10.0	14.5	9.5	8.0	ND	ND	ND	ND	42.0	ND	42.0
	30	A	ND	ND	ND	ND	ND	ND	ND	ND	12.0	ND	ND	28.0	37.0	18.0	21.0	20.0	ND	ND	12.0	104.0	20.0	136.0
		B	ND	ND	ND	ND	ND	ND	ND	ND	11.0	ND	ND	31.0	45.0	22.0	27.0	ND	ND	ND	11.0	125.0	ND	136.0
REP 2		CMBD/2=	ND	ND	ND	ND	ND	ND	ND	ND	11.5	ND	ND	29.5	41.0	20.0	24.0	10.0	ND	ND	11.5	114.5	10.0	136.0
	30	A	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	14.0	18.0	ND	ND	ND	ND	ND	ND	32.0	ND	32.0
		B	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	17.0	21.0	11.0	ND	ND	ND	ND	ND	49.0	ND	49.0
REP 3		CMBD/2=	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	15.5	19.5	5.5	ND	ND	ND	ND	ND	40.5	ND	40.5
0.3	60	A	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	10.0	11.0	ND	ND	ND	ND	ND	ND	21.0	ND	21.0
		B	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	11.0	12.0	4.0	ND	ND	ND	ND	ND	27.0	ND	27.0
REP 1		CMBD/2=	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	10.5	11.5	2.0	ND	ND	ND	ND	ND	24.0	ND	24.0
	60	A	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	11.0	ND	ND	ND	ND	ND	ND	ND	11.0	ND	11.0
		B	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	10.0	10.0	ND	ND	ND	ND	ND	ND	20.0	ND	20.0
REP 2		CMBD/2=	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	10.5	5.0	ND	ND	ND	ND	ND	ND	15.5	ND	15.5
	60	A	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	8.0	7.0	ND	ND	ND	ND	ND	ND	15.0	ND	15.0
		B	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	10.0	11.0	ND	ND	ND	ND	ND	ND	21.0	ND	21.0
REP 3		CMBD/2=	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	9.0	9.0	ND	ND	ND	ND	ND	ND	18.0	ND	18.0
0.3	90	A	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	6.0	6.0	ND	ND	ND	ND	ND	ND	12.0	ND	12.0
		B	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	7.0	8.0	ND	ND	ND	ND	ND	ND	15.0	ND	15.0
REP 1		CMBD/2=	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	6.5	7.0	ND	ND	ND	ND	ND	ND	13.5	ND	13.5
	90	A	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
		B	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	10.0	10.0	ND	ND	ND	ND	ND	ND	20.0	ND	20.0
REP 2		CMBD/2=	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	5.0	5.0	ND	ND	ND	ND	ND	ND	10.0	ND	10.0
	90	A	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	11.0	12.0	8.0	11.0	ND	ND	ND	ND	42.0	ND	42.0
		B	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	7.0	8.0	ND	ND	ND	ND	ND	ND	15.0	ND	15.0
REP 3		CMBD/2=	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	9.0	10.0	4.0	5.5	ND	ND	ND	ND	28.5	ND	28.5

ND = Not Detected - See Table 20 for detection limits

Table 65. Experiment II - Polycyclic aromatic hydrocarbons in site soil (ppm)
WILMINGTON

LOAD	DATE	DUPLICATE	NAPH	2-MET	1-MET	BIPH	ACTHY	ACTHE	DIBEN	FLORE	PHEN	ANTHR	CARBA	FLUOR	PYRENE	1,2-BZ	CHRYS	BEN-a	BghI	2 RING	3 RING	4 RING	5 RING	TOTALPAH
1.0	0	A	ND	ND	ND	ND	ND	ND	ND	ND	2.4	9.9	ND	13.3	16.0	ND	ND	ND	ND	ND	12.3	29.3	ND	41.6
		B	ND	ND	ND	ND	ND	ND	ND	3.5	15.2	4.2	ND	14.7	13.0	1.9	9.1	ND	ND	ND	22.9	38.7	ND	61.6
REP 1		GMEO/2=	ND	ND	ND	ND	ND	ND	ND	1.8	8.8	7.1	ND	14.0	14.5	1.0	4.6	ND	ND	ND	17.6	34.0	ND	51.6
	0	A	ND	ND	ND	ND	ND	ND	ND	3.3	12.8	3.2	ND	15.2	20.4	2.0	11.3	ND	ND	ND	19.3	48.9	ND	68.2
		B	ND	ND	ND	ND	ND	ND	ND	ND	2.3	7.5	ND	8.8	9.8	ND	ND	ND	ND	ND	9.8	18.6	ND	28.4
REP 2		GMEO/2=	ND	ND	ND	ND	ND	ND	ND	1.7	7.6	5.4	ND	12.0	15.1	1.0	5.7	ND	ND	ND	14.6	33.8	ND	48.3
	0	A	ND	ND	ND	ND	ND	ND	ND	ND	2.7	2.9	ND	6.1	9.9	ND	ND	ND	ND	ND	5.6	16.0	ND	21.6
		B	ND	ND	ND	ND	ND	ND	ND	4.8	7.5	2.2	ND	13.0	15.9	ND	ND	ND	ND	ND	14.5	28.9	ND	43.4
REP 3		GMEO/2=	ND	ND	ND	ND	ND	ND	ND	2.4	5.1	2.6	ND	9.6	12.9	ND	ND	ND	ND	ND	10.1	22.5	ND	32.5
1.0	30	A	ND	ND	ND	ND	ND	ND	ND	ND	13.0	ND	ND	10.0	22.0	ND	ND	ND	ND	ND	13.0	32.0	ND	45.0
		B	ND	ND	ND	ND	ND	ND	ND	ND	11.0	4.0	ND	16.0	27.0	ND	ND	ND	ND	ND	15.0	43.0	ND	58.0
REP 1		GMEO/2=	ND	ND	ND	ND	ND	ND	ND	ND	12.0	2.0	ND	13.0	24.5	ND	ND	ND	ND	ND	14.0	37.5	ND	51.5
	30	A	ND	ND	ND	ND	ND	ND	ND	ND	9.0	ND	ND	14.0	23.0	ND	ND	ND	ND	ND	9.0	37.0	ND	46.0
		B	ND	ND	ND	ND	ND	ND	ND	ND	9.0	ND	ND	14.0	29.0	ND	ND	ND	ND	ND	9.0	43.0	ND	52.0
REP 2		GMEO/2=	ND	ND	ND	ND	ND	ND	ND	ND	9.0	ND	ND	14.0	26.0	ND	ND	ND	ND	ND	9.0	40.0	ND	49.0
	30	A	ND	ND	ND	ND	ND	ND	ND	ND	14.0	ND	ND	22.0	52.0	ND	ND	ND	ND	ND	14.0	74.0	ND	88.0
		B	ND	ND	ND	ND	ND	ND	ND	ND	11.0	ND	ND	12.0	23.0	ND	ND	ND	ND	ND	11.0	35.0	ND	46.0
REP 3		GMEO/2=	ND	ND	ND	ND	ND	ND	ND	ND	12.5	ND	ND	17.0	37.5	ND	ND	ND	ND	ND	12.5	54.5	ND	67.0
1.0	60	A	ND	ND	ND	ND	ND	ND	ND	ND	7.0	ND	ND	13.0	14.0	ND	ND	ND	ND	ND	7.0	27.0	ND	34.0
		B	ND	ND	ND	ND	ND	ND	ND	ND	8.0	ND	ND	12.0	12.0	ND	ND	ND	ND	ND	8.0	24.0	ND	32.0
REP 1		GMEO/2=	ND	ND	ND	ND	ND	ND	ND	ND	7.5	ND	ND	12.5	13.0	ND	ND	ND	ND	ND	7.5	25.5	ND	33.0
	60	A	ND	ND	ND	ND	ND	ND	ND	ND	10.0	ND	ND	15.0	11.0	ND	ND	ND	ND	ND	10.0	26.0	ND	36.0
		B	ND	ND	ND	ND	ND	ND	ND	ND	10.0	ND	ND	15.0	19.0	ND	ND	ND	ND	ND	10.0	34.0	ND	44.0
REP 2		GMEO/2=	ND	ND	ND	ND	ND	ND	ND	ND	10.0	ND	ND	15.0	15.0	ND	ND	ND	ND	ND	10.0	30.0	ND	40.0
	60	A	ND	ND	ND	ND	ND	ND	ND	ND	8.0	ND	ND	16.0	16.0	7.0	ND	ND	ND	ND	8.0	39.0	ND	47.0
		B	ND	ND	ND	ND	ND	ND	ND	ND	10.0	ND	ND	19.0	19.0	ND	ND	ND	ND	ND	10.0	38.0	ND	48.0
REP 3		GMEO/2=	ND	ND	ND	ND	ND	ND	ND	ND	9.0	ND	ND	17.5	17.5	3.5	ND	ND	ND	ND	9.0	38.5	ND	47.5
1.0	90	A	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	14.0	18.0	6.0	ND	ND	ND	ND	ND	38.0	ND	38.0
		B	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	16.0	17.0	ND	ND	ND	ND	ND	ND	33.0	ND	33.0
REP 1		GMEO/2=	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	15.0	17.5	3.0	ND	ND	ND	ND	ND	35.5	ND	35.5
	90	A	ND	ND	ND	ND	ND	ND	ND	ND	14.0	ND	ND	26.0	30.0	8.0	ND	ND	ND	ND	14.0	64.0	ND	78.0
		B	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	12.0	10.0	ND	ND	ND	ND	ND	ND	22.0	ND	22.0
REP 2		GMEO/2=	ND	ND	ND	ND	ND	ND	ND	ND	7.0	ND	ND	19.0	20.0	4.0	ND	ND	ND	ND	7.0	43.0	ND	50.0
	90	A	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	12.0	14.0	ND	ND	ND	ND	ND	ND	26.0	ND	26.0
		B	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	16.0	18.0	ND	ND	ND	ND	ND	ND	34.0	ND	34.0
REP 3		GMEO/2=	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	14.0	16.0	ND	ND	ND	ND	ND	ND	30.0	ND	30.0

ND = Not Detected - See Table 20 for detection limits

Table 65. Experiment II - Polycyclic aromatic hydrocarbons in site soil (ppm)
WATERMILL

LOND	DATE	DUPLICATE	NAPH	2-MET	1-MET	BIPH	ACTHY	ACTHE	DIBEN	FLORE	PHEN	ANTHR	CARBA	FLUOR	PYRENE	1,2-BZ	CHRYS	BEN-e	BghI	2 RING	3 RING	4 RING	5 RING	TOTALPAH
3.0	0	A	ND	ND	ND	ND	ND	ND	ND	ND	22.0	ND	ND	ND	ND	ND	ND	ND	ND	ND	22.0	ND	ND	22.0
		B	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
REP 1		GMEO/2=	ND	ND	ND	ND	ND	ND	ND	ND	11.0	ND	ND	ND	ND	ND	ND	ND	ND	ND	11.0	ND	ND	11.0
	0	A	ND	ND	ND	ND	ND	ND	ND	ND	21.6	ND	ND	ND	ND	ND	ND	ND	ND	ND	21.6	ND	ND	21.6
		B	ND	ND	ND	ND	ND	ND	ND	ND	26.3	ND	ND	ND	ND	ND	ND	ND	ND	ND	26.3	ND	ND	26.3
REP 2		GMEO/2=	ND	ND	ND	ND	ND	ND	ND	ND	24.0	ND	ND	ND	ND	ND	ND	ND	ND	ND	24.0	ND	ND	24.0
	0	A	ND	ND	ND	ND	ND	ND	ND	ND	22.1	ND	ND	ND	ND	ND	ND	ND	ND	ND	22.1	ND	ND	22.1
		B	ND	ND	ND	ND	ND	ND	ND	ND	38.1	ND	ND	ND	ND	ND	ND	ND	ND	ND	38.1	ND	ND	38.1
REP 3		GMEO/2=	ND	ND	ND	ND	ND	ND	ND	ND	30.1	ND	ND	ND	ND	ND	ND	ND	ND	ND	30.1	ND	ND	30.1
3.0	60	A	ND	ND	ND	ND	ND	ND	21.0	ND	19.0	10.0	ND	13.0	9.0	ND	ND	ND	ND	ND	50.0	22.0	ND	72.0
		B	ND	ND	ND	ND	ND	ND	20.0	6.0	22.0	18.0	ND	16.0	12.0	ND	ND	ND	ND	ND	66.0	28.0	ND	94.0
REP 1		GMEO/2=	ND	ND	ND	ND	ND	ND	20.5	3.0	20.5	14.0	ND	14.5	10.5	ND	ND	ND	ND	ND	59.0	25.0	ND	83.0
	60	A	ND	ND	ND	ND	ND	ND	20.0	ND	20.0	13.0	ND	12.0	6.0	ND	ND	ND	ND	ND	53.0	18.0	ND	71.0
		B	ND	ND	ND	ND	ND	ND	14.0	6.0	25.0	16.0	12.0	18.0	14.0	ND	ND	ND	ND	ND	73.0	32.0	ND	105.0
REP 2		GMEO/2=	ND	ND	ND	ND	ND	ND	17.0	3.0	22.5	14.5	6.0	15.0	10.0	ND	ND	ND	ND	ND	63.0	25.0	ND	88.0
	60	A	ND	ND	ND	ND	ND	ND	15.0	ND	26.0	18.0	12.0	18.0	15.0	ND	ND	ND	ND	ND	71.0	33.0	ND	104.0
		B	ND	ND	ND	ND	ND	ND	16.0	5.0	23.0	16.0	8.0	18.0	13.0	ND	ND	ND	ND	ND	68.0	31.0	ND	99.0
REP 3		GMEO/2=	ND	ND	ND	ND	ND	ND	15.5	2.5	24.5	17.0	10.0	18.0	14.0	ND	ND	ND	ND	ND	69.5	32.0	ND	101.5
3.0	90	A	ND	ND	ND	ND	ND	ND	ND	ND	ND	22.3	ND	15.0	ND	ND	ND	ND	ND	ND	22.3	15.0	ND	37.3
		B	ND	ND	ND	ND	ND	ND	ND	ND	ND	26.8	ND	14.7	ND	ND	ND	ND	ND	ND	26.8	14.7	ND	41.5
REP 1		GMEO/2=	ND	ND	ND	ND	ND	ND	ND	ND	ND	24.6	ND	14.9	ND	ND	ND	ND	ND	ND	24.6	14.9	ND	39.4
	90	A	ND	ND	ND	ND	ND	ND	ND	ND	ND	20.2	ND	14.9	ND	ND	ND	ND	ND	ND	20.2	14.9	ND	35.1
		B	ND	ND	ND	ND	ND	ND	ND	ND	ND	23.3	ND	13.3	23.5	ND	ND	ND	ND	ND	23.3	36.8	ND	60.1
REP 2		GMEO/2=	ND	ND	ND	ND	ND	ND	ND	ND	ND	21.8	ND	14.1	11.8	ND	ND	ND	ND	ND	21.8	25.9	ND	47.6
	90	A	ND	ND	ND	ND	ND	ND	ND	ND	ND	24.6	ND	10.3	15.6	ND	ND	ND	ND	ND	24.6	25.9	ND	50.5
		B	ND	ND	ND	ND	ND	ND	ND	ND	ND	28.1	ND	52.9	37.1	ND	ND	ND	ND	ND	28.1	90.0	ND	118.1
REP 3		GMEO/2=	ND	ND	ND	ND	ND	ND	ND	ND	ND	26.4	ND	31.6	26.4	ND	ND	ND	ND	ND	26.4	58.0	ND	84.3

ND = Not Detected - See Table 20 for detection limits

Table 66. Experiment II - Pentachlorophenol in site soil (ppm)
ATLANTA

LOAD	DUPLICATE	DAYS AFTER INITIAL LOADING 0	30	60	90
0.3	A	56.4	67.4	68.9	66.1
	B	79.5	61.5	58.1	60.5
REP 1	(A+B)/2=	68.0	64.5	63.5	63.3
	A	63.9	65.5	78.4	66.2
	B	73.0	111.0	118.0	64.1
REP 2	(A+B)/2=	68.5	88.3	98.2	65.2
	A	64.2	59.0	65.9	50.3
	B	72.1	67.8	50.6	53.8
REP 3	(A+B)/2=	68.2	63.4	58.3	52.1
1.0	A	179.9	148.0	138.0	153.0
	B	125.6	144.0	162.0	172.0
REP 1	(A+B)/2=	152.8	146.0	150.0	162.5
	A	178.1	154.0	152.0	78.3
	B	176.6	166.0	167.0	69.2
REP 2	(A+B)/2=	177.4	160.0	159.5	73.8
	A	118.2	102.0	40.1	30.5
	B	100.7	108.0	25.1	47.1
REP 3	(A+B)/2=	109.5	105.0	32.6	38.8
3.0	A	883.2	608.0	435.3	386.6
	B	747.4	506.8	459.7	470.6
REP 1	(A+B)/2=	815.3	557.4	447.5	428.6
	A	624.9	546.5	411.0	375.5
	B	634.1	504.9	449.9	406.4
REP 2	(A+B)/2=	629.5	525.7	430.5	391.0
	A	443.9	412.1	398.3	66.7
	B	477.0	426.3	330.2	54.9
REP 3	(A+B)/2=	460.5	419.2	364.3	60.8

Table 66. Experiment II - Pentachlorophenol in site soil (ppm)
CHATTANOOGA

LOAD	DUPLICATE	DAYS AFTER INITIAL LOADING 0	30	60	90
0.3	A	132.6	139.8	137.0	139.0
	B	155.5	151.5	142.0	146.0
REP 1	(A+B)/2=	144.1	145.7	139.5	142.5
	A	152.2	153.9	140.0	152.0
	B	139.9	151.1	143.0	138.0
REP 2	(A+B)/2=	146.1	152.5	141.5	145.0
	A	140.9	150.3	134.0	140.0
	B	139.9	149.3	147.0	139.0
REP 3	(A+B)/2=	140.4	149.8	140.5	139.5
1.0	A	453.2	473.6	430.0	430.0
	B	458.3	483.0	435.0	427.0
REP 1	(A+B)/2=	455.8	478.3	432.5	428.5
	A	443.5	504.4	410.0	416.0
	B	405.9	479.8	417.0	417.0
REP 2	(A+B)/2=	424.7	492.1	413.5	416.5
	A	465.3	512.3	441.0	423.0
	B	463.2	504.2	439.0	419.0
REP 3	(A+B)/2=	464.3	508.3	440.0	421.0
3.0	A	1342.0	1447.1	1307.2	867.5
	B	1393.3	1356.5	1367.9	859.6
REP 1	(A+B)/2=	1367.7	1401.8	1337.6	863.6
	A	1503.9	1389.7	1341.1	888.2
	B	1459.6	1443.4	1334.5	890.2
REP 2	(A+B)/2=	1481.8	1416.6	1337.8	889.2
	A	1507.7	1522.2	1388.2	878.6
	B	1422.8	1405.4	1367.4	873.4
REP 3	(A+B)/2=	1465.3	1463.8	1377.8	876.0

Table 66. Experiment II - Pentachlorophenol in site soil (ppm)
COLUMBUS

LOAD	DUPLICATE	DAYS AFTER INITIAL LOADING 0	30	60	90
0.3	A	130.8	113.0	131.2	119.1
	B	135.5	124.1	147.7	116.9
REP 1	(A+B)/2=	133.1	118.6	139.4	118.0
	A	117.8	115.0	138.1	106.4
	B	128.7	141.8	136.7	112.1
REP 2	(A+B)/2=	123.3	128.4	137.4	109.3
	A	125.1	117.6	131.7	121.8
	B	126.4	118.4	136.5	113.2
REP 3	(A+B)/2=	125.8	118.0	134.1	117.5
1.0	A	814.4	654.0	990.7	1044.3
	B	835.4	650.5	1015.2	956.0
REP 1	(A+B)/2=	824.9	652.3	1002.9	1000.2
	A	831.5	1020.0	985.5	880.1
	B	812.6	1146.3	958.9	888.8
REP 2	(A+B)/2=	822.0	1083.2	972.2	884.4
	A	789.2	643.6	921.1	861.6
	B	815.1	611.4	916.2	939.7
REP 3	(A+B)/2=	802.2	627.5	918.7	900.6
3.0	A	2915.4	2678.6	1640.0	2427.5
	B	2948.9	2237.0	1910.0	2424.7
REP 1	(A+B)/2=	2932.2	2457.8	1775.0	2426.1
	A	2887.1	2930.4	1620.0	2332.7
	B	2935.2	2951.9	2100.0	2522.4
REP 2	(A+B)/2=	2911.2	2941.2	1860.0	2427.6
	A	2950.4	2848.0	1860.0	2464.6
	B	2895.0	2907.2	2240.0	2541.1
REP 3	(A+B)/2=	2922.7	2877.6	2050.0	2502.9

Table 66. Experiment II - Pentachlorophenol in site soil (ppm)
GRENADA

LOAD	DUPLICATE	DAYS AFTER INITIAL LOADING 0	30	60	90
0.3	A	24.6	13.7	8.5	4.4
	B	23.1	13.0	9.9	4.2
REP 1	(A+B)/2=	23.8	13.3	9.2	4.3
	A	20.9	14.7	8.8	4.3
	B	22.5	12.7	7.8	9.5
REP 2	(A+B)/2=	21.7	13.7	8.3	6.9
	A	23.6	13.4	8.9	4.7
	B	10.4	13.3	7.9	5.0
REP 3	(A+B)/2=	17.0	13.3	8.4	4.9
1.0	A	57.9	28.8	11.9	9.8
	B	54.9	33.6	5.4	11.0
REP 1	(A+B)/2=	56.4	31.2	8.6	10.4
	A	51.2	19.0	9.8	8.4
	B	50.7	22.7	8.8	9.9
REP 2	(A+B)/2=	50.9	20.8	9.3	9.1
	A	49.3	25.7	11.2	10.2
	B	47.3	22.9	12.8	133.7
REP 3	(A+B)/2=	48.3	24.3	12.0	72.0
3.0	A	131.8	109.1	0.0	11.1
	B	115.1	104.6	7.5	10.9
REP 1	(A+B)/2=	123.4	106.8	3.7	11.0
	A	110.2	107.5	9.3	10.0
	B	114.5	103.3	8.2	10.9
REP 2	(A+B)/2=	112.4	105.4	8.7	10.4
	A	120.1	120.5	12.0	10.3
	B	120.0	102.2	7.9	9.4
REP 3	(A+B)/2=	120.1	111.4	9.9	9.9

Table 66. Experiment II - Pentachlorophenol in site soil (ppm)
GULFPORT

LOAD	DUPLICATE	DAYS AFTER INITIAL LOADING 0	30	60	90
0.3	A	80.6	91.2	12.8	4.7
	B	83.5	87.7	11.7	5.3
REP 1	(A+B)/2=	82.1	89.5	12.3	5.0
	A	95.0	92.5	47.6	17.7
	B	127.1	92.7	70.7	16.3
REP 2	(A+B)/2=	111.1	92.6	59.2	17.0
	A	390.4	118.1	32.0	20.4
	B	98.1	117.8	17.2	7.0
REP 3	(A+B)/2=	244.3	118.0	24.6	13.7
1.0	A	NS	513.0	382.4	116.5
	B	NS	403.0	426.1	106.5
REP 1	(A+B)/2=	NS	458.0	404.3	111.5
	A	NS	422.2	396.7	138.0
	B	NS	444.1	481.1	131.2
REP 2	(A+B)/2=	NS	433.2	438.9	134.6
	A	NS	438.3	438.1	398.9
	B	NS	482.4	646.9	559.7
REP 3	(A+B)/2=	NS	460.4	542.5	479.3
3.0	A	859.2	807.9	883.7	973.6
	B	882.9	843.8	789.2	1025.6
REP 1	(A+B)/2=	871.0	825.9	836.5	999.6
	A	896.6	1005.4	960.9	1257.9
	B	1032.2	1021.1	954.3	1120.9
REP 2	(A+B)/2=	964.4	1013.3	957.6	1189.4
	A	1146.1	792.3	967.2	1135.0
	B	1058.6	880.8	952.1	1180.7
REP 3	(A+B)/2=	1102.4	836.6	959.7	1157.9

NS = No Sample

Table 66. Experiment II - Pentachlorophenol in site soil (ppm)
MERIDIAN

		DAYS AFTER INITIAL LOADING			
LOAD	DUPLICATE	0	30	60	90
0.3	A	31.2	16.5	18.2	9.0
	B	30.5	17.2	17.7	8.1
REP 1	(A+B)/2=	30.9	16.8	18.0	8.5
	A	30.5	10.1	10.5	8.6
	B	26.4	21.6	7.3	3.8
REP 2	(A+B)/2=	28.5	15.8	8.9	6.2
	A	30.6	35.6	5.9	5.3
	B	24.9	12.2	10.2	7.3
REP 3	(A+B)/2=	27.7	23.9	8.0	6.3
3.0	A	203.5	267.6	197.0	441.0
	B	190.5	240.8	177.0	378.0
REP 1	(A+B)/2=	197.0	254.2	187.0	409.5
	A	217.4	205.6	191.0	337.0
	B	199.9	184.8	187.0	326.0
REP 2	(A+B)/2=	208.6	195.2	189.0	331.5
	A	173.8	194.3	176.0	368.0
	B	207.3	215.8	188.0	382.0
REP 3	(A+B)/2=	190.6	205.0	182.0	375.0

Table 66. Experiment II - Pentachlorophenol in site soil (ppm)
WIGGINS

LOAD	DUPLICATE	DAYS AFTER INITIAL LOADING 0	30	60	90
0.3	A	23.3	249.3	15.6	93.1
	B	37.1	19.5	10.8	132.6
REP 1	(A+B)/2=	30.2	134.4	13.2	112.8
	A	91.6	29.7	202.2	91.8
	B	25.5	22.2	36.6	62.4
REP 2	(A+B)/2=	58.6	25.9	119.4	77.1
	A	48.7	708.7	116.6	40.0
	B	24.9	117.4	9.7	236.4
REP 3	(A+B)/2=	36.8	413.0	63.2	138.2
1.0	A	69.3	34.4	11.0	14.1
	B	65.5	43.2	10.6	17.8
REP 1	(A+B)/2=	67.4	38.8	10.8	16.0
	A	51.7	43.3	8.0	11.3
	B	75.4	41.5	106.9	14.9
REP 2	(A+B)/2=	63.6	42.4	57.4	13.1
	A	41.2	43.3	10.8	11.6
	B	289.6	26.5	10.4	98.8
REP 3	(A+B)/2=	165.4	34.9	10.6	55.2
3.0	A	486.6	337.0	723.0	37.6
	B	132.1	78.4	35.8	49.8
REP 1	(A+B)/2=	309.3	207.7	379.4	43.7
	A	72.0	76.6	62.2	26.3
	B	166.7	129.6	47.6	1183.6
REP 2	(A+B)/2=	119.4	103.1	54.9	605.0
	A	389.4	134.5	86.8	37.8
	B	154.2	103.2	190.3	40.9
REP 3	(A+B)/2=	271.8	118.9	138.5	39.4

Table 66. Experiment II - Pentachlorophenol in site soil (ppm)
WILMINGTON

LOAD	DUPLICATE	DAYS AFTER INITIAL LOADING 0	30	60	90
0.3	A	144.1	174.0	273.9	105.0
	B	152.1	169.0	299.4	110.0
REP 1	(A+B)/2=	148.1	171.5	286.7	107.5
	A	156.6	123.0	318.9	134.0
	B	151.6	108.0	330.6	128.0
REP 2	(A+B)/2=	154.1	115.5	324.8	131.0
	A	150.5	140.0	292.2	121.0
	B	146.0	165.0	297.1	119.0
REP 3	(A+B)/2=	148.3	152.5	294.7	120.0
1.0	A	928.7	765.0	675.0	769.0
	B	1048.6	778.0	697.0	776.0
REP 1	(A+B)/2=	988.7	771.5	686.0	772.5
	A	950.4	808.0	677.0	801.0
	B	1052.3	688.0	688.0	773.0
REP 2	(A+B)/2=	1001.4	748.0	682.5	787.0
	A	967.7	749.0	815.0	778.0
	B	922.3	734.0	691.0	776.0
REP 3	(A+B)/2=	945.0	741.5	753.0	777.0
3.0	A	2279.0	937.0	1622.5	1828.1
	B	2351.4	943.0	1785.3	1908.4
REP 1	(A+B)/2=	2315.2	940.0	1703.9	1868.3
	A	2486.0	973.0	1638.0	1930.8
	B	2666.1	960.0	1550.2	2107.8
REP 2	(A+B)/2=	2576.1	966.5	1594.1	2019.3
	A	2422.4	967.0	1694.6	1884.9
	B	2421.8	963.0	1632.8	1996.3
REP 3	(A+B)/2=	2422.1	965.0	1663.7	1940.6

Table 67. Experiment II - Octachlorodibenzo-p-dioxin in site soil (ppm)
ATLANTA

		DAYS AFTER INITIAL LOADING			
LOAD	DUPLICATE	0	30	60	90
0.3	A	0.67	1.23	0.90	0.76
	B	0.62	0.82	0.91	0.59
REP 1	(A+B)/2=	0.65	1.03	0.91	0.68
	A	0.70	1.65	1.21	1.46
	B	0.67	1.12	1.18	0.82
REP 2	(A+B)/2=	0.69	1.39	1.20	1.14
	A	0.57	1.17	1.10	ND
	B	0.57	0.81	0.80	ND
REP 3	(A+B)/2=	0.57	0.99	0.95	ND
1.0	A	0.74	1.10	1.36	1.23
	B	0.70	1.05	1.49	1.28
REP 1	(A+B)/2=	0.72	1.08	1.43	1.26
	A	0.65	1.00	1.06	0.82
	B	0.78	0.99	1.10	1.14
REP 2	(A+B)/2=	0.72	1.00	1.08	0.98
	A	0.79	0.93	1.07	1.06
	B	0.75	1.09	0.96	1.04
REP 3	(A+B)/2=	0.77	1.01	1.02	1.05
3.0	A	2.36	1.79	1.89	0.95
	B	1.96	1.61	1.64	0.80
REP 1	(A+B)/2=	2.16	1.70	1.77	0.88
	A	2.19	1.80	1.62	0.90
	B	1.87	1.81	1.83	0.72
REP 2	(A+B)/2=	2.03	1.81	1.73	0.81
	A	1.72	1.69	1.65	0.64
	B	1.79	1.83	1.21	0.54
REP 3	(A+B)/2=	1.76	1.76	1.43	0.59

ND = Not Detected - See Table 20 for detection limits

Table 67. Experiment II - Octachlorodibenzo-p-dioxin in site soil (ppm)
CHATTANOOGA

LOAD	DUPLICATE	DAYS AFTER INITIAL LOADING 0	30	60	90
0.3	A	0.34	0.31	0.29	0.66
	B	0.29	0.23	0.30	0.67
REP 1	(A+B)/2=	0.32	0.27	0.30	0.67
	A	0.34	0.35	0.29	0.65
	B	0.33	0.29	0.31	0.69
REP 2	(A+B)/2=	0.34	0.32	0.30	0.67
	A	0.29	0.30	0.61	1.38
	B	0.31	0.29	0.23	0.51
REP 3	(A+B)/2=	0.30	0.30	0.42	0.95
1.0	A	0.80	0.72	0.51	0.65
	B	0.83	0.71	0.63	0.58
REP 1	(A+B)/2=	0.82	0.72	0.57	0.62
	A	0.68	0.84	0.44	0.47
	B	0.81	0.70	0.53	0.52
REP 2	(A+B)/2=	0.75	0.77	0.49	0.50
	A	0.77	0.70	0.52	0.53
	B	0.81	0.79	0.57	0.56
REP 3	(A+B)/2=	0.79	0.75	0.55	0.55
3.0	A	1.70	2.03	2.10	1.93
	B	1.99	2.21	2.19	1.83
REP 1	(A+B)/2=	1.85	2.12	2.15	1.88
	A	2.26	2.17	2.14	2.16
	B	2.03	2.28	2.21	1.97
REP 2	(A+B)/2=	2.15	2.23	2.18	2.07
	A	2.57	2.07	2.30	2.17
	B	2.12	2.22	2.29	2.21
REP 3	(A+B)/2=	2.35	2.15	2.30	2.19

Table 67. Experiment II - Octachlorodibenzo-p-dioxin in site soil (ppm)
COLUMBUS

LOAD	DUPLICATE	DAYS AFTER INITIAL LOADING 0	30	60	90
0.3	A	0.18	0.18	0.22	0.14
	B	0.23	0.24	0.23	0.29
REP 1	(A+B)/2=	0.21	0.21	0.22	0.21
	A	0.18	0.18	0.24	0.21
	B	0.18	0.16	0.20	0.22
REP 2	(A+B)/2=	0.18	0.17	0.22	0.22
	A	0.18	0.16	0.19	0.21
	B	0.19	0.17	0.23	0.34
REP 3	(A+B)/2=	0.19	0.17	0.21	0.27
1.0	A	1.25	1.72	1.22	1.27
	B	1.25	1.85	1.27	1.31
REP 1	(A+B)/2=	1.25	1.79	1.24	1.29
	A	1.29	1.73	1.26	1.29
	B	1.21	1.81	1.15	1.26
REP 2	(A+B)/2=	1.25	1.77	1.20	1.27
	A	1.20	1.81	1.16	1.23
	B	1.22	1.79	1.19	1.25
REP 3	(A+B)/2=	1.21	1.80	1.18	1.24
3.0	A	5.18	5.16	3.75	5.25
	B	5.57	4.37	4.51	5.20
REP 1	(A+B)/2=	5.38	4.77	4.13	5.23
	A	5.20	5.43	4.26	5.31
	B	5.44	5.22	4.75	5.48
REP 2	(A+B)/2=	5.32	5.33	4.51	5.40
	A	5.30	5.16	4.60	5.40
	B	5.33	5.34	5.05	5.15
REP 3	(A+B)/2=	5.31	5.25	4.83	5.28

Table 67. Experiment II - Octachlorodibenzo-p-dioxin in site soil (ppm)

GRENADA		DAYS AFTER INITIAL LOADING			
LOAD	DUPLICATE	0	30	60	90
0.3	A	0.62	0.62	0.83	0.55
	B	0.59	0.59	0.91	0.40
REP 1	(A+B)/2=	0.60	0.60	0.87	0.48
	A	0.58	0.58	1.06	0.39
	B	0.58	0.62	0.99	0.57
REP 2	(A+B)/2=	0.58	0.60	1.03	0.48
	A	0.58	0.58	0.81	0.48
	B	0.58	0.57	0.76	0.54
REP 3	(A+B)/2=	0.58	0.57	0.78	0.51
1.0	A	0.69	0.60	1.21	0.83
	B	0.65	0.68	0.98	0.75
REP 1	(A+B)/2=	0.67	0.64	1.09	0.79
	A	0.70	0.61	0.99	0.70
	B	0.73	0.62	0.97	0.65
REP 2	(A+B)/2=	0.71	0.61	0.98	0.68
	A	0.71	0.56	1.01	0.72
	B	0.74	0.58	0.97	0.65
REP 3	(A+B)/2=	0.72	0.57	0.99	0.69
3.0	A	1.03	1.06	0.91	1.25
	B	1.22	0.96	0.84	1.31
REP 1	(A+B)/2=	1.13	1.01	0.88	1.28
	A	1.16	0.98	0.77	1.19
	B	0.98	0.93	0.77	1.23
REP 2	(A+B)/2=	1.07	0.95	0.77	1.21
	A	1.00	0.97	0.73	1.22
	B	1.05	0.89	0.96	1.24
REP 3	(A+B)/2=	1.03	0.93	0.85	1.23

Table 67. Experiment II - Octachlorodibenzo-p-dioxin in site soil (ppm)
GULFPORT

LOAD	DUPLICATE	DAYS AFTER INITIAL LOADING 0	30	60	90
0.3	A	0.37	0.45	0.25	0.27
	B	0.37	0.45	0.29	0.33
REP 1	(A+B)/2=	0.37	0.45	0.27	0.30
	A	0.43	0.52	0.32	0.41
	B	0.58	0.49	0.38	0.49
REP 2	(A+B)/2=	0.51	0.51	0.35	0.45
	A	0.80	0.55	0.40	0.57
	B	0.15	0.50	0.40	0.40
REP 3	(A+B)/2=	0.48	0.53	0.40	0.49
1	A	1.34	0.57	1.16	0.84
	B	1.40	0.32	1.21	1.07
REP 1	(A+B)/2=	1.37	0.45	1.19	0.96
	A	1.36	1.02	1.15	0.96
	B	1.81	1.08	1.29	1.33
REP 2	(A+B)/2=	1.59	1.05	1.22	1.15
	A	1.93	1.00	1.19	0.82
	B	2.10	1.10	1.14	1.16
REP 3	(A+B)/2=	2.02	1.05	1.17	0.99
3	A	3.77	7.46	3.20	3.69
	B	4.20	6.56	2.47	3.25
REP 1	(A+B)/2=	3.99	7.01	2.84	3.47
	A	4.44	5.75	3.37	3.77
	B	4.87	7.74	2.88	3.61
REP 2	(A+B)/2=	4.66	6.75	3.13	3.69
	A	5.41	4.18	3.90	3.70
	B	4.47	5.80	3.88	4.26
REP 3	(A+B)/2=	4.94	4.99	3.89	3.98

Table 67. Experiment II - Octachlorodibenzo-p-dioxin in site soil (ppm)
MERIDIAN

LOAD	DUPLICATE	DAYS AFTER INITIAL LOADING 0	30	60	90
0.3	A	0.22	0.23	0.24	ND
	B	0.28	0.22	0.26	ND
REP 1	(A+B)/2=	0.25	0.23	0.25	ND
	A	0.33	0.23	0.21	ND
	B	0.26	0.29	0.21	ND
REP 2	(A+B)/2=	0.30	0.26	0.21	ND
	A	0.25	0.35	0.20	ND
	B	0.22	0.27	0.26	ND
REP 3	(A+B)/2=	0.24	0.31	0.23	ND
1.0	A	0.44	0.48	0.40	0.71
	B	0.50	0.57	0.43	0.84
REP 1	(A+B)/2=	0.47	0.53	0.42	0.78
	A	0.53	0.80	0.43	0.73
	B	0.38	0.58	0.40	0.51
REP 2	(A+B)/2=	0.46	0.69	0.42	0.62
	A	0.52	0.61	0.60	0.45
	B	0.75	0.64	0.69	0.79
REP 3	(A+B)/2=	0.64	0.63	0.65	0.62
3.0	A	2.59	2.59	2.24	6.49
	B	2.68	2.68	2.27	6.97
REP 1	(A+B)/2=	2.64	2.64	2.26	6.73
	A	2.06	2.06	2.21	5.87
	B	2.46	2.46	2.31	5.78
REP 2	(A+B)/2=	2.26	2.26	2.26	5.83
	A	2.40	2.40	2.26	3.43
	B	2.57	2.57	2.27	5.70
REP 3	(A+B)/2=	2.49	2.49	2.27	4.57

ND = Not Detected - See Table 20 for detection limits

Table 67. Experiment II - Octachlorodibenzo-p-dioxin in site soil (ppm)
WIGGINS

LOAD	DUPLICATE	DAYS AFTER INITIAL LOADING 0	60	90
0.3	A	2.19	2.03	1.89
	B	2.08	1.88	1.64
REP 1	(A+B)/2=	2.13	1.95	1.77
	A	2.41	2.43	2.13
	B	1.98	1.71	2.02
REP 2	(A+B)/2=	2.19	2.07	2.08
	A	1.92	2.19	1.95
	B	2.01	1.48	2.04
REP 3	(A+B)/2=	1.97	1.84	2.00
1	A	2.37	2.07	2.10
	B	1.87	2.09	1.85
REP 1	(A+B)/2=	2.12	2.08	1.98
	A	2.30	2.16	1.65
	B	2.49	2.39	1.79
REP 2	(A+B)/2=	2.39	2.28	1.72
	A	2.06	2.18	1.91
	B	2.31	1.99	2.12
REP 3	(A+B)/2=	2.19	2.09	2.02
3	A	3.55	2.23	2.55
	B	3.79	1.69	2.46
REP 1	(A+B)/2=	3.67	1.96	2.51
	A	3.23	1.69	2.47
	B	3.41	2.08	3.43
REP 2	(A+B)/2=	3.32	1.89	2.95
	A	3.19	1.98	2.29
	B	3.23	2.36	2.36
REP 3	(A+B)/2=	3.21	2.17	2.33

Table 67. Experiment II - Octachlorodibenzo-p-dioxin in site soil (ppm)
WILMINGTON

LOAD	DUPLICATE	DAYS AFTER INITIAL LOADING 0	30	60	90
0.3	A	0.40	1.01	0.69	1.04
	B	0.40	0.81	0.79	0.79
REP 1	(A+B)/2=	0.40	0.91	0.74	0.92
	A	0.51	0.69	1.06	0.74
	B	0.51	0.50	0.84	0.65
REP 2	(A+B)/2=	0.51	0.60	0.95	0.70
	A	0.46	0.82	0.82	0.72
	B	0.40	0.65	0.73	0.81
REP 3	(A+B)/2=	0.43	0.74	0.78	0.77
1.0	A	0.98	1.25	1.29	1.38
	B	0.90	1.44	1.46	1.57
REP 1	(A+B)/2=	0.94	1.35	1.38	1.48
	A	0.95	1.22	1.32	1.44
	B	1.05	1.29	1.51	1.70
REP 2	(A+B)/2=	1.00	1.26	1.42	1.57
	A	0.98	1.60	1.29	2.32
	B	0.94	1.44	1.33	1.20
REP 3	(A+B)/2=	0.96	1.52	1.31	1.76
3.0	A	2.44	2.53	2.58	2.59
	B	2.55	2.63	2.58	2.73
REP 1	(A+B)/2=	2.50	2.58	2.58	2.66
	A	2.64	2.55	2.73	2.75
	B	2.66	2.75	2.87	2.90
REP 2	(A+B)/2=	2.65	2.65	2.80	2.83
	A	2.58	2.60	2.54	2.69
	B	2.71	2.48	2.62	2.84
REP 3	(A+B)/2=	2.65	2.54	2.58	2.77

Table 68. Wiggins Soil Treatment Unit - PAH in site soil (ppm)
11/26/87

CELL	SUBCELL	ZONE	DUPLICATE	NAPH	2-MET	1-MET	BIPH	ACTHY	ACTHE	DIBEN	FLORE	PHEN	ANTHR	OTHER	FLUOR	PYRENE	1,2-BZ	CHRYS	BEN-a	BpH	2 RING	3 RING	4 RING	5 RING	TOTALPAH
1	1	1	A	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
			B	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
			*(A+B)/2=	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
		2	A	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
			B	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
			*(A+B)/2=	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
		3	A	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
			B	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
			*(A+B)/2=	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
1	2	1	A	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
			B	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
			*(A+B)/2=	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
		2	A	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
			B	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
			*(A+B)/2=	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
		3	A	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
			B	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
			*(A+B)/2=	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
2	1	1	A	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
			B	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
			*(A+B)/2=	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
		2	A	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
			B	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
			*(A+B)/2=	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
		3	A	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
			B	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
			*(A+B)/2=	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
2	2	1	A	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
			B	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
			*(A+B)/2=	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
		2	A	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
			B	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
			*(A+B)/2=	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
		3	A	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
			B	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
			*(A+B)/2=	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
3	1	1	A	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
			B	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
			*(A+B)/2=	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
		2	A	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
			B	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
			*(A+B)/2=	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
		3	A	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
			B	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
			*(A+B)/2=	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
3	2	1	A	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
			B	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
			*(A+B)/2=	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
		2	A	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
			B	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
			*(A+B)/2=	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
		3	A	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
			B	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
			*(A+B)/2=	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND

ND = Not Detected - See Table 20 for detection limits

Table 66. Wiggins Soil Treatment Unit - PAH in site soil (ppm)
10/26/87

CELL	SUBCELL	ZONE	DUPLICATE	NAPH	2-MET	1-MET	BIPH	ACTHY	ACTHE	DIBEN	FLORE	PHEN	ANTHR	CARBA	FLUOR	PYRENE	1,2-BZ	CHRYS	BEN-a	BghI	2 RING	3 RING	4 RING	5 RING	TOTALPAH
4	1	1	A	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
			B	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
			*CALCD/2=	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
		2	A	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
			B	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
			*CALCD/2=	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
		3	A	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
			B	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
			*CALCD/2=	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
4	2	1	A	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
			B	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
			*CALCD/2=	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
		2	A	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
			B	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
			*CALCD/2=	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
		3	A	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
			B	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
			*CALCD/2=	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
5	1	1	A	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
			B	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
			*CALCD/2=	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
		2	A	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
			B	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
			*CALCD/2=	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
		3	A	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
			B	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
			*CALCD/2=	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
5	2	1	A	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
			B	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
			*CALCD/2=	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
		2	A	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
			B	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
			*CALCD/2=	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
		3	A	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
			B	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
			*CALCD/2=	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
6	1	1	A	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
			B	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
			*CALCD/2=	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
		2	A	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
			B	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
			*CALCD/2=	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
		3	A	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
			B	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
			*CALCD/2=	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
6	2	1	A	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
			B	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
			*CALCD/2=	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
		2	A	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
			B	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
			*CALCD/2=	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
		3	A	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
			B	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
			*CALCD/2=	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND

ND = Not Detected - See Table 20 for detection limits

Table 60. Wiggins Soil Treatment Unit - PAH in site soil (ppm)
10/26/87

CELL	SUBCELL	ZONE	DUPLICATE	NAPH	2-MET	1-MET	BIPH	ACTHY	ACTHE	DIBEN	FLORE	PHEN	ANTHR	CARBA	FLUOR	PYRENE	1,2-BZ	CHRYS	BEN-a	BzpL	2 RING	3 RING	4 RING	5 RING	TOTALPAH
7	1	1	A	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
			B	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
			*GM+SD/2=	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
		2	A	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
			B	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
			*GM+SD/2=	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
		3	A	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
			B	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
			*GM+SD/2=	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
7	2	1	A	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
			B	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
			*GM+SD/2=	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
		2	A	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
			B	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
			*GM+SD/2=	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
		3	A	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
			B	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
			*GM+SD/2=	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
8	1	1	A	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
			B	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
			*GM+SD/2=	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
		2	A	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
			B	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
			*GM+SD/2=	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
		3	A	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
			B	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
			*GM+SD/2=	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
8	2	1	A	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
			B	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
			*GM+SD/2=	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
		2	A	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
			B	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
			*GM+SD/2=	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
		3	A	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
			B	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
			*GM+SD/2=	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
9	1	1	A	ND	ND	ND	ND	ND	2.3	4.6	5.9	44.8	6.2	ND	48.6	38.1	8.7	8.9	ND	ND	ND	63.8	104.3	ND	168.1
			B	ND	ND	ND	ND	ND	2.0	3.5	5.1	43.6	5.9	ND	48.2	38.1	9.0	9.5	ND	ND	ND	60.1	104.8	ND	164.9
			*GM+SD/2=	ND	ND	ND	ND	ND	2.2	4.1	5.5	44.2	6.1	ND	48.4	38.1	8.9	9.2	ND	ND	ND	62.0	104.6	ND	166.5
		2	A	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
			B	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
			*GM+SD/2=	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
		3	A	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
			B	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
			*GM+SD/2=	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
9	2	1	A	ND	ND	ND	ND	ND	1.7	ND	3.2	34.5	4.5	ND	55.8	44.2	10.1	10.0	ND	ND	ND	49.9	121.1	ND	165.0
			B	ND	ND	ND	ND	ND	ND	ND	2.8	42.6	5.5	ND	57.9	44.3	6.6	2.5	ND	ND	ND	50.9	111.3	ND	162.2
			*GM+SD/2=	ND	ND	ND	ND	ND	0.9	ND	3.0	38.6	5.0	ND	57.4	44.3	8.4	6.3	ND	ND	ND	47.4	116.2	ND	163.6
		2	A	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	10.7	11.9	2.5	5.3	ND	ND	ND	ND	30.4	ND	30.4
			B	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	22.0	21.9	4.7	5.0	ND	ND	ND	ND	53.6	ND	53.6
			*GM+SD/2=	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	16.4	16.9	3.6	5.2	ND	ND	ND	ND	42.0	ND	42.0
		3	A	ND	ND	ND	ND	ND	1.5	2.1	5.0	25.2	14.6	3.3	13.8	10.2	ND	ND	ND	ND	ND	51.7	24.0	ND	75.7
			B	ND	ND	ND	ND	ND	2.0	1.8	3.2	23.4	4.6	ND	23.2	17.8	6.1	4.1	ND	ND	ND	35.0	51.2	ND	86.2
			*GM+SD/2=	ND	ND	ND	ND	ND	1.8	2.0	4.1	24.3	9.6	1.7	18.5	14.0	3.1	2.1	ND	ND	ND	43.4	37.6	ND	81.0

ND = Not Detected - See Table 20 for detection limits

Table 68. Wiggins Soil Treatment Unit - PAH in site soil (ppm)
11/13/87

CELL	SUBCELL	ZONE	DUPLICATE	NAPH	2-MET	1-MET	BIPH	ACTHY	ACTHE	DIBEN	FLORE	PHEN	ANTHR	CARBA	FLUOR	PYRENE	1,2-BZ	CHRYS	BEN-a	BghI	2 RING	3 RING	4 RING	5 RING	TOTALPAH
1	1	1	A	ND	2.1	3.6	4.0	0.9	61.4	43.9	87.5	343.3	51.1	31.0	209.6	122.2	21.9	20.1	4.2	ND	9.7	619.1	373.8	4.2	1006.8
			B	ND	4.9	5.7	6.5	1.2	92.7	71.3	139.4	566.2	72.1	50.0	358.9	222.3	37.6	35.4	6.0	ND	17.1	992.9	654.2	6.0	1670.2
			*GM+BD/2=	ND	3.5	4.7	5.3	1.1	77.1	57.6	113.5	454.8	61.6	40.5	284.3	172.3	29.8	27.8	5.1	ND	13.4	806.0	514.0	5.1	1338.5
		2	A	ND	ND	ND	ND	ND	3.7	ND	5.7	32.5	2.4	ND	14.3	11.8	ND	ND	ND	ND	ND	44.3	26.1	ND	70.4
			B	ND	ND	ND	ND	ND	ND	ND	2.7	15.0	0.5	ND	6.1	4.4	ND	ND	ND	ND	ND	18.2	10.5	ND	28.7
			*GM+BD/2=	ND	ND	ND	ND	ND	1.9	ND	4.2	23.8	1.5	ND	10.2	8.1	ND	ND	ND	ND	ND	31.3	18.3	ND	49.6
		3	A	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	1.2	ND	ND	ND	ND	ND	ND	1.2	ND	1.2
			B	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
			*GM+BD/2=	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	0.6	ND	ND	ND	ND	ND	ND	0.6	ND	0.6
1	2	1	A	ND	1.7	4.7	4.0	0.8	60.5	43.6	88.4	364.3	51.0	32.2	220.9	130.8	21.7	20.8	3.7	ND	10.4	640.8	394.2	3.7	1049.1
			B	ND	2.7	8.5	6.6	0.9	83.7	56.9	104.7	413.9	56.9	34.9	256.1	147.6	8.1	10.1	ND	ND	17.8	751.9	421.9	ND	1191.6
			*GM+BD/2=	ND	2.2	6.6	5.3	0.9	72.1	50.3	96.6	389.1	54.0	33.6	238.5	139.2	14.9	15.5	1.9	ND	14.1	696.4	408.1	1.9	1120.4
		2	A	ND	ND	ND	ND	ND	ND	ND	1.6	10.1	ND	ND	4.8	2.9	ND	ND	ND	ND	ND	11.7	7.7	ND	19.4
			B	ND	ND	ND	ND	ND	ND	ND	3.4	17.7	ND	ND	7.1	5.8	ND	ND	ND	ND	ND	21.1	12.9	ND	34.0
			*GM+BD/2=	ND	ND	ND	ND	ND	ND	ND	2.5	13.9	ND	ND	6.0	4.4	ND	ND	ND	ND	ND	16.4	10.3	ND	26.7
		3	A	ND	ND	ND	ND	ND	ND	ND	3.9	18.0	ND	ND	7.3	5.9	ND	ND	ND	ND	ND	21.9	13.2	ND	35.1
			B	ND	ND	ND	ND	ND	ND	ND	ND	8.5	ND	ND	4.4	3.2	ND	ND	ND	ND	ND	8.5	7.6	ND	16.1
			*GM+BD/2=	ND	ND	ND	ND	ND	ND	ND	2.0	13.3	ND	ND	5.9	4.6	ND	ND	ND	ND	ND	15.2	10.4	ND	25.6
2	1	1	A	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
			B	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
			*GM+BD/2=	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
		2	A	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
			B	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
			*GM+BD/2=	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
		3	A	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
			B	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
			*GM+BD/2=	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
2	2	1	A	ND	ND	ND	ND	ND	3.8	2.9	5.1	27.4	22.8	2.4	9.0	6.1	ND	ND	ND	ND	ND	64.4	15.1	ND	79.5
			B	ND	ND	ND	ND	ND	3.3	2.2	4.6	26.7	18.7	1.8	9.3	8.7	ND	ND	ND	ND	ND	57.3	18.0	ND	75.3
			*GM+BD/2=	ND	ND	ND	ND	ND	3.6	2.6	4.9	27.1	20.8	2.1	9.2	7.4	ND	ND	ND	ND	ND	60.9	16.6	ND	77.4
		2	A	ND	ND	ND	ND	ND	ND	ND	1.7	10.1	16.4	ND	3.4	2.5	ND	ND	ND	ND	ND	28.2	5.9	ND	34.1
			B	ND	ND	ND	ND	ND	3.8	ND	4.6	22.6	2.5	ND	6.5	3.5	ND	ND	ND	ND	ND	33.5	10.0	ND	43.5
			*GM+BD/2=	ND	ND	ND	ND	ND	1.9	ND	3.2	16.4	9.5	ND	5.0	3.0	ND	ND	ND	ND	ND	30.9	8.0	ND	38.8
		3	A	ND	ND	ND	ND	ND	3.3	ND	4.1	20.3	1.4	ND	6.2	4.3	ND	ND	ND	ND	ND	29.1	10.5	ND	39.6
			B	ND	ND	ND	ND	ND	ND	ND	ND	11.2	1.4	ND	3.0	4.7	ND	ND	ND	ND	ND	12.6	7.7	ND	20.3
			*GM+BD/2=	ND	ND	ND	ND	ND	1.7	ND	2.1	15.8	1.4	ND	4.6	4.5	ND	ND	ND	ND	ND	20.9	9.1	ND	30.0
3	1	1	A	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
			B	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
			*GM+BD/2=	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
		2	A	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
			B	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
			*GM+BD/2=	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
		3	A	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
			B	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
			*GM+BD/2=	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
3	2	1	A	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
			B	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
			*GM+BD/2=	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
		2	A	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
			B	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
			*GM+BD/2=	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
		3	A	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
			B	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
			*GM+BD/2=	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND

ND = Not Detected - See Table 20 for detection limits

Table 68. Wiggins Soil Treatment Unit - PAH in site soil (ppm)
11/13/87

CELL	SUBCELL	ZONE	DUPLICATE	NAPH	2-MET	1-MET	BIPH	ACNAY	ACNE	DIBEN	FLORE	PHEN	ANTHR	CARBA	FLUOR	PYRENE	1,2-BZ	CHRYS	BEN-a	BzFl	2 RING	3 RING	4 RING	5 RING	TOTALPAH
4	1	1	A	ND	ND	3.0	2.6	1.3	41.3	25.3	49.6	144.9	26.2	14.1	104.4	80.3	22.6	29.1	7.5	ND	5.8	302.9	236.4	7.5	552.6
			B	ND	ND	2.9	3.1	ND	44.3	29.9	57.7	179.9	31.8	18.5	122.1	94.0	28.8	37.6	10.3	ND	6.0	352.1	282.5	10.3	660.9
			*GM-BD/2=	ND	ND	3.0	3.0	0.7	42.6	27.6	53.8	162.4	29.0	16.3	113.3	87.2	25.7	33.4	8.9	ND	5.9	332.5	259.5	8.9	606.8
		2	A	ND	ND	ND	ND	ND	7.7	5.9	9.8	32.0	6.3	2.7	22.9	17.6	6.3	5.4	ND	ND	ND	64.4	52.2	ND	116.6
			B	ND	ND	ND	ND	ND	ND	ND	ND	3.5	ND	ND	ND	ND	ND	ND	ND	ND	ND	3.5	ND	ND	3.5
			*GM-BD/2=	ND	ND	ND	ND	ND	3.9	3.0	4.9	17.8	3.2	1.4	11.5	8.8	3.2	2.7	ND	ND	ND	34.0	26.1	ND	60.1
		3	A	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
			B	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
			*GM-BD/2=	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
4	2	1	A	ND	ND	ND	ND	ND	14.0	10.7	17.8	62.4	11.0	3.8	41.1	31.2	9.1	8.4	ND	ND	ND	119.7	89.8	ND	209.5
			B	ND	ND	ND	ND	ND	13.0	11.3	18.2	66.0	11.8	5.6	47.8	34.4	12.4	10.7	ND	ND	ND	125.9	105.3	ND	231.2
			*GM-BD/2=	ND	ND	ND	ND	ND	13.5	11.0	18.0	64.2	11.4	4.7	44.5	32.8	10.8	9.6	ND	ND	ND	122.8	97.6	ND	220.4
		2	A	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
			B	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
			*GM-BD/2=	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
		3	A	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
			B	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
			*GM-BD/2=	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
5	1	1	A	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	2.1	1.9	3.1	ND	ND	ND	ND	ND	7.1	ND	7.1
			B	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	2.0	2.0	3.9	ND	ND	ND	ND	ND	7.9	ND	7.9
			*GM-BD/2=	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	2.1	2.0	3.5	ND	ND	ND	ND	ND	7.5	ND	7.5
		2	A	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
			B	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
			*GM-BD/2=	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
		3	A	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
			B	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
			*GM-BD/2=	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
5	2	1	A	ND	ND	ND	3.9	ND	ND	ND	ND	4.8	ND	ND	ND	ND	ND	ND	ND	ND	3.9	4.8	ND	ND	8.7
			B	ND	ND	ND	7.3	ND	ND	ND	ND	7.8	3.9	ND	ND	ND	ND	ND	ND	ND	7.3	11.7	ND	ND	19.0
			*GM-BD/2=	ND	ND	ND	5.6	ND	ND	ND	ND	6.3	2.0	ND	ND	ND	ND	ND	ND	ND	5.6	8.3	ND	ND	13.9
		2	A	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
			B	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
			*GM-BD/2=	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
		3	A	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	47.1	ND	ND	ND	ND	47.1	ND	47.1
			B	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	7.8	ND	ND	ND	ND	7.8	ND	7.8
			*GM-BD/2=	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	27.5	ND	ND	ND	ND	27.5	ND	27.5
6	1	1	A	ND	ND	ND	ND	ND	ND	ND	ND	ND	3.9	ND	1.3	4.4	1.5	ND	ND	ND	ND	3.9	7.2	ND	11.1
			B	ND	ND	ND	ND	ND	ND	ND	ND	1.1	1.4	ND	ND	ND	1.8	ND	ND	ND	ND	2.5	1.8	ND	4.3
			*GM-BD/2=	ND	ND	ND	ND	ND	ND	ND	ND	0.6	2.7	ND	0.7	2.2	1.7	ND	ND	ND	ND	3.2	4.5	ND	7.7
		2	A	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
			B	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
			*GM-BD/2=	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
		3	A	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
			B	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
			*GM-BD/2=	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
6	2	1	A	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
			B	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
			*GM-BD/2=	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
		2	A	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
			B	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
			*GM-BD/2=	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
		3	A	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
			B	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
			*GM-BD/2=	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND

ND - Not Detected - See Table 20 for detection limits

Table 68. Wiggins Soil Treatment Unit - PAH in site soil (ppm)
11/13/07

CELL	SUBCELL	ZONE	DUPLICATE	NAPH	2-MET	1-MET	BIPH	ACTHY	ACTHE	DIBEN	FLORE	PHEN	ANTHR	CARBA	FLUOR	PYRENE	1,2-BZ	CHRYS	BEN-a	BzFl	2 RING	3 RING	4 RING	5 RING	TOTALPAH
7	1	1	A	ND	ND	ND	ND	ND	ND	ND	ND	3.0	ND	ND	4.6	ND	ND	3.1	ND	ND	ND	3.0	7.7	ND	10.7
			B	ND	ND	ND	ND	ND	ND	ND	ND	2.6	ND	ND	ND	ND	ND	3.0	ND	ND	ND	2.6	3.0	ND	5.6
			*GMEO/2=	ND	ND	ND	ND	ND	ND	ND	ND	2.8	ND	ND	2.3	ND	ND	3.1	ND	ND	ND	2.8	5.4	ND	8.2
		2	A	ND	ND	ND	ND	ND	1.2	ND	2.3	8.6	2.9	ND	16.0	15.9	3.1	5.3	ND	ND	ND	15.0	40.3	ND	55.3
			B	ND	ND	ND	ND	ND	1.2	ND	1.9	9.7	2.8	ND	15.9	17.0	3.6	6.4	ND	ND	ND	15.6	42.9	ND	58.5
			*GMEO/2=	ND	ND	ND	ND	ND	1.2	ND	2.1	9.2	2.9	ND	16.0	16.5	3.4	5.9	ND	ND	ND	15.3	41.6	ND	56.9
		3	A	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
			B	ND	ND	ND	ND	ND	ND	ND	ND	1.9	ND	ND	2.0	ND	ND	ND	ND	ND	ND	1.9	2.0	ND	3.9
			*GMEO/2=	ND	ND	ND	ND	ND	ND	ND	ND	1.0	ND	ND	1.0	ND	ND	ND	ND	ND	ND	1.0	1.0	ND	2.0
7	2	1	A	ND	ND	ND	ND	ND	1.4	ND	ND	3.6	ND	ND	5.1	ND	ND	2.8	ND	ND	ND	5.0	7.9	ND	12.9
			B	ND	ND	ND	ND	ND	ND	ND	ND	5.6	ND	ND	6.5	ND	ND	5.2	ND	ND	ND	5.6	11.7	ND	17.3
			*GMEO/2=	ND	ND	ND	ND	ND	0.7	ND	ND	4.6	ND	ND	5.8	ND	ND	4.0	ND	ND	ND	5.3	9.8	ND	15.1
		2	A	ND	ND	ND	ND	ND	ND	ND	ND	2.8	ND	ND	3.8	ND	ND	3.2	ND	ND	ND	2.8	7.0	ND	9.8
			B	ND	ND	ND	ND	ND	ND	ND	ND	2.8	ND	ND	3.8	ND	ND	3.2	ND	ND	ND	2.8	7.0	ND	9.8
			*GMEO/2=	ND	ND	ND	ND	ND	ND	ND	ND	2.8	ND	ND	3.8	ND	ND	3.2	ND	ND	ND	2.8	7.0	ND	9.8
		3	A	ND	ND	ND	ND	ND	ND	ND	ND	2.5	ND	ND	3.0	ND	ND	ND	ND	ND	ND	2.5	3.0	ND	5.5
			B	ND	ND	ND	ND	ND	ND	ND	ND	1.9	ND	ND	3.7	3.1	ND	3.0	ND	ND	ND	1.9	9.8	ND	11.7
			*GMEO/2=	ND	ND	ND	ND	ND	ND	ND	ND	2.2	ND	ND	3.4	1.6	ND	1.5	ND	ND	ND	2.2	6.4	ND	8.6
8	1	1	A	ND	ND	ND	ND	ND	ND	ND	ND	3.7	ND	ND	7.9	5.9	ND	1.7	ND	ND	ND	3.7	15.5	ND	19.2
			B	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	4.0	3.2	ND	1.9	ND	ND	ND	ND	9.1	ND	9.1
			*GMEO/2=	ND	ND	ND	ND	ND	ND	ND	ND	1.9	ND	ND	6.0	4.6	ND	1.8	ND	ND	ND	1.9	12.3	ND	14.2
		2	A	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	1.4	ND	ND	1.6	ND	ND	ND	ND	3.0	ND	3.0
			B	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	2.1	ND	ND	ND	ND	2.1	ND	2.1
			*GMEO/2=	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	0.7	ND	ND	1.9	ND	ND	ND	ND	2.6	ND	2.6
		3	A	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	2.1	ND	ND	ND	ND	2.1	ND	2.1
			B	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	1.7	ND	ND	ND	ND	1.7	ND	1.7
			*GMEO/2=	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	1.9	ND	ND	ND	ND	1.9	ND	1.9
8	2	1	A	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	1.5	ND	ND	1.8	ND	ND	ND	ND	3.3	ND	3.3
			B	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	1.7	ND	ND	ND	ND	ND	ND	ND	1.7	ND	1.7
			*GMEO/2=	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	1.6	ND	ND	0.9	ND	ND	ND	ND	2.5	ND	2.5
		2	A	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	1.6	ND	ND	ND	ND	1.6	ND	1.6
			B	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	1.2	ND	ND	1.9	ND	ND	ND	ND	3.1	ND	3.1
			*GMEO/2=	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	0.6	ND	ND	1.9	ND	ND	ND	ND	2.5	ND	2.5
		3	A	ND	ND	ND	ND	ND	ND	ND	1.1	ND	ND	ND	1.7	ND	ND	2.5	ND	ND	ND	1.1	4.2	ND	5.3
			B	ND	ND	ND	ND	ND	ND	ND	1.8	ND	ND	ND	1.6	ND	ND	3.2	ND	ND	ND	1.8	4.8	ND	6.6
			*GMEO/2=	ND	ND	ND	ND	ND	ND	ND	1.5	ND	ND	ND	1.7	ND	ND	2.9	ND	ND	ND	1.5	4.5	ND	6.0
9	1	1	A	1.0	5.0	4.0	4.0	2.0	51.0	39.0	77.0	259.0	44.0	26.0	109.0	152.0	33.0	35.0	5.0	ND	14.0	501.0	409.0	5.0	929.0
			B	ND	1.0	2.0	1.0	ND	34.0	22.0	45.0	165.0	28.0	13.0	137.0	107.0	25.0	29.0	8.0	ND	4.0	308.0	298.0	8.0	618.0
			*GMEO/2=	0.5	3.0	3.0	2.5	1.0	44.0	30.5	61.5	212.0	36.0	19.5	163.0	129.5	29.0	32.0	6.5	ND	9.0	404.5	353.5	6.5	773.5
		2	A	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
			B	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
			*GMEO/2=	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
		3	A	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
			B	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
			*GMEO/2=	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
9	2	1	A	1.0	4.0	6.0	5.0	2.0	101.0	98.0	121.0	365.0	62.0	27.0	256.0	213.0	77.0	49.0	12.0	ND	16.0	736.0	599.0	12.0	1363.0
			B	1.0	4.0	6.0	3.0	1.0	113.0	99.0	131.0	392.0	75.0	30.0	318.0	249.0	27.0	27.0	8.0	ND	14.0	801.0	621.0	8.0	1441.0
			*GMEO/2=	1.0	4.0	6.0	4.0	1.5	107.0	98.5	126.0	378.5	68.5	28.5	292.0	231.0	52.0	35.0	8.5	ND	15.0	768.5	610.0	8.5	1402.0
		2	A	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
			B	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
			*GMEO/2=	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
		3	A	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
			B	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
			*GMEO/2=	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND

ND = Not Detected - See Table 20 for detection limits

Table 60. Wiggins Soil Treatment Unit - PAH in site soil (ppm)
2/27/90

CELL	SUBCELL	ZONE	DUPLICATE	NAPH	2-MET	1-MET	BIPH	ACENAP	ACENE	DIBEN	FLORE	PHEN	ANTHR	CARBA	FLUOR	PYRENE	1,2-BZ	CHRYS	BEN-a	BzFl	2 RING	3 RING	4 RING	5 RING	TOTALPAH
1	1	1	A	ND	ND	ND	ND	ND	11.0	3.0	10.0	27.0	15.0	3.0	102.0	85.0	14.0	20.0	ND	ND	ND	69.0	221.0	ND	290.0
			B	ND	ND	ND	ND	ND	24.0	12.0	29.0	77.0	21.0	4.0	102.0	83.0	18.0	20.0	ND	ND	ND	167.0	223.0	ND	390.0
			*(A+B)/2=	ND	ND	ND	ND	ND	17.5	7.5	19.5	52.0	18.0	3.5	102.0	84.0	16.0	20.0	ND	ND	ND	118.0	222.0	ND	340.0
		2	A	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
			B	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
			*(A+B)/2=	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
		3	A	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
			B	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
			*(A+B)/2=	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
1	2	1	A	ND	ND	ND	ND	ND	6.0	1.0	5.0	5.0	12.0	2.0	90.0	91.0	19.0	23.0	ND	ND	ND	31.0	223.0	ND	254.0
			B	ND	ND	ND	ND	ND	33.0	6.0	21.0	33.0	28.0	4.0	162.0	136.0	27.0	30.0	ND	ND	ND	125.0	355.0	ND	480.0
			*(A+B)/2=	ND	ND	ND	ND	ND	19.5	3.5	13.0	19.0	20.0	3.0	126.0	113.5	23.0	26.5	ND	ND	ND	78.0	289.0	ND	367.0
		2	A	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	4.0	3.0	ND	2.0	ND	ND	ND	ND	9.0	ND	9.0
			B	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	1.0	ND	ND	1.0	ND	ND	ND	ND	2.0	ND	2.0
			*(A+B)/2=	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	2.5	1.5	ND	1.5	ND	ND	ND	ND	5.5	ND	5.5
		3	A	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	5.0	4.0	ND	3.0	ND	ND	ND	ND	12.0	ND	12.0
			B	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	2.0	ND	ND	ND	ND	2.0	ND	2.0
			*(A+B)/2=	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	2.5	2.0	ND	2.5	ND	ND	ND	ND	7.0	ND	7.0
2	1	1	A	ND	ND	ND	ND	ND	ND	ND	ND	2.0	3.0	ND	1.0	ND	ND	2.0	ND	ND	ND	5.0	3.0	ND	8.0
			B	ND	ND	ND	2.0	ND	ND	ND	ND	2.0	ND	ND	3.0	ND	ND	ND	ND	ND	2.0	2.0	3.0	ND	7.0
			*(A+B)/2=	ND	ND	ND	1.0	ND	ND	ND	ND	2.0	1.5	ND	2.0	ND	ND	1.0	ND	ND	1.0	3.5	3.0	ND	7.5
		2	A	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	1.0	ND	ND	ND	ND	1.0	ND	1.0
			B	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	3.0	ND	ND	ND	ND	3.0	ND	3.0
			*(A+B)/2=	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	2.0	ND	ND	ND	ND	2.0	ND	2.0
		3	A	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	5.0	ND	ND	ND	ND	5.0	ND	5.0
			B	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	3.0	ND	ND	ND	ND	3.0	ND	3.0
			*(A+B)/2=	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	4.0	ND	ND	ND	ND	4.0	ND	4.0
2	2	1	A	ND	ND	ND	3.0	ND	ND	ND	ND	5.0	ND	ND	7.0	3.0	ND	4.0	ND	ND	3.0	5.0	14.0	ND	22.0
			B	ND	ND	ND	2.0	ND	ND	ND	ND	4.0	ND	ND	10.0	5.0	ND	5.0	ND	ND	2.0	4.0	20.0	ND	26.0
			*(A+B)/2=	ND	ND	ND	2.5	ND	ND	ND	ND	4.5	ND	ND	8.5	4.0	ND	4.5	ND	ND	2.5	4.5	17.0	ND	24.0
		2	A	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	4.0	ND	ND	ND	ND	4.0	ND	4.0
			B	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
			*(A+B)/2=	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	2.0	ND	ND	ND	ND	2.0	ND	2.0
		3	A	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
			B	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
			*(A+B)/2=	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
3	1	1	A	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	2.0	ND	ND	ND	ND	2.0	ND	2.0
			B	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	2.2	ND	ND	ND	ND	2.2	ND	2.2
			*(A+B)/2=	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	2.1	ND	ND	ND	ND	2.1	ND	2.1
		2	A	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	1.6	ND	ND	ND	ND	1.6	ND	1.6
			B	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	1.3	ND	ND	ND	ND	1.3	ND	1.3
			*(A+B)/2=	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	1.5	ND	ND	ND	ND	1.5	ND	1.5
		3	A	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	1.8	ND	ND	ND	ND	1.8	ND	1.8
			B	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	2.2	ND	ND	ND	ND	2.2	ND	2.2
			*(A+B)/2=	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	2.0	ND	ND	ND	ND	2.0	ND	2.0
3	2	1	A	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	1.9	ND	ND	ND	ND	1.9	ND	1.9
			B	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	1.8	ND	ND	ND	ND	1.8	ND	1.8
			*(A+B)/2=	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	1.9	ND	ND	ND	ND	1.9	ND	1.9
		2	A	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	1.1	ND	ND	ND	ND	1.1	ND	1.1
			B	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
			*(A+B)/2=	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	0.6	ND	ND	ND	ND	0.6	ND	0.6
		3	A	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	3.1	ND	ND	ND	ND	3.1	ND	3.1
			B	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	1.3	ND	ND	ND	ND	1.3	ND	1.3
			*(A+B)/2=	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	2.2	ND	ND	ND	ND	2.2	ND	2.2

ND = Not Detected - See Table 20 for detection limits

Table 60. Wiggins Soil Treatment Unit - PAH in site soil (ppm)
2/26/88

CELL	SUBCELL	ZONE	DUPLICATE	NAPH	2-MET	1-MET	BIPH	ACTHY	ACTHE	DIBEN	FLORE	PHEN	ANTHR	CARBA	FLUOR	PYRENE	1,2-BZ	CHRYS	BEN-a	BghI	2 RING	3 RING	4 RING	5 RING	TOTALPAH
4	1	1	A	ND	ND	4.2	ND	1.6	74.0	33.5	55.7	124.8	42.1	6.4	170.8	146.3	33.5	33.6	9.6	ND	4.2	338.9	392.2	9.6	744.9
			B	ND	ND	3.9	ND	1.2	57.4	28.1	47.2	100.0	33.8	5.0	146.1	133.1	30.9	33.2	8.3	ND	3.9	272.7	343.3	8.3	628.2
			*(A+B)/2=	ND	ND	4.1	ND	1.4	66.1	30.8	51.5	112.4	38.0	5.7	162.5	139.7	32.2	33.4	9.0	ND	4.1	305.8	367.8	9.0	686.6
		2	A	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	1.8	2.1	ND	2.4	ND	ND	ND	ND	6.3	ND	6.3
			B	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	2.0	ND	ND	ND	ND	2.0	ND	2.0
			*(A+B)/2=	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	0.9	1.1	ND	2.2	ND	ND	ND	ND	4.2	ND	4.2
		3	A	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	3.3	3.5	ND	2.2	ND	ND	ND	ND	9.0	ND	9.0
			B	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	2.7	ND	ND	ND	ND	2.7	ND	2.7
			*(A+B)/2=	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	1.7	1.8	ND	2.5	ND	ND	ND	ND	5.9	ND	5.9
4	2	1	A	ND	ND	3.8	0.7	1.9	51.2	20.7	30.7	59.8	21.5	3.1	116.4	94.1	23.3	22.7	9.3	ND	4.5	188.9	256.5	9.3	459.2
			B	ND	ND	3.1	ND	ND	34.0	16.5	28.8	66.6	24.0	4.6	119.9	101.9	26.5	28.3	7.5	ND	3.1	173.5	276.6	7.5	460.7
			*(A+B)/2=	ND	ND	3.5	0.4	1.0	42.6	18.6	29.8	62.7	22.8	3.9	118.2	98.0	24.9	25.5	8.4	ND	3.8	181.2	266.6	8.4	460.0
		2	A	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
			B	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
			*(A+B)/2=	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
		3	A	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
			B	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
			*(A+B)/2=	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
5	1	1	A	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	2.0	2.0	ND	ND	ND	ND	ND	ND	4.0	ND	4.0
			B	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	1.0	ND	ND	ND	ND	ND	ND	1.0	ND	1.0
			*(A+B)/2=	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	1.0	1.5	ND	ND	ND	ND	ND	ND	2.5	ND	2.5
		2	A	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
			B	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
			*(A+B)/2=	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
		3	A	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
			B	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
			*(A+B)/2=	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
5	2	1	A	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	2.0	ND	ND	ND	ND	ND	ND	2.0	ND	2.0
			B	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	6.0	5.0	ND	ND	ND	ND	ND	ND	11.0	ND	11.0
			*(A+B)/2=	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	3.0	3.5	ND	ND	ND	ND	ND	ND	6.5	ND	6.5
		2	A	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
			B	ND	ND	ND	ND	ND	ND	ND	ND	2.0	6.0	ND	ND	ND	ND	ND	ND	ND	ND	8.0	ND	ND	8.0
			*(A+B)/2=	ND	ND	ND	ND	ND	ND	ND	ND	1.0	3.0	ND	ND	ND	ND	ND	ND	ND	ND	4.0	ND	ND	4.0
		3	A	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
			B	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	4.0	4.0	ND	ND	ND	ND	ND	ND	8.0	ND	8.0
			*(A+B)/2=	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	2.0	2.0	ND	ND	ND	ND	ND	ND	4.0	ND	4.0
6	1	1	A	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	3.0	3.0	ND	ND	ND	ND	ND	ND	6.0	ND	6.0
			B	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
			*(A+B)/2=	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	1.5	1.5	ND	ND	ND	ND	ND	ND	3.0	ND	3.0
		2	A	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
			B	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
			*(A+B)/2=	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
		3	A	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
			B	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
			*(A+B)/2=	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
6	2	1	A	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
			B	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	2.0	3.0	ND	ND	ND	ND	ND	ND	5.0	ND	5.0
			*(A+B)/2=	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	1.0	1.5	ND	ND	ND	ND	ND	ND	2.5	ND	2.5
		2	A	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
			B	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
			*(A+B)/2=	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
		3	A	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
			B	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
			*(A+B)/2=	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND

ND = Not Detected - See Table 20 for detection limits

Table 18. Wiggins Soil Treatment Unit - PAH in site soil (ppm)
2/27/91

CELL	SUBCELL	ZONE	DUPLICATE	NAPH	2-MET	1-MET	BIPH	ACENY	ACENE	DIBEN	FLORE	PHEN	ANTHR	CARBA	FLUOR	PYRENE	1,2-BZ	CHRYS	BZFL	BZPL	2 RING	3 RING	4 RING	5 RING	TOTALPAH
7	1	1	A	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
		2	A	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
		3	B	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
7	2	1	A	ND	1.0	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
			B	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	1.0	ND	ND	ND	1.0
			*(A+B)/2=	ND	0.5	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
		2	A	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	0.5	ND	ND	ND	0.5
			B	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
			*(A+B)/2=	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
		3	A	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
			B	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
			*(A+B)/2=	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
8	1	1	A	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
			B	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
			*(A+B)/2=	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
		2	A	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
			B	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
			*(A+B)/2=	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
		3	A	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
			B	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
			*(A+B)/2=	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
8	2	1	A	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
			B	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
			*(A+B)/2=	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
		2	A	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
			B	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
			*(A+B)/2=	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
		3	A	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
			B	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
			*(A+B)/2=	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
9	1	1	A	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
			B	ND	ND	ND	ND	ND	14.0	7.0	18.0	56.0	15.0	3.0	79.0	63.0	17.0	15.0	ND	ND	ND	113.0	174.0	ND	287.0
			*(A+B)/2=	ND	ND	ND	ND	ND	ND	ND	ND	4.0	6.0	ND	51.0	56.0	14.0	14.0	ND	ND	ND	10.0	135.0	ND	145.0
		2	A	ND	ND	ND	ND	ND	7.0	3.5	9.0	30.0	10.5	1.5	65.0	59.5	15.5	14.5	ND	ND	ND	61.5	154.5	ND	216.0
			B	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
			*(A+B)/2=	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
		3	A	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
			B	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
			*(A+B)/2=	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
9	2	1	A	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
			B	ND	ND	ND	ND	ND	39.0	8.0	25.0	46.0	37.0	ND	299.0	179.0	45.0	43.0	22.0	ND	ND	155.0	527.0	22.0	704.0
			*(A+B)/2=	ND	ND	ND	ND	ND	18.0	5.0	14.0	31.0	20.0	ND	170.0	122.0	33.0	30.0	11.0	ND	ND	88.0	355.0	11.0	454.0
		2	A	ND	ND	ND	ND	ND	28.5	6.5	19.5	38.5	28.5	ND	214.5	150.5	39.5	36.5	16.5	ND	ND	121.5	441.0	16.5	579.0
			B	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	6.0	5.0	3.0	3.0	ND	ND	ND	ND	17.0	ND	17.0
			*(A+B)/2=	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	10.0	8.0	ND	ND	ND	ND	ND	ND	18.0	ND	18.0
		3	A	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	8.0	6.5	1.5	1.5	ND	ND	ND	ND	17.5	ND	17.5
			B	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
			*(A+B)/2=	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	9.0	8.0	ND	ND	ND	ND	ND	ND	15.0	ND	15.0
															4.5	3.0	ND	ND	ND	ND	ND	ND	7.5	ND	7.5

NA = Not Analyzed
ND = Not Detected - See Table 20 for detection limits

Table (d). Wagga Soil Treatment Unit - 1991 in situ soil (ppm)
(5/11/91)

CELL	SUBCELL	ZONE	DUPLICATE	NAPH	2-MET	1-MET	BIPH	ACNAY	ACNE	DIBEN	FLORE	PHEN	ANTHR	CARBA	FLUOR	PYRENE	1,2-BZ	CRYS	BEN-a	BzFl	2 RING	3 RING	4 RING	5 RING	TOTALPAH
1	1	1	A	ND	ND	ND	ND	ND	7.0	1.0	2.0	2.0	14.0	ND	110.0	78.0	28.0	39.0	6.0	ND	ND	26.0	255.0	6.0	287.0
			B	ND	ND	ND	ND	ND	7.0	1.0	3.0	2.0	15.0	ND	120.0	82.0	29.0	39.0	5.0	ND	ND	28.0	270.0	5.0	303.0
			*GM BD/2=	ND	ND	ND	ND	ND	7.0	1.0	2.5	2.0	14.5	ND	115.0	80.0	28.5	39.0	5.5	ND	ND	27.0	262.5	5.5	295.0
		2	A	ND	ND	ND	ND	ND	9.0	8.0	15.0	73.0	13.0	8.0	66.0	43.0	14.0	21.0	3.0	ND	ND	126.0	144.0	3.0	273.0
			B	ND	ND	ND	ND	ND	9.0	9.0	17.0	76.0	15.0	6.0	53.0	33.0	5.0	8.0	ND	ND	ND	132.0	99.0	ND	231.0
			*GM BD/2=	ND	ND	ND	ND	ND	9.0	8.5	16.0	74.5	14.0	7.0	59.5	38.0	9.5	14.5	1.5	ND	ND	129.0	121.5	1.5	252.0
		3	A	ND	ND	ND	ND	ND	15.0	13.0	23.0	97.0	18.0	9.0	73.0	46.0	13.0	18.0	3.0	ND	ND	175.0	150.0	3.0	328.0
			B	ND	ND	ND	ND	ND	19.0	18.0	30.0	126.0	22.0	11.0	87.0	57.0	14.0	19.0	3.0	ND	ND	226.0	177.0	3.0	406.0
			*GM BD/2=	ND	ND	ND	ND	ND	17.0	15.5	26.5	111.5	20.0	10.0	80.0	51.5	13.5	18.5	3.0	ND	ND	200.5	163.5	3.0	367.0
1	2	1	A	ND	8.0	8.0	6.0	1.0	131.0	111.0	159.0	596.0	98.0	43.0	401.0	282.0	59.0	88.0	16.0	3.0	22.0	1139.0	830.0	19.0	2010.0
			B	ND	14.0	12.0	6.0	1.0	127.0	105.0	146.0	537.0	86.0	40.0	191.0	262.0	69.0	33.0	17.0	3.0	32.0	1042.0	555.0	20.0	1649.0
			*GM BD/2=	ND	11.0	10.0	6.0	1.0	129.0	108.0	152.5	566.5	92.0	41.5	296.0	272.0	64.0	60.5	16.5	3.0	27.0	1090.5	692.5	19.5	1829.5
		2	A	ND	ND	ND	ND	ND	3.0	3.0	6.0	32.0	6.0	3.0	25.0	17.0	4.0	5.0	ND	ND	ND	53.0	51.0	ND	104.0
			B	ND	ND	ND	ND	ND	1.0	2.0	4.0	25.0	5.0	3.0	20.0	14.0	3.0	4.0	ND	ND	ND	40.0	41.0	ND	81.0
			*GM BD/2=	ND	ND	ND	ND	ND	2.0	2.5	5.0	28.5	5.5	3.0	22.5	15.5	3.5	4.5	ND	ND	ND	46.5	46.0	ND	92.5
		3	A	ND	ND	ND	ND	ND	2.0	3.0	5.0	28.0	5.0	2.0	20.0	13.0	3.0	4.0	ND	ND	ND	45.0	40.0	ND	85.0
			B	ND	ND	ND	ND	ND	2.0	2.0	4.0	21.0	4.0	3.0	18.0	12.0	2.0	4.0	ND	ND	ND	36.0	36.0	ND	72.0
			*GM BD/2=	ND	ND	ND	ND	ND	2.0	2.5	4.5	24.5	4.5	2.5	19.0	12.5	2.5	4.0	ND	ND	ND	40.5	38.0	ND	78.5
2	1	1	A	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	2.0	9.0	ND	ND	ND	ND	ND	ND	11.0	ND	11.0
			B	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	2.0	10.0	ND	ND	ND	ND	ND	ND	12.0	ND	12.0
			*GM BD/2=	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	2.0	9.5	ND	ND	ND	ND	ND	ND	11.5	ND	11.5
		2	A	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
			B	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
			*GM BD/2=	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
		3	A	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
			B	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
			*GM BD/2=	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
2	2	1	A	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	8.0	31.0	3.0	4.0	ND	ND	ND	ND	46.0	ND	46.0
			B	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	11.0	34.0	3.0	4.0	ND	ND	ND	ND	52.0	ND	52.0
			*GM BD/2=	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	9.5	32.5	3.0	4.0	ND	ND	ND	ND	49.0	ND	49.0
		2	A	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
			B	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
			*GM BD/2=	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
		3	A	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
			B	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
			*GM BD/2=	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
3	1	1	A	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
			B	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
			*GM BD/2=	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
		2	A	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
			B	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
			*GM BD/2=	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
		3	A	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
			B	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
			*GM BD/2=	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
3	2	1	A	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
			B	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
			*GM BD/2=	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
		2	A	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
			B	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
			*GM BD/2=	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
		3	A	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
			B	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
			*GM BD/2=	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND

ND = Not Detected - See Table 20 for detection limits

Table 68. Wiggins Soil Treatment Unit - PAH in site soil (ppm)
5/10/88

CELL	SUBCELL	ZONE	DUPLICATE	NAPH	2-MET	1-MET	BIPH	ACTHY	ACTHE	DIBEN	FLORE	PHEN	ANTHR	CARBA	FLUOR	PYRENE	1,2-BZ	CHRYS	BEN-A	BghI	2 RING	3 RING	4 RING	5 RING	TOTALPAH
4	1	1	A	ND	ND	ND	ND	ND	3.0	1.5	3.2	16.1	13.0	2.4	105.1	95.5	31.8	48.5	15.9	5.1	ND	39.2	280.9	21.0	341.1
			B	ND	ND	ND	ND	ND	1.8	ND	1.8	8.6	8.5	1.4	81.2	81.3	27.3	42.5	13.7	3.6	ND	22.1	232.3	17.3	271.7
			*CM+BD/2=	ND	ND	ND	ND	ND	2.4	0.8	2.5	12.4	10.8	1.9	93.2	88.4	29.6	45.5	14.8	4.4	ND	30.7	256.6	19.2	306.4
		2	A	ND	ND	ND	ND	ND	ND	0.4	0.4	1.3	0.4	ND	1.6	1.6	0.6	0.9	ND	ND	ND	2.5	4.7	ND	7.2
			B	ND	ND	ND	ND	ND	0.5	0.4	0.6	1.7	0.6	0.3	1.6	1.5	ND	ND	ND	ND	ND	4.1	3.1	ND	7.2
			*CM+BD/2=	ND	ND	ND	ND	ND	0.3	0.4	0.5	1.5	0.5	0.2	1.6	1.6	0.3	0.5	ND	ND	ND	3.3	3.9	ND	7.2
		3	A	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
			B	ND	ND	ND	ND	ND	0.5	0.3	0.6	2.3	0.9	ND	2.4	2.1	0.4	0.8	ND	ND	ND	4.6	5.7	ND	10.3
			*CM+BD/2=	ND	ND	ND	ND	ND	0.3	0.2	0.3	1.2	0.5	ND	1.2	1.1	0.2	0.4	ND	ND	ND	2.3	2.9	ND	5.2
4	2	1	A	ND	ND	0.3	ND	0.8	25.7	5.7	8.8	17.0	19.8	0.8	127.3	103.4	26.1	37.2	11.4	3.1	0.3	78.6	294.0	14.5	387.4
			B	ND	ND	ND	ND	0.7	21.4	5.0	8.1	22.3	19.1	1.9	119.8	98.8	26.2	37.9	12.0	3.2	ND	78.5	282.7	15.2	376.4
			*CM+BD/2=	ND	ND	0.2	ND	0.8	23.6	5.4	8.5	19.7	19.5	1.4	123.6	101.1	26.2	37.6	11.7	3.2	0.2	78.6	288.4	14.9	381.9
		2	A	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
			B	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
			*CM+BD/2=	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
		3	A	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
			B	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
			*CM+BD/2=	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
5	1	1	A	ND	ND	ND	ND	ND	ND	ND	ND	3.0	ND	ND	2.0	4.0	ND	ND	ND	ND	ND	3.0	6.0	ND	9.0
			B	ND	ND	ND	ND	ND	ND	ND	ND	4.0	ND	ND	4.0	4.0	ND	ND	ND	ND	ND	4.0	8.0	ND	12.0
			*CM+BD/2=	ND	ND	ND	ND	ND	ND	ND	ND	3.5	ND	ND	3.0	4.0	ND	ND	ND	ND	ND	3.5	7.0	ND	10.5
		2	A	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
			B	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
			*CM+BD/2=	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
		3	A	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
			B	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
			*CM+BD/2=	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
5	2	1	A	ND	ND	ND	ND	ND	ND	ND	ND	10.0	ND	ND	13.0	12.0	ND	ND	ND	ND	ND	10.0	25.0	ND	35.0
			B	ND	ND	ND	ND	ND	ND	ND	2.0	10.0	3.0	ND	9.0	10.0	ND	ND	ND	ND	ND	15.0	19.0	ND	34.0
			*CM+BD/2=	ND	ND	ND	ND	ND	ND	ND	1.0	10.0	1.5	ND	11.0	11.0	ND	ND	ND	ND	ND	12.5	22.0	ND	34.5
		2	A	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
			B	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
			*CM+BD/2=	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
		3	A	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
			B	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
			*CM+BD/2=	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
6	1	1	A	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
			B	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
			*CM+BD/2=	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
		2	A	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
			B	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
			*CM+BD/2=	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
		3	A	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
			B	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
			*CM+BD/2=	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
6	2	1	A	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	2.0	3.0	ND	ND	ND	ND	ND	ND	5.0	ND	5.0
			B	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	2.0	ND	ND	ND	ND	ND	ND	2.0	ND	2.0
			*CM+BD/2=	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	1.0	2.5	ND	ND	ND	ND	ND	ND	3.5	ND	3.5
		2	A	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
			B	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
			*CM+BD/2=	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
		3	A	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
			B	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
			*CM+BD/2=	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND

ND = Not Detected - See Table 20 for detection limits

Table 60. Wiggins Soil Treatment Unit - PAH in site soil (ppm)
5/10/90

CELL	SUBCELL	ZONE	DUPLICATE	NAPH	2-MET	1-MET	BIPH	ACTHY	ACTHE	DIBDH	FLORE	PHEN	ANTHR	CARBA	FLUOR	PYRENE	1,2-BZ	CHRYS	BENZ-a	BzFl	2 RING	3 RING	4 RING	5 RING	TOTALPAH
7	1	1	A	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
			B	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
			*GMEAN/2=	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
		2	A	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
			B	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
			*GMEAN/2=	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
		3	A	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
			B	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
			*GMEAN/2=	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
7	2	1	A	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
			B	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
			*GMEAN/2=	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
		2	A	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
			B	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
			*GMEAN/2=	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
		3	A	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
			B	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
			*GMEAN/2=	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
8	1	1	A	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
			B	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
			*GMEAN/2=	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
		2	A	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	10.0	8.0	ND	ND	ND	ND	ND	ND	18.0	ND	18.0
			B	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	17.0	14.0	ND	ND	ND	ND	ND	ND	31.0	ND	31.0
			*GMEAN/2=	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	13.5	11.0	ND	ND	ND	ND	ND	ND	24.5	ND	24.5
		3	A	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
			B	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	5.0	5.0	ND	ND	ND	ND	ND	ND	10.0	ND	10.0
			*GMEAN/2=	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	2.5	2.5	ND	ND	ND	ND	ND	ND	5.0	ND	5.0
8	2	1	A	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
			B	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	2.0	ND	ND	ND	ND	ND	ND	2.0	ND	2.0
			*GMEAN/2=	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	1.0	ND	ND	ND	ND	ND	ND	1.0	ND	1.0
		2	A	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
			B	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
			*GMEAN/2=	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
		3	A	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
			B	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
			*GMEAN/2=	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
9	1	1	A	ND	ND	ND	ND	ND	ND	ND	ND	3.0	3.0	ND	41.0	30.0	11.0	10.0	ND	ND	ND	6.0	92.0	ND	98.0
			B	ND	ND	ND	ND	ND	ND	ND	ND	5.0	4.0	ND	49.0	37.0	18.0	16.0	ND	ND	ND	9.0	120.0	ND	129.0
			*GMEAN/2=	ND	ND	ND	ND	ND	ND	ND	ND	4.0	3.5	ND	45.0	33.5	14.5	13.0	ND	ND	ND	7.5	106.0	ND	113.5
		2	A	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	3.0	3.0	ND	ND	ND	ND	ND	ND	6.0	ND	6.0
			B	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	3.0	ND	ND	ND	ND	ND	ND	ND	3.0	ND	3.0
			*GMEAN/2=	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	3.0	1.5	ND	ND	ND	ND	ND	ND	4.5	ND	4.5
		3	A	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
			B	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
			*GMEAN/2=	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
9	2	1	A	ND	ND	ND	ND	ND	1.0	ND	1.0	7.0	5.0	ND	48.0	36.0	19.0	17.0	8.0	ND	ND	14.0	120.0	8.0	142.0
			B	ND	ND	ND	ND	ND	1.0	ND	1.0	2.0	4.0	ND	32.0	30.0	19.0	19.0	9.0	ND	ND	8.0	100.0	9.0	117.0
			*GMEAN/2=	ND	ND	ND	ND	ND	1.0	ND	1.0	4.5	4.5	ND	40.0	33.0	19.0	18.0	8.5	ND	ND	11.0	110.0	8.5	129.5
		2	A	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
			B	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
			*GMEAN/2=	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
		3	A	ND	ND	ND	ND	ND	ND	ND	ND	7.0	4.0	ND	30.0	19.0	4.0	4.0	ND	ND	ND	11.0	57.0	ND	68.0
			B	ND	ND	ND	ND	ND	ND	ND	ND	4.0	ND	ND	12.0	8.0	2.0	ND	ND	ND	ND	4.0	22.0	ND	26.0
			*GMEAN/2=	ND	ND	ND	ND	ND	ND	ND	ND	5.5	2.0	ND	21.0	13.5	3.0	2.0	ND	ND	ND	7.5	39.5	ND	47.0

ND - Not Detected - See Table 20 for detection limits

Table 80. Uiggins Soil Treatment Unit - PAH in site soil (ppm)
6/15/89

CELL	SUBCELL	ZONE	NAPH	2-MET	1-MET	BIPH	ACTHY	ACTHE	DIBEN	FLORE	PHEN	ANTHR	CARBA	FLUOR	PYRENE	1,2-BZ	CHRYS	BEN-a	Bzfl	2 RING	3 RING	4 RING	5 RING	TOTALPAH
1	1	1	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
		2	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
		3	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
1	2	1	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
		2	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
		3	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
2	1	1	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
		2	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
		3	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
2	2	1	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
		2	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
		3	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
3	1	1	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
		2	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
		3	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
3	2	1	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
		2	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
		3	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
4	1	1	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
		2	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
		3	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
4	2	1	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
		2	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
		3	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
5	1	1	ND	ND	ND	ND	ND	ND	ND	ND	7.0	10.0	ND	5.0	3.0	ND	ND	ND	ND	ND	17.0	8.0	ND	25.0
		2	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
		3	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
5	2	1	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
		2	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
		3	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND

ND = Not Detected - See Table 20 for detection limits

Table (4). Wagyna Soil Treatment Unit - PAH in site soil (ppm)
(6/15/1?)

CELL	SUBCELL	ZONE	NAPH	2-MET	1-MET	BIPH	ACTHY	ACTHE	DIBEN	FLORE	PHEN	ANTHR	CARBA	FLUOR	PYRENE	1,2-BZ	CHRYS	BEN-a	BghI	2 RING	3 RING	4 RING	5 RING	TOTALPAH
6	1	1	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
		2	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
		3	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
6	2	1	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
		2	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
		3	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
7	1	1	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
		2	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
		3	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
7	2	1	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
		2	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
		3	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
8	1	1	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
		2	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
		3	ND	ND	ND	ND	ND	ND	ND	ND	5.0	ND	ND	45.0	33.0	10.0	7.0	ND	ND	ND	5.0	95.0	ND	100.0
8	2	1	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
		2	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
		3	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
9	1	1	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
		2	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
		3	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
9	2	1	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	5.0	ND	ND	ND	ND	ND	ND	5.0	ND	5.0
		2	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	20.0	15.0	4.0	5.0	ND	ND	ND	ND	44.0	ND	44.0
		3	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND

ND = Not Detected - See Table 20 for detection limits

Table 60. Wiggins Soil Treatment Unit - PAH in site soil (ppm)
(V1/V2)

CELL	SUBCELL	ZONE	NAPH	2-MET	1-MET	BIPH	ACNAP	ACNE	DIBEN	FLORE	PHEN	ANTHR	CARBA	FLUOR	PYRENE	1,2-BZ	CHRYS	BEN-a	BghI	2 RING	3 RING	4 RING	5 RING	TOTALPAH
1	1	1	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
		2	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
		3	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
1	2	1	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
		2	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	6.0	ND	ND	ND	ND	ND	ND	6.0	ND	6.0
		3	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
2	1	1	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
		2	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
		3	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
2	2	1	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
		2	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
		3	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
3	1	1	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
		2	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
		3	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
3	2	1	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
		2	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
		3	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
4	1	1	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
		2	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
		3	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
4	2	1	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
		2	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
		3	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
5	1	1	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	8.0	8.0	ND	ND	ND	ND	ND	ND	14.0	ND	14.0
		2	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	6.0	7.0	ND	ND	ND	ND	ND	ND	13.0	ND	13.0
		3	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
5	2	1	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
		2	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
		3	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS

NS = No Sample taken
ND = Not Detected - See Table 20 for detection limits

Table 28. Wagging Soil Treatment Unit - PAH in site soil (ppm)
(1/11/1)

CELL	SUBCELL	ZONE	NPTH	2-MET	1-MET	BIPH	ACTHY	ACTHE	DIBEN	FLORE	PHEN	ANTHR	CARBA	FLUOR	PYRENE	1,2-BZ	CHRYS	BEN-a	Bgh1	2 RING	3 RING	4 RING	5 RING	TOTALPAH
6	1	1	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
		2	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
		3	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
6	2	1	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
		2	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
		3	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
7	1	1	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	8.0	ND	ND	ND	ND	ND	ND	8.0	ND	8.0
		2	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	37.0	24.0	ND	ND	ND	ND	ND	ND	61.0	ND	61.0
		3	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
7	2	1	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
		2	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
		3	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
8	1	1	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
		2	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
		3	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
8	2	1	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
		2	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
		3	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
9	1	1	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
		2	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
		3	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
9	2	1	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	5.0	ND	ND	ND	ND	ND	ND	5.0	ND	5.0
		2	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	20.0	15.0	1.0	5.0	ND	ND	ND	ND	41.0	ND	41.0
		3	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS

NS = No Sample taken
ND = Not Detected - See Table 20 for detection limits

Table 69. Wiggins Soil Treatment Unit - PCP in soil (ppm)

CELL	SUBCELL	ZONE	DUPLICATE	10/26/87	11/13/87	2/26/88	5/10/88	6/15/89	8/11/89
1	1	1	A	ND	37.1	18.7	12		
			B	ND	55.5	13	10.4		
			*(A+B)/2=	ND	46.3	15.85	11.2	ND	ND
		2	A	ND	ND	ND	11.8		
			B	ND	ND	ND	10.7		
			*(A+B)/2=	ND	ND	ND	11.25	ND	ND
		3	A	ND	ND	ND	10.4		
			B	ND	ND	ND	14.1		
			*(A+B)/2=	ND	ND	ND	12.25	ND	NA
1	2	1	A	ND	37.8	20.1	86.3		
			B	ND	40.8	19	85.5		
			*(A+B)/2=	ND	39.3	19.55	85.9	ND	ND
		2	A	ND	ND	ND	3.99		
			B	ND	ND	ND	3.07		
			*(A+B)/2=	ND	ND	ND	3.53	ND	1.24
		3	A	ND	3	ND	3.08		
			B	ND	ND	ND	2.63		
			*(A+B)/2=	ND	1.5	ND	2.855	ND	NA
2	1	1	A	ND	101.6	0.885	143		
			B	ND	94.5	0.614	154		
			*(A+B)/2=	ND	98.05	0.7495	148.5	0.707	1.35
		2	A	ND	ND	ND	4.42		
			B	ND	ND	ND	2.16		
			*(A+B)/2=	ND	ND	ND	3.29	ND	ND
		3	A	ND	ND	ND	ND		
			B	ND	ND	ND	ND		
			*(A+B)/2=	ND	ND	ND	ND	ND	NA
2	2	1	A	ND	242.6	33.4	355		
			B	ND	173.6	76	397		
			*(A+B)/2=	ND	208.1	54.7	376	2.34	1.21
		2	A	ND	13	ND	7.24		
			B	ND	18.3	ND	3.15		
			*(A+B)/2=	ND	15.65	ND	5.195	ND	ND
		3	A	ND	11.1	ND	ND		
			B	ND	12.6	ND	2.38		
			*(A+B)/2=	ND	11.85	ND	1.19	ND	NA
3	1	1	A	ND	175.7	3.33	0.916		
			B	ND	16.3	1.68	1.27		
			*(A+B)/2=	ND	96	2.505	1.093	ND	ND
		2	A	ND	79.1	ND	ND		
			B	ND	96.1	ND	ND		
			*(A+B)/2=	ND	87.6	ND	ND	ND	ND
		3	A	ND	325.5	ND	ND		
			B	ND	62.6	ND	ND		
			*(A+B)/2=	ND	194.05	ND	ND	ND	NA
3	2	1	A	ND	19.1	5.04	2.24		
			B	ND	97	3.3	213		
			*(A+B)/2=	ND	58.05	4.17	107.62	ND	ND
		2	A	ND	ND	ND	1.16		
			B	ND	ND	ND	0.805		
			*(A+B)/2=	ND	ND	ND	0.9825	ND	ND
		3	A	ND	ND	ND	ND		
			B	ND	ND	ND	ND		
			*(A+B)/2=	ND	ND	ND	ND	ND	NA

NA = Not Analyzed
ND = Not Detected - See Table 20 for detection limits

Table 69. Wiggins Soil Treatment Unit - PCP in soil (ppm)

CELL	SUBCELL	ZONE	DUPLICATE	10/26/87	11/13/87	2/26/88	5/10/88	6/15/89	8/11/89
4	1	1	A	100.2	302.6	190	72.8		
			B	54.3	367.6	133	96.4		
			*(A+B)/2=	77.25	335.1	161.5	84.6	1500	537
		2	A	858	68.1	2.24	2.39		
			B	699.2	26.4	1.18	1.53		
			*(A+B)/2=	778.6	47.25	1.71	1.96	4.75	1510
		3	A	19.1	417.3	3.58	ND		
			B	17.6	1225.7	2.52	0.964		
			*(A+B)/2=	18.35	821.5	3.05	0.482	ND	NA
4	2	1	A	6006.8	156.6	5170	509		
			B	2111.4	174.9	117	1070		
			*(A+B)/2=	4059.1	165.75	2643.5	789.5	ND	118
		2	A	11.9	6.1	8.14	80.4		
			B	16.9	ND	5.56	567		
			*(A+B)/2=	14.4	3.05	6.85	323.7	ND	4.3
		3	A	2104.1	ND	3.34	94.7		
			B	37.7	ND	2.39	376		
			*(A+B)/2=	1070.9	ND	2.865	235.35	ND	NA
5	1	1	A	ND	179.9	18.5	67.4		
			B	24.1	110.9	10.9	126		
			*(A+B)/2=	12.05	145.4	14.7	96.7	24.4	39.1
		2	A	ND	7.9	ND	3.33		
			B	ND	5.7	ND	2.87		
			*(A+B)/2=	ND	6.8	ND	3.1	ND	97.6
		3	A	ND	ND	ND	7.26		
			B	ND	ND	ND	5.58		
			*(A+B)/2=	ND	ND	ND	6.42	ND	NA
5	2	1	A	64	497.7	503	1070		
			B	71.4	671.8	545	568		
			*(A+B)/2=	67.7	584.75	524	819	ND	54.9
		2	A	24.2	17.5	42	0.404		
			B	16.9	42.3	21.6	0.171		
			*(A+B)/2=	20.55	29.9	31.8	0.2875	ND	2.78
		3	A	43.4	3.8	89.2	ND		
			B	18.8	1.4	97.2	ND		
			*(A+B)/2=	31.1	2.6	93.2	ND	ND	NA
6	1	1	A	11	406.1	45.9	13.9		
			B	43.7	1229.8	10.7	12.7		
			*(A+B)/2=	27.35	817.95	28.3	13.3	ND	6.1
		2	A	ND	1101.1	ND	ND		
			B	ND	68.4	ND	ND		
			*(A+B)/2=	ND	584.75	ND	ND	4.74	2.8
		3	A	ND	15.6	ND	ND		
			B	ND	12.9	ND	ND		
			*(A+B)/2=	ND	14.25	ND	ND	ND	NA
6	2	1	A	114	13.9	38.3	125		
			B	142.3	53.4	92.3	114		
			*(A+B)/2=	128.15	33.65	65.3	119.5	ND	4.6
		2	A	475	3.8	26.6	ND		
			B	846.5	3.7	10.9	ND		
			*(A+B)/2=	660.75	3.75	18.75	ND	ND	ND
		3	A	ND	ND	5	ND		
			B	ND	ND	4.68	ND		
			*(A+B)/2=	ND	ND	4.84	ND	ND	NA

NA = Not Analyzed
ND = Not Detected - See Table 20 for detection limits

Table 69. Higgins Soil Treatment Unit - PCP in soil (ppm)

CELL	SUBCELL	ZONE	DUPLICATE	10/26/87	11/13/87	2/26/88	5/10/88	6/15/89	8/11/89
7	1	1	A	ND	37	72.5	4.86		
			B	ND	41.6	68.3	3.48		
			*(A+B)/2=	ND	39.3	70.4	4.17	ND	2.8
		2	A	ND	32.1	ND	ND		
			B	ND	40.8	ND	ND		
			*(A+B)/2=	ND	36.45	ND	ND	ND	120
		3	A	ND	2.25	ND	ND		
			B	ND	1.59	ND	ND		
			*(A+B)/2=	ND	1.92	ND	ND	ND	NA
7	2	1	A	ND	68.8	9.78	23.3		
			B	ND	62.8	20.5	14.7		
			*(A+B)/2=	ND	65.8	15.14	19	1.88	3.5
		2	A	ND	7.42	1.3	ND		
			B	ND	4.78	1.54	ND		
			*(A+B)/2=	ND	6.1	1.42	ND	ND	3
		3	A	ND	2.09	1.28	ND		
			B	ND	2.25	1.39	ND		
			*(A+B)/2=	ND	2.17	1.335	ND	27.1	NA
8	1	1	A	ND	2.93	1.18	ND		
			B	ND	2.35	1.05	ND		
			*(A+B)/2=	ND	2.64	1.115	ND	4	ND
		2	A	ND	ND	0.829	1.76		
			B	ND	ND	1.04	1.72		
			*(A+B)/2=	ND	ND	0.9345	1.74	1.43	ND
		3	A	ND	ND	ND	1.93		
			B	ND	ND	ND	9.64		
			*(A+B)/2=	ND	ND	ND	5.785	134	NA
8	2	1	A	ND	2.19	ND	ND		
			B	ND	2.22	ND	ND		
			*(A+B)/2=	ND	2.205	ND	ND	3.9	ND
		2	A	ND	ND	ND	ND		
			B	ND	ND	ND	ND		
			*(A+B)/2=	ND	ND	ND	ND	ND	ND
		3	A	ND	ND	ND	2.82		
			B	ND	ND	ND	5.72		
			*(A+B)/2=	ND	ND	ND	4.27	ND	NA
9	1	1	A	25.3	65.3	34.9	28.5		
			B	32.8	80.2	50.2	32.8		
			*(A+B)/2=	29.05	72.75	42.55	30.65	ND	NA
		2	A	201.5	18.7	5.73	6.33		
			B	8.9	11.7	12.2	4.15		
			*(A+B)/2=	105.2	15.2	8.965	5.24	ND	NA
		3	A	ND	4.64	2.65	ND		
			B	9.6	3.6	5.93	ND		
			*(A+B)/2=	4.8	4.12	4.29	ND	ND	NA
9	2	1	A	101.1	53.6	44.7	14		
			B	4642	60.2	43.9	17.6		
			*(A+B)/2=	2371.55	56.9	44.3	15.8	ND	NA
		2	A	406.2	5.77	1.65	ND		
			B	212.2	3.88	1.43	ND		
			*(A+B)/2=	309.2	4.825	1.54	ND	7.46	NA
		3	A	28.9	2.57	44.7	8.9		
			B	44.1	1.78	1.22	6.41		
			*(A+B)/2=	36.5	2.175	22.96	7.655	46.5	NA

NA = Not Analyzed
ND = Not Detected - See Table 20 for detection limits

Table 70. Wiggins Soil Treatment Unit - OCDD in soil (ppm)

CELL	SUBCELL	ZONE	DUPLICATE	10/26/87	11/13/87	2/26/88	5/10/88	6/15/89	8/11/89
1	1	1	A	ND	0.37	0.27	0.65	ND	ND
			B	ND	0.49	ND	0.72	ND	ND
			*(A+B)/2=	ND	0.43	0.14	0.69	ND	0.49
		2	A	ND	ND	ND	0.60	ND	ND
			B	ND	ND	ND	0.46	ND	ND
			*(A+B)/2=	ND	ND	ND	0.53	ND	0.10
		3	A	ND	ND	ND	0.55	ND	ND
			B	ND	ND	ND	0.56	ND	ND
			*(A+B)/2=	ND	ND	ND	0.56	ND	ND
1	2	1	A	ND	0.28	0.49	2.89	ND	ND
			B	ND	0.63	0.40	3.00	ND	ND
			*(A+B)/2=	ND	0.46	0.45	2.95	ND	0.34
		2	A	ND	ND	0.01	0.18	ND	ND
			B	ND	ND	ND	0.13	ND	ND
			*(A+B)/2=	ND	ND	0.01	0.16	ND	0.31
		3	A	ND	ND	ND	0.13	ND	ND
			B	ND	ND	0.35	0.13	ND	ND
			*(A+B)/2=	ND	ND	0.18	0.13	ND	ND
2	1	1	A	ND	ND	ND	0.31	ND	ND
			B	ND	ND	ND	0.40	ND	ND
			*(A+B)/2=	ND	ND	ND	0.36	ND	0.16
		2	A	ND	ND	ND	ND	ND	ND
			B	ND	ND	ND	ND	ND	ND
			*(A+B)/2=	ND	ND	ND	ND	ND	0.07
		3	A	ND	ND	ND	ND	ND	ND
			B	ND	ND	ND	ND	ND	ND
			*(A+B)/2=	ND	ND	ND	ND	ND	ND
2	2	1	A	ND	ND	ND	0.73	ND	ND
			B	ND	ND	ND	0.67	ND	ND
			*(A+B)/2=	ND	ND	ND	0.70	ND	0.26
		2	A	ND	ND	ND	ND	ND	ND
			B	ND	ND	ND	ND	ND	ND
			*(A+B)/2=	ND	ND	ND	ND	ND	0.05
		3	A	ND	ND	ND	ND	ND	ND
			B	ND	ND	ND	ND	ND	ND
			*(A+B)/2=	ND	ND	ND	ND	ND	ND
3	1	1	A	ND	0.05	ND	ND	ND	ND
			B	ND	0.06	ND	ND	ND	ND
			*(A+B)/2=	ND	0.06	ND	ND	ND	0.04
		2	A	ND	ND	ND	ND	ND	ND
			B	ND	ND	ND	ND	ND	ND
			*(A+B)/2=	ND	ND	ND	ND	ND	ND
		3	A	ND	0.16	ND	ND	ND	ND
			B	ND	0.08	ND	ND	ND	ND
			*(A+B)/2=	ND	0.12	ND	ND	ND	ND
3	2	1	A	ND	ND	ND	ND	ND	ND
			B	ND	ND	ND	0.33	ND	ND
			*(A+B)/2=	ND	ND	ND	0.17	ND	ND
		2	A	ND	ND	ND	ND	ND	ND
			B	ND	ND	ND	ND	ND	ND
			*(A+B)/2=	ND	ND	ND	ND	ND	ND
		3	A	ND	1.00	ND	ND	ND	ND
			B	ND	1.95	ND	ND	ND	ND
			*(A+B)/2=	ND	1.48	ND	ND	ND	ND

ND = Not Detected - See Table 20 for detection limits

Table 70. Wiggins Soil Treatment Unit - OCDD in soil (ppm)

CELL	SUBCELL	ZONE	DUPLICATE	10/26/87	11/13/87	2/26/88	5/10/88	6/15/89	8/11/89
4	1	1	A	ND	0.50	ND	1.50	ND	ND
			B	ND	0.31	ND	1.44	ND	ND
			*(A+B)/2=	ND	0.41	ND	1.47	1.17	3.18
		2	A	ND	ND	ND	ND	ND	ND
			B	ND	ND	ND	ND	ND	ND
			*(A+B)/2=	ND	ND	ND	ND	ND	1.64
		3	A	ND	0.18	ND	ND	ND	ND
			B	ND	0.18	ND	ND	ND	ND
			*(A+B)/2=	ND	0.18	ND	ND	ND	ND
4	2	1	A	ND	ND	ND	1.93	ND	ND
			B	ND	ND	ND	1.91	ND	ND
			*(A+B)/2=	ND	ND	ND	1.92	ND	0.47
		2	A	ND	ND	ND	0.07	ND	ND
			B	ND	ND	ND	0.53	ND	ND
			*(A+B)/2=	ND	ND	ND	0.30	ND	0.04
		3	A	ND	ND	ND	0.12	ND	ND
			B	ND	ND	ND	0.39	ND	ND
			*(A+B)/2=	ND	ND	ND	0.26	ND	ND
5	1	1	A	ND	ND	0.08	0.37	ND	ND
			B	ND	ND	0.06	0.34	ND	ND
			*(A+B)/2=	ND	ND	0.07	0.36	ND	0.17
		2	A	ND	ND	ND	ND	ND	ND
			B	ND	ND	ND	ND	ND	ND
			*(A+B)/2=	ND	ND	ND	ND	ND	1.12
		3	A	ND	ND	ND	ND	ND	ND
			B	ND	ND	ND	ND	ND	ND
			*(A+B)/2=	ND	ND	ND	ND	ND	ND
5	2	1	A	0.07	0.55	0.26	0.87	ND	ND
			B	0.09	0.59	0.41	0.93	ND	ND
			*(A+B)/2=	0.08	0.57	0.34	0.90	ND	0.09
		2	A	0.04	ND	0.20	ND	ND	ND
			B	0.04	ND	0.10	ND	ND	ND
			*(A+B)/2=	0.04	ND	0.15	ND	ND	ND
		3	A	ND	ND	0.21	ND	ND	ND
			B	ND	ND	0.31	ND	ND	ND
			*(A+B)/2=	ND	ND	0.26	ND	ND	ND
6	1	1	A	ND	0.31	0.15	0.04	ND	ND
			B	ND	0.31	ND	0.04	ND	ND
			*(A+B)/2=	ND	0.31	0.08	0.04	ND	0.09
		2	A	ND	0.43	ND	ND	ND	ND
			B	ND	0.12	ND	ND	ND	ND
			*(A+B)/2=	ND	0.28	ND	ND	ND	0.08
		3	A	ND	ND	ND	ND	ND	ND
			B	ND	ND	ND	ND	ND	ND
			*(A+B)/2=	ND	ND	ND	ND	ND	ND
6	2	1	A	0.16	ND	0.07	0.55	ND	ND
			B	0.13	ND	0.15	0.53	ND	ND
			*(A+B)/2=	0.15	ND	0.11	0.54	ND	0.05
		2	A	0.07	ND	0.06	ND	ND	ND
			B	1.09	ND	0.05	ND	ND	ND
			*(A+B)/2=	0.58	ND	0.06	ND	ND	ND
		3	A	ND	ND	ND	ND	ND	ND
			B	ND	ND	ND	ND	ND	ND
			*(A+B)/2=	ND	ND	ND	ND	ND	ND

ND = Not Detected - See Table 20 for detection limits

Table 70. Wiggins Soil Treatment Unit - OCDD in soil (ppm)

CELL	SUBCELL	ZONE	DUPLICATE	10/26/87	11/13/87	2/26/88	5/10/88	6/15/89	8/11/89
7	1	1	A	ND	0.07	0.08	0.12	ND	ND
			B	ND	0.05	0.09	0.11	ND	ND
			*(A+B)/2=	ND	0.06	0.09	0.12	ND	0.33
		2	A	ND	0.08	ND	ND	ND	ND
			B	ND	0.11	ND	ND	ND	ND
			*(A+B)/2=	ND	0.10	ND	ND	ND	0.22
		3	A	ND	ND	ND	ND	ND	ND
			B	ND	ND	ND	ND	ND	ND
			*(A+B)/2=	ND	ND	ND	ND	ND	ND
7	2	1	A	ND	0.09	0.09	0.06	ND	ND
			B	ND	0.08	0.14	0.10	ND	ND
			*(A+B)/2=	ND	0.09	0.12	0.08	ND	0.09
		2	A	ND	0.06	0.02	ND	ND	ND
			B	ND	0.04	0.03	ND	ND	ND
			*(A+B)/2=	ND	0.05	0.03	ND	ND	ND
		3	A	ND	ND	ND	ND	ND	ND
			B	ND	ND	ND	ND	ND	ND
			*(A+B)/2=	ND	ND	ND	ND	ND	ND
8	1	1	A	ND	ND	ND	0.22	ND	ND
			B	ND	ND	ND	0.61	ND	ND
			*(A+B)/2=	ND	ND	ND	0.42	ND	0.08
		2	A	ND	ND	ND	ND	ND	ND
			B	ND	ND	ND	ND	ND	ND
			*(A+B)/2=	ND	ND	ND	ND	ND	ND
		3	A	ND	ND	ND	ND	ND	ND
			B	ND	ND	ND	ND	ND	ND
			*(A+B)/2=	ND	ND	ND	ND	0.73	ND
8	2	1	A	ND	ND	ND	ND	ND	ND
			B	ND	ND	ND	ND	ND	ND
			*(A+B)/2=	ND	ND	ND	ND	ND	ND
		2	A	ND	ND	ND	ND	ND	ND
			B	ND	ND	ND	ND	ND	ND
			*(A+B)/2=	ND	ND	ND	ND	ND	ND
		3	A	ND	ND	ND	ND	ND	ND
			B	ND	ND	ND	ND	ND	ND
			*(A+B)/2=	ND	ND	ND	ND	ND	ND
9	1	1	A	ND	0.64	0.26	0.33	ND	ND
			B	ND	0.34	0.42	0.27	ND	ND
			*(A+B)/2=	ND	0.49	0.34	0.30	ND	0.61
		2	A	ND	ND	0.15	ND	ND	ND
			B	ND	ND	ND	ND	ND	ND
			*(A+B)/2=	ND	ND	0.08	ND	ND	ND
		3	A	ND	ND	ND	ND	ND	ND
			B	ND	ND	0.12	ND	ND	ND
			*(A+B)/2=	ND	ND	0.06	ND	ND	ND
9	2	1	A	0.18	0.65	1.61	0.71	ND	ND
			B	1.72	0.65	1.35	0.69	ND	ND
			*(A+B)/2=	0.95	0.65	1.48	0.70	ND	0.13
		2	A	0.28	ND	ND	ND	ND	ND
			B	0.18	ND	ND	ND	ND	ND
			*(A+B)/2=	0.23	ND	ND	ND	0.38	ND
		3	A	0.08	ND	0.12	ND	ND	ND
			B	0.10	ND	ND	ND	ND	ND
			*(A+B)/2=	0.09	ND	0.06	ND	ND	ND

ND = Not Detected - See Table 20 for detection limits

Table 71. Wagging Soil Treatment Unit - Polycyclic aromatic hydrocarbons and pentachlorophenol in zone of incorporation soil (ppb)

CELL	SUBCELL	NAPH	2-MET	1-MET	BIPH	ACNAP	ACNE	DIBEN	FLORE	PHEN	ANTHR	CARBA	FLUOR	PYRENE	1,2-BZ	CHRYS	DBA-a	BghI	PCP	2 RING	3 RING	4 RING	5 RING	TOTALPAH
7/13/89																								
1	1	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	92.0	44.0	20.0	ND	3.9	ND	ND	136.0	20.0	156.0
1	2	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	58.0	124.0	69.0	73.0	32.0	ND	17.8	ND	ND	344.0	32.0	376.0
2	1	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	2.6	ND	ND	ND	ND	ND
2	2	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	39.5	ND	ND	ND	ND	ND
3	1	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	39.1	ND	ND	ND	ND	ND
3	2	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
4	1	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	25.0	48.0	37.0	20.0	ND	111.0	ND	ND	110.0	20.0	130.0
4	2	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	163.0	168.0	94.0	73.0	24.0	ND	36.9	ND	ND	498.0	24.0	522.0
5	1	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	29.4	ND	ND	ND	ND	ND
5	2	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	4.4	ND	ND	ND	ND	ND
6	1	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	2.6	ND	ND	ND	ND	ND
6	2	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
7	1	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	71.8	ND	ND	ND	ND	ND
7	2	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	8.4	ND	ND	ND	ND	ND
8	1	ND	ND	ND	ND	ND	ND	ND	ND	27.0	7.0	ND	ND	ND	ND	ND	ND	ND	ND	ND	34.0	ND	ND	34.0
8	2	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
9	1	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	34.0	ND	33.0	ND	2.0	ND	ND	34.0	33.0	67.0
9	2	ND	ND	ND	ND	ND	ND	ND	ND	3.0	48.0	ND	491.0	347.0	148.0	126.0	12.0	ND	48.5	ND	51.0	1112.0	12.0	1175.0
8/11/89																								
1	1	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	14.0	16.0	48.0	29.0	30.0	ND	4.7	ND	ND	107.0	30.0	137.0
1	2	ND	ND	ND	ND	ND	ND	ND	ND	ND	3.0	ND	107.0	144.0	65.0	54.0	27.0	ND	25.9	ND	3.0	370.0	27.0	400.0
2	1	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	7.0	ND	ND	ND	ND	60.0	ND	ND	7.0	ND	7.0
2	2	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	21.4	ND	ND	ND	ND	ND
3	1	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
3	2	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	3.8	ND	ND	ND	ND	ND
4	1	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	8.0	12.0	24.0	14.0	17.0	ND	14.4	ND	ND	59.0	17.0	76.0
4	2	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	14.0	35.0	38.0	32.0	24.0	10.0	28.7	ND	ND	119.0	34.0	153.0
5	1	ND	ND	ND	ND	ND	ND	ND	ND	11.0	ND	ND	35.0	28.0	6.0	13.0	ND	ND	13.0	ND	11.0	80.0	ND	91.0
5	2	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	51.9	ND	ND	ND	ND	ND
6	1	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	4.0	ND	ND	ND	ND	ND
6	2	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	108.0	ND	ND	ND	ND	ND
7	1	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	44.0	49.0	45.0	37.0	22.0	10.0	9.7	ND	ND	175.0	32.0	207.0
7	2	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	6.0	ND	ND	9.0	ND	2.2	ND	ND	6.0	9.0	15.0
8	1	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
8	2	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
9	1	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	6.0	ND	ND	ND	ND	89.1	ND	ND	6.0	ND	6.0
9	2	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	7.0	ND	ND	ND	ND	23.1	ND	ND	7.0	ND	7.0
9/8/89																								
1	1	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	13.0	6.0	53.0	17.0	29.0	18.0	2.4	ND	ND	89.0	47.0	136.0
1	2	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	21.0	31.0	34.0	18.0	18.0	ND	6.9	ND	ND	104.0	18.0	122.0
2	1	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	5.0	ND	ND	ND	ND	ND	4.0	ND	ND	5.0	ND	5.0
2	2	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	6.5	ND	ND	ND	ND	ND
3	1	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
3	2	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
4	1	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	16.0	33.0	44.0	25.0	27.0	12.0	43.3	ND	ND	120.0	39.0	159.0
4	2	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	7.0	8.0	28.0	11.0	19.0	ND	77.8	ND	ND	54.0	19.0	73.0
5	1	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	54.8	ND	ND	ND	ND	ND
5	2	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	14.2	ND	ND	ND	ND	ND
6	1	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	80.7	ND	ND	ND	ND	ND
6	2	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	1.2	ND	ND	ND	ND	ND
7	1	ND	ND	ND	ND	ND	ND	ND	ND	ND	5.0	ND	58.0	107.0	58.0	53.0	29.0	ND	39.4	ND	5.0	274.0	29.0	308.0
7	2	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	12.0	10.0	27.0	11.0	15.0	ND	4.1	ND	ND	60.0	15.0	75.0
8	1	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	0.6	ND	ND	ND	ND	ND
8	2	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	0.3	ND	ND	ND	ND	ND
9	1	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	13.0	ND	ND	ND	ND	ND
9	2	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	4.0	ND	ND	ND	ND	ND
10/27/89																								
1	1	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	52.0	ND	26.0	ND	4.5	ND	ND	52.0	26.0	78.0
1	2	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	9.0	17.0	37.0	ND	29.0	ND	6.2	ND	ND	63.0	29.0	92.0
2	1	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	2.5	ND	ND	ND	ND	ND
2	2	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	21.9	ND	ND	ND	ND	ND
3	1	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
3	2	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
4	1	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	34.0	ND	17.0	ND	281.0	ND	ND	34.0	17.0	51.0
4	2	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	18.0	48.0	28.0	ND	ND	ND	56.1	ND	ND	94.0	ND	94.0
5	1	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	4.9	ND	ND	ND	ND	ND
5	2	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	1.7	ND	ND	ND	ND	ND
6	1	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	23.8	ND	ND	ND	ND	ND
6	2	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	5.8	ND	ND	ND	ND	ND
7	1	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	15.0	ND	ND	ND	2.1	ND	ND	15.0	ND	15.0
7	2	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	48.0	64.0	35.0	26.0	13.0	ND	30.3	ND	ND	173.0	13.0	186.0
8	1	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
8	2	ND	ND	ND	ND	5.0	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	5.0	ND	ND	5.0
9	1	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	4.0	ND	ND	ND	ND	ND
9	2	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	1.3	ND	ND	ND	ND	ND

ND = Not Detected - See Table 20 for detection limits

Table 71. Wiggins Soil Treatment Unit - Polycyclic aromatic hydrocarbons and pentachlorophenol in zone of incorporation soil (ppb)

CELL	NAPH	2-MET	1-MET	BIPH	ACTHY	ACTHE	DIBEN	FLORE	PHEN	ANTHR	CARBA	FLUOR	PYRENE	1,2-BZ	CHRYS	BEN-a	BzFl	PCP	2 RING	3 RING	4 RING	5 RING	TOTALPAH
7/29/88																							
1	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	39.0	60.0	24.0	ND	ND	ND	8.2	ND	ND	123.0	ND	123.0
2	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	6.0	ND	ND	ND	ND	19.0	ND	ND	6.0	ND	ND
3	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
4	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	46.0	50.0	24.0	22.0	ND	ND	49.6	ND	ND	142.0	ND	142.0
5	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	19.9	ND	ND	ND	ND	ND
6	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	17.5	ND	ND	ND	ND	ND
7	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
8	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
9	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
10/7/88																							
1	ND	ND	ND	ND	ND	ND	ND	ND	4.0	10.0	ND	116.0	144.0	67.0	78.0	34.0	ND	17.7	ND	14.0	427.0	34.0	475.0
2	ND	ND	ND	ND	ND	ND	ND	ND	11.0	5.0	ND	27.0	25.0	ND	6.0	ND	ND	273.0	ND	16.0	58.0	ND	74.0
3	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	1.7	ND	ND	ND	ND	ND
4	ND	ND	ND	ND	ND	ND	ND	7.0	33.0	49.0	ND	357.0	313.0	113.0	95.0	50.0	ND	63.0	ND	69.0	878.0	50.0	1017.0
5	ND	ND	ND	4.0	ND	ND	ND	ND	ND	ND	ND	25.0	22.0	ND	ND	ND	ND	480.0	4.0	ND	47.0	ND	51.0
6	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	42.1	ND	ND	ND	ND	ND
7	ND	ND	ND	ND	ND	37.0	7.0	54.0	146.0	111.0	ND	594.0	383.0	131.0	114.0	44.0	11.0	46.2	ND	355.0	1222.0	55.0	1632.0
8	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	6.0	6.0	ND	ND	ND	ND	45.5	ND	ND	14.0	ND	14.0
9	ND	ND	ND	2.0	4.0	ND	ND	ND	ND	ND	ND	37.0	29.0	8.0	7.0	ND	ND	260.0	2.0	4.0	81.0	ND	87.0

U.S. Environmental Protection Agency
Region 5, Library (PL-12J)
77 West Jackson Boulevard, 12th Floor
Chicago, IL 60604-3590

☆U.S. GOVERNMENT PRINTING OFFICE: 1991-548-187/25635