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Administration
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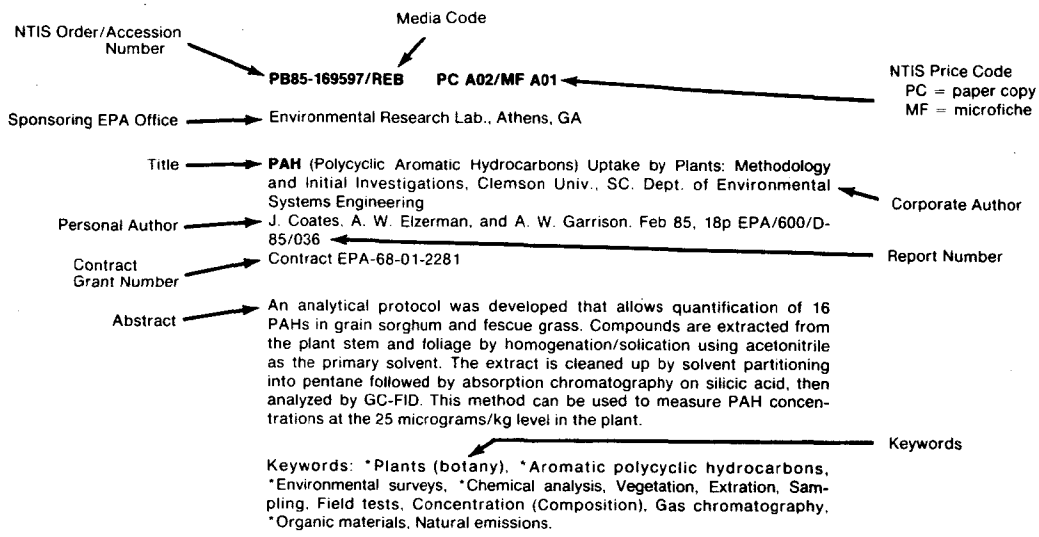

Index entries are arranged alphanumerically. Titles are included in all indexes except Contract/Grant Number Index. Sample entries for each index follow:

Title: Reports are listed alphabetically by title; **A, An,** and **The** at the beginning of a title are ignored in alphabetizing.	**PAH (Polycyclic Aromatic Hydrocarbons)** Uptake by Plants: Methodology and Initial Investigations **PB85-169597/REB PC** A02/**MF** A01
Keyword: Entries are sequenced by major subject term, second paired term, and NTIS order number.	**Plants (Botany)** PAH (Polycyclic Aromatic Hydrocarbons) Uptake by Plants: Methodology and Initial Investigations **PB85-169597/REB PC** A02/**MF** A01
Sponsoring EPA Office: Publications are sorted alphabetically by title under the sponsoring EPA office. The EPA office is listed alphabetically beginning with the major EPA Headquarters Office. Laboratories and Divisions are listed alphabetically within the appropriate office.	**Environmental Research Lab., Athens, GA** EPA/600/D-85/036 PAH (Polycyclic Aromatic Hydrocarbons) Uptake by Plants: Methodology and Initial Investigations **PB85-169597/REB PC** A02/**MF** A01
Corporate Author: Entries are sequenced by corporate author name, report number, and NTIS order number. The monitor agency number is given following the report title.	**Clemson Univ., SC, Dept.of Environmental Systems Engineering** EPA/600/D-85/036 PAH (Polycyclic Aromatic Hydrocarbons) Uptake by Plants: Methodology and Initial Investigations EPA/600/D-85/036 **PB85-169597/REB PC** A02/**MF** A01
Personal Author: Entries are sequenced by personal author, report title, and NTIS order number.	**J. Coates, A. W. Elzerman and A. W. Garrison** PAH (Polycyclic Aromatic Hydrocarbons) Uptake by Plants: Methodology **PB85-169597/REB PC** A02/**MF** A01
Contract/Grant Number: Entries are sequenced by contract or grant number, corporate author, and NTIS order number.	**EPA-68-01-2281** Clemson Univ., SC, Dept. of Environmental Systems Engineering **PB85-169597/REB PC** A02/**MF** A01
NTIS Order/Report Number: Entries are sequenced by NTIS order, report, or monitor agency number.	**EPA/600/D-85/036** PAH (Polycyclic Aromatic Hydrocarbons) Uptake by Plants: Methodology **PB85-169597/REB PC** A02/**MF** A01

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SAMPLE ENTRY

NTIS Order Number/Media Code Price Codes	**PB85-169597/REB PC A02/MF A01**
Report Title	PAH (Poly Cyclic Aromatic Hyrdocarbons) Uptake by Plants: Methodology and Initial Investigations
Corporate Author	Clemson Univ., SC, Dept. of Environmental Systems Engineering
Personal Authors	COATHES J., ELZERMAN A. W. and GARRISON A. W.
Date	February 85
Pages	18p
Report Number	EPA/600/D-85/036
Contract Number	EPA-68-01-2281
Abstract	An analytical protocol was developed that allows quantification of 16 PAHs in grain sorghum and fescue grass. Compounds are extracted from the plant stem and foliage by homogenation/solication using acetonitrile as the primary solvent. The extract is cleaned up by solvent partitioning into pentane followed by absorption chromatography on silicic acid, then analyzed by GC-FID. This method can be used to measure PAH concentrations at the 25 micrograms/kg level in the plant.
Keywords (Descriptors & Identifiers)	*Plants (botany, *Aromatic polycyclic hydrocarbons, Environmental surveys, *Chemical analysis, Vegetation, Extration, Sampling, Field tests, Concentration (Composition), Gas chromatography, *Organic materials, Natural emissions.

EPA PUBLICATIONS BIBLIOGRAPHY
Quarterly Abstract Bulletin

PB90-274549/REB PC **A04**/MF **A01**
Robert S. Kerr Environmental Research Lab., Ada, OK.
Basics of Pump-and-Treat Ground-Water Remediation Technology. Special rept.
GeoTrans, Inc., Herndon, VA.
J. W. Mercer, D. C. Skipp, and D. Giffin. Mar 90, 65p*
EPA/600/8-90/003
Contract EPA-68-C8-0058
Sponsored by Robert S. Kerr Environmental Research Lab., Ada, OK.

The pump-and-treat process, whereby contaminated ground water is pumped to the surface for treatment, is one of the most common ground-water remediation technologies used at hazardous waste sites. However, recent research has identified complex chemical and physical interactions between contaminants and the subsurface media which may impose limitations on the extraction part of the process. The report was developed to summarize the basic considerations necessary to determine when, where, and how pump-and-treat technology can be used effectively to remediate ground-water contamination.

Keywords: *Hazardous materials, *Ground water, *Waste treatment, *Water pollution control, Pumping, Sites, Chemical reactions, Extraction, Vacuum apparatus, Design criteria, Monitoring, Requirements, Density(Mass/Volume), Viscosity, Biodeterioration, Hydrocarbons, Carbon tetrachloride, Chlorobenzenes, Flow charts, Drawings, *Remedial action, Cleanup, Point sources.

PB91-100172/REB PC **A12**/MF **A02**
Development of Risk Assessment Methodology for Municipal Sludge Landfilling. Final rept.
Environmental Protection Agency, Cincinnati, OH. Environmental Criteria and Assessment Office.
Aug 89, 261p EPA/600/6-90/008

The report is one of a series of reports that present methodologies for assessing the potential risks to humans or other organisms from the disposal or reuse of municipal sludge. The sludge management practices addressed by the series include land application practices, distribution and marketing programs, landfilling, incineration and ocean disposal. In particular, the reports provide methods for evaluating potential health and environmental risks from toxic chemicals that may be present in sludge. The document addresses risks from chemicals associated with landfilling of municipal sludge. These proposed risk assessment procedures are designed as tools to assist in the development of regulations for sludge management practices. The procedures are structured to allow calculation of technical criteria for sludge disposal/reuse options based on the potential for adverse health or environmental impacts. The criteria may address management practices (such as site design or process control specifications), limits on sludge disposal rates or limits on toxic chemical concentrations in the sludge.

Keywords: *Risk assessment, *Sludge disposal, *Public health, *Waste management, *Environmental effects, *Toxic substances, Municipal wastes, Ground disposal, Earth fills, Waste disposal, Incineration, Ocean waste disposal, Pollution regulations, Waste product utilization, Chemical compounds, Concentration(Composition), Path of pollutants, Water pollution, Air pollution.

PB91-110411/REB PC **A04**/MF **A01**
Endangered Species Protection Program as It Relates to Pesticide Regulatory Activities. Report to Congress.
Environmental Protection Agency, Washington, DC. Office of Pesticides and Toxic Substances.
May 91, 63p EPA/540/09-91/120

The document addresses the amendments to the Endangered Species Act (ESA) of 1973 (16 U.S.C. 1531 et seq.). Section 1010(C) of the amended act directs the Administrator of the US, EPA to submit a report to Congress on the results of joint efforts undertaken by EPA, the United States Department of Agriculture (USDA) and the United States Department of the Interior (DOI). As described in Section 1010(b), the efforts are to identify reasonable and prudent means to implement an endangered species protection program as it relates to pesticide regulatory activities.

Keywords: *Pesticides, *Endangered species, *Environmental effects, US EPA, Pollution regulations, Environmental protection, US DOI, Resource conservation, Legal aspects, Maps, Implementation, Agricultural chemicals, Economic impacts, Habitats, *Endangered Species Act of 1973.

PB91-154583/REB PC **E99**/MF **E99**
Environmental Protection Agency, Washington, DC. Office of Policy, Planning and Evaluation.
Anticipated Pesticide Residues in Food.
Dynamac Corp., Rockville, MD.
26 Jul 89, 1213p-in 2v
Set includes PB91-154591 and PB91-154609. Sponsored by Environmental Protection Agency, Washington, DC. Office of Policy, Planning and Evaluation.

No abstract available.

PB91-154591/REB PC **A05**/MF **A01**
Environmental Protection Agency, Washington, DC. Office of Policy, Planning and Evaluation.
Anticipated Pesticide Residues in Food. Volume 1. Draft rept. (Final).
Dynamac Corp., Rockville, MD.
J. Reinert. 26 Jul 89, 99p
Contract EPA-68-01-7363
See also Volume 2, PB91-154609. Sponsored by Environmental Protection Agency, Washington, DC. Office of Policy, Planning and Evaluation.
Also available in set of 2 reports PC E99/MF E99, PB91-154583.

Pesticide residue data on raw and processed food were obtained on a voluntary basis from agencies and organizations not required to submit these data to the Office of Pesticide Programs (OPP). The project was part of a scoping exercise to compile and summarize in an electronic format available monitoring data from outside the Agency, and to begin to evaluate the usefulness of these data for scientific and regulatory purposes. Data for 286 pesticides on an estimated 49,857 samples were obtained from three sources: Agriculture Canada, state monitoring data compiled by FDA, and the National Food Processors Association.

Keywords: *Pesticide residues, *Food contamination, Monitoring, Data bases, Tables(Data), United States, Canada, Food processing, Data acquisition, Data processing, Access methods.

PB91-154609/REB PC **A99**/MF **E09**
Environmental Protection Agency, Washington, DC. Office of Policy, Planning and Evaluation.
Anticipated Pesticide Residues in Food. Volume 2. Draft rept. (Final).
Dynamac Corp., Rockville, MD.
J. Reinert. 26 Jul 89, 1114p
Contract EPA-68-01-7363
See also Volume 1, PB91-154591. Sponsored by Environmental Protection Agency, Washington, DC. Office of Policy, Planning and Evaluation.
Also available in set of 2 reports PC E99/MF E99, PB91-154583.

Pesticide residue data on raw and processed food were obtained on avoluntary basis from agencies and organizations not required to submit these data to the Office of Pesticide Programs (OPP). The project was part of a scoping exercise to compile and summarize in an electronic format available monitoring data from outside the Agency, and to begin to evaluate the usefulness of these data for scientific and regulatory purposes. Data for 286 pesticides on an estimated 49,857 samples were obtained from three sources: Agriculture Canada, state monitoring data compiled by FDA, and the National Food Processors Association. Volumes 2, 3, and 4 are tablrs generated by various sources, sorted by pesticide.

Keywords: *Pesticide residues, *Food contamination, Food processing, Tables(Data), United States, Canada.

PB91-156679/REB PC **A04**/MF **A01**
RCRA Implementation Plan, FY 1988.
Environmental Protection Agency, Washington, DC. Office of Emergency and Remedial Response.
J. W. Porter. 31 Mar 87, 62p EPA/530/SW-91/039, OSWER DIRECTIVE-9420.00-4
See also PB87-157673 and PB91-156687.Portions of this document are not fully legible.

The document provides guidance on implementing the RCRA Subtitle C program and provides a framework for determining priorities at the national and State levels. The highest priorities are to meet the 1988 and 1989 permitting deadlines, to process permit modifications, new treatment and R&D unit permits, to address environmentally significant closures and to perform inspections as mandated by statute and Agency policy.

Keywords: *State implementation plans, *Waste management, Research and development, Guidelines, Permits, Revisions, Waste treatment, Technology transfer, Pollution regulations, Inspection, Regional analysis, Grants, Law enforcement, Information management, *Resource Conservation and Recovery Act, *Office of Solid Waste and Emergency Response, National priorities list.

PB91-156687/REB PC **A06**/MF **A01**
RCRA Implementation Plan, FY 1989.
Environmental Protection Agency, Washington, DC. Office of Emergency and Remedial Response.
J. W. Porter. 5 Apr 88, 114p EPA/530/SW-91/040, OSWER DIRECTIVE-9420.00-5
See also PB91-156679.

The document provides guidance on implementing the RCRA Subtitle C program and provides a framework for determining priorities based on environmental benefits.

Keywords: *State implementation plans, *Waste management, Permits, Standards compliance, Law enforcement, Federal agencies, Grants, Information management, Technology transfer, Pollution regulations, *Resource Conservation and Recovery Act, *Office of Solid Waste and Emergency Response, National priorities list.

PB91-156695/REB PC **A05**/MF **A01**
RCRA Implementation Plan, FY 1990.
Environmental Protection Agency, Washington, DC. Office of Solid Waste and Emergency Response.
1990, 86p EPA/530/SW-91/041
See also PB91-156687.

The document outlines EPA's environmental program for FY 1990. It provides an overview of national program strategies, as well as priorities for permitting, en-

forcement, clean-up, and other activities for FY 1990. The most significant activities are included in the Strategic Planning and Management System (SPMS).

Keywords: *State implementation plans, *Hazardous materials, *Environmental surveys, Permits, Law enforcement, Remedial action, Standards compliance, Underground storage, Storage tanks, Pollution abatement, Pollution control, Waste management, Information transfer, Emergency planning, *Resource Conservation and Recovery Act, Clean-up operations, National Priorities List, Strategic Planning and Management System.

PB91-156711/REB PC **A03**/MF **A01**
Environmental Protection Agency, Research Triangle Park, NC. Office of Air Quality Planning and Standards.
Surface Impoundment Modeling System, Version 2.0. User's Manual.
Radian Corp., Research Triangle Park, NC.
S. L. Watkins. Sep 90, 37p* EPA/450/4-90/019A
Contract EPA-68-02-4378
For system on diskette, see PB91-506998. Supersedes PB90-141227. See also PB91-156729. Sponsored by Environmental Protection Agency, Research Triangle Park, NC. Office of Air Quality Planning and Standards.

Surface impoundments are used to treat, store, and dispose of wastewater generated by facilities in many different industries. Because surface impoundments are normally open to the atmosphere, the potential for air emissions of volatile organic compounds (VOC's) and toxic air pollutants exists. As such, State and local air pollution control agencies need a methodology to estimate the air emissions from surface impoundments. The Surface Impoundment Modeling System (SIMS) is a personal computer based program designed to estimate the air emissions from surface impoundments. The emission estimates are based on mass transfer models developed by the Emissions Standards Division (ESD) of the Environmental Protection Agency (EPA) during the evaluation of hazardous waste treatment, storage, and disposal facilities (TSDF's). SIMS allows the user to specify all the required inputs to these emission models when the information is available, or when only limited information is avaialble, provides default values for most of the model inputs. The manual presents a complete reference for all of the features and commands in SIMS. Another document entitled, Background Document for the SIMS, PB91-156729, discusses the emission models, surface impoundment design and operation, default parameter development, and the emission estimation procedure.

Keywords: *User manuals(Computer programs), *Air pollution, *Hazardous materials, *Surface impoundments, Volatile organic compounds, Study estimates, Information systems, Waste management, Waste disposal, Industrial waste treatment, Sewage treatment, Documentation, Water pollution control, State government, Mass transfer, Waste storage, Waste treatment, *Surface Impoundment Modeling System.

PB91-156729/REB PC **A08**/MF **A01**
Environmental Protection Agency, Research Triangle Park, NC. Office of Air Quality Planning and Standards.
Background Document for the Surface Impoundment Modeling System, Version 2.0. Documentation.
Radian Corp., Research Triangle Park, NC.
S. L. Watkins. Sep 90, 165p* EPA/450/4-90/019B
Contract EPA-68-02-4378
For system on diskette, see PB91-506998. Supersedes PB90-141235. See also PB91-156711. Sponsored by Environmental Protection Agency, Research Triangle Park, NC. Office of Air Quality Planning and Standards.

The document presents a brief description of the operation and design of surface impoundments and background information on the development of the Surface Impoundments Modeling System (SIMS). The SIMS was developed with funding from the U.S. Environmental Protection Agency's (EPA) Control Technology Center (CTC) and with project management provided by EPA's Technical Support Division of the Office of Air Quality Planning and Standards. SIMS is based on emission models developed by the Emission Standards Division (ESD) during the evaluation of surface impoundments located in treatment, storage, and disposal facilities (TSDF). The purpose of the latest update to SIMS is to add models for diffused air systems and several collection system devices, and to expand the compound database from 40 to 150. The technical document discusses these emission models, surface impoundment design and operation, default parameter development, and the emission estimation procedure. Another document entitled, SIMS Version 2.0 User's Manual, PB91-156711, presents a complete reference for all features and commands in the SIMS PC program.

Keywords: *Air pollution, *Hazardous materials, *Surface impoundments, Volatile organic compounds, Documentation, Study estimates, Waste management, Waste disposal, Waste treatment, Waste storage, Industrial waste treatment, Water pollution control, Sewage treatment, State government, Mass transfer, *Surface Impoundment Modeling System.

PB91-156794/REB PC **A02**/MF **A01**
Control of PCDD/PCDF Emissions from Municipal Waste Combustion Systems (Reannouncement).
Journal article Sep-Nov 89.
Environmental Protection Agency, Research Triangle Park, NC. Air and Energy Engineering Research Lab.
T. G. Brna, and J. D. Kilgroe. c1990, 10p EPA/600/J-90/310
Previously announced as PB91-146639. Pub. in Chemosphere, v20 n10-12 p1875-1882 1990.

The article gives results of tests on five modern municipal waste combustors (MWCs) to characterize or determine the performance of representative combustor types and associated air emission control systems in the regulatory development process. Test results for uncontrolled (combustor outlet) and controlled (flue gas cleaning system outlet) polychlorinated dibenzo-p-dioxins (PCDDs) and dibenzofurans (PCDFs) are reported, along with pertinent information on other tests. The EPA is revising air pollutant emission rules for new MWCs and preparing guidelines for existing MWCs. These rules will limit emissions of PCDDs, PCDFs, CO2, and acid gases (HCl and SO2) as well as require tighter control of particulate matter emissions.

Keywords: *Air pollution control, *Incinerators, Municipal wastes, Waste disposal, Performance evaluation, Flue gases, Particles, Pollution regulations, Air pollution standards, Reprints, *Polychlorinated dibenzodioxins, *Polychlorinated dibenzofurans.

PB91-156802/REB PC **A03**/MF **A01**
Environmental Protection Agency, Research Triangle Park, NC. Air and Energy Engineering Research Lab.
Effect of Metal Catalysts on the Formation of Polychlorinated Dibenzo-p-Dioxin and Polychlorinated Dibenzofuran Precursors (Reannouncement).
Journal article Oct 88-Oct 89.
Acurex Corp., Research Triangle Park, NC.
B. K. Gullett, K. R. Bruce, and L. O. Beach. c1990, 11p EPA/600/J-90/309
Contract EPA-68-02-4701
Previously announced as PB91-146647. Pub. in Chemosphere, v20 n10-12 p1945-1952 1990. Sponsored by Environmental Protection Agency, Research Triangle Park, NC. Air and Energy Engineering Research Lab.

The paper gives results of an examination of the catalytic effects of copper and iron compounds for their behavior in promoting formation of chlorine (Cl2), the major chlorinating agent of polychlorinated dibenzo-p-dioxins (PCDDs) and polychlorinated dibenzofurans (PCDFs), in an environment simulating that of municipal waste fly ash. Cl2 formed as a result of a metal-catalyzed reaction of HCl with O2. Catalytic activity was greatest at a temperature of about 400 C, supporting a theory of de novo synthesis of PCDDs and PCDFs on fly ash particles downstream of waste combustion.

Keywords: *Catalysis, *Fly ash, *Chlorine, *Synthesis(Chemistry), *Air pollution control, Metals, Municipal wastes, Waste disposal, Copper compounds, Experimental design, Toxic substances, Reprints, *Polychlorinated dibenzodioxins, *Polychlorinated dibenzofurans, Chemical reaction mechanisms.

PB91-162396/REB PC **A03**/MF **A01**
Minimization of Combustion By-Products: Characteristics of Hazardous Waste.
Environmental Protection Agency, Cincinnati, OH. Risk Reduction Engineering Lab.
C. C. Lee, and G. L. Huffman. Nov 90, 25p EPA/600/D-90/224
Presented at the National Research and Development Conference on the Control of Hazardous Materials, Anaheim, CA., February 20-22, 1991.

It has been well recognized that, although there are many potential solid waste treatment technologies, none are as universally applicable as incineration for the treatment of the many types of waste which are governed by the many different Federal laws and State regulations. However, incinerators may release trace amounts of unwanted combustion by-products, particularly if the incinerators are not well designed or properly operated. Control of emissions of combustion by-products (CBPs) is one of the major technical and sociological issues surrounding the implementation of incineration as a waste treatment alternative. Much of this is due to the lack of detailed knowledge about CBPs. The Clean Air Act Amendment is emphasizing the control of toxic air pollutants from all combustion sources; some of these pollutants are CBPs. CBPs include: (1) unburned principal organic hazardous constituents (POHCs); (2) products of incomplete combustion (PICs); (3) metals emissions; and (4) residuals/ashes. The Paper is a part of a series of writings on the subject of the CBP issue from EPA's Risk Reduction Engineering Laboratory in Cincinnati, Ohio. It specifically addresses the aspect of hazardous waste characteristics. The main objective of the series is to compare combustion by-products from all combustion sources including fossil fuel combustion and waste incineration, which hopefully will serve as an initial step in the eventual minimization of the release of CBPs to the environment.

Keywords: *Incinerators, *Refuse disposal, *Waste treatment, Air pollution, Waste disposal, Combustion products, Atmosphere contamination control, Ashes.

PB91-162586/REB PC **A02**/MF **A01**
Mutagenicity, Carcinogenicity, and Human Cancer Risk from Indoor Exposure to Coal and Wood Combustion in Xuan Wei, China. Journal article.
Health Effects Research Lab., Research Triangle Park, NC.
J. L. Mumford, R. S. Chapman, S. Nesnow, C. T. Helmes, and X. Li. c1990, 9p EPA/600/D-90/244
Pub. in Genetic Toxicology of Complex Mixtures, v39 p157-163 1990. Prepared in cooperation with SRI International, Menlo Park, CA., and Institute of Environmental Health and Engineering, Beijing (China).

The residents in Xuan Wei County, China, have been exposed to high levels of combustion emissions from smoky and smokeless coal and wood combustion under unvented conditions in homes. An unusually high lung cancer mortality rate that can not be attributed to tobacco smoke or occupational exposure was found. The communes using smoky coal, which emits more organics than smokeless coal, generally have a higher lung cancer rate than the communes using smokeless coal or wood. The mutagenicity and carcinogenicity of organic extracts of indoor air particles collected from Xuan Wei homes during cooking were investigated. The objectives of the study were (1) to investigate the characteristics of lung cancer mortality in Xuan Wei, (2) to determine the genotoxicity and chemical and physical properties of the combustion emissions, and (3) to link bioassay results to human lung cancer data. The organic extracts of these emission particles were tested for mutagenicity in the Ames Salmonella and the L5178Y TK+/- mouse lymphoma assays and for skin tumor-initiating activity and complete carcinogenicity in SENCAR mice. The two coal samples whoed higher activity in both mutagenicity and tumor initiation. When the emission rate of organics was taken into consideration, the smoky coal emission showed the highest potency of the three fuels. The smoky coal sample was also a more potent complete carcinogen than the wood sample. Higher mutagenicity and carcinogenicity of the smoky coal emission compared to wood or smokeless coal emissions are in agreement with the epidemiological data.

Keywords: *Air pollution, *Smoke, *Combustion products, Airborne wastes, Respiratory diseases, Lung disease, Public health, Mutagenicity tests, Carcinogenicity tests, *Lung cancer.

PB91-162735/REB PC **A03**/MF **A01**
Expert Systems to Assist in Decisions Concerning Land Disposal of Hazardous Wastes.
Environmental Protection Agency, Cincinnati, OH. Risk Reduction Engineering Lab.

D. G. Greathouse. c1991, 13p EPA/600/D-91/009
Presented at the Air Pollution Control Association Annual Meeting (81st), Dallas, TX., June 20-24, 1988.

Review of permits for land disposal of hazardous wastes requires numerous decisions concerning policy and technical issues. Some require interpretation and application of information in research reports, other involve interpretation and evaluation of specialized test data, and others involve assessment of compliance with latest regulatory policies. Specialized knowledge concerning a number of technical areas and a broad base of environmental regulatory experience are necessary to adequately perform these reviews. The need for current knowledge and background, in addition to the concern that reviews be consistent prompted the authors int systems derest in expert systems. The paper presents the history, current status, and future direction of the expert evelopment program supported by the Waste Minimization, Destruction and Disposal Research Division of the Risk Reduction Engineering Laboratory. The development methods being used and some of the authors' experiences are also presented.

Keywords: *Waste treatment, *Expert systems, *Environment management, Environment pollution, Environmental engineering, Waste disposal, Decision making, Management information systems, Problem solving, Hazardous wastes.

PB91-167569/REB PC **A04**/MF **A01**
Preparation Aids for the Development of Category 3: Quality Assurance Project Plans.
Environmental Protection Agency, Cincinnati, OH. Risk Reduction Engineering Lab.
G. Simes. Feb 91, 60p EPA/600/8-91/005
See also PB91-148312.

Data collection activities performed for the Risk Reduction Engineering Laboratory (RREL) of the U.S. Environmental Protection Agency are divided into four categories, depending on the intended use of the data. Quality Assurance (QA) Project Plans are written to ensure that project needs will be met and that quality control procedures are sufficient for obtaining data of known quality. The level of QA required, however, depends on the project category selected for a given project. Projects that produce results for the purpose of evaluating and selecting basic options, or performing feasibility studies or preliminary assessments of unexplored areas which might lead to further work are identified as Category III projects. To assist professional scientists and engineers in preparing QA Project Plans, separate guidance manuals in an easy-to-read format have been developed for each category. The Category III manual contains detailed descriptions of each of the 11 required elements of a Category III QA Project Plan. Also included are definitions and explanations of frequently used terms, examples of QA forms and charts, sample equations and numerous types of tables suggested for summarizing information.

Keywords: *Manuals, *Environmental surveys, *Project planning, *Data processing, Management planning, Quality assurance, Quality control, Standards compliance, Records management, Site surveys, Sampling, Research and development, Auditing, *Quality Assurance Project Plans.

PB91-167577/REB PC **A05**/MF **A01**
Environmental Protection Agency, Washington, DC. Office of Pesticides and Toxic Substances.
Section 313, Emergency Planning and Community Right-to-Know Act: Quality Assurance Audit Manual. Final rept.
Radian Corp., Herndon, VA. Dulles Technology Center.
D. S. Matthews, and M. T. McAdams. Aug 90, 79p EPA/560/4-90/018
Contract EPA-68-D9-0169
Sponsored by Environmental Protection Agency, Washington, DC. Office of Pesticides and Toxic Substances.

The document is designed to aid EPA staff and contractors when evaluating the quality of data submitted on EPA Form R, the report submitted to EPA by industrial facilities for Toxic Release Inventory (TRI) reporting. The TRI is an annual inventory compiled by EPA of releases of listed toxic chemicals into the environment by manufacturing facilities. Such facilities are required to submit release estimates and other pertinent data under requirements of Section 313 of the Emergency Planning and Community Right-to-Know Act (EPCRA) of 1986. The manual contains background information on TRI reporting requirements, suggestions for preparing for a site audit and an audit checklist. The checklist questions are designed to aid the auditor in assessing the completeness and quality of the TRI data as he reviews the Form R reports and supporting documentation. The manual is intended for use during technical data quality audits unrelated to EPCRA Section 313 enforcement inspections, but may be used by enforcement personnel as a supplemental technical reference.

Keywords: *Manuals, *Toxic substances, *Compliance audits, Site surveys, Quality assurance, Law enforcement, Pollution regulations, Standard Industrial Classification, Industrial wastes, Standards, On-site investigations, Environmental transport, Chemical compounds, *Superfund Amendments and Reauthorization Act of 1986, *Emergency Planning and Community Right-to-Know Act.

PB91-167585/REB PC **A09**/MF **A01**
Dioxins and Dibenzofurans in Adipose Tissue of U.S. Vietnam Veterans and Controls.
Environmental Protection Agency, Washington, DC. Office of Toxic Substances.
H. K. Kang, K. K. Watanabe, J. Breen, J. Remmers, and M. Conomos. Aug 90, 177p EPA/560/5-89/002
Prepared in cooperation with Department of Veterans Affairs, Washington, DC. Office of Environmental Epidemiology, Midwest Research Inst., Kansas City, MO., and Department of Veterans Affairs Medical Center, Leavenworth, KS.

Concern about the adverse effects of exposure to Agent Orange is for the most part attributable to its toxic contaminant, 2,3,7,8-tetrachlorodibenzo-p-dioxin (TCDD). A total of 40 Vietnam veterans, 80 non-Vietnam veterans and 80 civilian men were selected from males born between 1936 and 1954 and their adipose tissues were analyzed for 17 2,3,7,8-substituted dioxins and dibenzofurans. TCDD levels were log normally distributed and the mean level of 2,3,7,8-TCDD in adipose tissue of the Vietnam veterans (13.4 ppt) was not significantly different from that of the non-Vietnam veterans (12.5 ppt) or civilian men (15.8 ppt). Adjusting for demographic variables did not change the conclusions. The study results suggest that heavy exposure to Agent Orange for most Vietnam veterans was very unlikely and that there is no readily available and reliable indirect method of assessing exposure to Agent Orange for Vietnam veterans.

Keywords: *Toxicology, *Tetracholorodibenzodioxins, *Adipose tissue, *Dioxins, Military personnel, Exposure, Comparative evaluations, Health status, Tables(Data), Graphs(Charts), Biological markers, *Agent Orange, *Dibenzofurans, *Vietnam veterans.

PB91-167593/REB PC **A03**/MF **A01**
***Reporting Requirements for Continuous* Releases of Hazardous Substances: A Guide for Facilities and Vessels on Compliance.**
Environmental Protection Agency, Washington, DC. Office of Emergency and Remedial Response.
Oct 90, 43p EPA/540/G-91/003, OSWER DIRECTIVE-9360.7-01

The purpose of the Guide is to help you understand the definitions and requirements contained in the U.S. Environmental Protection Agency's (EPA) regulation on reporting continuous releases of hazardous substances (see 55 FR 30166; July 24, 1990). The effective date of the regulation was September 24, 1990. The continuous release reporting regulation allows reduced reporting for facilities or vessels that release hazardous substances in a continuous and stable manner. The Guide has been designed to provide information necessary to successfully comply with the regulation. The Guide is divided into two parts. The first part provides general information in a question and answer format regarding the continuous release reporting regulation and your responsibility to report releases of hazardous substances. The second part contains detailed instructions on how to prepare continuous release reports that include all required information.

Keywords: *Hazardous materials, *Superfund, *Reporting requirements, *Waste management, US EPA, Pollution regulations, Radioactive materials, Notification procedures, Information transfer, Information systems, Toxic substances, Pollution sources, *Comprehensive Environmental Response Compensation and Liability Act, Emergency Response Notification System.

PB91-167601/REB PC **A03**/MF **A01**
Environmental Protection Agency, Research Triangle Park, NC. Atmospheric Research and Exposure Assessment Lab.
Snow/Rain Collector Sampler.
Nevada Univ. System, Reno. Desert Research Inst.
R. G. Purcell, and R. B. Brown. Mar 91, 49p EPA/600/3-91/005
Contract EPA-68-D-80095
Sponsored by Environmental Protection Agency, Research Triangle Park, NC. Atmospheric Research and Exposure Assessment Lab.

A new snow/rain collector was designed, built, and field tested. The instrument was designed to be able to operate in all weather conditions at remote and unattended sites for up to seven days. The design criteria also included stipulations that the instrument be easily operated by non-technical personnel, be convenient for transfer of collected precipitation samples, and have provisions for excluding dry deposition. The instrument was field tested and test results are included.

Keywords: *Rain, *Snow, *Meteorological instruments, *Measuring instruments, Precipitation(Meteorology), Design, Atmospheric chemistry, Monitors, Field tests.

PB91-167692/REB PC **A23**/MF **A03**
Compilation of Air Pollutant Emission Factors. Volume 2. Mobile Sources. Supplement A.
Environmental Protection Agency, Ann Arbor, MI. Emission Control Technology Div.
Jan 91, 529p AP-42-SUPPL-A
See also PB87-205266.

A 'Compilation of Air Pollutant Emission Factors' (AP-42) reports data on atmospheric pollutants for which sufficient data exist to establish realistic emission estimates. The highway mobile source emission factors presented in this Supplement to the 4th edition of AP-42 (EPA, Sept. 1985) are based on EPA's MOBILE4 emission factor model (EPA, 1989), and provide emission factors for eight vehicle types and the highway vehicle fleet as a whole for a variety of different conditions (e.g., calendar year, average speed, temperature, fuel volatility, and operating modes). The supplement also discusses the algorithms used in MOBILE4 to estimate such emission factors.

Keywords: *Motor vehicles, *Air pollution control, *Highways, Estimates, Sources, Exhaust emissions, Rates(Per time), Mobility, Exhaust gases, Velocity measurement, Age, Distance, Fuels, Volatility, Temperature, Diurnal variations, Revisions, Trips, Refueling.

PB91-167718/REB PC **A03**/MF **A01**
Environmental Protection Agency, Research Triangle Park, NC. Air and Energy Engineering Research Lab.
Landfill Air Emissions Estimation Model, Version 1.1. User's Manual. Final rept.
Radian Corp., Research Triangle Park, NC.
W. R. Pelt, R. L. Bass, I. R. Kuo, and A. L. Blackard. Apr 91, 37p EPA/600/8-90/085A , , EPA/SW/DK-91/081A
Contract EPA-68-02-4286
For system on diskette, see PB91-507541. Sponsored by Environmental Protection Agency, Research Triangle Park, NC. Air and Energy Engineering Research Lab.

The document is a user's guide for the computer program, Landfill Air Emissions Estimation Model. It provides step-by-step guidance for using the program to estimate landfill air emissions. The purpose of the program is to aid local and state agencies in estimating landfill air emission rates for nonmethane organic compounds and individual air toxics. The program will also be helpful to landfill owners and operators affected by the upcoming New Source Performance Standard (NSPS) and Emission Guidelines for Municipal Solid Waste Landfill Air Emissions. The model is based on the Scholl Canyon Gas Generation Model, used in the development of the soon-to-be-proposed regulation for landfill air emissions. The Scholl Canyon Model is a first order decay equation that uses site-specific characteristics for estimating the gas generation rate.

In the absence of site-specific data, the program provides conservative default values from the soon-to-be-proposed NSPS for new landfills and emission guidelines for existing landfills. These default values may be revised based on future information collected by the Agency.

Keywords: *Earth fills, *Air pollution standards, *User manuals(Computer programs), *Computerized simulation, *Air pollution abatement, Documentation, Pollution regulations, New Source Performance Standards, Guidelines, Concentration(Composition), Toxic substances, Non-methane hydrocarbons, Waste disposal, Site surveys, Study estimates, *Landfill Air Emissions Estimation Model.

PB91-167767/REB PC **A03**/MF **A01**
Computer-Readable TSCA Chemical Substances Inventory. Data Tape Documentation.
Environmental Protection Agency, Washington, DC.
1991, 36p EPA/DF/MT-91/082A
For system on magnetic tape, see PB91-507301.

The computer-readable TSCA Chemical Substance Inventory is issued periodically to provide chemical substance information for those substances on the non-confidential substance identity portion of the TSCA Master Inventory File. For a complete understanding of the data contained on these tapes, it is necessary to consult the introductory material of the printed 1985 Edition and the 1990 Supplement to 1985 Edition. The tapes consist of two files: Inventory Preferred Name File and Inventory Synonym Name File. The first file contains the CAS Registry Number, preferred CA Index Name, molecular formula, and other appropriate information for each non-confidential Inventory chemical substance. The entries are in ascending CAS Registry Number order. The second file is a file of synonymous chemical names for the same substances listed in the Preferred Name File. Its entries are ordered alphabetically by name with each name accompanied by the same information for the substance as appears in the Preferred Name File.

Keywords: *Chemical compounds, *Environmental surveys, Pollution, Documentation, Revisions, Polymers, Toxic substances, *Toxic Substance Control Act, *Toxic substance inventory, Molecular formula, CAS Registry Number, Chemical nomenclature.

PB91-167841/REB PC **E19**
General Enforcement Policy Compendium.
Environmental Protection Agency, Washington, DC.
16 Dec 88, 1179p*
Portions of this document are not fully legible.

The attached documents contained in the report, are an update of the General Enforcement Policy Compendium. The update consists of policies which have been added, revised or deleted since the issuance of the June 11, 1987, update. Some of the policies are: Issuance of Enforcement Considerations for Drafting and Reviewing Regulations and Guidelines for Developing New or Revised Compliance and Enforcement Strategies, Procedures and Responsibilities for Updating and Maintaining the Enforcement Docket, Final Guidance on Use of Alternative Dispute Resolution Techniques in Enforcement Action, Processing of Consent Decrees, Procedures for Assessing Stipulated Penalties, Case Management Plans, and Guidance on Certification of Compliance with Enforcement Agreements. There are also modifications to existing policies.

Keywords: *Law enforcement, *Environmental policy, *Pollution laws, *Pollution regulations, Guidelines, Revisions, Standards compliance, Substitutes, Consent orders, Administrative procedures, Management planning, Charges, Consent orders.

PB91-168336/REB PC **A06**/MF **A01**
Environmental Protection Agency, Washington, DC. Office of Policy, Planning and Evaluation.
Communicating Environmental Risks: A Guide to Practical Evaluations. Risk Communications Series.
Research Triangle Inst., Research Triangle Park, NC. Center for Economics Research.
M. J. Regan, and W. H. Desvousges. Dec 90, 107p EPA/230/01-91/001
Grant EPA-R-814676
Sponsored by Environmental Protection Agency, Washington, DC. Office of Policy, Planning and Evaluation.

'Communicating Environmental Risks: A Guide to Practical Evaluations' is a guidebook designed to help program offices determine whether risk communication activities are achieving their goals. The guidebook explains how to plan a practical, cost-effective evaluation strategy that can be integrated with risk communication efforts. The framework described has been developed to facilitate thinking about where and when various evaluation techniques and activities are most effective.

Keywords: *Risk assessment, *Environmental management, *Information transfer, Health risks, Public information, Pollution regulations, Management planning, Cost effectiveness, Design, Selective dissemination of information, Baseline measurements, Questionnaires, Assessments, Data processing, Guidelines, US EPA.

PB91-168344/REB PC **A03**/MF **A01**
Guide for Preparation of Quality Assurance Project Plans for the National Estuarine Program. Interim Final.
Environmental Protection Agency, Washington, DC. Office of Marine and Estuarine Protection.
Jun 88, 35p EPA/556/2-88/001

The document presents guidance for completing the elements of a QA project plan specified by OWRS QA-1, 'Guidance for the Preparation of Combined Work/Quality Assurance Project Plans for Environmental Monitoring,' May 1984. The QA project plan is made up of a cover page, a table of contents, and 19 sections as indicated below. All of these elements should be included in the plan. If a particular section does not apply to the work assignment, the section should be listed and marked with 'Not Applicable.' QA project plans are controlled documents for EPA. The document control format should consist of the following information on each page: section number, revision number, date of revision, and page.

Keywords: *Guidelines, *Project planning, *Data processing, *Environmental monitoring, *Estuaries, Quality assurance, Research and development, Environmental management, Sampling, Records management, Auditing, Flow charting, Performance evaluation, *National Estuarine Program.

PB91-168351/REB PC **A05**/MF **A01**
Economics of Improved Estuarine Water Quality: An NEP Manual for Measuring Benefits.
Environmental Protection Agency, Washington, DC. Office of Marine and Estuarine Protection.
P. Caulkins, T. Armitage, M. Pryor, and T. Bigelow. Sep 90, 87p EPA/503/5-90/001
Prepared in cooperation with Battelle Memorial Inst., Washington, DC.

Section 320 of the Clean Water Act provides for the development of Comprehensive Conservation and Management Plans (CCMPs) for estuaries of National significance. To ensure the greatest return on resources spent, it is often necessary to document the economic benefits associated with alternative management strategies. The purpose of the manual is to assist estuary program managers and staff in identifying, estimating, and evaluating the economic benefits of water quality improvements created by various pollution abatement options. Estimating economic benefits helps to determine that a project's benefits are reasonably commensurate with the project's costs.

Keywords: *Estuaries, *Water quality management, *Water pollution abatement, *Water pollution economics, *Benefit cost analysis, Management planning, Economic analysis, Water pollution control, Agricultural engineering, Municipal water, Habitats, Industrial wastes, Potable water, Fishing, Navigation, Recreation, Benefit plans, Advantages and disadvantages, Comprehensive Conservation and Management Plans, Clean Water Act.

PB91-168369/REB PC **A08**/MF **A01**
Assessing Human Health Risks from Chemically Contaminated Fish and Shellfish: A Guidance Manual. Final rept.
Environmental Protection Agency, Washington, DC. Office of Marine and Estuarine Protection.
K. Devonald, and J. Maxted. Sep 89, 158p EPA/503/8-89/002

The manual identifies procedures for assessing health risks from fish and shellfish, including summarizing assumptions and uncertainties; provides guidance on presenting assessment results; and summarizes standard model variables and criteria related to risk assessment.

Keywords: *Seafood, Shellfish, *Food contamination, *Health hazards, Risk assessment, Chemicals, Dose-response relationships, Carcinogenicity tests.

PB91-168377/REB PC **A04**/MF **A01**
Environmental Protection Agency, Washington, DC. Office of Marine and Estuarine Protection.
Citizen Volunteers in Environmental Monitoring: Summary Proceedings of the National Workshop (2nd). Held in New Orleans, Louisiana in December 1989.
Rhode Island Univ., Kingston. Sea Grant Program.
Aug 90, 66p EPA/503/9-90/009
See also PB89-154462. Sponsored by Environmental Protection Agency, Washington, DC. Office of Marine and Estuarine Protection, and National Sea Grant Coll. Program, Silver Spring, MD.

The second national workshop on 'The Role of Citizen Volunteers in Environmental Monitoring' was held in New Orleans, Louisiana, in December 1989. Cosponsored by EPA's Office of Marine and Estuarine Protection and the Gulf of Mexico Program, the workshop was attended by 160 people representing many different kinds of volunteer monitoring programs and government agencies from all around the country. A primary objective of the second national workshop was to explore 'how to provide useful information and how to encourage partnership between citizen monitoring groups and state or regional government.' A second major objective of the workshop was to introduce state and regional government officials to the achievements and potential of volunteer monitoring. The third goal of the conference was to provide an opportunity for participants to meet and foster a national network of citizen volunteers.

Keywords: *Meetings, *Environmental monitoring, *Volunteers, *Voluntary organizations, *Water quality, Estuaries, Public relations, State government, Information management, Information transfer, Ecosystems, Regional analysis, Water pollution sampling, Surface waters, Ocean waste disposal, Quality assurance, Quality control, US EPA, Cleanup operations.

PB91-168385/REB PC **A03**/MF **A01**
Progress in the National Estuary Program: Report to Congress. Rept. for 1987-89.
Environmental Protection Agency, Washington, DC. Office of Marine and Estuarine Protection.
Feb 90, 50p EPA/503/9-90/005

The problems facing the nation's estuaries do not fit into existing conventional pollution control programs based solely on regulations and enforcement. Neither do they fit neatly into the traditional, restricted definition of 'water pollution'. Rather, they involve complex issues of habitat protection, multimedia and nonpoint source pollution, land-use planning, and resource management. Congress established the National Estuary Program (NEP) precisely to address these issues. Under the Clean Water Act, the program is to show how estuaries (and other ecosystems) can be protected and their living resources enhanced through comprehensive, action-oriented management that: identifies the probable causes of major environmental problems in estuaries of national significance; promotes and sustains long-term state and local commitment to solving the problems; generates meaningful public involvement and participation; focuses existing regulatory, institutional, and financial resources to act on identified problems; and encourages innovative management approaches.

Keywords: *Estuarines, *Aquatic ecosystems, *Coastal regions, *Water quality management, Narragansett Bay, Puget Sound, Regulations, Comprehensive planning, Water pollution abatement, Water pollution control, Habitats, Albemarle Sounds, Pamlico Sound, Buzzards Bay, Long Island Sound, Management planning, Community development, Nonpoint sources, Land use, Natural resources management, San Francisco Bay, *Natural Estuary Program, Clean Water Act of

1987, Comprehensive Conservation and Management Plan.

PB91-168393/REB PC **A05**/MF **A01**
Environmental Protection Agency, Washington, DC. Office of Marine and Estuarine Protection.
Financing Marine and Estuarine Programs: A Guide to Resources.
Apogee Research, Inc., Bethesda, MD.
K. Rubin, M. Hardison, R. Brodie, T. Callender, and E. Cardon. Sep 88, 100p EPA/503/8-88/001
Contract EPA-68-01-7281
Prepared in cooperation with American Management Systems, Inc., Arlington, VA. Sponsored by Environmental Protection Agency, Washington, DC. Office of Marine and Estuarine Protection.

Under the U.S. Environmental Protection Agency's (EPA) National Estuary Program, state resource managers, town planners, and local administrators jointly develop plans to protect the coastal waters and preserve the living resources of the estuaries. The three-part document, Financing Marine and Estuarine Programs: A Guide to Resources, will help estuarine and marine managers understand the concepts and terminology of public finance, and secure the funds needed to support restoration and protection programs. The first part of the report, the financial primer, introduces basic financing concepts and explains the initiatives needed to begin financial planning for long-term resource management activities. The second part, the case studies, provides specific examples of how some towns and cities have raised money to solve specific water quality problems. Finally, the glossary serves as a quick reference to the financial terminology that managers unfamiliar with financial planning need to understand.

Keywords: *Estuaries, *Water management(Applied), *Water pollution control, *Water pollution abatement, *Financing, Financial assistance, Case studies, Environmental protection, Water quality management, Administrative procedures, Liabilities, Financial management, Management planning, Capitalized costs, Revenue, Taxes, State government.

PB91-168401/REB PC **A05**/MF **A01**
Study Using a Three Dimensional Photochemical Smog Formation Model under Conditions of Complex Flow: Application of the Urban Airshed Model to the Tokyo Metropolitan Area. Rept. for Jan 85-Jan 91.
Environmental Protection Agency, Research Triangle Park, NC. Atmospheric Research and Exposure Assessment Lab.
S. Wakamatsu, and K. L. Schere. Mar 91, 98p EPA/600/3-91/015
See also PB86-213246. Prepared in cooperation with National Inst. for Environmental Studies, Ibaraki (Japan).

The purpose of the study is to evaluate the Urban Airshed Model (UAM), a three-dimensional photochemical urban air quality simulation model, using field observations from the Tokyo Metropolitan Area. Emphasis was placed on the photochemical smog formation mechanism under stagnant meteorological conditions. The UAM produced reasonable calculated results for the diurnal, areal and vertical distributions of O3 concentrations covering the Tokyo Metropolitan Area. The role and significance of the previous day's secondary pollutants on O3 formation mechanisms were also investigated. During the night time, high values of secondary pollutant concentrations were predicted above the radiation inversion layer. These aged pollutants were then entrained into the mixing layer during the day in accordance with the elevation of the lid. These characteristic features were also observed in the field study.

Keywords: *Smog, *Air pollution monitoring, *Atmospheric models, Urban areas, Atmospheric chemistry, Ozone, Photochemical oxidants, Graphs(Charts), Tables(Data), Atmospheric diffusion, *Urban Airshed Model, Tokyo(Japan).

PB91-168419/REB PC **A03**/MF **A01**
Colloidal-Facilitated Transport of Inorganic Contaminants in Ground Water. Part 1. Sampling Considerations. Research rept. Feb 88-Sep 90.
Robert S. Kerr Environmental Research Lab., Ada, OK.
R. W. Puls, J. H. Eychaner, and R. M. Powell. Dec 90, 12p EPA/600/M-90/023
Prepared in cooperation with Geological Survey, Tucson, AZ., and NSI Technology Services Corp., Ada, OK.

Investigations at Pinal Creek, Arizona, evaluated routine sampling procedures for determination of aqueous inorganic geochemistry and assessment of contaminant transport by colloidal mobility. Sampling variables included pump type and flow rate, collection under air or nitrogen, and filter pore diameter. During well purging and sample collection, suspended particle size and number as well as dissolved oxygen, temperature, specific conductance, pH, and redox potential were monitored. Laboratory analyses of both unfiltered samples and the filtrates were performed by inductively coupled argon plasma, atomic absorption with graphite furnace, and ion chromatography. Scanning electron microscopy with Energy Dispersive X-ray was also used for analysis of the filtered particulates. Suspended particle counts consistently required approximately twice as long as the other field-monitored indicators to stabilize. High-flow-rate pumps entrained normally nonmobile particles. Differences in elemental concentrations using different filter-pore sizes were generally not large with only two wells having differences greater than 10 percent in most elemental concentrations, although trends showed increasing concentrations with increasing filter pore sizes in most wells. Similar differences (>10%) were observed for some wells when samples were collected under nitrogen rather than in air.

Keywords: *Ground water, Sampling, *Water pollution, Mobility, Colloids, Pumps, Dispersions, Geochemistry, Dissolved gases, Oxygen, pH, Conductivity, Field tests, Pinal Creek(Arizona).

PB91-168427/REB PC **A04**/MF **A01**
Environmental Protection Agency, Research Triangle Park, NC. Office of Air Quality Planning and Standards.
Best Demonstrated Control Technology for Graphic Arts.
Midwest Research Inst., Cary, NC.
B. Friedman, and C. Vaught. Feb 91, 52p EPA/450/3-91/008
Contract EPA-68-02-4379
Sponsored by Environmental Protection Agency, Research Triangle Park, NC. Office of Air Quality Planning and Standards.

The Graphic Arts Industry is a source of volatile organic compound (VOC) emissions. The study was conducted to document the reported overall control efficiency for VOC at a number of rotogravure and flexographic printing facilities. The primary conclusions from the study are: (1) the use of capture and control systems and the use of water-based ink systems have been demonstrated to be effective and reliable in achieving greater than 90 percent overall VOC reduction rotogravure and flexographic printing facilities; (2) facilities can be retrofitted to achieve 90 percent VOC reductions; and (3) permanent total enclosures meeting EPA criteria have been successfully installed and operated at rotogravure and flexographic printing facilities.

Keywords: *Best technology, *Graphic arts, *Air pollution control, *Volatile organic compounds, *Capture effect, Performance standards, Design criteria, Air pollution control equipment, Flexography, Gravure printing, Printing inks, Control Technology Center.

PB91-168450/REB PC **A05**/MF **A01**
Continuous Release-Emergency Response Notification System and Priority Assessment Model: User's Manual for EPA Regions.
Environmental Protection Agency, Washington, DC. Office of Emergency and Remedial Response.
Oct 90, 88p* EPA/540/G-91/001, OSWER DIRECTIVE-9360.7-05
See also PB90-249715 and PB91-168468.

The user's manual provides EPA Regional personnel with information and detailed instructions on how to use the Continuous Release-Emergency Response Notification System (CR-ERNS) and Priority Assessment Model (PAM), an integrated database management system and screening-level risk assessment model.

Keywords: *User manuals(Computer programs), *Computerized simulation, *Hazardous materials, *Superfund, *Environmental surveys, *Waste management, Personnel development, Pollution sources, Air pollution, Water pollution, Radioactive waste, Emergency plans, Remedial action, Information systems, Risk assessment, Regional analysis, Law enforcement, Pollution regulations, Database management, *Emergency Response Notification System, *Priority Assessment Model, EPA regions 1-10, Remedial response, Office of Solid Waste and Emergency Response.

PB91-168468/REB PC **A04**/MF **A01**
Continuous Release-Emergency Response Notification System and Priority Assessment Model: Model Documentation.
Environmental Protection Agency, Washington, DC. Office of Emergency and Remedial Response.
13 Feb 91, 75p* EPA/540/G-91/004, OSWER DIRECTIVE-9360.7-03
See also PB91-168450 and PB90-249715.

The purpose of the model documentation is to provide a detailed description of the modeling and risk analysis procedures used in CR-ERNS/PAM to assist OSCs and other Superfund decision-makers in interpreting the system results. PAM is a screening-level model; to properly interpret PAM's outputs, the user must understand the limitations and uncertainties in the equations and data used to generate these results. Chapter 2 presents the system's fate and transport models and describes the assumptions associated with these equations. Chapter 3 describes PAM's auxiliary data bases and provides the source(s) of each parameter and the methods by which values were selected. Chapter 4 explains the methods and exposure assumptions used to estimate exposures to hazardous substances and to evaluate the risks and hazards associated with these exposures. Chapter 5 presents examples of reports generated by PAM and explains the meaning of the 'flags' assigned to hazardous substances, media, and facilities. Appendix A contains versions of the fate and transport equations used for radionuclides. Appendix B contains copies of PAM's reports.

Keywords: *Computerized simulation, *Hazardous materials, *Superfund, *Environmental surveys, *Waste management, *Documentation, Database management, Personnel development, Pollution sources, Air pollution, Radioactive wastes, Information systems, Pollution regulations, Water pollution, Emergency plans, Remedial action, Risk assessment, Regional analysis, Law enforcement, *Emergency Response Notification System, *Priority Assessment Model, EPA regions 1-10, Remedial response, Office of Solid Waste and Emergency Response.

PB91-168476/REB PC **A15**/MF **A02**
Environmental Protection Agency, Cincinnati, OH. Risk Reduction Engineering Lab.
Soil Vapor Extraction Technology: Reference Handbook. Final rept. Jun 89-Mar 90.
Camp, Dresser and McKee, Inc., Cambridge, MA.
T. A. Pedersen, and J. T. Curtis. Feb 91, 330p EPA/540/2-91/003
Contract EPA-68-03-3409
See also PB90-216995. Sponsored by Environmental Protection Agency, Cincinnati, OH. Risk Reduction Engineering Lab.

Soil vapor extraction (SVE) systems are being used in increasing numbers due to many advantages these systems hold over other soil treatment technologies. SVE systems appear to be simple in design and operation, yet the fundamentals governing subsurface vapor transport are quite complex. In view of the complexity, an expert workshop was held to discuss the state-of-the-art of the technology, the best approach to optimize systems application, and process efficiency and limitations. As a result of the workshop, an SVE Technology Assessment report was produced. The report discusses the basic science of the subsurface environment and subsurface monitoring, emission control, and costs. The report also serves as the proceedings of the expert workshop. Additional research activities being conducted include a field demonstration of a structured SVE system design approach; a laboratory column study to determine and characterize residuals following vapor extraction; an assessment of secondary emissions and regulations governing releases from SVE systems; cost of SVE implementation and operation; and a survey of techniques to enhance vapor removal.

Keywords: *Land pollution, *Volatile organic compounds, *Soil gases, *Air pollution control, *Hydrocarbons, Soils, Monitoring, Handbooks, Gasoline, Remedial action, Waste disposal, Cost analysis, Field tests, *Soil vapor extraction.

PB91-168484/REB PC **A04**/MF **A01**
Environmental Protection Agency, Research Triangle Park, NC. Atmospheric Research and Exposure Assessment Lab.
Data Users Guide to the Mountain Cloud Chemistry Project.
State Univ. of New York at Albany. Atmospheric Sciences Research Center.
V. A. Mohnen. Mar 91, 69p EPA/600/8-91/009
See also PB89-148597 and PB91-100164. Sponsored by Environmental Protection Agency, Research Triangle Park, NC. Atmospheric Research and Exposure Assessment Lab.

Atmospheric pollution is deposited on the forests of the eastern United States in a variety of forms. Concern has been raised that the exposure to and deposition of these atmospheric pollutants may play a role in the decline of these forests. The Mountain Cloud Chemistry Project (MCCP), sponsored by the U.S. Environmental Protection Agency (EPA) and the National Acid Precipitation Assessment Program (NAPAP), has studied the exposure and deposition of atmospheric constituents to these forests. Research scientists and technicians of the MCCP have measured the concentrations of atmospheric pollutants at six remote monitoring stations for four growing seasons (1986-89). Measurements of ozone, sulfur dioxide, oxides of nitrogen, hydrogen peroxide, cloud and rain water ions, meteorological parameters, and other parameters of interest were collected at sites in Howland, ME; Mt. Moosilauke, NH; Whiteface Mt., NY; Shenandoah Park, VA; Whitetop Mt., VA; and Mt. Mitchell, NC. The report served to document the type and amount of data collected for the Mountain Cloud Chemistry Project during the four warm seasons between 1986 and 1989. Details are presented on the locations of the six research/monitoring sites, the types of measurements made, the periods of record, the quality of the data, and the availability of the data.

Keywords: *Forest land, *Air pollution, *Clouds(Meteorology), Chemical analysis, Tables(Data), Wind velocity, *Atmospheric chemistry, Acid deposition, Precipitation(Meteorology), Ozone, Sulfur dioxide, Nitrogen oxides, *Mountain Cloud Chemistry Project, *Appalachian Mountain Region(United States), Acid rain.

PB91-168492/REB PC **A03**/MF **A01**
Environmental Protection Agency, Research Triangle Park, NC. Air and Energy Engineering Research Lab.
Proceedings of Two Highway Vehicle Emission Inventory Workshops. Held in Washington, DC. on July 19-20, 1990 and in Sacramento, CA. on August 21, 1990. Rept. for Jul-Sep 90.
Pechan (E.H.) and Associates, Inc., Springfield, VA.
J. H. Wilson. Mar 91, 23p EPA/600/9-91/007
Contract EPA-68-D9-0168
Sponsored by Environmental Protection Agency, Research Triangle Park, NC. Air and Energy Engineering Research Lab.

EPA's Joint Emission Inventory Oversight Group is initiating research projects with the goal of better quantifying air pollution emissions in both current and future years. Highway vehicles have been found to be an important contributor to organic, oxides of nitrogen, and carbon monoxide emissions as well as some hazardous air pollutants, despite the significant emission reductions that have already been achieved on a per vehicle basis. Therefore, EPA is actively investigating research opportunities to improve the state-of-the-art in estimating highway vehicle emissions. The project was an effort to solicit research ideas from people outside EPA via a workshop forum.

Keywords: *Motor vehicles, *Air pollution, *Emission factors, *Meetings, Air pollution control, Stationary sources, Estimating, Planning.

PB91-168500/REB PC **A05**/MF **A01**
Corvallis Environmental Research Lab., OR.
Indicator Development Strategy for the Environmental Monitoring and Assessment Program.
Technical Resources, Inc., Davis, CA.
C. M. Knapp, D. R. Marmorek, J. P. Baker, K. W. Thornton, and J. M. Klopatek. Mar 91, 94p EPA/600/3-91/023
Contract EPA-68-CO-0021
Prepared in cooperation with Environmental and Social Systems Analysts Ltd., Vancouver (British Columbia), Western Aquatics, Inc., Durham, NC., and FTN Associates, Little Rock, AR. Sponsored by Corvallis Environmental Research Lab., OR.

The overall goal of Environmental Monitoring and Assessment Program (EMAP) is to provide a quantitative assessment of the current status and long-term trends in the condition of the nation's ecological resources on regional and national scales. The document outlines a strategy for indicator selection, development, and evaluation within EMAP. Its objectives are twofold: (1) to present general guidelines, criteria, and procedures for indicator selection and evaluation, and (2) to establish an organizational framework for coordinating and integrating indicator development and use within EMAP. It should serve both to promote internal consistency among EMAP resource groups and to provide a basis for external review of the proposed indicator development process.

Keywords: *Environmental monitoring, *Environmental impact assessments, *Biological indicators, Biological effects, Long term effects, Indicator species, Ecosystems, Regional analysis, Environmental transport, Guidelines, Habitats, Decision making, Risk assessment, Forecasting.

PB91-168518/REB PC **A09**/MF **A02**
EMAP-Surface Waters Monitoring and Research Strategy. Fiscal Year 1991.
Corvallis Environmental Research Lab., OR.
S. G. Paulsen, D. P. Larsen, P. R. Kaufmann, T. R. Whittier, and J. R. Baker. Mar 91, 194p EPA/600/3-91/022
Prepared in cooperation with Nevada Univ., Las Vegas, Utah State Univ., Logan, Oregon State Univ., Corvallis, and ManTech Environmental Technology, Inc., Corvallis, OR.

The document describes the Environmental Monitoring and Assessment Program's (EMAP) vision of what is needed to evaluate the ecological condition of the surface waters of the United States. It describes the content and organization of the research plan.

Keywords: *Environmental monitoring, *Water pollution sampling, *Aquatic ecosystems, *Surface waters, Water quality, United States, Project planning, Research and development, Biological effects, Biological indicators, Hydrology, Quality assurance, Information management, *Environmental Monitoring and Assessment Program.

PB91-168526/REB PC **A07**/MF **A01**
Environmental Protection Agency, Washington, DC. Criteria and Standards Div.
Peer Review Standards for the Disposal of Sewage Sludge. U.S. EPA Proposed Rule 40 CFR Parts-257 and 503 (February 6, 1989 Federal Register pp5746-5902).
Cooperative State Research Service, Washington, DC.
Feb 89, 147p
Prepared in cooperation with Ohio State Univ., Columbus, and California Univ., Riverside. Sponsored by Environmental Protection Agency, Washington, DC. Criteria and Standards Div.

The report is a comprehensive document on the use and disposal of municipal sewage sludge by using modern scientific and technological means.

Keywords: *Sewage sludge, *Sludge disposal, *Waste utilization, Standards, Pollution regulations, Reviews, Comprehensive planning, Technology utilization, Biological effects, Risk assessment, Public health, Health risks, Recommendations, Clean Water Act.

PB91-168534/REB PC **A22**/MF **A03**
Environmental Protection Agency, Research Triangle Park, NC. Office of Air Quality Planning and Standards.
Municipal Waste Combustion: Background Information for Promulgated Standards and Guidelines. Summary of Public Comments and Responses. Final rept.
Radian Corp., Research Triangle Park, NC.
Dec 90, 520p EPA/450/3-91/004
Contract EPA-68-02-4378
See also PB91-168542. Sponsored by Environmental Protection Agency, Research Triangle Park, NC. Office of Air Quality Planning and Standards.

EPA is preparing for promulgation under Clean Air Act 111(b) emission standards for new MWC's and, under 111(d), emission guidelines for existing MWC's. The standards and guidelines will apply to MWC units with a capacity to combust 250 or more tons of municipal solid waste per day. The standards and guidelines were proposed in the Federal Register on December 20, 1989 (54 FR 52251 and 54 FR 52209). Public hearings were held in January 1990 in Boston MA, Detroit MI, and Seattle WA. These meetings were open to the public and the public was given an opportunity to comment on the proposal. Additionally, EPA received over 300 written comment letters. The report summarizes all comments and presents the Agency's responses.

Keywords: *Municipal wastes, *Air pollution standards, *Waste disposal, *Guidelines, *Incineration, Combustion products, Public opinion, US EPA, Pollution regulations, Performance standards, Pollution sources, Air pollution control equipment, Air pollution abatement, Air pollution control, Best technology, Standards compliance, Law enforcement, Nitrogen oxides, Materials recovery, *New Source Performance Standards, Clean Air Act.

PB91-168542/REB PC **A06**/MF **A01**
Environmental Protection Agency, Research Triangle Park, NC. Office of Air Quality Planning and Standards.
Municipal Waste Combustion: Background Information for Promulgated Standards and Guidelines. Summary of Public Comments and Responses. Appendices A to C. Final rept.
Radian Corp., Research Triangle Park, NC.
Dec 90, 105p EPA/450/3-91/004A
Contract EPA-68-02-4378
See also PB91-168534. Sponsored by Environmental Protection Agency, Research Triangle Park, NC. Office of Air Quality Planning and Standards.

Appendices A to C to the 'Municipal Waste Combustion: Background Information for Promulgated Standards and Guidelines - Summary of Public Comments and Responses' (PB91-168534), address key technical issues related to the promulgated rules for municipal waste combustors (MWC's). Appendix A provides analysis of the continuous SO2 control capabilities of spray dryer/fabric filter (SD/FF) and spray dryer/electrostatic precipitator (SD/ESP) control systems for MWC's. Achievable SO2 performance levels for these systems are determined based on the analysis. Similarly, Appendix B provides analysis of continuous NOX emissions data from MWC's. Results are presented for the statistical analysis of NOX data obtained from a grate-fired mass burn waterwall MWC using selective noncatalytic reduction (SNCR) to reduce NOX emissions and from a rotary mass burn waterwall MWC designed to limit NOX emissions through combustion control. Appendix C provides additional MWC emissions test data which became available following proposal of the standards and guidelines for MWC's on December 20, 1989. The appendix reviews data at four MWC's with either unique air pollution control technologies or emissions which are higher than for similarly controlled MWC's that had been previously examined.

Keywords: *Municipal wastes, *Air pollution standards, *Waste disposal, *Guidelines, *Incineration, Graphs(Charts), Combustion products, Public opinion, US EPA, Pollution regulations, Performance standards, Tables(Data), Air pollution control, Materials recovery, Nitrogen oxides, Law enforcement, Pollution sources, Air pollution control equipment, Air pollution sampling, Standards compliance, Best technology, *New Source Performance Standards, Clean Air Act.

PB91-168559/REB PC **A05**/MF **A01**
National Air Pollutant Emission Estimates, 1940-1989. Final rept.
Environmental Protection Agency, Research Triangle Park, NC. Office of Air Quality Planning and Standards.
Mar 91, 82p* EPA/450/4-91/004
See also PB90-199266.

The report presents estimates of trends in nationwide air pollutant emissions for six major pollutants: particulate (PM/TSP and PM10), sulfur oxides, nitrogen oxides, reactive volatile organic compounds, carbon monoxide, and lead. Estimates are provided for major categories of air pollution sources. A short analysis of

emission trends is given along with a discussion of methods used to develop the data.

Keywords: *Air pollution, *Particulates, *United States, Tables(Data), Exhaust emissions, Study estimates, Pollution sources, Carbon monoxide, Sulfur oxides, Graphs(Charts), Concentration(Composition), Industrial wastes, Combustion products, Trends, Solid waste disposal, Nitrogen oxides, Emission factors, Lead(Metal), Volatile organic compounds, *Emission inventories.

PB91-168567/REB PC **A08**/MF **A01**
Municipal Waste Combustion: Background Information for Materials Separation. Final rept.
Environmental Protection Agency, Research Triangle Park, NC. Office of Air Quality Planning and Standards.
Jan 91, 168p EPA/450/3-90/021

Several issues related to materials separation from municipal solid waste (MSW) are discussed. Current nationwide rates of materials separation and recycling, as well as the methodology for determining municipal solid waste separation rates, are presented. Case studies of four community curbside separation programs include performance data and program costs. Two centralized materials separation facilities which separate materials from unsorted MSW are described with respect to the separation mechanisms employed, performance, and available cost data. Available data on the impacts of materials separation on municipal waste combustor (MWC) air emissions, combustor operation, and MWC ash are presented. The potential occupational risks of the handpicking process used to separate materials from MSW at some centralized separation facilities are discussed. The use of mercury in household batteries, and current information on community battery separation and collection programs and recycling efforts, are also discussed.

Keywords: *Municipal wastes, *Materials recovery, *Incinerators, *Air pollution control, *Air pollution standards, Separation, Waste recycling, Case studies, Operating, Household wastes, Combustion products, Waste disposal, Pollution regulations, Performance evaluation, Cost analysis, Occupation exposure, Electric batteries.

PB91-168575/REB PC **A06**/MF **A01**
Environmental Protection Agency, Research Triangle Park, NC. Office of Air Quality Planning and Standards.
Air Pollutant Emission Standards and Guidelines for Municipal Waste Combustors: Revision and Update of Economic Impact Analysis and Regulatory Impact Analysis. Final rept.
Research Triangle Inst., Research Triangle Park, NC. Center for Economics Research.
G. E. Morris, B. L. Jellicorse, and R. Sarmiento. Nov 90, 115p EPA/450/3-91/003
Contract EPA-68-D-80073
See also PB90-154899, PB90-154907, and PB90-154915. Sponsored by Environmental Protection Agency, Research Triangle Park, NC. Office of Air Quality Planning and Standards.

EPA is preparing for promulgation under Clean Air Act 111(b) emission standards for new Municipal Waste Combustors (MWCs) and, under 111(d), emission guidelines for existing MWCs. The standards and guidelines will apply to MWCs with a capacity to combust 35 or more Mg of municipal solid waste per day. The report updates 'Economic Impact of Air Pollutant Emission Standards for New Municipal Waste Combustors,' EPA-450/3-89-006 (August 1989), 'Economic Impact of Air Pollutant Emission Guidelines for Existing Municipal Waste Combustors,' EPA-450/30-89-005 (August 1989), and 'Regulatory Impact Analysis of Air Pollutant Emission Standards and Guidelines for Municipal Waste Combustors,' (PB90-154915), (October 1989). The update describes baseline projections of MWCs, economic analysis methodology, national costs and emission reductions attributable to the standards and guidelines, the sensitivity of costs to assumptions about capacity utilization and about materials separation requirements, and how the standards and guidelines may change communities' choices of waste disposal technology.

Keywords: *Air pollution standards, *Air pollution economics, *Municipal wastes, *Incinerators, *Waste disposal, Economic factors, Air pollution control, Pollution regulations, Standards compliance, Materials recovery, Cost estimates, Household wastes, Revisions, Performance standards, *New Source Performance Standards, Small systems, Clean Air Act.

PB91-168583/REB PC **A13**/MF **A02**
Environmental Protection Agency, Research Triangle Park, NC. Office of Air Quality Planning and Standards.
Nonmethane Organic Compound and Three-Hour Air Toxics Monitoring Program, 1990.
Radian Corp., Research Triangle Park, NC.
R. A. McAllister, P. L. O'Hara, D. P. Dayton, J. E. Robbins, and R. F. Jongleux. Jan 91, 286p EPA/450/4-91/008
Contract EPA-68D80014
See also PB90-265331. Sponsored by Environmental Protection Agency, Research Triangle Park, NC. Office of Air Quality Planning and Standards.

In certain areas of the country where the National Ambient Air Quality Standard (NAAQS) for ozone is being exceeded, additional measurements of ambient nonmethane organic compounds (NMOC) are needed to assist the affected States in developing revised ozone control strategies. Because of previous difficulty in obtaining accurate NMOC measurements, the U.S. Environmental Protection Agency (EPA) has provided monitoring and analytical assistance to these States, beginning in 1984 and continuing through the 1990 NMOC Monitoring Program.

Keywords: *Air pollution monitoring, *Toxic substances, *Non-methane hydrocarbons, Air pollution standards, Air pollution control, Air quality, Ozone, Air pollution detection, Concentration(Composition), Quality assurance, Quality control, Data processing, Standards compliance.

PB91-171355/REB PC **A04**/MF **A01**
Environmental Protection Agency, Research Triangle Park, NC. Air and Energy Engineering Research Lab.
Technology for the Control of Particulates and Sulfur Oxides by Electrostatic Techniques. Final rept. Aug 85-Jul 90.
Southern Research Inst., Birmingham, AL.
E. B. Dismukes, and J. P. Gooch. Mar 91, 55p SRI-ENV-90/892-5868, EPA/600/7-91/004
Sponsored by Environmental Protection Agency, Research Triangle Park, NC. Air and Energy Engineering Research Lab.

The report summarizes research performed by Southern Research Institute on several aspects of the E-SOx Process, invented by EPA to jointly control particulate matter and SO2 in coal-fired boiler emissions by retrofitting an existing electrostatic precipitator (ESP), formerly used only for particulate removal. The report covers research on potential ESP sites for process application, process economics, characterization of process solid waste collected in the ESP, measurement and modeling of prechargers in the retrofitted ESP, and effectiveness of the process with respect to SO2 removal. Experiment results described in the report confirm original EPA laboratory work and were influential in the decision to proceed with a large pilot evaluation of E-SOx. Research emphasis was on ESP performance, under E-SOx conditions, to verify that this essential equipment process component could retain its primary function of particle removal at a level equal to removal prior to modifications necessary for E-SOx. Further research is suggested.

Keywords: *Air pollution control equipment, *Electrostatic precipitators, Sulfur dioxide, Particles, Experimental design, Technology utilization, Performance evaluation, Solid wastes, Retrofitting, Injection, *E-SOX process.

PB91-171363/REB PC **A12**/MF **A02**
Macroinvertebrate Field and Laboratory Methods for Evaluating the Biological Integrity of Surface Waters.
Environmental Monitoring Systems Lab., Cincinnati, OH.
D. J. Klemm, P. A. Lewis, F. Fulk, and J. M. Lazorchak. Nov 90, 270p EPA/600/4-90/030
See also PB-227 183.

The manual describes guidelines and standardized procedures for using benthic macroinvertebrates in evaluating the biological integrity of surface waters. Included are sections on quality assurance and quality control procedures, safety and health recommendations, selection of sampling stations, sampling methods, sample processing, data evaluation, and an extensive taxonomic bibliography of the benthic macroinvertebrate groups. Supplementary information on the pollution tolerance of selected species, examples of macroinvertebrate bench sheets and macroinvertebrate data summary sheets, and a list of equipment and supplies for conducting biomonitoring studies are provided in the Appendices.

Keywords: *Surface waters, *Biological fouling, *Water pollution, *Invertebrates, Field tests, Quality assurance, Sampling, Monitoring, Taxonomy, *Laboratory methods.

PB91-171371/REB PC **A06**/MF **A01**
Innovative and Alternative Technology Assessment Manual.
Environmental Protection Agency, Cincinnati, OH. Water Engineering Research Lab.
Feb 80, 117p EPA/430/9-78/009
See also PB81-103277.

The EPA updated the publication entitled 'Innovative and Alternative Technology Assessment Manual' (PB81-103277) with 'Municipal Waste Water Treatment Technology Fact Sheets'. The document contains information on collection systems, disinfection, sludge, on-site systems, biology, secondary treatment, and miscellaneous technology.

Keywords: *Sewage treatment, *Municipalities, *Water pollution control, Sewers, Design criteria, Performance evaluation, Waste disposal, Waste utilization, Cost effectiveness, Secondary sewage treatment, Biological treatment, Technology utilization, Disinfection, Incineration, Composting, Sludge disposal, On-site investigations, Alternative planning, Clean Water Act of 1977.

PB91-171389/REB PC **A21**/MF **A03**
Environmental Protection Agency, Research Triangle Park, NC. Air and Energy Engineering Research Lab.
Follow-Up Durability Measurements and Mitigation Performance Improvement Tests in 38 Eastern Pennsylvania Houses Having Indoor Radon Reduction Systems. Final rept. Oct 89-Feb 90.
Acres International Corp., Amherst, NY.
W. O. Findlay, A. Robertson, and A. G. Scott. Mar 91, 492p*
Contract EPA-68-02-4262
See also PB88-156617. Sponsored by Environmental Protection Agency, Research Triangle Park, NC. Air and Energy Engineering Research Lab.

The report gives results of follow-up tests in 38 difficult-to-mitigate Pennsylvania houses where indoor radon reduction systems had been installed 2 to 4 years earlier. Objectives were to assess system durability, methods for improving performance, and methods for reducing installation and operating costs. The durability tests indicated that the 38 systems have not experienced any significant degradation in indoor radon levels or in system flows/suctions, except in 6 houses where system fans failed, and in houses where homeowners turned off the systems. Tests to improve performance indicated that nearly all of the elevated residual radon levels are due to re-entrainment back into the house of very-high-radon exhaust gas from the soil depressurization systems, and to radon release from well water. Tests to reduce system costs showed that premitigation sub-slab suction field measurements can help prevent installation of too many suction pipes when communication is good, but suggest a need for too many pipes when communication is poor. Soil depressurization fans could not be turned down to the extent expected in some systems that were over-designed. Between 6 and 42% of the exhausted air was withdrawn from the house.

Keywords: *Radon, *Indoor air pollution, Performance evaluation, Radioactive materials, Design criteria, Operating costs, Houses, Durability, Installation costs, Residential buildings, *Source reduction, *Subslab depressurization systems, *Draintile depressurization systems, Soil gases.

PB91-171405/REB PC **A03**/MF **A01**
Environmental Protection Agency, Cincinnati, OH. Risk Reduction Engineering Lab.

Chemistry of Water Treatment Processes Involving Ozone, Hydrogen Peroxide and Ultraviolet Radiation. Journal article.
California Univ., Los Angeles. Office of Environmental Science and Engineering.
W. H. Glaze, J. W. Kang, and D. H. Chapin. c1987, 20p
EPA/600/J-87/545
Grant EPA-R-813188
Pub. in Ozone Science and Engineering, v9 p335-352 1987. Sponsored by Environmental Protection Agency, Cincinnati, OH. Risk Reduction Engineering Lab.

Advanced oxidation processes are defined as those which involve the generation of hydroxyl radicals in sufficient quantity to affect water purification. The theoretical and practical yield of OH from O3 at high pH, O3/H2O, O3/UV and H2O2/UV systems is reviewed. New data is presented which illustrates the importance of direct photolysis in the O3/UV process, the effect of the H2O2:O3 ratio in the O3/H2O2 process, and the impact of the low extinction coefficient of H2O2 in the H2O2/UV process. (Copyright (c) 1987, International Ozone Association.)

Keywords: *Water treatment, *Water chemistry, *Water pollution control, *Sewage treatment, Ozonization, Ultraviolet radiation, Water purification, Photochemical reactions, Water treatment(Chemicals), Free radicals, Photolysis, Chemical reactions, Decomposition reactions, Industrial waste treatment, Hydrogen peroxide, Reprints, Chemical reaction mechanisms.

PB91-171413/REB PC **A03/MF A01**
Corvallis Environmental Research Lab., OR.
Arsenic Sedimentation Along the Slope of a Lake Basin. Journal article.
Michigan State Univ., East Lansing. Dept. of Fisheries and Wildlife.
M. Siami, C. D. McNabb, T. R. Batterson, and R. P. Glandon. c1987, 13p EPA/600/J-87/546
Pub. in Environmental Toxicology and Chemistry, v6 p595-605 1987. Sponsored by Corvallis Environmental Research Lab., OR.

Lake Lansing, Michigan was treated with sodium arsenite for macrophyte control in 1957. Seven 1.5-m sediment cores were taken along a line through the littoral zone to the deepest portion of the lake and analyed for arsenic. In each core, arsenic concentrations going from the surface downward increased to some maximum and then receded to background. Depth of peak concentrations followed two patterns; three littoral cores showed peak arsenic at 0.13 m from the sediment surface, and four cores from progressively deeper portions of the lake showed a regular decrease in peak depth from 0.32 m to 0.17 m. Sediment accumulation rates were calculated along this transect. Particle-size sorting of sediments along this slope was also measured. This work suggested that sediments originated from wetland vegetation at the edge of the lake. Turbulent movement of water in the shallows caused suspension and down-slope movement of small particles. Fewer particles of wetland origin were available for sedimentation beyond the region of highest fallout (3.75 m), thus accounting for progressively lower sedimentation rates in deeper portions of the basin. A model was developed to predict the time it would take for surface sediments to reach pretreatment concentrations of arsenic levels; for Lake Lansing it would be more than 100 years. (Copyright (c) SETAC 1987.)

Keywords: *Arsenic, *Lake Lansing(Michigan), *Sedimentation, Water pollution, Mathematical models, Littoral zone, Sodium arsenite, Surface waters, Reprints.

PB91-171421/REB PC **A02/MF A01**
Environmental Protection Agency, Research Triangle Park, NC. Air and Energy Engineering Research Lab.
Triangle-Shaped DC Corona Discharge Device for Molecular Decomposition. Journal article May-Aug 87.
Research Triangle Inst., Research Triangle Park, NC.
T. Yamamoto, P. A. Lawless, and L. E. Sparks. c1989, 9p EPA/600/J-89/507
Pub. in IEEE (Institute of Electrical and Electronics Engineers) Transactions on Industry Applications, v25 n4 p743-749 Jul/Aug 89. Presented at the Industry Applications Society Annual Meeting, Atlanta, GA., October 19-23, 1987. Sponsored by Environmental Protection Agency, Research Triangle Park, NC. Air and Energy Engineering Research Lab.

The paper discusses the evaluation of electrostatic DC corona discharge devices for the application of molecular decomposition. A point-to-plane geometry corona device with a rectangular cross section demonstrated low decomposition efficiencies in earlier experimental work. The numerical simulation of the device suggested that there were low electron density and electric field zones, resulting in electrical sneakage. Thus, the kinetic rate coefficients in the chemical reaction process were significantly reduced. A triangle-shaped DC corona discharge device was developed to improve the electrical sneakage problem, and a mathematical model was developed to describe the detailed electrical characteristics and to refine estimates on the optimum shape of the device. The preliminary experimental results indicated that the decomposition efficiency was much improved.

Keywords: *Electric coronas, Electrostatics, Decomposition, Phosphonic acid/dimethyl methyl ester, Pollution control, Mathematical models, Stationary sources, Reaction kinetics, Technology assessment, Reprints.

PB91-171439/REB PC **A03/MF A01**
Environmental Protection Agency, Cincinnati, OH. Risk Reduction Engineering Lab.
Ozonation Byproducts. 2. Improvement of an Aqueous-Phase Derivatization Method for the Detection of Formaldehyde and Other Carbonyl Compounds Formed by the Ozonation of Drinking Water. Journal article.
California Univ., Los Angeles. Office of Environmental Science and Engineering.
W. H. Glaze, M. Koga, and D. Cancilla. c1989, 12p
EPA/600/J-89/508
Grant EPA-R813188
Pub. in Environmental Science and Technology, v23 n7 p838-847 Jul 89. Prepared in cooperation with University of Occupational and Environmental Health, Kitakyushu (Japan). Sponsored by Environmental Protection Agency, Cincinnati, OH. Risk Reduction Engineering Lab.

A method for the determination of low molecular weight aldehydes in water using aqueous-phase derivization with O-(2,3,4,5,6-pentafluorobenzyl)hydroxylamine hydrochloride has been improved by the use of high-resolution capillary GC. Detection limits with GC/ECD and GC/MS with selected ion monitoring are in the low microgram per liter (ppb) range. The method has been used to evaluate levels of aldehydes in three surface water treatment plants and one ground water treatment plant before and after ozonation. Aldehydes are increased as a result of ozonation, with formaldehyde being the most prevalent. Higher yields are observed in the plant treating surface water with the highest TOC level, but very low yields are observed in a high TOC ground water. Spiking studies show that the raw ground water has a very high demand for formaldehyde, suggesting that the aldehydes may be converted into secondary byproducts.

Keywords: *Water treatment plants, *Formaldehyde, *Water pollution detection, *Water analysis, *Ozonization, *Potable water, Surface waters, Ground water, Aldehydes, Gas chromatography, Mass spectroscopy, Byproducts, Carbonyl compounds, Halomethanes, Substitutes, Reprints, Amine hydrochloride/(pentafluorobenzyl)hydroxyl.

PB91-171447/REB PC **A03/MF A01**
Use of Expert Systems to Assist in Decisions Concerning Environmental Control. Journal article.
Environmental Protection Agency, Cincinnati, OH. Risk Reduction Engineering Lab.
D. Greathouse, J. Clements, and K. Morris. c1989, 19p
EPA/600/J-89/509
Pub. in Critical Reviews in Environmental Control, CRC Press, Inc., Issue 4, v19 p341-357 1989. Prepared in cooperation with Computer Sciences Corp., Cincinnati, OH.

Expert systems are being developed by a number of organizations to aid decision makers in the evaluation of complex environmental issues. The paper presents some of the basic concepts of expert systems, discusses some of the important development issues, and provides a brief summary of several systems currently under development.

Keywords: *Hazardous materials, *Waste disposal, *Environmental impact, *Expert systems, Decision making, Artificial intelligence, Systems engineering, Management, Reprints.

PB91-171454/REB PC **A02/MF A01**
Application of Ecological Theory to Determine Recovery Potential of Disturbed Lotic Ecosystems: Research Needs and Priorities. Journal article.
Environmental Research Lab.-Duluth, MN.
J. A. Gore, J. R. Kelly, and J. A. Yount. c1990, 8p EPA/600/J-90/389
Pub. in Environmental Management, v14 n5 p755-762 Sep/Oct 90. Prepared in cooperation with Austin Peay State Univ., Clarksville, TN. Center for Field Biology, and Cornell Univ., Ithaca, NY. Ecosystems Research Center.

The article summarizes the views of aquatic scientists who gathered to assess the ability of stream ecosystem theory to predict recovery from disturbance. Two views of disturbance were evident: a discrete removal of organisms vs an unusual deviation from normal. These were perceived as applying to different scales and/or objectives. Long-term information is required from both points of view to define recovery. Recovery also may be defined in different ways, but it is clear that recovery has both spatial and temporal components, and includes both physical and biological processes. There was strong consensus that a national monitoring system of representative lotic ecosystems within ecological regions be established. The purpose of the monitoring system would be to acquire long-term data on natural variability, to establish viable indicators of spatial and temporal aspects of recovery, and to develop and test emerging theoretical developments.

Keywords: *Lotic environment, *Aquatic ecosystems, *Streams, *Recovery, *Remedial action, *Environmental monitoring, Spatial distribution, Temporal distribution, Balance of nature, Biological effects, Long term effects, Water pollution effects, Research and development, Chemical properties, Reprints.

PB91-171462/REB PC **A03/MF A01**
Bioassay Directed Characterization of the Acute Aquatic Toxicity of a Creosote Leachate. Journal article.
Environmental Research Lab.-Duluth, MN.
D. W. Kuehl, G. T. Ankley, L. P. Burkhard, and D. Jensen. c1990, 11p EPA/600/J-90/390
Pub. in Hazardous Waste and Hazardous Materials, v7 n3 p283-291 Jul 90. Prepared in cooperation with AScI Corp., Duluth, MN.

A toxicity based approach to chemical characterization has been used to identify select toxicants in an aqueous leachate of creosote. Gas chromatographic-mass spectral analysis of toxic fractions of the leachate identified pentachlorophenol and a mixture, of low molecular weight heterocyclic aromatic hydrocarbons as suspect toxicants from among the hundreds of chemicals found in the leachate.

Keywords: *Hazardous wastes, *Toxicity, *Creosote, Bioassay, Leaching, Gas chromatography, Aromatic hydrocarbons, Toxic substances, Daphnia, Environmental monitoring, Mass spectroscopy, Reprints.

PB91-171470/REB PC **A03/MF A01**
Influence of Cytochrome P450 Mixed-Function Oxidase Induction on the Acute Toxicity to Rainbow Trout 'Salmo gairdner' of Primary Aromatic Amines. Journal article.
Environmental Research Lab.-Duluth, MN.
J. L. M. Hermens, S. P. Bradbury, and S. J. Broderius. c1990, 13p EPA/600/J-90/391
Pub. in Ecotoxicology and Environmental Safety, v20 p156-166 1990. Prepared in cooperation with Utrecht Rijksuniversiteit (Netherlands). Research Inst. of Toxicology.

The influence of enzyme induction on the acute toxicity of aniline and 4-chloroaniline to rainbow trout (Salmo gairdneri) was investigated. For these two xenobiotics, bioactivation reactions are known to occur in mammals. Induction of cytochrome P450 mixed-function oxidase was obtained by intraperitoneal (ip) injection of trout with a mixture of polychlorinated biphenyls (Aroclor 1254). Five days after ip injection with three different doses of Aroclor 1254 (50, 100, and 200 mg/kg), benzo(a)pyrene hydroxylase activity in trout liver

microsomes increased five- to sixfold. Cytochrome P450 concentrations in the microsomes were slightly, but significantly, enhanced in two of the three dose levels. The 96-hr LC50's of aniline and 4-chloroaniline were not affected by pretreatment with Aroclor 1254, suggesting that metabolic activation does not necessarily play a role in the acute toxicity of aromatic amines to fish. (Copyright (c) 1990 Academic Press, Inc.)

Keywords: *Mixed function oxidases, *Trout, *Anilines, Enzyme induction, Polychlorobiphenyl compounds, Benzopyrene, Dose-response relationships, Liver microsomes, Metabolic activation, Water pollution effects(Animals), Reprints, *Cytochrome P-450.

PB91-171488/REB PC **A02**/MF **A01**
Sintering and Sulfation of Calcium Silicate: Calcium Aluminate. Journal article.
Environmental Protection Agency, Research Triangle Park, NC. Air and Energy Engineering Research Lab.
R. H. Borgwardt, and G. T. Rochelle. c1990, 8p EPA/600/J-90/392
Pub. in Jnl. of Industrial and Engineering Chemistry Research, v29 n10 p2118-2123 Oct 90. Prepared in cooperation with Texas Univ. at Austin. Dept. of Chemical Engineering.

The effect of sintering on the reactivity of solids at high temperature was studied. The nature of the interaction was studied with calcium silicate-aluminate reacting with SO2 between 665 and 800 C. The kinetics of the sintering and sulfation processes were measured independently in terms of the common variables, temperature and specific surface area. Surface reduction parameters were evaluated by the German-Munir sinter model, modified to account for a strong catalytic effect of H2O vapor. Sulfation parameters were determined from a series of conversion vs. time measurements at various temperatures using calcined solids of known surface area. These show product layer diffusion through CaSO4 to be the probable controlling process above 670 C and diffusion through a mixture of CaSO3 and CaSO4 controlling below that temperature. Like sintering, sulfation was enhanced by the presence of H2O in the feed gas. With 7% H2O vapor, the enhancement factor for sulfation was 1.5 at 665 C and estimated to be 5.0 at higher temperatures where only CaSO4 is formed. A combined sinter/sulfation model, based on the parameters evaluated for the independent processes, is compared to sulfation rates measured for the uncalcined solid when sintering is occurring simultaneously.

Keywords: *Sintering, *Calcium silicates, *Aluminates, *Sulfation, *Chemical reactivity, Sulfur dioxide, Water, Calcium sulfates, Temperature effects, Reaction kinetics, Surface properties, Air pollution control, Reprints.

PB91-171496/REB PC **A03**/MF **A01**
Environmental Protection Agency, Research Triangle Park, NC. Air and Energy Engineering Research Lab.
Nitrous Oxide Emissions from Fossil Fuel Combustion. Journal article.
Acurex Corp., Research Triangle Park, NC.
W. P. Linak, J. A. McSorley, R. E. Hall, J. V. Ryan, and J. O. L. Wendt. c1990, 11p EPA/600/J-90/393
Contracts EPA-68-02-4701, EPA-68-02-4285
Pub. in Jnl. of Geophysical Research, v95 nD6 p7533-7541, 20 May 90. Prepared in cooperation with Arizona Univ., Tucson. Dept. of Chemical Engineering. Sponsored by Environmental Protection Agency, Research Triangle Park, NC. Air and Energy Engineering Research Lab.

The role of coal combustion as a significant global source of nitrous oxide (N2O) emissions was reexamined through on-line emission measurements from six pulverized-coal-fired utility boilers and from laboratory and pilot-scale combustors. The full-scale utility boilers yielded direct N2O emission levels of less than 5 ppm. The sub-scale combustor test data were consistent with full-scale data, and also showed N2O emission levels not exceeding 5 ppm, although these levels increased slightly when various combustion modifications to lower NO emissions were employed. These on-line emission measurements are very different from previously published data. The discrepancy is shown to be due to a sampling artifact by which significant quantities of N2O can be produced in sample containers which have been used in establishing the prevously employed N2O data base. Consequently, it was concluded that N2O emissions bear no direct relationship to NO emissions from these combustion sources, and that the direct source of N2O is negligible. Other indirect routes for the conversion of NO into N2O outside the combustor and other combustion sources not examined by the study, however, cannot be ruled out. (Copyright (c) 1990 by the American Geophysical Union.)

Keywords: *Nitrogen oxide(N2O), *Coal combustion, Emission, Boilers, Air pollution, Air pollution control, Stationary sources, Fossil fuels, Laboratory tests, Reprints.

PB91-171504/REB PC **A03**/MF **A01**
Robert S. Kerr Environmental Research Lab., Ada, OK.
Cosolvent Effects on Sorption and Mobility of Organic Contaminants in Soils. Journal article.
Florida Univ., Gainesville.
A. L. Wood, D. C. Bouchard, M. L. Brusseau, and P. S. C. Rao. c1990, 15p EPA/600/J-90/394
Grant EPA-R-814512
Pub. in Chemosphere, v21 n4-5 p575-587 Nov 90. Sponsored by Robert S. Kerr Environmental Research Lab., Ada, OK.

Batch equilibrium and column miscible displacement techniques were used to investigate the influence of an organic cosolvent (methanol) on the sorption and transport of three hydrophobic organic chemicals (HOCs) - naphthalene, phenanthrene, and diuron herbicide - in a sandy surface soil (Eustis fine sand). Equilibrium sorption constant (K) values calculated from batch and column data exhibited an inverse log-linear dependence on the volume fraction (fc) of methanol in the mixed solvent. The slope of the log-linear plot was approximately equal to the logarithm of the ratio of the HOC solubilities in neat cosolvent and water. K values obtained from breakthrough curves were comparable to those estimated from equilibrium sorption isotherms. Long-term exposure to methanol-water mixtures had little effect on sorption and transport properties of the soil, but column retardation factors were influenced by the short-term solvent exposure history prior to solute elution.

Keywords: *Naphthalene, *Phenanthrene, *Diuron, *Sands, *Sorption, Transport properties, Solvents, Methanol, Water, Solubility, Land pollution, Ground water, Herbicides, Thermodynamic properties, Reprints.

PB91-171512/REB PC **A01**/MF **A01**
Chemical Transport Facilitated by Colloidal-Sized Organic Molecules. Journal article.
Robert S. Kerr Environmental Research Lab., Ada, OK.
C. G. Enfield. c1990, 4p EPA/600/J-90/395
Pub. in Hazardous Materials Control, v3 n4 p50-51 Jul/Aug 90.

The fluid passing through the pores of soils and geologic materials is not just water with dissolved inorganic chemicals, but a complex mixture of organic and inorganic molecules. Large organic molecules such as humic and fulvic materials may impact the movement of contaminants. If the large organic molecules are mobile and they act like surfactant micelles, they can facilitate the movement of hydrophobic organic contaminants. Enfield and Bengtsson performed a sensitivity analysis evaluating the importance of several processes that might impact the movement of hydrophobic organic chemicals. The sensitivity shown in the analysis demonstrates the importance of a knowledge of the mobility of the organic colloids and the ability of the organic colloids to partition a contaminant and facilitate its movement as well as the amount of organic colloid present. The analysis indicates that if the colloid is not mobile it will not have an impact on chemical transport and also shows the importance of the amount of mobile carbon assuming the partition coefficient was the same for all carbon (mobile and associated with the mineral fraction of the soil). Experimental evidence of facilitated transport for hexachlorobenzene due to the presence of a polysaccharide (blue dextran) is also discussed.

Keywords: *Transport theory, *Soils, *Colloids, *Hexachlorobenzene, *Blue Dextran, Micelles, Mathematical models, Contaminants, Porosity, Ground water, Organic compounds, Reprints.

PB91-171520/REB PC **A03**/MF **A01**
Benzene and Naphthalene Sorption on Soil Contaminated with High Molecular Weight Residual Hydrocarbons from Unleaded Gasoline. Journal article.
Robert S. Kerr Environmental Research Lab., Ada, OK.
D. C. Bouchard, S. C. Mravik, and G. B. Smith. c1990, 17p EPA/600/J-90/396
Pub. in Chemosphere, v21 n8 p975-989 1990.

For complex nonaqueous phase liquids (NAPLs), the composition of the NAPL retained in the pore space of geologic material weathers until the residual NAPL no longer acts as a liquid and exists as discrete regions of hydrocarbon (termed residual hydrocarbons) in association with the geologic media (water wet media), or as thin film coatings on the media (NAPL wet media). In the study, the residual hydrocarbons were found to resist separation from the soil solids even when subjected to shaking in batch reactors. In addition, the magntude of solute sorption was significantly higher for a low organic carbon soil contaminated with residual hydrocarbons than for natural soil organic carbon.

Keywords: *Oil pollution, *Unleaded gasoline, *Land pollution, *Petroleum residues, *Environmental persistence, Soil contamination, Geologic formation, Weathering, Sorption, Benzene, Naphthalene, Petroleum products, Reprints, *Nonaqueous phase liquids.

PB91-171538/REB PC **A03**/MF **A01**
Robert S. Kerr Environmental Research Lab., Ada, OK.
Bioremediated Soil Venting of Light Hydrocarbons. Journal article.
Massachusetts Univ., Amherst.
D. W. Ostendorf, and D. H. Kampbell. c1990, 18p EPA/600/J-90/397
Pub. in Hazardous Waste and Hazardous Materials, v7 n4 p319-334 1990. Sponsored by Robert S. Kerr Environmental Research Lab., Ada, OK.

The effectiveness and feasibility of bioremediated soil venting of light hydrocarbons in the unsaturated zone was investigated. Degradation mechanics were considered as a one dimensional balance of storage, linear sorption, vertical advection, and Michaelis-Menton kinetics. The resulting analytical solution was tested successfully against field performance data of an unsaturated clay soil bioreactor for a pollpellant waste gas mixture of propane, n-butane, and isobutane. A series of venting simulations was run to assess the biodegradation of vapors above an aviation gasoline spill in sandy soil at Traverse City, Michigan, based on field and microcosm estimates of the kinetic parameters. Acclimated, nutrient rich soil effectively and feasibly reduced effluent vapor concentration from the strong influent concentration associated with dispersed residual gasoline in the contaminated capillary fringe. Aggregated residual contamination required a stronger airflow for a longer duration while natural kinetics were too slow for feasible and effective treatment by bioremediated soil venting at Traverse City.

Keywords: *Remedial action, *Land pollution control, *Hydrocarbons, *Biodeterioration, *Hazardous materials, Waste disposal, Pesticides, Chemical spills, Oil spills, Soil contamination, Reprints, *Soil venting, Traverse City(Michigan).

PB91-171546/REB PC **A02**/MF **A01**
Environmental Research Lab., Narragansett, RI.
Preparation of Benthic Substrates for Sediment Toxicity Testing. Journal article.
Environmental Research Lab.-Narragansett, Newport, OR. Mark O. Hatfield Marine Science Center.
G. R. Ditsworth, D. W. Schults, and J. K. P. Jones. c15 Mar 90, 9p EPA/600/J-90/398, ERLN-N077
Pub. in Environmental Toxicology and Chemistry, v9 p1523-1529 1990. Sponsored by Environmental Research Lab., Narragansett, RI.

A jar-rolling apparatus was constructed to prepare test substrates using sediments spiked with laboratory chemicals, the toxicity of which were assessed with the Rhepoxynius abronius bioassay. Test sediments were mixed by rolling them for several hours in one-gallon glass jars. Mixing was considered adequate based on the analytical results of sediment samples that were collected at locations along the longitudinal axis within each horizontally lying jar immediately after rolling. However, because comparative standards did

not exist, definitive conclusions of mixing thoroughness could not be drawn. Coefficients of variation, used to assess mixing within jars, were 11.5% or less (mean 5.1%). Mixing was not significantly different among replicated jars but, in some jars, was significantly different among within-jar sample locations.

Keywords: *Sediments, *Water pollution effects, *Toxicity, *Benthos, Sediment-Water interfaces, Bioassay, Experimental design, Design criteria, Sample preparation, Reprints.

PB91-171553/REB PC **A03/MF A01**
Retrospective Study of the Water Quality Issues of the Upper Potomac Estuary. Journal article.
Environmental Research Lab., Narragansett, RI.
N. A. Jaworski. c1990, 32p EPA/600/J-90/399, ERLN-P02
Pub. in Aquatic Sciences, Issue 1, v3 p11-40 1990. Also pub. as Environmental Research Lab., Narragansett, RI. rept. no. CONTRIB-P2.

The water quality of the upper Potomac Estuary near Washington, D.C., has changed dramatically during the past century. The channels that carried untreated wastewaters from the city in the mid-1880s are gone. The low dissolved oxygen levels, nuisance algal conditions, and high coliform densities in the upper estuary which occurred in the 1950s and 1960s are also gone. The improvements in water quality are a result of a massive wastewater management effort costing over $1 billion during the past 20 years. The paper reviews the major scientific and technical issues as they were presented to the decision-makers and follows these decisions as they were accepted, rejected, and/or modified. The review also includes how good the predictions for wastewater management efforts were, and how the uncertainty issues were addressed. Special emphasis is placed on the unpredicted 1983 algal bloom and its causes. The review also includes cost and benefits analyses, societal conveniences, and zero discharge implications. (Copyright (c) 1990 by CRC Press, Inc.)

Keywords: *Water quality management, *Sewage treatment, *Potomac Estuary, Chesapeake Bay, Biochemical oxygen demand, Decision making, Algae, Benefit cost analysis, District of Columbia, Maryland, Reprints.

PB91-171561/REB PC **A02/MF A01**
Definition of Adverse Effects for the Purpose of Establishing Secondary National Ambient Air Quality Standards. October-December 1990. Journal article.
Corvallis Environmental Research Lab., OR.
D. T. Tingey, W. E. Hogsett, and S. Henderson. c1990, 7p EPA/600/J-90/400
Pub. in Jnl. of Environmental Quality, v19 n4 p635-639 Oct-Dec 90. See also PB90-116617. Prepared in cooperation with NSI Technology Services Corp., Corvallis, OR.

Under the Clean Air Act, the USEPA establishes ambient air quality standards to protect public welfare from known or anticipated adverse effects from criteria air pollutants. Although adversity is simply defined (i.e., opposed to one's interest; harmful), its determination is fraught with difficulties. The definition depends on one's viewpoint; society has established that some effects are more serious than others. There is a view that ecological effects are adverse only if they can be expressed in economic terms. This leads to the conclusion that mitigative actions need not be taken unless the costs of the action are offset by sufficient benefits. Adverse effects, however, should be viewed in a broader societal content, i.e., the total benefits from ecological systems. (Copyright (c) 1990, ASA, CSSA, SSSA.)

Keywords: *Environmental effects, *Air pollution standards, *Ecology, *Public health, Biological effects, Pollution regulations, Exposures, Air quality, Socioeconomic factors, Air pollution effects(Plant), Air pollution effects(Humans), Economic analysis, Reprints, *Secondary National Ambient Air Quality Standards.

PB91-171579/REB PC **A03/MF A01**
Corvallis Environmental Research Lab., OR.
Theoretical Investigation of the Pressure and Temperature Dependence of Atmospheric Ozone Deposition of Trees. Journal article.
Washington Univ., Seattle. Dept. of Civil Engineering.
T. V. Larson, and R. J. Vong. c1990, 13p EPA/600/J-90/401
Pub. in Environmental Pollution, v67 p179-189 1990. Prepared in cooperation with Oregon State Univ., Corvallis. Dept. of Atmospheric Sciences. Sponsored by Corvallis Environmental Research Lab., OR.

Methods for describing the exposure patterns of forests to atmospheric ozone concentrations are compared with special emphasis on the situation at high altitudes, such as the Appalachian Mountains of the eastern USA. Limitations to the use of ozone concentration as mass per unit volume are discussed and a correction for temperature and pressure changes is derived. If identical ozone mass concentrations were measured at two sites separated by 2000 m elevation, the ozone flux at the lower site would exceed the flux at the higher site by 4-8% due to the temperature and pressure effects on both air volume and ozone deposition velocity. It is recommended that ozone exposures be described in terms of 'flux-corrected' mass concentrations or volumetric mixing ratios when ambient ozone data from sites at different altitudes are to be compared. (Copyright (c) 1990 Elsevier Science Publishers Ltd, England.)

Keywords: *Air pollution affects(Plants), *Ozone, *Deposition, *Atmospheric temperature, *Atmospheric pressure, *Trees(Plants), High altitude tests, Appalachian Mountains, Concentration(Composition), Exposure, Flux density, Mixing height, Mass transfer, Reprints, Eastern Region(United States).

PB91-171587/REB PC **A02/MF A01**
Effects of the Duration and Timing of Dietary Methyl Parathion Exposure on Bobwhite Reproduction. Journal article.
Corvallis Environmental Research Lab., OR.
R. S. Bennett, R. Bentley, T. Shiroyama, and J. K. Bennett. c1990, 10p EPA/600/J-90/402
Pub. in Environmental Toxicology and Chemistry, v9 p1473-1480 1990. Prepared in cooperation with NSI Technology Services Corp., Corvallis, OR.

Two northern bobwhite (Colinus virginianus) reproduction tests were conducted concurrently to evaluate how the duration and time of initiation of methyl parathion exposure affected dose-response relationships of reproductive parameters. In the long-term exposure test, pairs of adult bobwhite were fed methyl parathion-amended diets (0,7,10,14,20 or 28 ppm) for 25 weeks: 10 weeks prior to the onset of laying, 6 weeks as they came into laying condition and 9 weeks during egg laying. In the short-term exposure test, quail received amended diets (0,10,14,20,28, or 40 ppm) for only three weeks during the egg laying period, followed by a three-week posttreatment period. Fourteen birds died in the long-term test, compared to two in the short-term test. Significant dose-related reductions in daily food consumption, egg production and the number of 14-d-old chicks were observed in both tests during the treatment periods. No dose-related effects on fertility, hatchability or chick weights were detected. In the long-term test there were dose-related decreases in adult body weight, brain and serum cholinesterase activity and female serum calcium concentrations. Cholinesterase and calcium were not measured in the short-term test. Eggshell weights were significantly decreased in both tests, but a dose-related decrease in eggshell strength and thickness was detected only in the short-term test.

Keywords: *Methyl parathion, *Birds, *Wildlife, *Reproduction(Biology), Diet, Eggs, Dose-response relationships, Cholinesterase, Calcium, Body weight, Fertility, Reprints, *Northern bobwhite, Colinus virginianus.

PB91-171595/REB PC **A02/MF A01**
Effects of Dietary Methyl Parathion on Northern Bobwhite Egg Production and Eggshell Quality. Journal article.
Corvallis Environmental Research Lab., OR.
J. K. Bennett, and R. S. Bennett. c1990, 7p EPA/600/J-90/403
Pub. in Environmental Toxicology and Chemistry, v9 p1481-1485 1990. Prepared in cooperation with NSI Technology Services Corp., Corvallis, OR.

The effect of a short-term dietary methyl parathion exposure on northern bobwhite (Colinus virginianus) egg production and shell quality was investigated. Hens in egg production were fed either a methyl parathion diet (0,14,20,28 or 40 ppm) or a pair-fed diet (PF28 or PF40 received the same daily allotment of control feed on a g/kg/d basis as the 28 or 40 ppm-treated hen with whom she was paired) for 8 d. Daily food consumption was significantly reduced in all treatment groups and inversely related to chemical concentration. However, actual chemical consumption was similar for all methyl parathion-treated groups. Body weight, egg production, egg weight and eggshell strength, thickness and weight were reduced in the methyl parathion groups in a dose-related manner. Similar responses were observed in the pair-fed groups, indicating that effects were associated with a pesticide-induced reduction in food consumption. The dietary methyl parathion exposure impacted bobwhite egg production within 3 to 4 d and eggshell quality within 1 d of the onset of treatment.

Keywords: *Methyl parathion, *Birds, *Wildlife, diet, Dose-response relationships, Food consumption, Body weight, Reprints, *Northern bobwhite, *Eggshells, *Egg production, Colinus virginianis.

PB91-171603/REB PC **A03/MF A01**
Some Novel Statistical Analyses Relevant to the Reported Growth Decline of Pine Species in the Southeast. Journal article.
Corvallis Environmental Research Lab., OR.
W. G. Warren. c1990, 18p EPA/600/J-90/404
Pub. in Forest Science, v36 n2 p448-463 Jun 90.

Existing statistical methodology has been adapted to give additional insight into the data on pine-growth reduction in the Southeast as presented by Sheffield et al. (1985). Specifically the generation of confidence intervals for the percentage growth reduction is illustrated. The probability integral transformation and cumulative sum techniques are employed as a meta-analytic approach to testing the significance of the growth reduction. While these methods are suggested as a means of obtaining a quantitative overview of these particular data, the potential for wider application exists. It is also shown how the observed pattern of reduction and most, if not all, of its magnitude can be explained by a simple conceptual model for hardwood competition. Verification of the approach is, however, not possible with the data as provided by Sheffield et al. (Copyright (c) 1990 by the Society of American Foresters.)

Keywords: *Pine trees, *Statistical analysis, *Plant growth, *Growth rate, Forests, Study estimates, Graphs(Charts), Mathematical models, Air pollution effects(Plants), Deposition, Data processing, Species diversity, Baseline ecology, Reprints, *Southeast Region(United States).

PB91-171611/REB PC **A02/MF A01**
Global Climate Change: Policy Implications for Fisheries. Journal article.
Corvallis Environmental Research Lab., OR.
H. Gucinski, R. T. Lackey, and B. C. Spence. c1990, 8p EPA/600/J-90/405
Pub. in Fisheries, v15 n6 p33-38 Nov/Dec 90. Prepared in cooperation with NSI Technology Services Corp., Corvallis, OR., and Oregon State Univ., Corvallis.

Several government agencies are evaluating policy options for addressing global climate change. These include planning for anticipated effects and developing mitigation options where feasible if climate does change as predicted. For fisheries resources, policy questions address effects on international, national, and regional scales. Climate change variables expected to affect inland and offshore fisheries include temperature rise, changes in the hydrologic cycle, alterations in nutrient fluxes, and reduction and relocation of spawning and nursery habitat. These variables will affect resources at all levels of biological organization, including the genetic, organism, population, and ecosystem levels. In this context, changes in primary productivity, species composition in the food-web, migration, invasions, synchrony in biological cycles, shifts in utilization of niches, and problems of larvae entrainment in estuaries have been identified. Maintaining ecosystem robustness (i.e., high biodiversity) is another component of the problem. Action requires establishing priorities for information needs, determining appropriate temporal and spatial scales at which to model effects, and accounting for interactive changes in physical and biological cycles. A policy response can be derived when these results are integrated with social needs and human population constraints.

Keywords: *Climatic changes, *Fisheries, *Environmental effects, Air pollution, Global aspects, Aquatic ecosystems, Global warming, Oceans, Fresh water, Species distribution, Biological effects, Air water interactions, Food chains, Reprints.

PB91-171629/REB PC **A02**/MF **A01**
Corvallis Environmental Research Lab., OR.
Long-Term Starvation-Induced Loss of Antibiotic Resistance in Bacteria. Journal article.
Oregon State Univ., Corvallis.
R. P. Griffiths, C. L. Moyer, B. A. Caldwell, C. Ye, and R. Y. Morita. c1990, 9p EPA/600/J-90/406
Grant EPA-R-913413-01-0
Pub. in Microbial Ecology, v19 p251-257 1990. Also pub. as Oregon Agricultural Experiment Station, Corvallis rept. no. TP-9224. Prepared in cooperation with Oregon Agricultural Experiment Station, Corvallis. Sponsored by Corvallis Environmental Research Lab., OR.

Escherichia coli, Pseudomonas fluorescens, and a Pseudomonas sp. strain 133B containing the pSa plasmid were starved in well water for up to 523 days. There were two patterns of apparent antibiotic resistance loss observed. In Pseudomonas sp. strain 133B, there was no apparent loss of antibiotic resistance even after starvation for 340 days. In E. coli, by day 49 there was a ten-fold difference between the number of cells that would grow on antibiotic- and nonantibiotic-containing plates. However, over 76% of the cells that apparently lost their antibiotic resistance were able to express antibiotic resistance after first being resuscitated on non-selective media. By day 523, only 12% of these cells were able to express their antibiotic resistance after being resuscitated. After starvation for 49 days, cells that could not grow on antibiotic medium even after resuscitation, showed a permanent loss of chloramphenicol (Cm) resistance but retained resistance to kanamycin (Km) and streptomycin (Sm). (Copyright (c) 1990 Springer-Verlag New York, Inc.)

Keywords: *Microbial drug resistance, *Antibiotic resistance, *Pseudomonas, *Escherichia coli, *Starvation, Plasmids, Chloroamphenicol, Kanamycin, Streptomycin, Restriction endonucleases, Restriction mapping, Polyacrylamide gel electrophoresis, Reprints.

PB91-171637/REB PC **A03**/MF **A01**
Characterizing Surface Waters That May Not Require Filtration. Journal article.
Environmental Protection Agency, Cincinnati, OH. Risk Reduction Engineering Lab.
E. E. Geldreich, J. A. Goodrich, and R. M. Clark. cDec 90, 14p EPA/600/J-90/408
Pub. in Jnl. American Water Works Association, p40-50 Dec 90.

A relatively clean raw surface water can be determined that is amenable to disinfection as the only controlling treatment process. The essential criteria and associated standards are: Fecal coliform 20 organisms/100 mL, turbidity 1.0 NTU, color 15 ACU, and chlorine demand 2 mg/L. These criteria were selected from a study of a variety of data gathered from 34 raw source waters used by utilities in full scale application of disinfection as the only treatment process. Selection of water characteristics was based on the potential for impact on disinfection effectiveness and magnitude of fecal pollution tolerated. Watershed management is an essential aspect of controlling water quality fluctuations and in preventing progressive deterioration in the raw water resource. Monitoring data should not only be utilized to form a continual historical record that demonstrates water quality suitability for minimal treatment but also as an integral part of guidance in making day to day changes in process control to avoid any chance for microbial penetration into the public water supply.

Keywords: *Surface waters, *Water treatment, *Disinfection, Water pollution, Standards, Watershed management, Water quality management, Water supply, Turbidity, Filtration, Monitoring, Guidelines, Coliform bacteria, Color, Chlorine, Reprints.

PB91-171645/REB PC **A02**/MF **A01**
Environmental Protection Agency, Cincinnati, OH. Risk Reduction Engineering Lab.
In-Place Performance Evaluation of HEPA-Filtration Systems at Asbestos Abatement Sites. Journal article.
PEI Associates, Inc., Cincinnati, OH.
J. R. Kominsky, R. W. Freyberg, J. M. Boiano, J. A. Browniee, and D. R. Gerber. c1990, 7p EPA/600/J-90/409
Contract EPA-68-03-4006
Prepared in cooperation with New Jersey State Dept. of Health, Trenton. Sponsored by Environmental Protection Agency, Cincinnati, OH. Risk Reduction Engineering Lab.

The study was conducted to assess the in-place performance of high-efficiency particulate air (HEPA) filtration systems at asbestos-abatement sites in New Jersey to determine each system's particle-removal efficiency. An air-generated dioctyl phtalate aerosol was used to challenge the filtration system, including possible filter and housing bypass leaks, or damaged filter medium. Sixteen percent of the HEPA-filtration systems tested showed particle-removal efficiencies lower than the American National Standards Institute N509-1980 acceptance criterion of 99.95 percent.

Keywords: *Air pollution control equipment, *Air filters, *Asbestos, Air pollution abatement, Aerosols, Performance evaluation, Air flow, Design criteria, Reprints, *High efficiency particulate air filters.

PB91-171652/REB PC **A03**/MF **A01**
Concerns with Using Chlorine-Dioxide Disinfection in the USA. Journal article.
Environmental Protection Agency, Cincinnati, OH. Drinking Water Research Div.
B. W. Lykins, J. A. Goodrich, and J. C. Hoff. c1990, 13p EPA/600/J-90/410
Pub. in Jnl. of Water SRT-Aqua, v39 n6 p376-386 1990.

There is a renewed interest in disinfection with chlorine dioxide in the United States because of upcoming Federal regulations on disinfection by-products. Bench studies and field applications of chlorine dioxide have shown that it is an effective biocide that does not produce halogenated by-products such as trihalomethanes. There are some health concerns with ingesting chlorine dioxide and its metabolites, chlorite and chlorate, and concerns about tastes and odors. These concerns may be alleviated by removing the chlorine dioxide species with granular activated carbon or reducing them to chloride before water distribution.

Keywords: *Water treatment, *Disinfection, *Potable water, *Chlorination, *Water pollution control, Pollution regulations, Chlorine dioxide, Byproducts, Halomethanes, Granular activated carbon treatment, Reduction(Chemistry), Reprints.

PB91-171660/REB PC **A03**/MF **A01**
Environmental Protection Agency, Cincinnati, OH. Risk Reduction Engineering Lab.
Evaluation of Polyester and Metallized-Polyethylene Films for Chemical Protective Clothing Applications. Journal article.
Little (Arthur D.), Inc., Cambridge, MA.
R. Goydan, T. R. Carroll, A. D. Schwope, and M. Gruenfeld. c1990, 13p EPA/600/J-90/411
Contract EPA-68-03-3293
Pub. in Jnl. of Plastic Film and Sheeting, v6 n2 p106-116 Apr 90. Sponsored by Environmental Protection Agency, Cincinnati, OH. Risk Reduction Engineering Lab.

The permeation resistance of thin polyester films and metallized, low-density polyethylene (LDPE) films was evaluated to assess their feasibility for use in chemical protective clothing applications. For a 0.002 cm polyester film, permeation tests were conducted with acetone, carbon disulfide, dichloromethane, and tetrahydrofuran. In all cases no permeation was detected for a five hour duration at the sensitivity of the permeation method. Concentrated sulfuric acid, however, severely degraded the polyester film. Permeation tests were also conducted with a series of 0.0033 and 0.0071 cm LDPE, metallized-LDPE films, and their laminates to study the contribution of the metal layer to the barrier properties. Tests with dichloromethane were performed on the films and laminates as is and also after flexing. In all cases, the dichloromethane permeation rates were lower through the metallized-LDPE films than through the LDPE substrate alone when tested without flexing. The permeation rates through the metallized-LDPE films following flexing, however, were similar to those measured for the LDPE substrate. (Copyright (c) 1990 Technomic Publishing Co., Inc.)

Keywords: *Protective clothing, *Polyester fibers, *Metal films, *Polyethylene, Solvent resistance, Polymeric films, Liquid permeability, Thin films, Acetone, Carbon disulfide, Chloromethanes, Solvents, Hazardous materials, Feasibility, Barrier materials, Sulfuric acid, Laminates, Substrates, Low density materials, Reprints.

PB91-171678/REB PC **A03**/MF **A01**
Update of the U.S. Environmental Protection Agency's SITE Emerging Technology Program, 1990. Journal article.
Environmental Protection Agency, Washington, DC. Office of Emergency and Remedial Response.
D. E. Sanning, and N. M. Lewis. cDec 90, 13p EPA/600/J-90/412
Pub. in Jnl. of the Air and Waste Management Association, v40 n12 p1706-1719 Dec 90. See also PB90-103490.

Under the Superfund Innovative Technology Evaluation (SITE) Program, the U.S. Environmental Protection Agency (U.S. EPA) is seeking to foster the further development of technologies that have been successfully tested at bench-scale and are now ready for pilot-scale testing, prior to field- or full-scale demonstration. The goal is to ensure that permanent, cost-effective technologies will be ready for field demonstration, thereby increasing the number of viable alternatives available for use in Superfund removal and remedial actions. Under this program, the U.S. EPA can offer technology developers financial assistance of up to $150,000 per year, for up to two years. The program is now initiating its fourth solicitation (E04) with two projects form the E01 solicitation completed; five more E01 projects are scheduled for completion by September 30, 1990; eight E02 projects are starting their second year; and 16 projects were selected from the third (E03) solicitation. The fourth Emerging Technology Program Solicitation is open to the receipt of new proposals from July 6, 1990, through September 7, 1990. The purpose of the article is to provide the reader with (1) an introduction to the Emerging Technology Program (ETP); (2) an understanding of how the Program operates; (3) a summary of those technologies currently being tested and evaluated under the Program; and (4) information on how to apply to the Program.

Keywords: *Technology utilization, *Waste management, Research and development, US EPA, Remedial action, Substitutes, Financial assistance, Cost effectiveness, Pilot plants, Project management, Reprints, *Superfund Innovative Technology Evaluation Program, Cleanup operations.

PB91-171686/REB PC **A02**/MF **A01**
EPA SITE Demonstration of the International Waste Technologies/Geo-Con In situ Stabilization/Solidification Process. Journal article.
Environmental Protection Agency, Cincinnati, OH. Risk Reduction Engineering Lab.
M. K. Stinson. cNov 90, 10p EPA/600/J-90/413
Pub. in Jnl. of Air and Waste Management Association, v40 n11 p1569-1576 Nov 90. See also PB89-194161 and PB89-194179. Prepared in cooperation with Foster Wheeler Enviresponse, Inc., Edison, NJ.

The paper presents an EPA evaluation of the first field demonstration of an in situ stabilization/solidification process for contaminated soil under the EPA Superfund Innovative Technology Evaluation (SITE) program. Demonstration of the process was a joint effort of two vendors: International Waste Technologies' (IWT) of Wichita, Kansas, who provided the treatment process, specifically the proprietary additive called HWT-20, and Geo-Con, Inc., of Pittsburgh, Pennsylvania, who provided both engineering and hardware for the in situ soil treatment. The field demonstration took place in April, 1988 at a site contaminated mainly with polychlorinated biphenyls (PCBs). EPA tested the soil before and after treatment and the EPA evaluation of the process is based on results from the testing. A year later, in April 1989, EPA tested again the treated soil and results of that testing were compared to those of the demonstration. Results of the EPA evaluation of the IWT process, the Geo-Con performance, and treatment costs are discussed separately. (Copyright (c) 1990--Air & Waste Management Association.)

Keywords: *Hazardous materials, *Stabilization, *Solidification, *Remedial action, *Soil treatment, *Land pollution, Performance evaluation, Waste disposal,

Soil contamination, Additives, US EPA, Polychlorinated biphenyls, Comparison, Technology utilization, Reprints, *Superfund Innovative Technology Evaluation Program, Hialeah(Florida).

PB91-171694/REB PC **A02**/MF **A01**
Use of Electrokinetics for Hazardous Waste Site Remediation. Journal article.
Environmental Protection Agency, Cincinnati, OH. Risk Reduction Engineering Lab.
D. Cabrera-Guzman, J. T. Swartzbaugh, and A. W. Weisman. c1990, 9p EPA/600/J-90/414
Pub. in Jnl. of Air Waste Management Association, v40 n12 p1670-1676 Dec 90. Prepared in cooperation with PEER Consultants, Inc., Dayton, OH.

The Superfund Innovative Technology Evaluation (SITE) program was authorized as part of the 1986 amendments to the Superfund legislation. It represents a joint effort between the U.S. EPA's Office of Research and Development and Office of Solid Waste and Emergency Response. The program is designed to assist and encourage the development of waste treatment technologies that would contribute to more solutions to our hazardous waste problems. Recently, EPA, through the SITE program, issued a work assignment to assess the 'state-of-the-art' of electrokinetically enhanced contaminant removal from soils. Prior research efforts, both laborator and field, have demonstrated the electo-osmosis has the potential to be effective in facilitating the removal of certain types of hazardous wastes from soils. Particularly encouraging results have been achieved with inorganics in fine grained soils where more traditional removal alternatives are less effective. Although the results of various studies suggest that electrokinetics is a promising technology, further testing is needed at both the laboratory and field levels to fully develop this technology for site remediation. A conceptual test program is presented based on best available data which incorporates system design and operating parameters used in previous applications of this technology in the use of electrokinetics treatment as a remediation technique at hazardous waste sites. (Copyright (c) 1990--Air & Waste Management Association.

Keywords: *Superfund, *Hazardous materials, *Remedial action, *Soil contamination, *Electrodynamics, Best technology, Land pollution, State of the art, Technology utilization, Electroosmosis, Ground water, Performance evaluation, Soil water, Electric fields, Environmental transport, Electrochemistry, Reprints.

PB91-171702/REB PC **A03**/MF **A01**
Reductions of Enteric Microorganisms during Aerobic Sludge Digestion. Journal article.
Environmental Protection Agency, Cincinnati, OH. Risk Reduction Engineering Lab.
J. H. Martin, H. E. Bostian, and G. Stern. c1990, 11p EPA/600/J-90/415
Pub. in Water Research, v24 n11 p1377-1385 1990. See also PB89-138846. Prepared in cooperation with Cornell Univ., Ithaca, NY. Center for Environmental Research.

Seasonal variations in the reductions of total coliform, fecal coliform, fecal streptococci, and enterovirus densities that occur during conventional aerobic sludge digestion in cold climates were characterized. Also, the potential to improve reductions in the densities of these four groups of enteric microorganisms in cold climates by simple modifications that increase process temperature by reducing heat losses was demonstrated. To obtain this data, two 32 cu m aerobic digesters located at a small municipal wastewater treatment plant were operated continuously over a period of twenty months. One digester was a conventional digester while the other was designed to minimize heat losses, and thus, facilities autoheating. When the results obtained during 11 separate periods of steady-state operation at mean mixed liquor temperatures ranging from 8 to 40 C and at residence times of 10, 15, and 20 days were combined for analysis, it was evident that significant reductions in the densities of the four groups of enteric microorganisms was dependent both residence time and temperature. Using the Arrhenius equation, it was possible to describe mathematically the temperature dependence of the rate of log10 reduction in density of each of these four groups of enteric microorganisms. The four mathematical relationships developed provide a rational basis to determine residence times necessary to achieve desired levels of indicator organism and enterovirus reductions during aerobic sludge digestion at mixed liquor temps. ranging from 8 to 40 C. (Copyright (c) Pergamon Press 1990.)

Keywords: *Sludge digestion, *Aerobic processes, *Aerobic bacteria, *Microorganism control(Sewage), Seasonal variations, Water treatment, Sludge disposal, Municipalities, Digestion(Decomposition), Enteroviruses, Streptococcus, Digesters, Temperature effects, Field tests, Reprints, Coliform bacteria, Trumansburg(New York).

PB91-171710/REB PC **A03**/MF **A01**
Exposure of Frog Hearts to CW or Amplitude-Modulated VHF Fields: Selective Efflux to Calcium Ions at 16 Hz. Journal article.
Health Effects Research Lab., Research Triangle Park, NC.
J. L. Schwartz, D. E. House, and G. A. R. Mealing. c1990, 12p EPA/600/J-90/416
Pub. in Bioelectromagnetics, v11 p349-358 1990. Prepared in cooperation with National Research Council of Canada, Ottawa (Ontario).

The effects of continuous and amplitude-modulated radiofrequency electromagnetic waves on calcium efflux from 45 Ca preloaded frog hearts were examined. Frog hearts, electrically stimulated at their natural beating frequency, were exposed for 30 min to 240 MHz radiowaves in a Crawford irradiation cell. Exposures at incident power levels of 0.5, 0.8, 1.0, 1.2, 5.0 and 10.0 Watts (corresponding to calculated specific absorption rates (SAR) of 0.15, 0.24, 0.30, 0.36, 1.50, and 3.00 mW/kg) were tested either in the continuous wave mode or using sinusoidal amplitude modulation at 0.5 Hz, the average beating frequency of the frog hearts, or at 16 Hz. Continuous at 0.5 Hz amplitude-modulated waves did not affect calcium efflux from the hearts. However, 16 Hz amplitude-modulated electromagnetic radiation resulted in statistically significant increases in calcium efflux. The effect was most significant at the 1 W incident power level (17.9%, $p<0.01$) but was also observed at 0.5 W(21.0%, $p<0.05$). Therefore, it appears that frog hearts are affected by electromagnetic radiation at particular power levels and 16 Hz modulation frequency, a bioelectromagnetic interaction displaying power and frequency windows comparable to those reported by other investigators in calcium efflux studies on neural tissue.

Keywords: *Electromagnetic radiation, *Calcium, *Biological transport, *Heart, *Rana catesbeiana, Frequency, Nerve tissue, Statistical analysis, Radiation dose-response relationship, Reprints.

PB91-171728/REB PC **A03**/MF **A01**
Acute Exposure to Tris(2-Chloroethyl)Phosphate Produces Hippocampal Neuronal Loss and Impairs Learning in Rats. Journal article.
Health Effects Research Lab., Research Triangle Park, NC. Neurotoxicology Div.
H. A. Tilson, B. Veronesi, R. L. McLamb, and H. B. Matthews. c1990, 18p EPA/600/J-90/417
Pub. in Toxicology and Applied Pharmacology, v106 n2 p254-269 Nov 90. Prepared in cooperation with National Inst. of Environmental Health Sciences, Research Triangle Park, NC.

Adult female, Fischer-344 rats were exposed to 275 mg/kg of tris(2-chloroethyl)phosphate (TRCP) by gavage. TRCP produced consistent signs of convulsive activity within 60-90 minutes after dosing and extensive loss of CA1 hippocampal pyramidal cells when examined 7 days after dosing. At the light microscopic level, toxic effects of TRCP on pyramidal cells in the CA3, and CA4 and granule cells in the dentate gyrus were less severe than on the CA1 cells. The seizure-related and neurohistological effects of TRCP were significantly attenuated by pretreatment with atropine or chlordizepoxide, suggesting that the hippocampal damage was related to the seizures produced by TRCP. In a second experiment designed to assess the potential health risk associated with TRCP, exposed rats were mildly impaired in the acquisition of a reference memory task in a water maze. However, TRCP-exposed rats were consistently impaired in performing a repeated acquisition task in the water maze. These data underscore the potential health risk associated with exposure to TRCP and support the conclusion that the hippocampus is intimately involved in spatial memory in rats. (Copyright (c) 1990 Academic Press Inc.)

Keywords: *Toxicology, *Hippocampus, *Nerve cells, *Learning, Seizures, Health hazards, Spatial discrimination, Memory, Atropine, Rats, Dose-response relationships, Histology, Reprints, *Tris(2-chloroethyl)phsphate, Chlordiazepoxide.

PB91-171736/REB PC **A03**/MF **A01**
Environmental Mutagens and Risk Assessment. Journal article.
Health Effects Research Lab., Research Triangle Park, NC. Genetic Toxicology Div.
J. Lewtas, J. E. Gallagher, and D. M. DeMarini. c1990, 11p EPA/600/J-90/418
Pub. in Environmental Mutagen Research Communications, v12 p1-9 Dec 90.

Recognition that most human exposures to environmental chemicals occur as complex mixtures has stimulated research and the development of new methods to assess exposure, dosimetry, and genotoxic effects. New genetic and molecular methods are being applied to each aspect of research to develop new methods for the assessment of cancer risk from human exposure to complex mixtures. Short-term genetic bioassay methods utilizing new engineered bacterial strains are being used to assess total human exposure to mutagens in the environment. New DNA adduct methods are being used in exposure-dosimetry studies of complex mixtures in humans and in experimental systems. Finally, new advances in sequencing the genetic mutations induced by environmental mutagens will improve our understanding of the relationship between DNA adducts, DNA damage and repair, mutation induction, and tumor initiation.

Keywords: *Environmental pollutants, *Mutagens, *Risk assessment, *Toxicology Environmental exposure pathways, Mutagenicity tests, DNA damage, DNA repair, Carcinogenicity tests, Environmental monitoring, Pulmonary neoplasm, Dose-response relationships, Reprints.

PB91-171744/REB PC **A03**/MF **A01**
CASE-SAR Analysis of Polycyclic Aromatic Hydrocarbon Carcinogenicity. Journal article.
Health Effects Research Lab., Research Triangle Park, NC. Carcinogenesis and Metabolism Branch.
A. M. Richard, and Y. Woo. c1990, 21p EPA/600/J-90/419
Pub. in Jnl. of Mutation Research, v242 n4 p285-303 Dec 90. Prepared in cooperation with Environmental Protection Agency, Washington, DC.

A CASE SAR analysis was performed on a selected database of PAH's to investigate the possible use of the CASE method as an aid for preliminary assessment of carcinogenic potential of untested environmental PAH's. A data set consisting of 78 PAH's and their experimental carcinogenicities was used to 'train' the CASE fragment. These fragments predicted the activities of 94% of the 'training' set correctly. Using these fragments, the potential activities of a database of 106, mostly untested PAH's were predicted and compared to 'expert judgement' predictions in order to evaluate the extent of concordance between these two methods. Initial poor agreement (64%) was attributed to inadequate CASE knowledge of 2- and 3-ring PAH subclasses; when these subclasses were excluded, the concordance improved to 90%. The prediction accuracy of 75%, despite the structural diversity of the data set, provided independent evidence of the utility of the present CASE results. A close examination of the CASE incorrect predictions was conducted to delineate inadequacies of these CASE results in order to provide cautionary guidance for future application of the method. Finally, the present results were compared to the results of a previous CASE analysis based on a more limited PAH data set, and were found to be of greater general utility.

Keywords: *Carcinogenicity tests, *Aromatic polycyclic hydrocarbons, *Structure-activity relationship, Information systems, Computer systems software, Molecular structure, Reprints, *CASE.

PB91-171751/REB PC **A03**/MF **A01**
Bleomycin Effects on Mouse Meiotic Chromosomes. Journal article.
Health Effects Research Lab., Research Triangle Park, NC.
P. Poorman-Allen, L. C. Backer, I. D. Adler, B. Westbrook-Collins, and M. J. Moses. c1990, 11p EPA/600/J-90/420

Pub. in Jnl. of Mutagenesis, v5 n6 p573-581 Nov 90. Prepared in cooperation with Wellcome Research Labs., Research Triangle Park, NC., Gesellschaft fuer Strahlen- und Umweltforschung m.b.H., Neuherberg bei Munich (Germany, F.R.). Inst. fuer Biologie, and Duke Univ. Medical Center, Durham, NC.

The effects of a radiomimetic chemical, bleomycin (BLM), on meiotic chromosomes was evaluated in mice. Chromosome aberrations were analyzed at meiotic metaphase I, and damage to the synaptonemal complex was analyzed in meiotic prophase cells. In the metaphase aberration studies, an ip. injection of 80 mg/kg BLM, timed to precede or coincide with ultimate S-phase, led to a significant increase in structural damage ($p<0.01$) in cells reaching metaphase I 12 d after treatment. However, no increases in clastogenic effects were observed at metaphase I after treatment of cells during various stages of prophase. SC analyses in pachytene cells following an ip. or it. injection at S-phase revealed various forms of synaptic errors and structural anomalies, including qualitative changes similar to those observed following irradiation. Ip. doses ranging from 25-100 mg/kg, and it. doses as low as 0.5 mg/kg, caused roughly sixfold increases over control levels in the number of damaged cells. It was concluded that BLM is clastogenic for meiotic chromosomes; however, it does not reveal the strong S-independedt clastogenic activity at meiosis that is characteristic of its activity at mitosis.

Keywords: *Toxicology, *Bleomycin, *Mutagens, *Chromosomes, *Meiosis, Mutagenicity tests, Cell cycle, Synapses, Nerve cells, Dose-response relationships, Chromosome aberrations, Spermatozoa, Reprints.

PB91-171769/REB PC **A02**/MF **A01**
Genotoxicity of Inhibitors of DNA Topoisomerases I (Camptothecin) and II (m-AMSA) in vivo and in vitro. Journal article.
Health Effects Research Lab., Research Triangle Park, NC. Genetic Toxicology Div.
L. C. Backer, J. W. Allen, K. Harrington-Brock, J. A. Campbell, and D. M. DeMarini. c1990, 9p EPA/600/J-90/421
Pub. in Mutagenesis, v5 n6 p541-547 1990. Prepared in cooperation with Environmental Health Research and Testing, Inc., Research Triangle Park, NC.

The present study was designed to determine and compare the clastogenicity of amsacrine and camptothecin in vivo in mouse bone marrow and peripheral blood lymphocytes and in vitro in mouse lymphoma L5178Y cells. It was expected that amsacrine, which interferes with topoisomerase II to induce double-strand DNA breaks, and camptothecin, which interferes with topoisomerase I to induce single-strand DNA breaks, would induce different types of chromosomal aberrations. However, both drugs produced quantitatively and qualitatively similar numbers and types of aberrations under similar experimental conditions. In mouse bone marrow, both drugs (3 mg/kg) induced about 30% damaged cells, with an average of 0.4 chromatid breaks per cell. Cell cycle specificity was indicated by the absence of chromosomal aberrations when exposure to the drugs occurred during GO in vivo. In vitro, amsacrine, and camptothecin induced 161 and 20 mutants/10 (to the sixth power) survivors/nM, respectively; they induced 6 and 2 aberrant cells/nM, respectively. In contrast to the in vivo results, the drugs induced high levels of both chromatid- and chromosome-type aberrations in vitro.

Keywords: *Enzyme inhibitors, *Mutagens, *Camptothecin, *Amsacrine, *DNA topoisomerase I, DNA damage, Mutagenicity tests, In vitro analysis, In vivo analysis, Lymphoma, Chromosome aberrations, Cell cycle, Thymidine kinase, Cultured tumor cells, Adenosine cyclic monophosphate, Reprints.

PB91-171777/REB PC **A02**/MF **A01**
Comparison of Chromosome Aberration Frequency and Small-Colony TK-Deficient Mutant Frequency in L5178Y/TK(+/-)-3.7.2C Mouse Lymphoma Cells. Journal article.
Health Effects Research Lab., Research Triangle Park, NC. Genetic Toxicology Div.
M. M. Moore, and C. L. Doerr. c1990, 8p EPA/600/J-90/095
Pub. in Mutagenesis, v5 n6 p609-614 Nov 90. Prepared in cooperation with Environmental Health Research and Testing, Inc., Research Triangle Park, NC.

The L5178Y/TK+/- mouse lymphoma assay is utilized to quantitate the induction of thymidine kinase (TK)-deficient mutants. TK-heterozygous cells are treated with the test compound, newly induced mutants are allowed to express, and mutants are selected with trifluorothymidine (TFT). Mutant colonies detected in the assay can be classified by colony size as large (> than approximately 0.6 mm) and small (< than approximately 0.6 mm). An extensive analysis of these two classes of mutants has led to the hypothesis that the two types of mutants result from different degrees of genetic damage and that the assay can be used to detect and discriminate between chemicals acting as point mutagens (inducing significant numbers of large colonies) and/or clastogens (inducing significant numbers of small colonies). This raises the question as to how the small-colony TK mutant frequency would be related to the gross aberration frequency obtained by standard microscopic technique. Preliminary studies with a very small number of chemicals indicated that there might be a simple mathematical comparison between the two endpoints.

Keywords: *Chromosome aberrations, *Thymidine kinase, *Mutagens, Cultured tumor cells, Lymphoma, Mutagenicity tests, Enzyme induction, Heterozygote, Reprints.

PB91-171785/REB PC **A03**/MF **A01**
Metabolism of 1-Nitropyrene by Human, Rat, and Mouse Intestinal Flora: Mutagenicity of Isolated Metabolites by Direct Analysis of HPLC Fractions with a Microsuspension Reverse Mutation Assay. Journal article.
Health Effects Research Lab., Research Triangle Park, NC.
L. C. King, M. J. Kohan, S. E. George, J. Lewtas, and L. D. Claxton. c1990, 16p EPA/600/J-90/423
Pub. in Jrnl. of Toxicology and Environmental Health, v31 n3 p179-192 Nov 90.

Among the nitro-substituted polycyclic aromatic hydrocarbons identified in environmental samples and known to be genotoxic, 1-nitropyrene is one of the most abundant. The biotransformation of 1-nitro((14)C)pyrene by human, rat, and mouse intestinal microflora and the mutagenicity of the isolated metabolites by direct analysis of the HPLC fractions with a microsuspension mutation assay were investigated. 1-nitro((14)C)pyrene was metabolized by human, rat and mouse intestinal microflora to the following reductive metabolites; 1-aminopyrene, Nacetylaminopyrene, N-formyl-1-aminopyrene and two unknown metabolites identified as A and B. The predominant metabolite of 1-nitro((14)C)pyrene produced by human, rat or mouse intestinal microflora following a 12 h incubation was 1-aminopyrene which accounted for 79 to 93% of the total (14)C respectively. Only minor amounts of N-formyl-1-aminopyrene (1%), N-acetylaminopyrene (3 - 4%) were produced. The similarity in the distribution of the reductive metabolites suggests that a similar mechanism exists in the biotransformation of 1-nitropyrene by intestinal microflora of different mammalian species.

Keywords: *Metabolism, *Enterobacteriaceae, *Toxicology, High pressure liquid chromatography, Mutagenicity tests, Aromatic polycyclic hydrocarbons, Rats, Human, Mice, Reprints, *1-Nitropyrene.

PB91-171793/REB PC **A03**/MF **A01**
Delay-Dependent Impairment of Reversal Learning in Rats Treated with Trimethyltin. Journal article.
Health Effects Research Lab., Research Triangle Park, NC. Neurotoxicology Div.
P. J. Bushnell. c1990, 17p EPA/600/J-90/424
Pub. in Behavioral and Neural Biology, v54 p75-89 Apr 90. Portions of text were presented at the Annual Meeting, Society of Toxicology, Dallas, TX., February 17, 1988 and Behavioral Toxicology Society, Savannah, GA., May 17, 1988.

Recent theories of hippocampal function focus on its role in the formation of associations in the temporal domain. A reversal learning paradigm based on lever-press automaintenance was developed to vary the CS-UCS relationship along two independent dimensions, one temporal and one not: CS+-UCS delay and the probability of reinforcement (P(RFT)) following the CS+. Eight male hooded Long-Evans rats were trained to reverse the automaintained discriminations repeatedly, until stable reversal performance was achieved. The neurotoxicant trimethyltin (TMT) was used to induce lesions in the CNS, including the CA3-4 region of Ammon's Horn in dorsal hippocampus. Following iv injection of 7 mg/kg TMT to half the rats, reversal performance was assessed under varying conditions of delay and P(RFT). After recovery from the acute effects of TMT (1-2 weeks), treated rats reversed normally when no delay separated the CS+ and UCS; with delays of 2 to 4 sec, they reversedless completely within a session than did controls. The degree of behavioral impairment correlated significantly with hippocampal damage only at nonzero CS+-UCS delays.

Keywords: *Toxicology, *Learning disorders, *Trimethyltin compounds, Hippocampus, Time factors, Animal behavior, Histology, Body weight, Reprints.

PB91-171801/REB PC **A03**/MF **A01**
Health Effects Research Lab., Research Triangle Park, NC.
Subchronic 90 Day Toxicity of Dichloroacetic and Trichloroacetic Acid in Rats. Journal article.
Idaho Univ., Moscow.
G. G. Mather, J. H. Exon, and L. D. Koller. c1990, 12p EPA/600/J-90/425
Pub. in Toxicology, v64 n1 p71-80 Oct 90. Prepared in cooperation with Oregon State Univ., Corvallis. School of Veterinary Medicine. Sponsored by Health Effects Research Lab., Research Triangle Park, NC.

Male Sprague-Dawley rats were treated with either dichloroacetic acid (DCA) or trichloroacetic acid (TCA) in the drinking water at levels of 0, 50, 500 and 5000 ppm for a period of 90 days to determine the toxicities associated with subchronic exposure. All animals were sacrificed and examined for gross and histopathologic lesions, serochemical changes, immune dysfunction, hepatic peroxisomal and mixed function oxidase enzyme induction and organ-body weight changes. Animals treated with DCa had decreased body weight gains (500 and 5000 ppm) and decreased total serum protein (all doses). Rats given either TCA (5000 ppm) or DCA (500 or 5000 ppm) had increased liver and kidney organ to body weight ratios. Rats offered DCA had significantly elevated alkaline phosphatase (500 and 5000 ppm) and alanine-amino transferase (5000 ppm). No consistent immunotoxicity was observed in animals exposed to either compound. Rats treated with 5000 ppm TCA or DCA had significantly increased hepatic peroxisomal beta-oxidation activity. (Copyright (c) 1990 Elsevier Scientific Publishers Ireland Ltd.)

Keywords: *Toxicity, *Dichloroacetate, *Trichloroacetic acid, Dose-response relationships, Mixed function oxidases, Blood proteins, Organ weight, Body weight, Alkaline phosphatase, Alanine aminotransferase, Pathology, Immune system, Statistical analysis, Blood chemistry, Enzyme induction, Reprints.

PB91-171819/REB PC **A03**/MF **A01**
Age-Related Changes in Sensitivity to Environmental Chemicals. Journal article.
Health Effects Research Lab., Research Triangle Park, NC. Environmental Toxicology Div.
L. S. Birnbaum. c1990, 12p EPA/600/J-90/426
Pub. in Japanese Jnl. of Toxicology and Environmental Health, v36 n6 p461-479 Dec 90.

The processes of aging result in many physiological changes which can lead to alterations in both pharmacokinetic and pharmacodynamic properties. Such changes can result in altered sensitivity to chemicals, whether drugs or environmental agents, in the elderly. It is extremely difficult, however, to generalize about the nature of such changes. Part of this may reflect disagreement, or at least, confusion in the literature over what the term 'age' means. It is not uncommon for a study to discuss age-related changes and, in fact, be comparing neonatal to pubescent or young adult animals. Therefore, it is clear that 'age' should always be clearly defined. When interest is in post-maturational organisms, and, at the very least, those at the mean life span of the population. The requirement has been stated before, but not always adhered to. Studies comparing only very young and terminally senescent animals may not provide fair representation of the effects occuring over the life-span of the species in question. While no broad generalization can be made about pharmacokinetic and/or pharmacodynamic changes, it is probably fair to state that such changes will often occur.

Keywords: *Environmental pollutants, *Toxicology, *Aging, Pharmacokinetics, Pharmacology, Risk assessment, Reprints.

PB91-171827/REB PC **A02**/MF **A01**
Is 1,4-Dioxane a Genotoxic Carcinogen. Journal article.
Health Effects Research Lab., Research Triangle Park, NC. Environmental Toxicology Div.
K. T. Kitchin, and J. L. Brown. cAug 90, 7p EPA/600/J-90/427
Pub. in Cancer Letters, v53 n1 p67-71 Aug 90.

Linear models of risk assessment may be appropriate for chemical that are initiators of carcinogenesis while threshold model of risk assessment have been proposed for promoters. The proper risk assessment model for the regulation of promoters of carcinogenesis remains an active area of research and controversy. Cancer is a multistage process (e.g. initiation, promotion and prograssion). These three stages of the oncogenic process have different biological characteristics. Studies to determine which chemicals effects which stages and to what degree are needed for risk assessment. The in-vivo biochemical system described in the report can be performed in a species specific and organ specific manner. In the report 1,4-dioxane is given to rats at doses of 168, 840, 2550, or 4200 mg/kg. DNA damage occurred at 2550 and 4200 mg/kg. This is the first description of genotoxicity of 1,4-dioxane in-vivo. Hepatic ornithine decarboxylase activity was also induced by 1,4-dioxane. This 1,4-dioxane appears to be a weak genotoxics carcinogen and a strong nongenotoxic carcinogen.

Keywords: *Dioxanes, *Mutagens, *Carcinogens, *Toxicology, Mutagenicity tests, Carcinogenicity tests, Dose-response relationships, Biochemistry, DNA damage, Liver, Cytochrome P-450, Reprints.

PB91-171835/REB PC **A02**/MF **A01**
Health Effects Research Lab., Research Triangle Park, NC.
Mirex Induces Ornithine Decarboxylase in Female Rat Liver. Journal article.
University of South Florida, Tampa. Coll. of Public Health.
A. Mitra, I. Richards, K. Kitchin, R. Conolly, and A. P. Kulkarni. c1990, 8p EPA/600/J-90/428
Contract EPA-68-02-4175
Pub. in Jnl. of Biochemical Toxicology, v5 n2 p119-124 Jul 90. Prepared in cooperation with Chemical Industry Inst. of Toxicology, Research Triangle Park, NC. Sponsored by Health Effects Research Lab., Research Triangle Park, NC.

Ornithine decarboxylase (ODC), the rate-limiting enzyme in polyamine synthesis, was significantly induced in female rat liver following oral administration of the pesticide, mirex. After dual oral exposure (120 mg/kg; 21 and 4 hrs. prior to sacrifice) induction of ODC activity in rat liver cytosol was 70-fold as compared to controls. A single oral dose of mirex (180 mg/kg) induced hepatic ODC activity 55-fold over controls. The time-course study indicated that maximal induction of ODC activity after a single oral dose of mirex was at 36 hours post-dosing. Though the exact mechanisms is still unclear, it appears that sex could be a pre-disposing factor in the induction of ODC activity in rat liver. Mirex is an unusually strong and long lasting inducer of rat hepatic ODC activity. (Copyright (c) 1990 VCH Publishers, Inc.)

Keywords: *Mirex, *Toxicology, *Liver, *Ornithine decarboxylase, Enzyme induction, Polyamines, Dose-response relationships, Statistical analysis, Reprints.

PB91-171843/REB PC **A03**/MF **A01**
Neurotoxicity of Parathion-Induced Acetylcholinesterase Inhibition in Neonatal Rats. Journal article.
Health Effects Research Lab., Research Triangle Park, NC.
B. Veronesi, and C. Pope. c1990, 20p EPA/600/J-90/429
Pub. in NeuroToxicology, v11 n4 p609-626 Dec 90. Prepared in cooperation with Northeast Louisiana Univ., Monroe. Toxicology Program.

The biochemical and morphological neurotoxic effects of postnatal acetylcholinesterase (AChE) inhibition were examined in rat pups dosed with parathion, at time points critical to hippocampal neurogenesis and synaptogenesis (i.e., D5-20). Hippocampal cytopathology as assessed by light and electron microscopy, consisted of cellular disruption and necrosis in the DG, CA4, and CA3a regions. Synaptic disruption in the DG molecular layer was suggested by histochemical preparation using both the Timm's and AChE stains. In parathion-treated D12 pups, hippocampal AChE was depressed 70% and QNB binding depressed by 36%. The above results indicated that definite neurotoxic consequences are associated with persistent AChE depression in the neonatal rat.

Keywords: *Parathion, *Neurotoxins, *Cholinesterase inhibitors, *Acetylcholinesterase, Rats, Newborn animals, Hippocampus, Histology, Electron microscopy, Histocytochemistry, Biochemistry, Dose-response relationships, Chemical depression, Reprints.

PB91-171850/REB PC **A03**/MF **A01**
Health Effects Research Lab., Research Triangle Park, NC. Clinical Research Branch.
Production of Arrhythmias by Elevated Carboxyhemoglobin in Patients with Coronary Artery Disease. Journal article.
North Carolina Univ. at Chapel Hill.
D. S. Sheps, M. C. Herbst, A. L. Hinderliter, K. F. Adams, and L. G. Ekelund. c1990, 11p EPA/600/J-90/430
Pub. in Annals of Internal Medicine, v113 n5 p343-351 Sep 90. Sponsored by Health Effects Research Lab., Research Triangle Park, NC. Clinical Research Branch.

Sudden death frequently occurs from coronary artery disease. It almost always results from cardiac arrhythmias and is often the first and only clinically recognizable manifestation of the disease process (1). Because of the relations among cardiac arrhythmias, sudden death, and coronary artery disease, as well as the high prevalence of coronary artery disease in the United States today, it is important to answer the question of whether or not exposure to carbon monoxide causes arrhythmias (2-10). Few carefully controlled double-blind studies exist with adequate control monitoring periods to assess spontaneous variability of arrhythmias in the control period. The purpose of double-blind study was to ascertain whether carbon monoxide exposure leading to elevated venous carboxyhemoglobin concentrations has an arrhythmogenic effect in patients with coronary artery disease. (Copyright (c) 1990 American College of Physicians.)

Keywords: *Arrhythmia, *Carboxyhemoglobin, *Carbon monoxide, *Coronary artery disease, Double-blind method, Tables(Data), Exercise, Stroke volume, Adrenergic beta receptor blockaders, Calcium channel blockers, Reprints.

PB91-171868/REB PC **A02**/MF **A01**
Persistence of Lymphocytes with Dicentric Chromosomes Following Whole-Body X Irradiation of Mice. Journal article.
Health Effects Research Lab., Research Triangle Park, NC. Genetic Toxicology Div.
A. D. Kilgerman, E. C. Halperin, G. L. Erexson, and G. Honore. c1990, 8p EPA/600/J-90/431
Pub. in Radiation Research, v124 p22-27 1990. Prepared in cooperation with Duke Univ. Medical Center, Durham, NC. Dept. of Radiology, and Environmental Health Research and Testing, Inc., Research Triangle Park, NC.

Thirty-six male C57B1/6 mice were whole-body x-irradiated with 3 Gy to generate lymphocytes with dicentric chromosomes to study the persistence of these lymphocytes in the spleen and peripheral blood to estimate the lifespan of mature B- and T-cells. Blood and spleen were removed from groups of four mice immediately after radiation exposure and on days 1, 3, 7, 14, 28, 56, and 12, thereafter. The initial frequencies of dicentric chromosomes with accompanying fragments observed in splenic T-cells (0.44), splenic B-cells (0.43), and peripheral blood lymphocyte cultures (0.48) initiated on day 0 were not significantly different. For both splenic and peripheral blood-T-lymphocytes, the frequency of cells containing dicentric chromosomes declined in an exponential manner following irradiation, with a 50% reduction in frequency occurring 14 days after exposure. In contrast, the frequency of B-cells containing dicentric chromosomes remained stable through day 7 but then declined precipitously between day 7 and 14 and remained relatively stable, although slightly above baseline, through day 112 post-exposure.

Keywords: *Chromosome aberrations, *X-rays, *Lymphocytes, Mice, Kinetics, Statistical analysis, Metaphase, Leukocytes, Whole body irradiation, Reprints.

PB91-171876/REB PC **A03**/MF **A01**
Morphometric Analysis of Osteosclerotic Bone Resulting from Hexachlorobenzene Exposure. Journal article.
Health Effects Research Lab., Research Triangle Park, NC.
J. E. Andrews, L. D. Jackson, A. G. Stead, and W. E. Donaldson. c1990, 11p EPA/600/J-90/432
Pub. in Jnl. of Toxicology and Environmental Health, v31 n3 p193-201 Nov 90. Prepared in cooperation with Organon Teknika Corp., Durham, NC. Documentation and Clinical Studies Div., and North Carolina State Univ. at Raleigh.

Hexachlorobenzene (HCB) exposure has been shown to induce hyperparathyroidism and osteosclerosis in rats. Experiments were undertaken to investigate the effects of HCB on femur morphometry as well as breaking strength. Fischer 344 rats were dosed 5 days/wk for 15 wks with 0, 0.1, 1, 10 or 25 mg HCB/kg body weight. Hyperparathyroidism was produced in the two higher dose groups as reported previously (Andrews et al., 1988). Femur weight was significantly increased in the rats receiving 0.1, 1 and 25 mg HCB/kg body weight wheras density was increased significantly at 1, 10 and 25 mg HCB/kg dose levels. Bone strength was also significantly increased at the three higher dose levels. Bone flexibility was significantly increased at the 0.1 mg HCB dose level. Cross sectional area of the midpoint of the femur was significantly increased at the 1 mg/kg HCB dose level. Cortical area, as well as the proportion of the total area of the bone which the cortex occupied, were significantly increased at the three higher dose levels. Medullary cavity area was significantly increased at the 0.1 mg/kg dose level but significantly decreased at the two higher dose levels of HCB.

Keywords: *Hexachlorobenzene, *Toxicity, *Osteosclerosis, *Bones, *Biomechanics, Organ weight, Dose-response relationships, Body weight, Hyperparathyroidism, Statistical analysis, Reprints.

PB91-171884/REB PC **A02**/MF **A01**
Robert S. Kerr Environmental Research Lab., Ada, OK.
Relationship between Cell Surface Properties and Transport of Bacteria through Soil. Journal article.
Cornell Univ., Ithaca, NY. Lab. of Soil Microbiology.
J. T. Cannon, V. B. Manilal, and M. Alexander. c1991, 6p EPA/600/J-91/002
Pub. in Applied and Environmental Microbiology, v57 n1 p190-193 Jan 91. Sponsored by Robert S. Kerr Environmental Research Lab., Ada, OK.

A study was conducted to relate the properties of Enterobacter, Pseudomonas, Bacillus, Achromobacter, Flavobacterium, and Arthrobacter strains to their transport with water moving through soil. The bacteria differed markedly in their extent of transport; their hydrophobicity, as measured by adherence to n-octane and by hydrophobic-interaction chromatography; and their net surface electrostatic charge, as determined by electrostatic interaction chromatography and by measurements of the zeta potential. Transport of the 19 strains through Kendaia loam or their retention by the soil was not correlated with hydrophobicities or net surface charges of the cells or the presence of capsules. Among 10 strains tested, the presence of flagella was also not correlated with transport. Retention was statistically related to cell size, with bacteria shorter than 1.0 micro m usually showing higher percentages of cells being transported through the soil. It is suggested that more than one characteriostic of bacterial cells determines whether the organisms are transported through soil with moving water. (Copyright (c) 1991 American Society for Microbiology.)

Keywords: *Water microbiology, *Transport properties, *Cell membrane, *Membrane potential, *Ground water, *Bacteria, Liquid chromatography, Species specificity, Surface properties, Reprints.

PB91-171892/REB PC **A03**/MF **A01**
Biodegradation of Aromatic Hydrocarbons by Aquifer Microorganisms under Denitrifying Conditions. Journal article.
Robert S. Kerr Environmental Research Lab., Ada, OK.
S. R. Hutchins, G. W. Sewell, D. A. Kovacs, and G. A. Smith. c1991, 11p EPA/600/J-91/003
Pub. in Environmental Science and Technology, v25 n1 p68-76 Jan 91. Prepared in cooperation with NSI Technology Services Corp., Ada, OK.

Laboratory tests were conducted to evaluate whether denitrification would be a suitable alternative for bioremediation of an aquifer contaminated with JP-4 jet fuel. Microcosms were prepared from uncontaminated and contaminated aquifer material, amended with nitrate, nutrients, and aromatic hydrocarbons, and incubated under a nitrogen atmosphere at 12 C. With uncontaminated core material, there was no observable lag period prior to removal of toluene whereas 30 days was required before biodegradation commenced for xylenes, ethylbenzene, and 1,2,4-trimethylbenzene. An identical test with contaminated aquifer material exhibited not only much longer lag periods but decreased rates of biodegradation; benzene, ethylbenzene, and o-xylene were not significantly degraded within the 6-month time period even though active denitrification occurred at this time. First-order biodegradation rate constants ranged from 0.016 to 0.38/day for uncontaminated core material and from 0.022 to 0.067/day for contaminated core material. Tests with individual compounds in uncontaminated core indicated that benzene and m-xylene inhibited the basal rate of denitrification. These data demonstrate that several aromatic compounds are degraded under denitrifying conditions, but rates of biodegradation may be lower in material contaminated with JP-4 jet fuel. (Copyright (c) 1990 American Chemical Society.)

Keywords: *Biological treatment, *Aquifers, *Biodeterioration, *Oil pollution, *Denitrification, *Water pollution control, Aquatic microorganisms, Aromatic hydrocarbons, Jet engine fuels, Underground storage, Storage tanks, Hazardous materials, Benzenes, Toluene, Xylenes, Oil spills, Reprints.

PB91-171900/REB PC **A01**/MF **A01**
Reducing Waste in the Photo Lab. Waste Minimization: Opportunity Assessment Make It Easy. Journal article.
Environmental Protection Agency, Cincinnati, OH. Risk Reduction Engineering Lab.
D. Evans, A. Robertson, M. A. Curran, and G. Dunaway. Sep 90, 5p EPA/600/J-91/004
Pub. in Photo Marketing Jan 91. Prepared in cooperation with Accuphoto Film Lab., Cincinnati, OH.

As the attention given to waste disposal and pollution prevention increases, so does the possibility of regulation. Owners and operators of small photo processing labs are among the many who must be concerned about waste disposal and pollution prevention. The U.S. EPA conducted a waste minimization opportunity assessment of Accuphoto, a photo lab in Cincinnati, Ohio. The assessment process and the results of the assessment of Accuphoto are described at Accuphoto include reduction in use of wash water, recovery of silver, and recovery of bleach fix.

Keywords: *Waste management, *Materials recovery, *Photographic processors, Waste disposal, Pollution abatement, Pollution regulations, Silver, *Waste minimization, *Source reduction, Cincinnati(Ohio), Accuphoto.

PB91-171918/REB PC **E99**/MF **E99**
Environmental Protection Agency, Research Triangle Park, NC. Atmospheric Research and Exposure Assessment Lab.
Regional Oxidant Model User's Guide.
Computer Sciences Corp., Research Triangle Park, NC.
Jan 91, 1084p-in 3v
Set includes PB91-171928 through PB91-171942. See also PB90-197831. Sponsored by Environmental Protection Agency, Research Triangle Park, NC. Atmospheric Research and Exposure Assessment Lab.

No abstract available.

PB91-171926/REB PC **A16**/MF **A02**
Environmental Protection Agency, Research Triangle Park, NC. Atmospheric Research and Exposure Assessment Lab.
Regional Oxidant Model User's Guide. Part 1. The ROM Preprocessors. Final rept. Aug 89-Jan 91.
Computer Sciences Corp., Research Triangle Park, NC.
L. Milich, L. Bender, T. Boehm, O. Bullock, and J. Novak. Jan 91, 356p EPA/600/8-90/083A
Contract EPA-68-01-7365
See also Part 2, PB91-171934. Sponsored by Environmental Protection Agency, Research Triangle Park, NC. Atmospheric Research and Exposure Assessment Lab.
Also available in set of 3 reports PC E99/MF E99, PB91-171918.

The Regional Oxidant Model (ROM) determines hourly concentrations and fates of ozone and 34 other chemical species over a scale of 1000 km x 1000 km for ozone 'episodes' of up to one month's duration. The model structure, based on phenomenological concepts, consists of 3 1/2 layers. The surfaces separating the layers respond to variations in space and time in the meteorological phenomena simulated in each layer. The model simulates many physical and chemical processes that affect the motion and distribution of chemical concentrations; among these are: horizontal transport, photochemistry, nighttime wind shear and nocturnal jet; cumulus cloud effects and mesoscale vertical motion; terrain and mesoscale eddy effects; subgrid scale chemistry processes, natural sources of hydrocarbons, NOx and stratospheric ozone; and dry deposition. The ROM is a complex model that requires users to have expertise in photochemical grid modeling. Meteorologists, engineers, and computer scientists familiar with this type of modeling will find the User's Guide relevant and helpful for running the ROM.

Keywords: *User manuals(Computer programs), *Computerized simulation, *Air pollution sampling, *Atmospheric composition, Meteorology, Ozone, Concentration(Composition), Photochemical reactions, Atmospheric diffusion, Environmental transport, Information systems, Dry methods, Wind(Meteorology), Mesoscale phenomena, Physical properties, Chemical properties, Natural emissions, Deposition, *Regional Oxidant Model.

PB91-171934/REB PC **A19**/MF **A03**
Environmental Protection Agency, Research Triangle Park, NC. Atmospheric Research and Exposure Assessment Lab.
Regional Oxidant Model User's Guide. Part 2. The ROM Processor Network. Final rept. Aug 89-Jan 91.
Computer Sciences Corp., Research Triangle Park, NC.
L. Milich, L. Bender, T. Boehm, O. Bullock, and J. Novak. Jan 91, 443p EPA/600/8-90/083B
Contract EPA-68-01-7365
See also Part 1, PB91-171926 and Part 3, PB91-171942. Sponsored by Environmental Protection Agency, Research Triangle Park, NC. Atmospheric Research and Exposure Assessment Lab.
Also available in set of 3 reports PC E99/MF E99, PB91-171918.

The volume is divided into three sections. The first section is on the I/O support for the Regional Oxidant Model (ROM) processor network. The second and third sections discuss the ROM processor network and regional dependencies and the VAX/VMS implementation of domain changes in the Regional Oxidant Model's processor network and analysis programs.

Keywords: *User manuals(Computer programs), *Computerized simulation, *Air pollution sampling, *Atmospheric composition, Information systems, Meteorology, Ozone, Concentration(Composition), Photochemical reactions, Atmospheric diffusion, Environmental transport, Computer programs, Computer programming, Regional analysis, Wind(Meteorology), Dry methods, Deposition, *Regional Oxidant Model.

PB91-171942/REB PC **A13**/MF **A02**
Environmental Protection Agency, Research Triangle Park, NC. Atmospheric Research and Exposure Assessment Lab.
Regional Oxidant Model User's Guide. Part 3. The Core Model. Final rept. Aug 89-Jan 91.
Computer Sciences Corp., Research Triangle Park, NC.
J. Young, L. Milich, and D. Jorge. Jan 91, 285p EPA/600/8-90/083C
Contract EPA-68-01-7365
See also Part 2, PB91-171934. Sponsored by Environmental Protection Agency, Research Triangle Park, NC. Atmospheric Research and Exposure Assessment Lab.
Also available in set of 3 reports PC E99/MF E99, PB91-171918.

The volume is divided into two sections. The first section contains the overview and structure of the core model. The other section discusses the core model input files.

Keywords: *User manuals(Computer programs), *Computerized simulation, *Air pollution sampling, *Atmospheric composition, Information systems, Meteorology, Ozone, Concentration(Composition), Photochemical reactions, Deposition, Atmospheric diffusion, Environmental transport, Computer programs, Computer programming, Regional analysis, Wind(Meteorology), Dry methods, *Regional Oxidant Model.

PB91-171975/REB PC **A03**/MF **A01**
Cancer Dose-Response Models Incorporating Clonal Expansion. Symposium paper.
Environmental Protection Agency, Washington, DC. Office of Health and Environmental Assessment.
C. W. Chen, and A. Moini. Oct 89, 26p EPA/600/D-91/042, OHEA-C-330
Presented at the Research Application Conference on Scientific Issues in Quantitative Cancer Risk Assessment, Arlington, VA., October 1989. Prepared in cooperation with Computer Sciences Corp., Arlington, VA.

Under the assumption that a malignant tumor develops through a sequence of steps (normal cells->initiated cells/foci->nodules->tumors) two classes of mathematical models of carcinogenesis that have a potential to be used for cancer dose-response modeling are discussed. The two classes of models considered are (1) a general version of the two-stage model by Moolgavkar and colleagues, henceforth called the MVK model, and (2) a clone process model derived from Tucker. These two classes of models incorporate essentially the same biological information but in different ways and offer a conceptual contrast between the two differing approaches. The objectives of the paper are to (1) highlight issues and problems that arise in using biologically based dose-response models to predict cancer risk and (2) discuss how parameters in the models could be estimated using auxiliary information.

Keywords: *Carcinogenesis, *Dose-response relationships, *Mathematical models, Risk factors, Predictive value of tests.

PB91-172122/REB PC **A11**/MF **A02**
Environmental Protection Agency, Washington, DC. Office of Health and Environmental Assessment.
Summary Report on Issues in Ecological Risk Assessment.
Eastern Research Group, Inc., Arlington, MA.
J. H. Gentile, W. H. H. van der Schalie, and W. P. Wood. Feb 91, 242p EPA/625/3-91/018
Contract EPA-68-C8-0036
Sponsored by Environmental Protection Agency, Washington, DC. Office of Health and Environmental Assessment.

In 1986, the U.S. Environmental Protection Agency (EPA) published a series of guidelines for carrying out human health risk assessments. As part of the ongoing effort to develop guidance in areas not addressed by the 1986 guidelines, EPA's Risk Assessment Forum sponsored a series of meetings to consider issues relevant to developing the Agency's first Agency-wide guidelines for ecological risk assessment. The report summarizes the discussion and conclusions of seven information-gathering meetings held in the spring of 1990. Invited speakers and EPA staff addressed the scope and content of future ecological guidelines, the nature and diversity of ecological assessments, approaches to characterizing and quantifying uncertainty in ecological hazard and exposure assessments, and the potential use of population modeling for characterizing ecological risk. Relying in part upon the results of these discussions, EPA has embarked on a multiyear effort to develop ecological risk assessment guidelines that will foster consistency in the Agency's approach

to evaluating not only the risks posed by conventional stresses such as toxic chemicals, but also other anthropogenic stresses such as habitat loss and global climate change.

Keywords: *Risk assessment, *Ecology, *Environmental surveys, *Hazardous materials, Toxic substances, Guidelines, Meetings, Exposure, Biological effects, Dose-response relationships, Habitats, Climatic changes, Population density, Toxicity, Ecosystems, Environmental impacts, Species diversity, Animals, Plants(Botany), Chemicals.

PB91-172940/REB PC **A11**/MF **A02**
Information Systems Inventory (ISI).
Environmental Protection Agency, Washington, DC. Office of Information Resources Management.
May 91, 246p
For system on diskette, see PB91-507558 (IBM compatible) and PB91-507566 (Macintosh compatible).

This is a hardcopy version of the EPA Information Systems Inventory (ISI) database. The ISI database is maintained on an IBM PC and an Apple Macintosh and currently holds roughly 500 records. The ISI was developed to enhance the Agency's ability to track major information systems, facilitate the sharing of information across media and program boundaries and improve the Agency's oversight of information systems development. For each system in the Inventory, the following information is included: system identification, descriptors of database content, and administrative data about access, and legal authorities. The database is available in the EPA Headquarters, Regional Libraries, and NTIS. The system is managed by the Information Management and Services Division, OIRM. The hardcopy contains only a subset of the information. The ISI diskette with functionality is sold separately.

Keywords: US EPA, *Information Systems Inventory Database, *ISI database, Agency information systems.

PB91-175877/REB PC **A08**/MF **A01**
Environmental Protection Agency, Research Triangle Park, NC. Atmospheric Research and Exposure Assessment Lab.
User's Guide for Executing OZIPR. Rept. for Apr 89-Apr 90.
Atmospheric Research Associates, Inc., Boston, MA.
M. W. Gery, and R. R. Crouse. Jan 91, 175p EPA/600/8-90/069 , , EPA/SW/DK-91/084A
For system on diskette, see PB91-507376. Sponsored by Environmental Protection Agency, Research Triangle Park, NC. Atmospheric Research and Exposure Assessment Lab.

A new, trajectory-type, air quality simulation model called Ozone Isopleth Plotting Package (Research Version) (OZIPR) has been developed. OZIPR is based on previous versions of EPA's Ozone Isopleth Plotting Program (OZIPP) Model, but contains improved and expanded capabilities that make the model useful for research purposes. OZIPR serves the dual purpose of providing: (1) a simple trajectory model capable of using complex chemical mechanisms, emissions, and various meteorological parameters, and (2) procedures through which the Empirical Kinetics Modeling Approach (EKMA) can be implemented to calculate emission reductions for compliance with the National Ambient Air Quality Standard for ozone. While these capabilities were included in earlier versions of OZIPP, the new OZIPR contains major improvements that expand the program's capability to input, utilize, and output a much larger range of information. The Project Report serves as a user's manual for OZIPR. It contains a description of the model, along with input and output requirements and options. The input and output files for nine examples are also included.

Keywords: *Air quality, Ozonosphere, Reaction kinetics, Photochemical reactions, Models, Emission factors, Oxidants, Nitrogen oxides, Computerized simulation, User manuals(Computer programs), Documentation, *Ozone isopleths, Empirical Kinetics Modeling Approach.

PB91-176057/REB PC **A06**/MF **A01**
Episodic Acidification and Associated Fish and Benthic Invertebrate Responses in Five Northern Appalachian Streams: An Interim Report of the Episodic Response Project.
Corvallis Environmental Research Lab., OR.
D. R. DeWalle, C. J. Gagen, M. C. Jones, R. F. Carline, and W. E. Sharpe. May 91, 122p EPA/600/3-91/035
See also PB89-138861. Prepared in cooperation with Pennsylvania State Univ., University Park.

The report summarizes progress from October 1988 to May 1989 on an ongoing research project to investigate the chemicals and biological response of five Northern Appalachian Plateau streams to episodic changes in flow. The research described is part of the U.S. EPA Episodic Response Project (ERP), Aquatic Effects Research Program. Research includes monitoring of stream discharge, episodic stream chemistry, precipitation amounts and intensity, and snowpack chemistry and water equivalent. Biological research includes bethic invertebrate surveyss stream bioassays with brook trout and sculpins, and tracking of brook trout movement during episodes using radiotelemetry.

Keywords: *Water pollution effects(Animals), *Acidification, *Water chemistry, *Aquatic ecosystems, *Streams, Hydrology, Biological effects, Fisheries, Fishes, Deposition, New York, Precipitation(Meteorology), Bioassay, Field tests, Air water interactions, Graphs(Charts), *Episodic Response Project, Benthic invertebrates, Adirondack mountains, National Acidic Deposition Assessment Program.

PB91-176065/REB PC **A06**/MF **A01**
Episodic Acidification and Associated Fish and Benthic Invertebrate Responses of Four Adirondack Headwater Streams: An Interim Report of the Episodic Response Project.
Corvallis Environmental Research Lab., OR.
W. A. Kretser, H. A. Simonin, D. W. Bath, B. P. Baldigo, and D. DiTommaso. May 91, 121p EPA/600/3-91/036
Prepared in cooperation with Adirondack Lakes Survey Corp., Ray Brook, NY.

The U.S. EPA Episodic Response Project (ERP) through cooperation with Adirondack Lakes Survey Corporation, Pennsylvania State University, and the U.S. Geological Survey initiated field work in the autumn of 1988 to examine the effects of acidic deposition on aquatic ecosystems. During the first nine months of study, significant results were obtained, thus the interim report was produced.

Keywords: *Acidification, *Water pollution effects(Animals), *Water chemistry, *Aquatic ecosystems, *Streams, Hydrology, Deposition, Bioassay, Air water interaction, Experimental tests, Precipitation(Meteorology), Fisheries, Fishes, Biological effects, New York, *Episodic Response Project, Benthic invertebrates, Adirondack mountains, National Acidic Deposition Assessment Program.

PB91-176735/REB PC **A02**/MF **A01**
Environmental Protection Agency, Research Triangle Park, NC. Air and Energy Engineering Research Lab.
Fundamental Evaluation of an Electronic Air Cleaner.
Research Triangle Inst., Research Triangle Park, NC.
J. T. Hanley, D. D. Smith, P. A. Lawless, D. S. Ensor, and L. E. Sparks. c1990, 8p EPA/600/D-91/020
Grant EPA-R814169-03
Presented at IAQ '90 held in Toronto (Canada) on July 29-August 3, 1990. Sponsored by Environmental Protection Agency, Research Triangle Park, NC. Air and Energy Engineering Research Lab.

The paper gives results of a fundamental evaluation of an electronic air cleaner (EAC). The ozone generation rate and particle-size-dependent (0.01-10 micrometers) filtration efficiency of an in-duct residential EAC were measured. Filtration efficiencies were typically 70-90%, showing decreasing efficiency with increasing flowrate. Ozone generation rates were about 3 micrograms/s. Scans of the aerosol concentration on the downwind face of the EAC were used to locate, then eliminate, areas of aerosol sneakage. Sneakage was detected along the top and bottom of the EAC face, apparently due to incomplete aerosol charging for aerosol passing near the ends of the ionizing wires. Areas away from the top and bottom had near-zero aerosol penetration. Based on these results, the inlet to the EAC was masked to eliminate airflow through the sneakage areas. The resultant efficiency of the masked EAC was nearly 100% for particles larger than 0.1 micrometer diameter; however, the filtration efficiency for particles smaller than 0.1 micrometer was not significantly affected by masking.

Keywords: *Air pollution control equipment, *Air cleaners, *Aerosols, *Indoor air pollution, *Ozone, Particle size, Filtration, Performance evaluation, Residential buildings, Ventilation, Air pollution sampling, Concentration(Composition), Reprints.

PB91-176743/REB PC **A03**/MF **A01**
Simple Model for Describing Radon Migration and Entry into Houses. Rept. for Jul-Dec 90.
Environmental Protection Agency, Research Triangle Park, NC. Air and Energy Engineering Research Lab.
R. B. Mosley. c1990, 32p EPA/600/D-91/021
Presented at the Hanford Symposium on Health and the Environment (29th), Richland, WA. on October 15-19, 1990.

The paper discusses a simplified model for soil-gas transport through soil surrounding the substructure of a house. The model provides the ability to answer, in semi-quantitative terms, such fundamental questions as: (1) What role does diffusion play in transporting radon to the house/soil interface, where pressure-driven flow tends to dominate the process of entry into the house. (2) Do active subslab depressurization mitigation systems significantly increase the rate of emission of radon into the ambient air. (3) At what flow rate through the subslab depressurization system does dilution of the radon in the soil gas contribute significantly to the performance of the mitigation system. Simplifying assumptions about the distribution of entry routes and driving forces are used to relate indoor air radon levels to soil characteristics and to dynamics within the house. Preliminary validation of the model predictions consists of demonstrating reasonable values for indoor radon concentrations. While it is quite possible to formulate a fairly rigorous mathematical model to describe radon transport through soil, such a model would require rather complex numerical solutions that would be time consuming and expensive to evaluate. Numerical solutions are also cumbersome for evaluating both the relative importance of the individual mechanisms and the appropriateness of alternative boundaries.

Keywords: *Mathematical models, *Radon, *Soil gases, *Environmental transport, *Indoor air pollution, Flow rate, Gas flow, Houses, Residential buildings, Radionuclide migration, Concentration(Composition), Soil mechanics, Diffusion, Radioactive contaminants, Air pollution control, Subslab depressurization systems.

PB91-176750/REB PC **A03**/MF **A01**
Environmental Protection Agency, Research Triangle Park, NC. Air and Energy Engineering Research Lab.
Operational Experience of the EPA Owned Bench Scale Pilot Plant for Evaluating SCR DeNOx Catalysts.
Acurex Corp., Research Triangle Park, NC.
S. C. Tseng, W. Jozewicz, and C. B. Sedman. c1991, 16p EPA/600/D-91/022
Contract EPA-68-02-4701
Presented at the AIChE Annual Meeting held in Houston, TX. on April 11, 1991. Sponsored by Environmental Protection Agency, Research Triangle Park, NC. Air and Energy Engineering Research Lab.

The paper discusses the use of EPA's bench-scale pilot plant to evaluate catalysts used in the ammonia (NH3)-based technology and process for selective catalytic reduction (SCR) of nitrogen oxides. A key objective was to establish the performance of SCR catalysts on U.S. fuels and combustion sources. A rudimentary catalyst produced inhouse and two commercial catalysts were evaluated. The temperature ranged from 327 to 440 C. The space velocity ranged from 7650 to 36,500 hr to the -1 power. The combustion gas was doped with nitric oxide (NO) and NH3, and the NH3/NO ratio ranged from about 0.6 to 2.2. Sulfur dioxide (SO2) was added to the combustion gas in some runs to investigate its effect on NO conversion over one commercial catalyst. The formation of nitrous oxide (N2O) on the same catalyst at 400 C was also investigated. The evaluation indicated that, for the inhouse catalyst, the space velocity has a significant effect on NO conversion. For the two commercial catalysts, the NO conversion was 90% and higher when the NH3/NO ratio was near or above unity, and the NO conversion was approximately proportional to the NH3 concentration at the inlet of the reactor when the ratio was less than unity. Flue gas SO2 was found to be poisonous to one commercial catalyst. Furthermore, the amount of N2O formed over the same commercial catalysts was negligible.

Keywords: *Air pollution control, *Nitrogen oxides, *Catalyic effects, *Selective catalytic reduce, US EPA, Operating, Denitrification, Catalysis, Flue gas, Reduction(Chemistry), Pilot plants, Ammonia, *DeNOx process.

PB91-176768/REB PC **A03**/MF **A01**
Bioassessment Methods for Determining the Hazards of Dredged Material Disposal in the Marine Environment. Journal article.
Environmental Research Lab., Narragansett, RI.
J. H. Gentile, G. G. Pesch, K. J. Scott, W. Nelson, and W. R. Munns. c1991, 19p EPA/600/D-91/023, ERLN-1209
Pub. in In situ Evaluations of Biological Hazards of Environmental Pollutants, p31-47 1990. Prepared in cooperation with Woods Hole Oceanographic Institution, MA., and Science Applications International Corp., Narragansett, RI.

Approximately 325 million cu m of sediment are dredged annually for navigation purposes in the United States. Of this, 46 million cu m are disposed of annually in the ocean. Decisions regarding the ocean disposal of dredged material result, in large part, from bioassessment-based estimates of contaminant exposure and ecological impacts. Predictions of impacts for an individual dredging project are estimated from laboratory determinations of the magnitude, bioavailability, bioaccumulation, and hazards (toxicity) of dredged material contaminants. Disposal site management of individual and multiple dredging projects requires monitoring for contaminant transport, availability and accumulation in biota, and the hazards to ecologically and commercially important populations. Because of their importance, suites of bioassessment methods representing several levels of biological organization have been proposed for predicting and assessing the hazards resulting from the ocean disposal of dredged material.

Keywords: *Ocean disposal, *Marine biology, *Dredge spoil, *Biological effects, *Water pollution effects, Sediments, Ecosystems, Bioaccumulation, Dredging, Toxic substances, Exposure, Waste management, Biota, Assessments, Reprints.

PB91-176776/REB PC **A03**/MF **A01**
Kinetics of Chemical and Microbiological Contaminants in Distribution Systems.
Environmental Protection Agency, Cincinnati, OH. Risk Reduction Engineering Lab.
J. A. Goodrich. c1991, 19p EPA/600/D-91/024
Presented at the AWWA Computers and Automation Specialty Conference, Denver, CO., April 2-4, 1989.

Once treated drinking water enters the distribution system, substantial microbial, chemical, and physical changes can occur. Examples of such changes can include loss of disinfectant residual, increases in disinfection byproducts (DBP), growth of microbial diversity and population or an increase in heavy metal concentration. These water quality changes often result in aesthetic problems such as turbid water, red and/or black water or tastes and odors. Such conditions do not necessarily pose a threat to human health. However, several water quality changes in distribution systems could violate Maximum Contaminant Levels (MCLs) proposed by the Safe Drinking Water Act Amendments and pose a threat to human health. Asbestos fibers can be released into drinking water from deteriorated asbestos-cement water mains (1). Treated waters may also have mutagenic potential from increases in polycyclic aromatic hydrocarbons because of the leaching of asphalt-lined pipes (2). Lead, trihalomethanes (THMs), other DBPs, or coliforms may exceed the regulations at the tap although the water leaving the treatment plant was in compliance.

Keywords: *Water quality, *Potable water, *Distribution systems, *Chemical compounds, *Aquatic microbiology, *Kinetics, Water treatment, Water chemistry, Physical properties, Odors, Taste, Pollution regulations, Asbestos, Disinfection, Byproducts, Heavy metals, Standards compliance, Aromatic polycyclic hydrocarbons, Halomethanes, Reprints.

PB91-176784/REB PC **A03**/MF **A01**
Environmental Protection Agency, Cincinnati, OH. Risk Reduction Engineering Lab.
Monitoring Strategies for Water Distribution Systems. Proceedings paper.
Michigan Univ., Ann Arbor. School of Public Health.
R. A. Deininger, and B. H. Lee. 1989, 13p EPA/600/D-91/025
Grant EPA-R-814324
Presented at AWWA Computers and Automation Specialty Conference, Denver, Co., April 2-4, 1989. Sponsored by Environmental Protection Agency, Cincinnati, OH. Risk Reduction Engineering Lab.

The current monitoring procedures seem to select a geographically representative sample, with an almost complete disregard of the underlying water distribution network. However, the quality of water changes as it travels from the treatment plant to the consumer. Thus, the purpose of the paper is to distinguish between aspects of macrolocation and microlocation of sampling stations for not only compliance purposes but to more accurately characterize water quality. Macrolocation determines a general geographic area and microlocation determines the specific house or tap.

Keywords: *Water quality, *Water distribution, *Distribution systems, *Potable water, Environmental monitoring, Water treatment plants, Water analysis, Sampling, Chlorine, Halomethanes, Coliform bacteria, Reprints.

PB91-176792/REB PC **A03**/MF **A01**
Environmental Protection Agency, Cincinnati, OH. Risk Reduction Engineering Lab.
Overview of Metals Recovery Technologies for Hazardous Wastes. Symposium paper.
PEI Associates, Inc., Cincinnati, OH.
E. R. Krishnan, P. W. Utrecht, and R. J. Turner. Dec 90, 30p EPA/600/D-91/026
Contract EPA-68-03-3413
Presented at and pub. in proceedings from the National Research and Development Conference on the Control of Hazardous Materials, Anaheim, CA., February 20-22, 1991. Sponsored by Environmental Protection Agency, Cincinnati, OH. Risk Reduction Engineering Lab.

The paper presents information on the state-of-the-art of metals recovery technologies to assist in identifying waste-management options dealing with recovery for metal-bearing sludges and wastewaters that may be regulated under RCRA and the Clean Water Act. Waste treatment technologies (e.g., chemical precipitation) that could eventually result in recovery of specific metals are also included in the paper. Metals recovery technologies addressed in the paper include the following: chemical precipitation, electrolytic recovery, high-temperature metals recovery (HTMR), membrane separation, leaching, ion exchange, and evaporation. For each of these technologies, the following parameters are summarized: (1) design specifications of applicable processes, (2) waste characteristics affecting performance, (3) pretreatment/post-treatment requirements, (4) available performance data, and (5) availability of the technology and feasibility for treating various hazardous waste categories.

Keywords: *Hazardous materials, *Materials recovery, *Metals, *Waste treatment, Evaporation, Electrolysis, Leaching, Ion exchanging, Precipitation(Chemistry), Sludge disposal, Ground disposal, Pollution regulations, Technology utilization, State of the art, Waste disposal, Liquid wastes, Waste water, Industrial waste, High temperature tests, *Land Disposal Restrictions, Resource Conservation and Recovery Act.

PB91-176800/REB PC **A03**/MF **A01**
Use of Pipe Loop Tests for Corrosion Control Diagnostics. Journal article.
Environmental Protection Agency, Cincinnati, OH. Risk Reduction Engineering Lab.
R. Levin, and M. R. Schock. 1990, 29p EPA/600/D-91/027
Pub. in Proceedings of American Water Works Association Water Quality Technology Conference, San Diego, CA., 1990.

Well-designed test rigs allow the systematic control and evaluation of many variables affecting corrosion processes and corrosion rates. They provide a relatively simple screening procedure for determining possibly favorable corrosion control water treatment strategies. They cannot, however, be used as a substitute for tap water monitoring. The better the pipe loop mimics the conditions it is intended to model, the more applicable the test results are likely to be.

Keywords: *Water utilities, *Water pipes, *Corrosion tests, Water treatment, Copper, Monitors, Corrosion control.

PB91-176818/REB PC **A02**/MF **A01**
Environmental Protection Agency, Cincinnati, OH. Risk Reduction Engineering Lab.
Closure of a Dioxin Incineration Facility. Symposium paper Jan-Sep 89.
Foster Wheeler Enviresponse, Inc., Edison, NJ.
J. M. Perdek, F. J. Freestone, D. Sandifer, and A. Sherman. 1991, 6p EPA/600/D-91/028
Contract EPA-68-03-3255
Presented at the DIOXIN '90 Conference, Bayreuth, Germany, September 1990. Sponsored by Environmental Protection Agency, Cincinnati, OH. Risk Reduction Engineering Lab.

The EPA Mobile Incineration System treated approximately six million kilograms of dioxin wastes when it was in operation at the Denney Farm site in southwestern Missouri between 1985 and 1989. At the conclusion of operations, the site soils, equipment, and buildings were decontaminated in accordance with approved closure plans.

Keywords: *Incinerators, *Remedial action, *Dioxins, *Waste disposal, *Portable equipment, Soil contamination, US EPA, Buildings, Sampling, Decontamination, Hazardous materials, On-site investigations, Closures, *Cleanup operations, Southwest Region(Missouri).

PB91-176826/REB PC **A03**/MF **A01**
EPA Clean Products Research Program.
Environmental Protection Agency, Cincinnati, OH. Risk Reduction Engineering Lab.
M. A. Curran, and A. R. Robertson. 1991, 11p EPA/600/D-91/029
Pub. in Proceedings from the Air and Waste Management Association International Symposium on Research and Developments for Improving Solid Waste Management, Cincinnati, OH., February 6, 1991. See also PB91-108977.

The recent emphasis on developing information on achieving pollution prevention has resulted in increased research activity by the Environmental Protection Agency (EPA) in the area of clean product development. Currently the EPA's Pollution Prevention Research Branch (PPRB) has six funded research projects under the Clean Products Research Program. These projects include (1) compilation of background information, (2) profiling case studies of industries implementing changes, (3) identification of safe substitutes for toxic products, (4) life-cycle analysis methodology development, (5) development of guidance for industry to use in self-evaluations of product and process design, and (6) development of a method for measuring pollution prevention. A brief description with the status of each project is included in the paper. The paper should be of interest to other researchers, industry and consumers who want to follow the advances made by EPA in the area of clean product and life-cycle analysis research.

Keywords: *Pollution abatement, *Research and development, *Environmental impact assessments, US EPA, Case studies, Industrial plants, Guidelines, Consumer products, Public information, Environmental chemical substitutes, Marking, Toxic substances, Service life, *Clean Products Research Program.

PB91-176834/REB PC **A03**/MF **A01**
Rainfall Data Analysis Using the Gamma Distribution Function.
Environmental Protection Agency, Cincinnati, OH. Risk Reduction Engineering Lab.
R. G. Eilers. Mar 91, 28p EPA/600/D-91/030
Presented at the Annual EPA Conference on Statistics (7th), Richmond, VA., March 1991.

The Gamma distribution function can be useful for fitting rainfall data. An integral part of the assessment of storm loads on water quality is the statistical evaluation of rainfall records. Hourly rainfall records of many years duration are cumbersome and difficult to analyze. The Gamma distribution can be a tool to examine variables of interest (volume, duration, intensity, and time between storms) which are of importance in determining seasonal trends and selecting control alternatives for storm related runoff.

Keywords: *Rainfall, *Meteorological data, *Water quality, *Gamma function, *Computerized simulation, Seasonal variations, Storm water runoff, Statistical analysis, Water pollution control, *Gamma distribution.

PB91-176842/REB PC **A03**/MF **A01**
University City Science Center, Philadelphia, PA.
Technical Assistance for Waste Minimization.
Environmental Protection Agency, Cincinnati, OH. Risk Reduction Engineering Lab.
B. A. Westfall, F. W. Kirsch, and G. P. Looby. 1991, 16p EPA/600/D-91/031
Presented at the EPA/AESF Environmental Control Conference, Orlando, FL., January 28-30, 1991. Sponsored by University City Science Center, Philadelphia, PA.

Many metal finishing facilities are small businesses which lack in-house expertise or resources to initiate waste minimization programs. In 1988 the Risk Reduction Engineering Laboratory began a pilot project with the University City Science Center to provide waste minimization assessments for small businesses at no out-of-pocket expense to the host facility. Several metal finishing operations were included among the plants visited. The results of waste minimization assessments at two of these plants are discussed. The recommended waste minimization options and the actual experience with implemented recommendations are presented.

Keywords: *Metal finishing, *Waste management, *Pollution abatement, Assessments, Recommendations, Technology utilization, Forecasting, Industrial wastes, Case studies, *Waste minimization, Source reduction, Small systems.

PB91-176859/REB PC **A02**/MF **A01**
Sludge Organics Bioavailability.
Environmental Protection Agency, Cincinnati, OH. Risk Reduction Engineering Lab.
G. E. Eiceman, C. A. Bellin, J. A. Ryan, and G. A. O'Connor. 1991, 8p EPA/600/D-91/032
Pub. in Proceedings from 1989 International Battelle Symposium on Solid/Liquid Separation: Waste Management and Productivity Enhancement. Prepared in cooperation with New Mexico State Univ., Las Cruces. Dept. of Agronomy and Horticulture.

Concern over the bioavailability of toxic organics that can occur in municipal sludges threatens routine land application of sludge. Available data, however, show that concentrations of priority organics in normal sludges are low. Sludges applied at agronomic rates yield chemical concentrations in soil-sludge mixtures 50 to 100 fold lower. Plant uptake at these pollutant concentrations (and at much higher concentrations) is minimal. Chemicals are either (1) accumulated at extremely low levels (PCBs), (2) possibly accumulated, but then rapidly metabolized within plants to extremely low levels (DEHP), or (3) likely degraded so rapidly in soil that only minor contamination occurs (PCP and 2,4-DNP).

Keywords: *Sewage sludge, *Sludge disposal, *Organic compounds, *Soil contamination, *Biological effects, Toxic substances, Polychlorinated biphenyls, Plants(Botany), Path of pollutants, Farm crops, Concentration(Composition), Plant metabolism, Bioaccumulation, Degradation, Reprints, Phthalic acid/di(ethylhexyl-ester), Phenol/pentachloro, Phenol/dinitro.

PB91-176867/REB PC **A03**/MF **A01**
Technical Basis of Pathogen and Vector Attraction Reduction Requirements in EPA's Sludge Regulation Proposed February 1989. Symposium paper.
Environmental Protection Agency, Cincinnati, OH. Risk Reduction Engineering Lab.
J. B. Farrell. 1989, 34p EPA/600/D-91/033
Presented at American Water Works Association/Water Pollution Control Federation Joint Residuals Management Conference, San Diego, CA., August 13-16, 1989.

In response to the requirements of the Clean Water Act, EPA is developing comprehensive regulations for the use and disposal of sewage sludge, and published proposed regulations in the Federal Register on February 6, 1989. A portion of these regulations covers disposal and use of sludge on land. The requirements for pathogen and vector attraction reduction in the sludge to be disposed to the land are presented, and their technical bases are described. The proposed regulation is similar in approach to the current regulation but corrects its deficiencies. Instead of requiring use of specifically described processes that individually must reduce pathogen densities and vector attraction to the desired level, the proposed regulation instead sets performance goals. For example, Allowable maximum microbial densities (usually fecal indicator densities) in the final sludge product have been identified instead of describing process conditions to achieve these densities. For vector attraction reduction, performance goals could be set, but they are not independent of process type. The presentation provides scientific evidence supporting the approach taken. Publication of the regulation after consideration of public comment is expected in January 1992.

Keywords: *Pollution regulations, *Sewage sludge, *Sludge disposal, *Pathogens, *Disease vectors, Ground disposal, Waste disposal, US EPA, Performance standards, Pollution abatement, Waste management, Public health, Environmental effects, Infectious diseases, Risk assessment, Food chain, Sewage treatment, Bacteria, Clean Water Act.

PB91-176875/REB PC **A03**/MF **A01**
American Water Works Association, Denver, CO.
Design and Performance of Slow Sand Filters in the Pacific Northwest.
Environmental Protection Agency, Cincinnati, OH. Drinking Water Research Div.
G. Logsdon, S. Tanner, M. Grimm, and R. James. 1989, 15p EPA/600/D-91/034
Pub. in Proceedings, Annual Conference, American Water Works Association, p279-302, Los Angeles, CA., June 18-22, 1989. Prepared in cooperation with Idaho Div. of Environmental Quality, Coeur d'Alene, and Oregon State Health Div., Portland. Drinking Water Program. Sponsored by American Water Works Association, Denver, CO.

The paper was prepared as a review of slow sand filtration design and operating practices at 13 filtration plants constructed between 1958 and 1988 in the Pacific Northwest. It represents an attempt to learn from the past in order to do a better job in the future. Among the topics presented are plant construction features, including media characteristics, filter design, and hydraulics; water quality; and operation and maintenance practices. Narrative descriptions of each plant are given, and some specific design and operating examples are presented. Data from the plants have been tabulated so that frequently observed or common characteristics of design and operation can be noted. Finally, some comments are made about recent design and operating practices, in order to assist those who will design or operate slow sand filters in coming years.

Keywords: *Filtration, *Water treatment, Water production, Maintenance, Water quality, Water filters, Water supply, Hydraulics, Purification, Sand, Water treatment devices, Reprints, Pacific Northwest Region(United States).

PB91-176883/REB PC **A03**/MF **A01**
Slow Sand Filtration in the United States (Book Chapter).
Environmental Protection Agency, Cincinnati, OH. Drinking Water Research Div.
G. Logsdon, K. Fox, and N. J. D. Graham. c1991, 11p* EPA/600/D-91/035
Pub. in Slow Sand Filtration: Recent Developments in Water Treatment Technology, Section 1.3, p29-45 1988. See also PB88-238118.

Interest in slow sand filtration has increased dramatically in the United States in the past ten years. Research conducted to evaluate removal of Giardia cysts and bacteria, showed that slow sand filtration is very effective in removal of these contaminants. Slow sand filters are much simpler and easier to operate than plants that employ coagulation. Thus they are very well suited for treatment of previously unfiltered surface waters and would be well suited for small utilities serving from 25 to 3000 persons. The U.S. EPA estimates that about 1000 slow sand filters may be built as a result of proposed EPA regulations on surface water treatment.

Keywords: *Sand filtration, *Water treatment, Water supply, Potable water, Water services, Bacteria, Viruses, Giardia, Utilization, Water pollution, Slow sand filtration.

PB91-176891/REB PC **A02**/MF **A01**
Demonstration Projects Under the U.S. EPA Superfund Innovative Technology Evaluation Program. Symposium paper.
Environmental Protection Agency, Cincinnati, OH. Risk Reduction Engineering Lab.
J. F. Martin. 1991, 10p EPA/600/D-91/036
Pub. in the Annual Army Environmental Research and Development Symposium (14th) Proceedings, November 14-16, 1989, p25-32.

The U.S. Environmental Protection Agency (EPA) is engaged in an initiative called the Superfund Innovative Technology Evaluation (SITE) program. This program offers a mechanism for conducting joint technology demonstration/evaluation projects between the private sector and EPA. The purpose of the program is to provide an opportunity for developers to demonstrate the performance of their technologies on actual hazardous waste materials, and provide reliable and accurate information for future cleanup activities at Superfund sites. Currently there are 38 active projects in the Demonstration Program. Eight of these projects involve solidification/stabilization, nine concentrate on thermal processes, five are biological processes, and the remaining 16 include separation techniques, chemical treatment, and in-place vitrification. The paper briefly describes the active program and highlights those demonstrations which have been completed.

Keywords: *Hazardous materials, *Waste treatment, *Demonstration programs, US EPA, Remedial action, Waste disposal, Biological treatment, Incinerators, Separation, Vitrification, Solidification, Stabilization, Technology utilization, Reprints, *Superfund Innovative Technology Evaluation Program, Cleanup, Chemical treatment.

PB91-176909/REB PC **A02**/MF **A01**
Demonstration of Hazardous Waste Site Treatment Technologies. Symposium paper.
Environmental Protection Agency, Cincinnati, OH. Risk Reduction Engineering Lab.
J. F. Martin. 1989, 10p EPA/600/D-91/037
Pub. in Berlin Recycling Congress Proceedings, Berlin, Germany, November 1989, p1-8.

The SITE Program is intended to accelerate the use of new and innovative treatment processes that provide permanent control of hazardous waste as well as evaluate innovative measurement and monitoring techniques and pursue an active technology transfer program. Within the SITE Program, the Demonstration Program and the Emerging Technology Program are responsible for alternative technology development. The SITE Demonstration Program has as its major thrust the documentation of reliable performance and cost information for innovative alternative technologies. The demonstration projects identify limitations of the technology, the need for pre- or post-treatment of wastes, applicable wastes and waste media, potential operating problems, and the approximate cost of applying the technology.

Keywords: *Demonstration programs, *Hazardous materials, *Waste treatment, Technology utilization, Substitutes, Incineration, Waste disposal, Solidification, Cost analysis, Operating, Stabilization, Waste forms, Waste management, Extraction, Oxidation, Reprints, *Superfund Innovative Technology Evaluation.

PB91-176917/REB PC **A03**/MF **A01**
Review of Federal/State Medical Waste Management.
Environmental Protection Agency, Cincinnati, OH. Risk Reduction Engineering Laboratory.
C. C. Lee, and G. L. Huffman. Feb 91, 17p EPA/600/D-91/038

The paper will discuss what has been learned as a result of the following recent activities: (1) EPA's/Risk Reduction Engineering Laboratory's (RREL's) state-of-the-art assessment of medical waste thermal treatment; (2) the four medical waste management workshops co-sponsored by EPA's RREL, OSW, and the California Air Resources Board; (3) the passage of the Medical Waste Tracking Act (MWTA) in 1988; (4) the two-year Demonstration Program required by the

MWTA in the 'covered' States; (5) the promulgation of medical waste incineration standards by several States; and (6) EPA's/Office of Solid Waste's (OSW's) submittal of their first Interim Report to Congress. Because of the information needed to support these activities, both the Federal Government and States have conducted various studies. The paper is to discuss what has been learned as a result of these studies.

Keywords: *Waste management, Waste disposal, Hospital solid wastes, Incineration, State of the art, Meetings, Pollution regulations, Standards compliance, National government, Reviews, State government, Information transfer, Reprints, *Medical wastes, Resource Conservation and Recovery Act, Medical Waste Tracking Act of 1988.

PB91-176925/REB PC **A03**/MF **A01**
Membrane Summary: Performance, Concerns, and Regulations.
Environmental Protection Agency, Cincinnati, OH. Risk Reduction Engineering Lab.
B. W. Lykins. 1991, 12p EPA/600/D-91/039
Presented at the American Water Works Association Membrane Processes Conference, Orlando, FL., March 10-13, 1991.

Several Federal regulations have been promulgated and many more are expected for limiting the concentrations of contaminants in drinking water. As these regulations are developed, Best Available Technology (BAT) has to be stipulated for meeting these regulations. Various treatment technologies have proven effective in controlling many drinking water contaminants of concern. For instance, one of the most promising methods for halogenated by-product control includes removal of precursors before disinfection. Research studies in Florida indicate that membranes are effective in removing halogenated by-product precursors from certain waters. There are also other regulatory concerns where membranes can provide adequate treatment. Membranes can be used for removing inorganics and radionuclides. Also, with appropriate pilot-scale and field scale data, membranes could possibly be considered BAT for meeting the Surface Water Treatment Rule requirements.

Keywords: *Membranes, *Thin films, *Cellulose acetate, *Polymeric films, *Ultrafiltration, Water pollution control, Ground water, Potable water, Regulations, Laboratory tests, Field tests, Technology assessment, Best technology.

PB91-176933/REB PC **A03**/MF **A01**
Production and Processing of Metals: Their Disposal and Future Risks. Book chapter.
Environmental Protection Agency, Cincinnati, OH. Risk Reduction Engineering Lab.
R. C. Wilmoth, S. J. Hubbard, J. O. Burckle, J. F. Martin, and E. Merian. c1991, 49p EPA/600/D-91/040
Pub. in Metals and Their Compounds in the Environment, Chapter I.2, p19-65 1991.

The report describes the various wastes streams that are generated during the production and processing of both metals and nonmetals. The waste streams created by these techniques are presented as well as many of the current disposal practices used for these wastes. The potential for environmental degradation while handling these wastes is characterized. A number of waste disposal techniques are discussed.

Keywords: *Beneficiation, *Metals, *Waste disposal, *Tailings, *Minerals, Processing, Production, Reduction(Chemistry), Lead(Metal), Copper, Iron, Zinc, Silver, Gold, Uranium, Mining, Phosphates, Reprints.

PB91-176941/REB PC **A02**/MF **A01**
Significance of DNA Damage and Repair Mechanisms in Health Risk Assessment.
Environmental Protection Agency, Washington, DC. Office of Health and Environmental Assessment.
L. Rhomberg, V. L. Dellarco, W. H. Farland, and R. S. Cortesi. Oct 89, 9p EPA/600/D-91/041
Presented at Brookhaven Symposium in Biology No. 36, Brookhaven National Laboratory, Upton, NY., October 1-4, 1989.

Estimations of human risk are generally based on animal studies, and thus require a species-to-species extrapolation. Such data are usually obtained at exposure levels much higher than those ordinarily encountered by humans; consequently, estimates of low-dose risk require a consideration of how the animal dose-response can be extrapolated to lower exposures. Information on mechanisms and rates of DNA repair and on similarities and differences among different cell types and species is important in the development of biologically based extrapolation models for quantitative risk assessment. Such information serves to guide or to provide insight into predicted shapes of dose-response curves at low exposures and how to extrapolate risk across species. The paper will present a conceptual outline for considering how information on DNA damage and repair mechanism may be applicable to the assessment of health risks, particularly those posed by exposure to carcinogens and mutagens.

Keywords: *Risk assessment, *DNA damage, *Toxicology, *Health hazards, DNA repair, Dose-response relationships, Extrapolation, Carcinogens, Mutagens, Quantitative analysis, Species specificity, Cultured cells, Pharmacokinetics, Cytokinetics, Reprints.

PB91-176958/REB PC **A03**/MF **A01**
Quantitative Approaches to Human Risk Assessment for Noncancer Health Effects. Journal article.
Environmental Protection Agency, Washington, DC. Office of Health and Environmental Assessment.
C. A. Kimmel. c1990, 11p EPA/600/D-91/043
Pub. in NeuroToxicology 11, p189-198 1990. Presented at International Neurotoxicology Conference (7th), Little Rock, AR., September 18-21, 1989.

The estimation of risk for health effects due to chemical exposure is important to the development of standards for regulating the manufacture, use and release of chemicals into the environment. The quantitative data used to develop risk estimates usually come from laboratory animal studies employing relatively high dose levels. Thus, both interpolation from high to low dose levels and extrapolation from laboratory animals to humans are required. The approach most widely used for noncancer end points is to determine the no-observed-adverse-effect level (NOAEL) for the critical effect and then apply uncertainty factors (UFs) to account for scientific uncertainties in the total data base, such as response variability within and between species, the lack of chronic exposure data, and lack of a NOAEL, etc. The resulting value is a reference dose (RfD), the dose at or below which there is unlikely to be any excess risk. Research is currently underway to further develop and explore the application of such approaches.

Keywords: *Health hazards, *Risk assessment, *Hazardous substances, *Environmental pollutants, Dose-response relationships, Quantitative analysis, Evaluation, Reprints, *Reference doses, *Noncancer health effects, No-observed-adverse effect level(NOAEL).

PB91-176966/REB PC **A03**/MF **A01**
DOAS Urban Pollution Measurements.
Environmental Protection Agency, Research Triangle Park, NC. Atmospheric Research and Exposure Assessment Lab.
R. K. Stevens, and T. L. Vossler. 1991, 13p EPA/600/D-91/044

During July and August of 1990, a differential optical absorption spectrometer (DOAS) made by OPSIS Inc. was used to measure gaseous air pollutants over three separate open paths in Atlanta, GA. Over path 1 (1099 m) and path 2 (1824 m), ozone (O3), sulfur dioxide (SO2), nitrogen dioxide (NO2), nitrous acid (HNO2), formaldehyde (HCHO), benzene, toluene, and o-xylene were measured. Nitric oxide (NO) and ammonia (NH3) were monitored over path 3 (143 m). The data quality and data capture depended on the compound being measured and the path over which it was measured. Benzene, toluene, and o-xylene concentrations measured over path 2, which crossed over an interstate highway, were higher than concentrations measured over path 1, implicating emissions from vehicles on the highway as a significant source of these compounds. Federal Reference Method (FRM) instruments and a gas chromatograph (GC) were located near the DOAS light receivers and operated concurrently. Correlation coefficients greater than 0.85 were obtained between the DOAS and FRM's for O3, NO2, and NO; however, there was a difference between the mean values obtained by the two methods for O3 and NO. Correlation coefficients of about 0.66 were obtained between the DOAS and GC measurements of benzene and o-xylene. However, the correlation coefficient between the DOAS and GC measurements of toluene averaged only 0.15 for the two DOAS measurement paths. The lack of correlation and other factors indicate the possibility of a localized source of toluene near the GC.

Keywords: *Air pollution detection, *Urban areas, *Gas analysis, Xylenes, Absorption spectroscopy, Pollution sources, Exhaust emissions, Chemical analysis, Gas chromatography, Concentration(Composition), Toluene, Benzene, Ammonia, Nitrogen oxide(NO), Air pollution sampling, Ozone, Sulfur dioxide, Nitrogen dioxide, Nitrous acid, Formaldehyde, *Differential optical absorption spectrometers.

PB91-176974/REB PC **A03**/MF **A01**
Bioaccumulation and Toxicity of 2,3,7,8-Tetrachlorodibenzo-p-dioxin and Related Compounds in Aquatic Ecosystems.
Environmental Research Lab.-Duluth, MN.
P. M. Cook, M. K. Walker, D. W. Kuehl, and R. E. Peterson. c1990, 38p EPA/600/D-91/045
Prepared in cooperation with Wisconsin Univ.-Madison.

In order to complete ecological or human health risk assessments, exposure of aquatic organisms to 2,3,7,8-tetrachorodibenzo-p-dioxin (TCDD) and related chemicals must be linked to toxic or other biological effects in fish, wildlife, or man.

Keywords: *Water pollution effects(Animals), *Tetrachlorodibenzodioxin, *Aquatic ecosystems, Risk assessment, Health hazards, Pharmacokinetics, Fishes, Food chains, Biological availability, Reprints.

PB91-176982/REB PC **A03**/MF **A01**
Health Effects Research Lab., Research Triangle Park, NC.
Effects of Ozone Exposure on Lipid Metabolism in Human Alveolar Macrophages.
North Carolina Univ. at Chapel Hill. Center for Environmental Medicine and Lung Biology.
M. Friedman, M. C. Madden, J. M. Samet, and H. S. Koren. c1991, 29p EPA/600/D-91/046
Grant EPA-R-812738
Sponsored by Health Effects Research Lab., Research Triangle Park, NC.

Alveolar macrophages (AM) store arachidonic acid (AA) which is esterified in cellular phospholipids until liberated by phospholipase A2 or C after exposure to inflammatory stimuli. Following release, there can be subsequent metabolism of AA into various potent, biological active mediators including prostaglandins and platelet activating factor (PAF). To examine the possibility that these mediators may account for some of the pathophysiologic alterations seen in the lung following O3 exposure, human AM were collected by bronchoalveolar lavage of normal subjects, plated into tissue culture dishes, and the adherent cells were incubated with 3H-AA or 3H-lysoPAF. Human AM exposed 1.0 ppm O3 for 2 hr released 65 + or - 12% more tritium, derived from 3H-AA, than paired air-exposed controls into media supernatants. In other studies using a similar O3 exposure protocol, there was also a significant increase in human AM PGE2 production (2.0 + or - 0.5 fold-increase above air-exposure values, $p<0.01$, $n=17$). In additional studies, using a similar O3 exposure protocol (1.0 ppm for 1 hr), there was also a significant increase in human AM PAF content (1.7 + or - 0.2 fold-increase above air-exposure values, $p<0.02$, $n=5$).

Keywords: *Air pollution effects(Humans), *Ozone, *Pulmonary alveoli, *Macrophages, *Lipids, *Metabolism, Arachidonic acids, Phospholipids, Phospholipase A2, Phospholipase C, Prostaglandins, Platelet-activating factor, Bronchoalveolar lavage fluid, High pressure liquid chromatography, Thin layer chromatography, Statistical analysis, Eicosanoids.

PB91-176990/REB PC **A04**/MF **A01**
Use of Cell Culture for Evaluating Neurotoxicity. Book chapter.
Health Effects Research Lab., Research Triangle Park, NC. Neurotoxicology Div.
B. Veronesi. 1991, 68p EPA/600/D-91/047

The chapter familiarizes the reader with the need to develop, validate and utilize in vitro models to test chemicals for neurotoxic potential. The major advan-

tages and disadvantages of using cell and tissue culture, factors which have stimulated and hampered the promulgation of in vitro models for neurotoxicity testing and recent improvements in tissue culture methodologies are discussed. The rationale of using tissue culture for evaluating neurotoxicants and the unique aspects of culturing nervous tissue will be described. Major considerations for designing screening tests and factors used in selecting a screening battery are discussed. Topics such as parameters in the validation process, choice and quantification of endpoints (i.e., cytotoxic and neurotoxic), cost and technical requirements; choice of test chemicals and other quality control aspects are discussed.

Keywords: *Nervous system, *Toxicity, *Cultured cells, In vitro analysis, Nerve tissue, Toxic substances, Cell survival, Reprints.

PB91-177006/REB PC **A03**/MF **A01**
Health Effects Research Lab., Research Triangle Park, NC.
Regression on Medians of Probability Distributions.
ManTech Environmental Technology, Inc., Research Triangle Park, NC.
M. R. Sumler, H. L. Fisher, and L. L. Hall. 1991, 20p EPA/600/D-91/048
Contract EPA-68-02-4450
Sponsored by Health Effects Research Lab., Research Triangle Park, NC.

The median is a fundamental parameter in the area of lifetime and survival statistics. In toxicodynamics the LD50, lethal dose that results in 50% mortality, is frequently used. The median is also used to describe the incidence of cancer and other disease states. Factors such as nutritional status, age of animal, and exposure to a second chemical can cause the LD50 to shift. It is therefore desirable to determine a functional relationship between the median of a distribution and a cofactor. The paper used SAS to examine the use of median regression to predict a continuous dependent variable as a function of a single cofactor and compare these results to the standard ordinary least squares regression techniques. Two data sets were generated using the SAS RANUNI and NORMAL functions. In one, the median line was proportional to the mean line, and both the median and mean had positive slopes with respect to a cofactor. In the other, the slope of the median line was positive while that of the mean line was negative.

Keywords: *Lethal dose 50, *Toxic tolerances, Carcinogenesis, Epidemiology, Regression analysis, Survival analysis, Dose-response relationships, Mortality, Probabilistic estimation, *Statistical Analysis System(SAS).

PB91-177014/REB PC **A03**/MF **A01**
Genetic Activity Profile (GAP) Data Base.
Health Effects Research Lab., Research Triangle Park, NC.
M. D. Waters, H. F. Stack, and M. A. Jackson. 11 Jan 91, 21p EPA/600/D-91/049
Prepared in cooperation with Environmental Health Research and Testing, Inc., Research Triangle Park, NC.

The report provides an update on the status of the genetic activity profile (GAP) data base which now consists of more than 400 chemicals. The data base is available in a personal computer software package which is described in the report. The report also describes several of the ways in which the data base and associated methodology are currently being utilized by international and U.S. governmental agencies and by industry. These include: (I) Evaluation of genetic and related effects of suspected human carcinogens, (II) Comparative evaluation of genetic activity profiles using computer-based profile matching techniques, (III) Testing and evaluation of complex mixtures, and (IV) Weight-of-evidence ranking schemes. The fundamental techniques and computer programs devised for the GAP data base may be used to develop similar data bases in genetic toxicology and in other disciplines.

Keywords: *Mutagens, *Carcinogens, Test methods, Microcomputers, Dose-response relationships, Comparative study, Mutagenicity tests, Carcinogenicity tests, Data bases, *Genetic Activity Profile Database, Weight-of-evidence ranking.

PB91-177022/REB PC **A01**/MF **A01**
Reply to Discussion by Geoff Kite: Relationship between Annual Runoff and Watershed Area for the Eastern United States. Journal article.
Corvallis Environmental Research Lab., OR.
B. P. Rochelle, M. R. Church, W. A. Gebert, D. J. Graczyk, and W. R. Krug. c1988, 4p EPA/600/J-88/558
Pub. in Water Resources Bulletin, v24 n5 p1115-1116 Oct 88. See also PB90-108226. Prepared in cooperation with NSI Technology Services Corp., Corvallis, OR., and Geological Survey, Madison, WI.

The study was initiated because annual runoff is needed for several analyses being conducted by the U.S. Environmental Protection Agency (EPA). The study was concerned with the existence of a relationship between annual runoff volume per unit area and area; the reason underlying the relationship is unimportant. The variables were chosen based on the estimation procedure used in previous studies. Thus, the procedure of using runoff maps to estimate annual runoff for the Southern Blue Ridge Province and Northeast has no apparent bias due to watershed area.

Keywords: *Estimates, *Surface water runoff, *Watersheds, Correlation, Volume, Area, Utilization, Maps, Drainage, Hydrology, Water flow, Statistical analysis, Eastern Region(United States), *Annual variations.

PB91-177030/REB PC **A03**/MF **A01**
Environmental Protection Agency, Research Triangle Park, NC. Air and Energy Engineering Research Lab.
Characterization of Advanced Sorbents for Dry SO2 Control (Journal Article).
Acurex Corp., Research Triangle Park, NC.
W. Jozewicz, J. C. S. Chang, C. B. Sedman, and T. G. Brna. c1988, 22p EPA/600/J-88/559
Contract EPA-68-02-3988
Pub. in Reactivity of Solids, v6 p243-262 1988. See also PB88-175857. Presented at the AIChE Spring National Meeting held in Houston, TX. on March 29-April 2, 1987. Sponsored by Environmental Protection Agency, Research Triangle Park, NC. Air and Energy Engineering Research Lab.

The paper discusses the development of new flyash/lime sorbents for removing SO2 from coal-fired flue gas. Flyash/lime weight ratios of 1:1 to 10:1 and several additives to these sorbents for promoting their reactivity were evaluated in a bench-scale reactor simulating conditions in a fabric filter. Of the additives tested, Na2HPO4.7H2O, (NH4)2HPO4, and H3PO4 significantly enhanced the reactivity of the dry sorbents with SO2. Alternative sources of silica were reacted with lime, and the resultant dry sorbents were shown to be highly reactive with SO2. Of the siliceous materials tested, several diatomaceous earths, montmorillonitic clays, and kaolins were identified as containing reactive silica. The morphology of the sorbents developed was characterized. The information, along with the reactor test results, was used to rate the sorbents for pilot plant evaluation.

Keywords: *Sulfur dioxide, *Adsorbents, *Air pollution control, *Fly ash, *Calcium oxides, Chemical reactivity, Additives, Silicon dioxide, Flue gases, Phosphates, Stationary sources, Coal combustion, Filters, Surface properties, Technology assessment, Reprints, *Dry sulfur dioxide control.

PB91-177048/REB PC **A03**/MF **A01**
Environmental Protection Agency, Research Triangle Park, NC. Air and Energy Engineering Research Lab.
Advanced Electrostatic Stimulation of Fabric Filtration: Performance and Economics (Journal Article).
Research Triangle Inst., Research Triangle Park, NC.
A. S. Viner, G. P. Greiner, and L. S. Hovis. c1988, 12p EPA/600/J-88/560
Pub. in JAPCA, v38 n12 p1573-1582 Dec 88. See also PB87-195368. Prepared in cooperation with ETS, Inc., Roanoke, VA. Sponsored by Environmental Protection Agency, Research Triangle Park, NC. Air and Energy Engineering Research Lab.

The paper discusses the performance and economics of advanced electrostatic stimulation of fabric filtration (AESFF), in which a high-voltage electrode is placed coaxially inside a filter bag to establish an electric field between the electrode and the bag surface. The electric field alters the dust deposition pattern in the bag, yielding a much lower pressure drop than that in a conventional bag. Pilot plant results show that AESFF bags can operate with a rate of pressure loss that is 70% below that for conventional bags. The presence of the electric field also affects the aging characteristics of the AESFF bags. On the average, the AESFF bags had residual drags that were 10% below those of conventional bags. The results show that AESFF baghouses can yield the same pressure drop performance as conventional baghouses while operating at much higher air/cloth ratios. An economic analysis evaluated the capital, operating, and maintenance costs for electric utility plants ranging from 200 to 1000 MW. For AESFF baghouses, the capital cost was found to be 25 to 48% below that of a conventional baghouse. A lifetime cost analysis predicts a net present value for an AESFF baghouse that is 10 to 30% below that of a conventional baghouse.

Keywords: *Baghouses, *Fabric filters, *Electrostatics, *Air pollution control equipment, *Dust filters, Fabrics, Dust collectors, Performance tests, Electric power plants, Electrodes, Economic analysis, Air pollution abatement, Filtration, Stimulation.

PB91-177055/REB PC **A02**/MF **A01**
Environmental Protection Agency, Research Triangle Park, NC. Air and Energy Engineering Research Lab.
Evaluation of Control Strategies for Volatile Organic Compounds in Indoor Air (Journal Article).
Research Triangle Inst., Research Triangle Park, NC.
K. Ramanathan, and V. L. Debler. c1988, 8p EPA/600/J-88/561
Grant EPA-R812522
Pub. in Environmental Progress, v7 n4 p 230-235 Nov 88. See also PB88-158951. Sponsored by Environmental Protection Agency, Research Triangle Park, NC. Air and Energy Engineering Research Lab.

The paper discusses research which evaluates the application of adsorption techniques to the control of indoor organic vapors. The adsorption on activated carbon of three compounds representing three classes of organic species was studied at 30 C in the concentration range zero to 200 ppb using a microbalance. The three were benzene (aromatic), acetaldehyde (oxygenated aliphatic), and 1,1,1-trichloroethane (halogenated aliphatic). Three sorbents (a wood base carbon, a coal base carbon, and a coconut shell base carbon) were examined. Uptakes for all the compounds on all the carbons were low (on the order of 10 to the minus 7th power gmol/g carbon). Simulation of a packed bed of carbon indicated that carbon adsorption may not be practical for continuous removal, but may be applicable to sudden releases (e.g., spills). Potential alternatives to activated carbon adsorption are discussed. Potentially toxic organic vapors are emitted from a wide variety of building materials, consumer products, and human activities. Control of indoor organic vapors generally involves removing the source and/or increasing the ventilation rate. The ubiquitous nature of sources of organic vapors generally makes source removal impractical. Increased ventilation causes increased energy usage with its resultant economic penalties. Therefore, practical removal methods are needed.

Keywords: *Air pollution control, *Indoor air pollution, *Volatile organic compounds, Adsorption, Activated carbon treatment, Construction materials, Pollution sources, Ventilation, Substitutes, Consumer products, Toxic substances, Performance evaluation, Buildings, Reprints.

PB91-177063/REB PC **A03**/MF **A01**
Mechanisms Governing Transients from the Batch Incineration of Liquid Wastes in Rotary Kilns. Journal article.
Environmental Protection Agency, Research Triangle Park, NC. Air and Energy Engineering Research Lab.
J. O. L. Wendt, and W. P. Linak. c1988, 19p EPA/600/J-88/562
Pub. in Combustion Science and Technology, v61 p169-185 1988. Presented at the International Symposium on Combustion (22nd), Seattle, WA., August 14-19, 1988. Prepared in cooperation with Arizona Univ., Tucson. Dept. of Chemical Engineering.

The paper describes mechanisms governing transients from the batch incineration of liquid wastes in rotary kilns. When containerized liquid wastes, bound on sorbents, are introduced into a rotary kiln in a batch mode, transient phenomena involving heat transfer into, and waste mass transfer out of, the sorbent can

promote the rapid release of waste vapor into the kiln environment. This rapid vapor release can deplete and displace excess oxygen from the primary flame, and form a puff, which can result in temporary failure of the incinerator. Parametric studies on a specially designed rotary kiln incinerator simulator showed that puffs are very easily generated even with small quantities of wastes and at excess air values exceeding 100%. Furthrmore, their magnitudes and intensities increase with increasing kiln tempere and rotation speed. A theoretical model describing simultaneous heat and mass transfer into a sorbent aggregate, coupled with vapor-pressure-driven waste vaporization within the sorbent aggregate, was combined with a fragmentation model and was able qualitatively to predict experimentally observed effects relating to puff duration, kiln rotation speed and temperature, and stoichiometric oxygen requirement of the waste. The model was extrapolated to conditions beyond the experimental test matrix.

Keywords: *Liquid waste disposal, *Incinerators, *Kilns, Design criteria, Performance evaluation, Sorbents, Mass transfer, Mathematical models, Combustion efficiency, Heat transfer, Stoichiometry, Flame stability, Oxygenation, Reprints, *Puffs.

PB91-177071/REB PC **A03**/MF **A01**
Plant Uptake of Non-Ionic Organic Chemicals from Soils. Journal article.
Environmental Protection Agency, Cincinnati, OH. Risk Reduction Engineering Lab.
J. A. Ryan, R. M. Bell, J. M. Davidson, and G. A. O'Connor. c1988, 27p EPA/600/J-88/563
Pub. in Chemosphere, v17 n12 p2299-2323 1988. Prepared in cooperation with Liverpool Univ. (England). Environmental Advisory Unit, Florida Univ., Gainesville, and New Mexico State Univ., Las Cruces.

There are over 200 industrial waste land treatment sites in the United States, and a larger number of land treatment sites for municipal wastewater and sludge (Loehr and Malina, 1986). Land disposal of wastes has increased during the past decade and is projected to continue to increase in the future (Loehr and Malina, 1986). The study of organic chemicals in the soil environment has been dominated by agricultural chemicals (e.g., insecticides, nematicides and herbicides) and specific compounds that persist in the soil (e.g., PCB's, PBB's etc.). Therefore the document discusses methodologies utilizing simple properties of chemicals--half-life (T(sub 1/2)), log octanolwater partition coefficient (log K(sub ow)) and Henry's Law constant (Hc)--are developed to screen organic chemicals for potential plant uptake.

Keywords: *Plants(Botany), *Organic compounds, *Waste disposal, *Soil contamination, *Land pollution, Ground disposal, Soil mechanics, Environmental transport, Industrial wasts, Sewage sludge, Agricultural chemicals, Pesticides, Physicochemical properties, Environmental effects, Reprints.

PB91-177089/REB PC **A02**/MF **A01**
Effect of Methyl Parathion on Food Discrimination in Northern Bobwhite ('Colinus virginianus'). Journal article.
Corvallis Environmental Research Lab., OR.
J. L. Bussiere, R. J. Kendall, T. E. Lacher, and R. S. Bennett. c1989, 9p EPA/600/J-89/510
Pub. in Environmental Toxicology and Chemistry, v8 p1125-1131 1989. Presented at the Annual Meeting of the Society of Environmental Toxicology and Chemistry (8th), Pensacola, FL., November 9-12, 1987. Prepared in cooperation with Western Washington Univ., Bellingham. Inst. of Wildlife Toxicology.

The effect of methyl parathion on dietary discrimination ability was assessed in two-week-old northern bobwhite (Colinus virginianus). An initial oral dose of methyl parathion (0, 3 or 6 mg/kg: O, O-dimethyl O-(4-nitrophenyl)ester) was given to two subgroups of bobwhite before a 6-d food discrimination test; one group was tested with a choice of food treated with 45 ppm methyl parathion versus normal food and the second with a choice of 90 ppm treated food versus normal food. The average discrimination ratios (i.e., amount of treated to untreated food consumed) were used to indicate the chicks' ability to discriminate and avoid contaminated food. Chicks administered 6 mg/kg methyl parathion did not discriminate between treated and untreated food at either food treatment level and initially chose treated over untreated food (ratio=1.28; $p<0.05$). Brain cholinesterase activity in the 6 mg/kg groups averaged 50% of control levels, indicating high exposure to methyl parathion, which correlated with a behavioral disturbance (i.e.,preference for treated food on day 1). Cholinesterase activity did not correlate with the discrimination ratios throughout the remainder of the 6-d exposure period due to the strong side preference that developed in the treated groups. The study demonstrates that feeding behavior and taste discrimination ability of bobwhite chicks was impaired due to exposure to methyl parathion. (Copyright (c) 1989 SETAC.)

Keywords: *Methyl parathion, *Birds, *Wildlife, *Feeding behavior, Dose-response relationships, Avoidance behavior, Body weight, Food consumption, Cholinesterase, Food contamination, Reprints, *Taste discrimination, *Northern bobwhite, Colinus virginianus.

PB91-177097/REB PC **A02**/MF **A01**
Environmental Protection Agency, Cincinnati, OH. Risk Reduction Engineering Lab.
Trial Burn Results and Future Activities of the EPA Mobile Incinerator. Journal article.
Foster Wheeler Enviresponse, Inc., Edison, NJ.
J. M. Perdek, F. J. Freestone, G. D. Gupta, G. King, and R. H. Sawyer. c1989, 6p EPA/600/J-89/511
Contract EPA-68-03-3255
Pub. in Chemosphere, v19 n1-6 p561-564 1989. Sponsored by Environmental Protection Agency, Cincinnati, OH. Risk Reduction Engineering Lab.

The EPA Mobile Incinerator has demonstrated its ability to successfully destroy dioxin. A trial burn conducted in 1987 demonstrated the incinerator's ability to destroy a wide variety of compounds. The destruction and removal efficiency (DRE) of carbon tetrachloride, hexachloroethane, and trichlorobenzene was greater than the required 99.99%, and the DRE for PCBs was greater than the required 99.9999%. The field demonstration of the mobile incinerator that began in 1985 is scheduled for completion in 1989 after incinerating 4,530,000 kg of waste material.

Keywords: *Incinerators, *Portable equipment, *Waste disposal, Combustion efficiency, Demonstrations, Dioxins, Forecasting, Performance evaluation, US EPA, Carbon tetrachloride, Polychlorinated biphenyls, Reprints, Ethane/hexachloro, Benzene/trichloro.

PB91-177105/REB PC **A03**/MF **A01**
Controlling Organics with GAC: A Cost and Performance Analysis. Journal article.
Environmental Protection Agency, Cincinnati, OH. Drinking Water Research Div.
J. Q. Adams, R. M. Clark, and R. J. Miltner. c1989, 11p EPA/600/J-89/512
Pub. in Jnl. of American Water Works Association 81, n4 p132-140 Apr 89.

The amendments to the US Safe Drinking Water Act require extensive evaluation of the feasibility of removing organic compounds using granular activated carbon (GAC). To meet deadlines for the technology evaluation, the US Environmental Protection Agency has combined the use of column studies and adsorption modeling with cost models to make projections for the performance of full-scale GAC systems. A representative list of synthetic organic chemicals was studied, and cost and performance results for GAC treatment are presented in the article.

Keywords: *Water treatment, *Granular activated carbon treatment, *Potable water, *Organic compounds, Cost analysis, Performance evaluation, Adsorption, Mathematical models, Feasibility studies, Technology utilization, Reprints.

PB91-177113/REB PC **A03**/MF **A01**
Environmental Protection Agency, Research Triangle Park, NC. Air and Energy Engineering Research Lab.
Activation and Reactivity of Novel Calcium-Based Sorbents for Dry SO2 Control in Boilers (Journal Article).
Acurex Corp., Research Triangle Park, NC.
W. Jozewicz, and D. A. Kirchgessner. c1989, 11p EPA/600/J-89/513
Contract EPA-68-02-4701
Pub. in Powder Technology 58, p221-229 1989. See also PB88-250212. Presented at the Annual Pittsburgh Coal Conference (5th) held in Pittsburgh, PA. on September 9-11, 1988. Sponsored by Environmental Protection Agency, Research Triangle Park, NC. Air and Energy Engineering Research Lab.

Chemically modified Ca(OH)2 sorbents for SO2 control in utility boilers were tested in an electrically heated, bench-scale isothermal flow reactor, operated at between 700 and 1000 C and residence times of from 0.6 to 2 sec calculated from bulk gas flowrates. Novel surfactant-modified Ca(OH)2 (SM-Ca(OH)2) sorbents were compared to conventional Ca(OH)2 produced by dry hydration (DH-Ca(OH)2). Sorbents were activated in the flow reactor. The gas composition was 5 vol % oxygen with the balance nitrogen. Activated sorbents, SM-CaO and DH-CaO, were size classified with an inertial cascade impactor downstream of the flow reactor. The structure of each separated fraction (six trays plus preimpactor, D50 from 0.74 to > 11.9 micrometers) was characterized by nitrogen adsorption. For each size fraction measured, the surface area was higher for SM-CaO than for DH-CaO. The effect of thermal sintering was the increase of median pore size as a result of eliminating fine pores (below 100 A). Changes in the pore structure of Ca(OH)2 sorbents reacting with SO2 were also investigated. The effect of thermal sintering on pore structure of sorbents reacting with SO2 was eliminated. The degree of conversion was controlled by varying gas-phase mass transfer resistance (SO2 concentrations from 50 to 3000 ppm).

Keywords: *Sulfur dioxide, *Air pollution control, *Adsorbents, *Calcium oxides, Activation, Chemical reactivity, Boilers, Stationary sources, Sintering, Surface properties, Technology assessment, Combustion, Reprints.

PB91-177121/REB PC **A02**/MF **A01**
Environmental Protection Agency, Cincinnati, OH. Risk Reduction Engineering Lab.
Effects of Sewage Sludge on Di- (2-Ethylhexyl) Phthalate Uptake by Plants. Journal article.
New Mexico State Univ., Las Cruces.
J. M. Aranda, G. A. O'Connor, and G. A. Eiceman. c1989, 8p EPA/600/J-89/514
Pub. in Jnl. of Environmental Quality, v18 n1 p45-50 Jan/Mar 89. Sponsored by Environmental Protection Agency, Cincinnati, OH. Risk Reduction Engineering Lab.

Di-(2-ethylhexyl) phthalate (DEHP) is a priority organic pollutant frequently found in municipal sludges. A greenhouse study was conducted to determine the effects of sludge on plant uptake of (14)C-DEHP (carbonyl labeled). Plants grown included three food chain crops, lettuce (Lactuca sativa L.), carrot (Daucus carota L.), and chile pepper (Capsicum annuum L.) and tall fescue (Festuca arundinacea Schreb.). Net (14)C concentration in plants grown in soil amended with (14)C-DEHP-contaminated sludge was independent of sludge rate (at the same DEHP loading) for lettuce, chile fruit, and carrot roots. Net (14)C concentration, however, was inversely related to sludge rate in carrot tops, fescue, and chile plants. Intact DEHP was not detected in plants by gas chromatography/mass spectrometry analysis. Calculated plant DEHP concentrations based on measured net (14)C concentrations and DEHP specific activities) were generally correlated better with DEHP soil solution concentrations than with total DEHP soil concentrations. Net (14)C-DEHP bioconcentration factors were calculated from initial soil DEHP concentration and plant fresh weights. Bioconcentration factors ranged from 0.01 to 0.03 for fescue, lettuce, carrots, and chile, suggesting little DEHP uptake. Additionally, because intact DEHP was not detected in any plants, DEHP uptake by plants was of minor importance and would not limit sludge additions to the soils used to grow these crops. (Copyright (c) 1989, ASA, CSSA, SSSA.)

Keywords: *Sewage sludge, *Plants(Botany), *Land pollution, *Sludge disposal, Soil contamination, Food chains, Ground disposal, Farm crops, Waste disposal, Isotopic labeling, Tracer techniques, Path of pollutants, Sampling, Concentration(Composition), Phthalates, Carbon 14, Reprints, *Phthalic acid/ di(ethylhexyl-ester).

PB91-177139/REB PC **A02**/MF **A01**
Environmental Protection Agency, Cincinnati, OH. Risk Reduction Engineering Lab.
Sources of Error in Analysis of Municipal Sludges and Sludge-Amended-Soils for Di(2-ethylhexyl) Phthalate. Journal article.
New Mexico State Univ., Las Cruces.

G. A. Eiceman, J. L. Gardea-Torresdey, G. A. O'Connor, and N. S. Urquhart. c1989, 9p EPA/600/J-89/515
Grant EPA-R812687-02
Pub. in Jnl. of Environmental Quality 18, p374-379 1989. Sponsored by Environmental Protection Agency, Cincinnati, OH. Risk Reduction Engineering Lab.

Rapid quantitative determination of di-(2-ethylhexyl) phthalate (DEHP) in municipal sludge is described for capillary gas chromatography/mass spectrometry (GC/MS) using selected ion monitoring with isotope dilution techniques. Propagation of error through a four-step technique is measured as an increase in variance with each additional step. Stepwise accumulated variation (as a percentage of total error) was GC/MS analysis with data reduction, 3%; analyst (sample preparation), 8% heterogeneity of sludge, 30%; heterogeneity in sludge-amended soil, 77%; and errors between planters, 100%. The relative standard deviation (RSD) associated with analysis of sludge alone was 16% at 51 mg/kg DEHP. Analysis precision was dependent on sample size and DEHP concentration. The RSD for a 13 mg/kg DEHP loading in soil/sludge mixtures for a greenhouse study was 26.5%. Detection limits for DEHP in sludges with rapid screening procedures were fixed by interfering extractable matrices.

Keywords: *Sewage sludge, *Chemical analysis, *Error analysis, *Land pollution, *Waste disposal, Gas chromatography, Mass spectroscopy, Ground disposal, Soil contamination, Path of pollutants, Plants(Botany), Phthalates, Sample preparation, Reprints, *Phthalic acid/di(ethylhexyl-ester).

PB91-177147/REB PC **A02**/MF **A01**
Survival of Bacteria during Aerosolization. Journal article.
Corvallis Environmental Research Lab., OR.
B. Marthi, V. P. Fieland, M. Walter, and R. J. Seidler. c1990, 7p EPA/600/J-90/433
Pub. in Applied and Environmental Microbiology, v56 n11 p3463-3467 Nov 90. Prepared in cooperation with NSI Technology Services Corp., Corvallis, OR.

One form of commercial application of microorganisms, including genetically engineered microorganisms is as an aerosol. To study the effect of aerosol-induced stress on bacterial survival, nonrecombinant spontaneous antibiotic-resistant mutants of four organisms, Enterobacter cloacae, Erwinia herbicola, Klebsiella planticola, and Pseudomonas syringae, were sprayed in separate experiments in a greenhouse. Samples were collected over a distance of 15 m from the spray site for enumeration. Spores of Bacillus subtilis were used as tracers to estimate the effects of dilution on changes in population over distance. Viable counts of P. syringae, Enterobacter cloacae, and K. planticola decreased significantly over a distance of 15 m. Erwinia herbicola showed no significant decline in counts over the same distance. The degree of survival of P. syringae during aerosolization was dependent on ambient environmental conditions (i.e., temperature, relative humidity), droplet size of the aerosol, and prior preparative conditions. Survival was greatest at high relative humidities (70 to 80%) and low temperatures (12 C). Survival was reduced when small droplet sizes were used. The process of washing the cells prior to aerosolization also caused a reduction in their survival. Results from these experiments will be useful in developing sound methodologies to optimize enumeration and for predicting the downwind dispersal of airborne microorganisms, including genetically engineered microorganisms. (Copyright (c) 1990, American Society for Microbiology.)

Keywords: *Bacterial spores, *Aerosols, *Survival analysis, Humidity, Droplets, Ambient temperature, Cell survival, Bacillus subtilis, Reprints, *Enterobacter cloacae, *Erwinia herbicola, *Klebsiella planticola, *Pseudomonas syringe.

PB91-177154/REB PC **A01**/MF **A01**
Ecotoxicology: Problems and Approaches (Book Review). Journal article.
Corvallis Environmental Research Lab., OR.
A. Fairbrother. c1990, 3p EPA/600/J-90/434
Pub. in Jnl. of Wildlife Diseases, v26 n1 p143 1990.

In today's chemical-oriented society, any student of ecology must be cognizant of the potential for environmental toxicants to alter the balances and relationships among the plants, animals and biogeochemical cycles in an ecosystem. 'Ecotoxicology: Problems and Approaches' provides a well-balanced overview of the subject that would be useful for specialists in ecotoxicology or in related applied ecology disciplines and as a supplementary text for graduate-level courses in ecology. (Copyright (c) Wildlife Disease Association 1990.)

Keywords: *Terrestrial ecosystems, *Toxicology, *Environmental pollution, *Toxic substances, Hazardous substances, Wildlife, Reprints, Environmental pollution effects(Plants), Environmental pollution effects(Animals), Biogeochemistry.

PB91-177162/REB PC **A02**/MF **A01**
Corvallis Environmental Research Lab., OR.
Episodic Acidification of Adirondack Lakes during Snowmelt. Journal article.
Syracuse Univ., NY. Dept. of Civil and Environmental Engineering.
D. A. Schaefer, C. T. Driscoll, R. Van Dreason, and C. P. Yatsko. cJul 90, 7p EPA/600/J-90/435
Pub. in Water Resources Research, v26 n7 p1639-1647 Jul 90. Sponsored by Corvallis Environmental Research Lab., OR.

Maximum values of acid neutralizing capacity (ANC) in Adirondack, New York lake outlets generally occur during summer and autumn. During spring snowmelt, transport of acidic water through acid-sensitive watersheds causes depression of upper lake water ANC. In some systems lake outlet ANC reaches negative values. The authors examined outlet water chemistry from II Adirondack lakes during 1986 and 1987 snowmelts. In these lakes, SO concentrations were diluted during snowmelt and did not depress ANC. For lakes with high baseline ANC values, springtime ANC depressions were primarily accompanied by basic cation dilution. For lakes with low baseline ANC, No increases dominated ANC depressions. Lakes with intermediate baseline ANC were affected by both processes and exhibited larger ANC depressions. Ammonium dilution only affected wetland systems. A model predicting a linear relationship between outlet water ANC minima and autumn ANC was inappropriate. To assess watershed response to episodic acidification, hydrologic flow paths must be considered. (Copyright (c) 1990 by the American Geophysical Union.)

Keywords: *Acidification, *Lakes, *Snowmelt, Concentration(Composition), Watersheds, Water chemistry, Baseline measurements, Hydrology, Water pollution, Surface waters, Mathematical models, Air water interactions, Hydrogeology, Runoff, Reprints, *Acid neutralizing capacity, Adirondack Region(New York).

PB91-177170/REB PC **A02**/MF **A01**
Depuration Kinetics of Hexachlorobenzene in the Clam, 'Macoma nasuta'. Journal article.
Environmental Research Lab.-Narragansett, Newport, OR. Mark O. Hatfield Marine Science Center.
B. L. Boese, M. Winsor, H. Lee, D. T. Specht, and K. C. Rukavina. Feb 90, 7p EPA/600/J-90/436, ERLN-N081
Pub. in Comp. Biochem. Physiol., v96C n2 p327-331 1990.

Hexachlorobenzene (HCB) is a persistent environmental pollutant that bioaccumulates in tissues of marine and fresh water fish. Once taken up by these tissues, biodegradation is very slow with pentachlorophenol and polar conjugates as possible metabolites in aquatic organisms. Numerous studies have been done on HCB uptake and depuration in fish. In these studies the HCB bioconcentration factors (BCFs) varied from 5000 to 40,000 (wet weight basis) with half-lives (t 1/2) from a few days to several years. Although several studies have examined HCB uptake in invertebrates, only Oliver's (1987) study estimate a BCF. Oliver (1987) found that the BCF of HCB in oligochaete worms was 3120 when calculated on a wet weight basis, with a t(1/2) of 27 days. However, in Oliver's study the worms were buried in the contaminated sediment and the BCF calculated using the interstitial water concentration. As a portion of the HCB body burden was likely due to the ingestion of particulates, the reported BCF value may be in error.

Keywords: *Water pollution effects(Animals), *Clams, *Hexachlorobenzene, Environmental monitoring, Pharmacokinetics, Half-life, Biodeterioration, Reprints, *Depuration, Macoma nasuta.

PB91-177188/REB PC **A03**/MF **A01**
Taxonomic Level and Sample Size Sufficient for Assessing Pollution Impacts on the Southern California Bight Macrobenthos. Journal article.
Environmental Research Lab.-Narragansett, Newport, OR. Mark O. Hatfield Marine Science Center.
S. P. Ferraro, and F. A. Cole. c1990, 14p EPA/600/J-90/437, ERLN-N124
Pub. in Marine Ecology Progress Series, v67 p251-262 1990.

Macrobenthic data from samples taken in 1980, 1983 and 1985 along a pollution gradient in the Southern California Bight (USA) were analyzed at 5 taxonomic levels (species, genus, family, order, phylum) to determine the taxon and sample size sufficient for assessing pollution impacts on 5 measures of community structure. Two statistical designs were compared: a t-test for differences between reference and impacted stations where the error term was (1) among-year variation at the reference station (impact effects design), (2) replicate (within-station) sampling error (location effects design). The estimated statistical power (1-Beta) to detect impacts was a function of type and magnitude of impact, level of taxonomic identification, the statistical design, and the sample size (ni = number of sampling years at the reference station for the impact effects design, and nl = number of replicate samples per station for the location effects design). Four replicate 0.1 sq m van Veen grabs per station were needed to ensure community-wide, unbiased estimates of Shannon's, 1-Simpson's and McIntosh's Index. Family-level identification appeared to be a good choice for assessing pollution impacts at the study site as it ensured a high probability (1-Beta > or = to 0.80) of detecting intermediate or larger impacts on most (impact effects design) or all (location effects design) of 5 measures of community structure when ni and nl > or = to 4. The level of taxonomic identification and sample size should be considered along with other sampling variables (e.g. sample unit size, sieve mesh size) when seeking a statistically rigorous, cost-effective study design sufficient to meet pollution assessment objectives.

Keywords: *Environmental impact assessments, *Benthos, *Taxonomy, *Environmental monitoring, *Water pollution effects, Sample preparation, Classification, Marine ecosystems, Site surveys, Water pollution sampling, Experimental design, Systematics, Santa Monica Bay, Reprints, Southern California Bight.

PB91-177196/REB PC **A02**/MF **A01**
Environmental Protection Agency, Research Triangle Park, NC. Air and Energy Engineering Research Lab.
Particle Size Distributions for an Office Aerosol. Journal article.
Research Triangle Inst., Research Triangle Park, NC.
M. K. Owen, D. S. Ensor, L. S. Hovis, W. G. Tucker, and L. E. Sparks. c1990, 9p EPA/600/J-90/438
Grant EPA-R-814169
Pub. in Aerosol Science and Technology, v13 n4 p486-492 1990. Sponsored by Environmental Protection Agency, Research Triangle Park, NC. Air and Energy Engineering Research Lab.

The article discusses an evaluation of the effect of percent outdoor air supplied and occupation level on the particle size distributions and mass concentrations for a typical office building. (NOTE: As attention has become focused on indoor air pollution control, it has become important to obtain basic information on the effects of heating, ventilating, and air-conditioning system parameters on office aerosols. In addition, it is important to know the particle size distributions in a typical office environment.) The outdoor, return, and supply air streams, as well as hallway air, were sampled using measuring equipment covering particle diameters from < 0.1 to > 10.0 micrometers. The mass concentrations, when the building was occupied, increased by a factor of about 2 when all return air was used over all outdoor air. The concentrations when unoccupied using no outdoor air were as low or lower than were those when the building was occupied using all outdoor air. All of the occupied concentrations were < 200 micrometers/cu m. As expected, the outdoor air was cleaner than the other streams. The next lowest concentrations were for supply air, then return air, with hallway air showing the highest concentrations. The normalized number distributions had a single mode consistently near 0.13 micrometer; the volumetric distributions peaked at 0.3 micrometer.

Keywords: *Particle size distribution, *Aerosols, *Indoor air pollution, *Office buildings, Air pollution control, Environmental engineering, Air pollution sampling, Concentration(Composition), Mass distribution, Reprints.

PB91-177204/REB PC **A02**/MF **A01**
Robert S. Kerr Environmental Research Lab., Ada, OK.
Biodegradation of Diphenyl Ethers by a Copper-Resistant Mutant of 'Erwinia' sp. Journal article.
Louisiana State Univ., Baton Rouge. Dept. of Microbiology.
H. J. Liaw, and V. R. Srinivasan. c1990, 9p EPA/600/J-90/439
Grant EPA-R-813088-01
Pub. in Jnl. of Industrial Microbiology, v6 n4 p235-242 Dec 90. Sponsored by Robert S. Kerr Environmental Research Lab., Ada, OK.

A bacterium tentatively identified as an Erwinia sp. was isolated from sewage by enrichment on menthanol and lignin. Several mutants developed from this strain were studied for their ability to degrade aromatic ethers. Different concentrations of the chemicals were incubated with the organisms and the degradation was estimated by high-performance liquid chromatography (HPLC). Among these mutants, one isolate, Erwinia sp. strain CU3614, showed resistance to copper ions (>20 mM CuSO4) and the ability to degrade 4-hydroxydiphenyl ether (4-HDPE), 4-chlorodiphenyl ether (4-CDPE), 4-nitrodiphenyl ether (4-NDPE), and 2,7-dichlorodibenzo-p-dioxin (2,7-DCDD) in the presence of copper ions. Increased concentrations of copper in the medium resulted in higher degradation of 4-HDPE. Further studies with copper-sensitive mutants obtained from Erwinia sp. CU3614 by Tn5 transposon-induced mutagenesis showed a corresponding decrease in the ability to degrade 4-HDPE. These results suggest the presence of copper-associated activity in the biotransformation of aromatic ethers. (Copyright (c) 1990 Society for Industrial Microbiology.)

Keywords: *Erwinia, *Biodeterioration, *Phenyl ethers, *Copper ions, *Microbial drug resistance, High pressure liquid chromatography, Sewage, Mutation, Biotransformation, DNA insertion elements, Thin layer chromatography, Reprints.

PB91-177212/REB PC **A02**/MF **A01**
Use of DNA Purified In situ from Cells Embedded in Agarose Plugs for the Molecular Analysis of tk (-/-) Mutants Recovered in the L5178Y tk (+/-)3.7.2C Mutagen Assay System. Journal article.
Health Effects Research Lab., Research Triangle Park, NC.
M. Applegate, G. Juhn, M. Moore, and J. Hozier. c1990, 7p EPA/600/J-90/440
Pub. in Mutation Research, v245 n1 p55-59 Sep 90. Prepared in cooperation with Florida State Univ., Tallahassee. Dept. of Biological Science.

It has been reported that tk-/- mutants recovered in the mouse L5178Y TK+/- 3.7.2C mutagen assay have often lost the tk+ allele. Allele loss in tk-/- mutants is documented on Southern blots as the absence of a 6.3-kb Nco I fragment seen in both tk+/+ and tk+/- cell DNAs. For the routine screening of large- and small-colony tk-/- mutant DNAs for the absence of the genomic fragment, it has been found that cells can be lysed in agarose plugs, and DNA of cells embedded in plugs can be purified, restricted with Nco I, electrophoresed, and analyzed on Southern blots without significant band distortion or diffusional loss of tk-specific fragments in the 2- to 7-kb range. Purification and restriction analysis of DNA in agarose plugs, originally developed to allow pulsed-field gel electrophoresis of very large DNA fragments, represents a convenient alternative to conventional DNA purification methods, allowing quantitative recovery of DNA from small numbers of cells, eliminating centrifugation, phenol extraction, and ethanol precipitation steps, and requiring smaller quantities of reagents. (Copyright (c) Elsevier Science Publishers B.V. (Biomedical Division).)

Keywords: *Mutagens, *Thymidine kinase, *Deoxyribonucleic acids, Mutagenicity tests, Southern blotting, Agar gel electrophoresis, Alleles, Mutation, Cell line, Reprints.

PB91-177220/REB PC **A02**/MF **A01**
Serum Chemistries of 'Coturnix coturnix japonica' Given Dietary Manganese Oxide (Mn3O4). Journal article.
Health Effects Research Lab., Research Triangle Park, NC.
F. W. Edens, and J. W. Laskey. c1990, 6p EPA/600/J-90/441
Pub. in Comparative Biochemistry and Physiology, v97C n1 p130-142 Oct 90. Prepared in cooperation with North Carolina State Univ. at Raleigh. Dept. of Poultry Science.

Plasma creatinine and inorganic phosphorus were increased in manganese oxide (Mn3O4)-treated adult male Coturnix quail, but BUN, BUN/creatinine ratio, uric acid, and total calcium were decreased. Serum enzymes (alkaline phosphatase, glutamic oxaloacetic transminase, glutamic pyruvic transaminase, and lactic dehydrogenase) were elevated in Mn3O4-treated adult male Coturnix quail, but creatine phosphokinase was not affected. Dietary Mn3O4 at 5000 ppm did not produce overt signs of toxicosis. (Copyright (c) 1990 Pergamon Press plc.)

Keywords: *Blood chemistry, *Coturnix, *Diet, *Manganese oxide, Liver function tests, Kidney function tests, Reprints.

PB91-177238/REB PC **A03**/MF **A01**
Health Effects Research Lab., Research Triangle Park, NC. Epidemiology Branch.
Chronic Respiratory Effects of Indoor Formaldehyde Exposure. Journal article.
Arizona Univ. Health Sciences Center, Tucson.
M. Krzyzanowski, J. J. Quackenboss, and M. D. Lebowitz. c1990, 11p EPA/600/J-90/442
Pub. in Environmental Research, v52 n2 p117-125 Aug 90. Prepared in cooperation with Panstwowy Zaklad Higieny, Warsaw (Poland). Sponsored by Health Effects Research Lab., Research Triangle Park, NC. Epidemiology Branch, and National Institutes of Health, Bethesda, MD.

The relation of chronic respiratory symptoms and pulmonary function to formaldehyde (HCHO) in homes was studied in a sample of 298 children (6-15 years of age) and 613 adults. HCHO measurements were made with passive samplers two one-week periods. Data on chronic cough and phlegm, wheeze, attacks of breathlessness, and doctor diagnoses of chronic bronchitis and asthma were collected with self-completed questionnaires. Peak expiratory flow rates (PEFR) were obtained during the evenings and mornings for up to 14 consecutive days for each individual. Significantly greater prevalence rates of asthma and chronic bronchitis were found in children from houses with HCHO levels 60-120 ppb than in those less exposed, especially in children also exposed to environmental tobacco smoke. In children, levels of PEFR linearly decreased with HCHO exposure, with estimated decrease due to 60 ppb of HCHO equivalent to 22% of PEFR level in nonexposed children. (Copyright (c) 1990 Academic Press, Inc.)

Keywords: *Respiratory system, *Air pollution effects(Humans), *Formaldehyde, *Indoor air pollution, Adults, Children, Dose-response relationships, Flow rate, Asthma, Bronchitis, Chronic disease, Tobacco, Smoking, Prevalence, Reprints.

PB91-177246/REB PC **A03**/MF **A01**
Potentiation of Organophosphorus-Induced Delayed Neurotoxicity by Phenylmethylsulfonyl Fluoride. Journal article.
Health Effects Research Lab., Research Triangle Park, NC. Neurotoxicology Div.
C. N. Pope, and S. Padilla. c1990, 12p EPA/600/J-90/443
Pub. in Jnl. of Toxicology and Environmental Health, v31 n4 p261-273 Dec 90. Prepared in cooperation with Northeast Louisiana Univ., Monroe. School of Pharmacy.

It is well known that pretreatment with the serine esterase inhibitor phenylmethylsulfonyl fluoride (PMSF) can protect experimental animals from organophosphorus-induced delayed neurotoxicity (OPIDN), presumably by blocking the active site of neurotoxic esterase (NTE) such that binding and 'aging' of the neuropathic OP is thwarted. The authors report here that while PMSF (60 mg/kg, s.c.) given 4 hours before the neuropathic OP mipafox (50 mg/kg, i.m.) completely prevented the clinical expression of OPIDN in hens, the identical PMSF treatment markedly amplified the delayed neurotoxicity (relative to hens treated with the OP only) if administed 4 hours after mipafox (5 or 50 mg/kg, i.m.). Moreover, in a separate experiment using diisopropylphosphorofluoridate (DFP) as the neurotoxicant in place of mipafox, posttreatment with PMSF 4 hours after DFP (0.5 mg/kg) also accentuated the severity of the ataxia. These data indicate that PMSF only protects against OPIDN if given prior to exposure to the neurotoxicant; treatment with PMSF after OP exposure critically exacerbates the delayed neurotoxicity from exposure to organophosphorus compounds. (Copyright (c) 1990 by Hemisphere Publishing Corporation.)

Keywords: *Nervous system, *Organophosphorus compounds, *Toxicity, *Antidotes, *Phenylmethylsulfonyl fluorides, Delayed hypersensitivity, Enzyme inhibitors, Esterases, Chickens, Reprints, *Organophosphorus induced delayed neurotoxicity(OPIDN).

PB91-177253/REB PC **A03**/MF **A01**
Robert S. Kerr Environmental Research Lab., Ada, OK.
Eulerian-Lagrangian Localized Adjoint Method for the Advection-Diffusion Equation. Journal article.
Princeton Univ., NJ. Dept. of Civil Engineering and Operations Research.
M. A. Celia, T. F. Russell, I. Herera, and R. E. Ewing. c1990, 22p
Grant NSF-8657419-CES
Pub. in Advances in Water Resources, v13 n4 p187-206 1990. Prepared in cooperation with Colorado Univ. at Denver. Dept. of Mathematics, and Universidad Nacional Autonoma de Mexico, Mexico City. Inst. de Geofisica. Sponsored by Robert S. Kerr Environmental Research Lab., Ada, OK., and National Science Foundation, Washington, DC.

The paper presents a space-time localized adjoint method (LAM) approximation for the advection-diffusion transport equation. The formulation is based on a space-time discretization in which specialized test functions are defined. These functions locally satisfy the homogeneous adjoint equation within each element. The formulation leads to a general approximation that subsumes many specific methods based on combined Lagrangian and Eulerian approaches, so-called characteristic methods (CM's). The authors refer to the method as an Eulerian-Lagrangian localized adjoint method (ELLAM). The ELLAM approach not only provides a unification of CM methods, but also provides a systematic framework for incorporation of boundary conditions in CM approximations. Example calculations were presented to demonstrate that the ELLAM procedure can handle all types of boundary conditions.

Keywords: *Transport theory, *Diffusion theory, Numerical solution, Approximation, Advection, Reprints, Localized adjoint methods.

PB91-177261/REB PC **A03**/MF **A01**
Robert S. Kerr Environmental Research Lab., Ada, OK.
General Mass-Conservative Numerical Solution for the Unsaturated Flow Equation. Journal article.
Princeton Univ., NJ. Dept. of Civil Engineering and Operations Research.
M. A. Celia, E. T. Bouloutas, and R. L. Zarba. c1990, 16p EPA/600/J-90/445
Contract NRC-04-88-074, Grant NSF-8657419-CES
Pub. in American Geophysical Union, v26 n7 p1483-1495 Jul 90. Prepared in cooperation with Camp, Dresser and McKee, Inc., Boston, MA. Sponsored by Robert S. Kerr Environmental Research Lab., Ada, OK., Nuclear Regulatory Commission, Washington, DC., and National Science Foundation, Washington, DC.

The paper investigates the numerical behavior of standard approximation methods for the unsaturated flow equation. Solution using the h-based formulation and a backward Euler time discretization is shown to produce unacceptably large mass balance errors for many example calculations. This is true for any iteration method (Picard, Newton-Raphson, etc.). It is also true for both finite difference and finite element approximations in space, although finite elements are generally inferior to finite differences. A modified numerical approach is proposed that alleviates the mass balance problems discussed above. This approach is based on a fully implicit (backward Euler) time approxi-

mation applied to the mixed form of the unsaturated flow equation.

Keywords: *Flow equations, Computational fluid dynamics, Partial differential equations, Numerical integration, Ground water, Approximation, Soils, Reprints.

PB91-177279/REB PC **A03**/MF **A01**
Corvallis Environmental Research Lab., OR.
Hydrologic Sensitivities of the Sacramento-San Joaquin River Basin, California, to Global Warming. Journal article.
Washington Univ., Seattle. Dept. of Civil Engineering.
D. P. Lettenmaier, and T. Y. Gan. cJan 90, 19p EPA/600/J-90/446
Pub. in Water Resources Research, v26 n1 p69-86 Jan 90. Prepared in cooperation with Asian Inst. of Tech., Bangkok (Thailand). Div. of Water Resources Engineering. Sponsored by Corvallis Environmental Research Lab., OR.

The hydrologic sensitivities of four medium-sized mountainous catchments in the Sacramento and San Joaquin River basins to long-term global warming were analyzed. The hydrologic response of these catchments, all of which are dominated by spring snowmelt runoff, were simulated by the coupling of the snowmelt and the soil moisture accounting models of the U.S. National Weather Service River Forecast System. In all four catchments the global warming pattern, which was indexed to CO2 doubling scenarios simulated by three (global) general circulation models, produced a major seasonal shift in the snow accumulation pattern. Under the alternative climate scenarios more winter precipitation fell as rain instead of snow, and winter runoff increased while spring snowmelt runoff decreased. In addition, large increases in the annual flood maxima were simulated, primarily due to an increase in rain-on-snow events, with the time of ocurrence of many large floods shifting from spring to winter. (Copyright (c) 1990 by the American Geophysical Union.)

Keywords: *Global warming, *Air water interactions, *Hydrology, California, Long term effects, Sacramento River, San Joaquin River, Watersheds(Basins), General circulation models, Evapotranspiration, Flooding, Soil water, Snowmelt, Carbon dioxide, Runoff, Seasonal variations, Climatic changes, Air pollution, Precipitation(Meteorology), Reprints.

PB91-177287/REB PC **A02**/MF **A01**
Plant Uptake of Sludge-Borne PCBs. Journal article.
Environmental Protection Agency, Cincinnati, OH. Risk Reduction Engineering Lab.
G. A. O'Connor, D. Kiehl, G. A. Eiceman, and J. A. Ryan. c1990, 8p EPA/600/J-90/447
Pub. in Jnl. of Environmental Quality, v19 p113-118 1990. Prepared in cooperation with New Mexico State Univ., Las Cruces.

Plant uptake of sludge-borne polychlorinated biphenyls (PCBs) (similar to Aroclor 1248) was evaluated in a greenhouse study with two food-chain crops and a grass species. Polychlorinated biphenyl loading to two soils was varied in one experiment by adding different rates of a municipal sewage sludge heavily contaminated (52 mg/kg) with PCBs. In a second experiment, Aroclor 1248 was spiked into unamended soils or soils amended with another sludge containing <1mg/kg PCBs. Analysis of PCBs was by GC/MS with a reliable detection limit in plants of 20 microg/kg for individual chlorinated classes (tri, tetra-, and pentachlorobiphenyls) and total PCBs. Only carrots (Daucus carota) were contaminated with PCBs, and contamination was restricted to carrot peels. Current USEPA guidelines for land application of sludges based on sludge PCB content are shown to be extremely conservative.

Keywords: *Polychlorinated biphenyls, *Plants(Botany), *Soil contamination, *Land pollution, *Sludge disposal, Sewage sludge, Food chains, Ground disposal, Soil contamination, Path of pollutants, Ecosystems, Farm crops, Waste disposal, Reprints.

PB91-177295/REB PC **A02**/MF **A01**
Environmental Protection Agency, Cincinnati, OH. Risk Reduction Engineering Lab.
Behavior of Toluene Added to Sludge-Amended Soils. Journal article.
New Mexico State Univ., Las Cruces. Dept. of Agronomy and Horticulture.
Y. Jin, and G. A. O'Connor. c1990, 9p EPA/600/J-90/448
Pub. in Jnl. of Environmental Quality, v19 p573-579 1990. Sponsored by Environmental Protection Agency, Cincinnati, OH. Risk Reduction Engineering Lab.

Toluene is a priority pollutant that can be introduced to soils in a variety of wastes, including some municipal sludges. Laboratory experiments were conducted to study the behavior of toluene in two soils in the presence and absence of municipal sludge. Sludge additions increased toluene adsorption in two soils because of increased organic C content. The source of organic C (soil or sludge) and soil clay content also influenced toluene adsorption. Toluene adsorption-desorption was reversible in one soil, but slightly hysteretic in the other soil. An air-flow incubation system was used to evaluate toluene volatilization and degradation. The primary fate of surface-applied toluene in both soils was volatilization. Toluene volatilization rates were independent of sludge treatments. Toluene degradation was negligible in all treatments because of rapid volatilization losses. Despite increased toluene adsorption in the presence of sludge and reduced volatilization in saturated soils, gaseous transfer dominated all soils and treatments so that no toluene remained after 10 d.

Keywords: *Sewage sludge, *Toluene, *Soil contamination, *Soil analysis, *Sludge disposal, Waste disposal, Adsorption, Desorption, Air flow, Degradation, Land pollution, Vaporizing, Path of pollutants, Anaerobic processes, Reprints.

PB91-177303/REB PC **A02**/MF **A01**
Environmental Protection Agency, Cincinnati, OH. Risk Reduction Engineering Lab.
Sorption and Degradation of Pentachlorophenol in Sludge-Amended Soils. Journal article.
New Mexico State Univ., Las Cruces. Dept. of Agronomy and Horticulture.
C. A. Bellin, G. A. O'Connor, and Y. Jin. c1989, 8p EPA/600/J-90/449
Pub. in Jnl. of Environmental Quality 19, p603-608 1990. Sponsored by Environmental Protection Agency, Cincinnati, OH. Risk Reduction Engineering Lab.

Sorption and degradation of pentachlorophenol (PCP) by two alkaline and one acid soil was studied in the presence and absence of sewage sludge. The PCP concentrations used (0.1-10 mg/kg) included PCP rates expected with land application of normal municipal sewage sludges. Sorption/desorption isotherms, derived using batch equilibrium techniques, were described by the freundlich equation. The PCP sorption increased with increasing sludge additions. Desorption in the alkaline soils was completely reversible and no irreversible residues were formed. Leaching of PCP would be most likely in the unamended alkaline soils. Degradation of PCP at low (0.75 mg/kg) initial concentration was rapid (t(sub 1/2) approximately equal to 10-15 d) in alkaline soils, but much slower (t(sub 1/2) approximately equal to 38 d) in the acid soils. Sludge additions to the soils did not substantially affect PCP degradation. More rapid degradation of PCP in the alkaline vs. acid soils was attributed to less sorption and more favorable conditions for microbial activity. Rapid degradation in the alkaline soil, and greater sorption in the acid soil, reduces the chance of PCP leaching. However, longer PCP residence times in the acid soil increase the possibility for plant uptake.

Keywords: *Sewage sludge, *Sludge disposal, *Soil contamination, *Soil analysis, Pesticides, Chlorine organic compounds, Ground disposal, Waste disposal, Plants(Botany), Path of pollutants, Land pollution, Sorption, pH, Toxic substances, Degradation, Reprints, *Phenol/pentachloro.

PB91-177311/REB PC **A02**/MF **A01**
Environmental Protection Agency, Cincinnati, OH. Risk Reduction Engineering Lab.
Plant Uptake of Pentachlorophenol from Sludge-Amended Soils. Journal article.
New Mexico State Univ., Las Cruces. Dept. of Agronomy and Horticulture.
C. A. Bellin, and G. A. O'Connor. c1990, 7p EPA/600/J-90/450
Pub. in Jnl. of Environmental Quality, v19 p598-602 1990. Sponsored by Environmental Protection Agency, Cincinnati, OH. Risk Reduction Engineering Lab.

A greenhouse study was conducted to determine the effects of sludge on plant uptake of 14C-pentachlorophenol (PCP). Plants included all fescue (Festuca arundinacea Schreb.), lettuce (Latuca sativa L.), carrot (Daucus carota L.), and chile pepper (Capsicum annum L.). Minimal intact PCP was detected in the fescue and lettuce by gas chromatography/mass spectrometry (GC/MS) analysis. No intact PCP was detected in the carrot tissue extracts. Chile pepper was not analyzed for intact PCP because methylene chloride extracts contained minimal 14C. The GC/MS analysis of soil extracts at harvest suggests a half-life of PCP of about 10 d independent of sludge rate or PCP loading rate. Rapid degradation of PCP in the soil apparently limited PCP availability to the plant. Bioconcentration factors (dry plant wt./initial soil PCP concentration) based on intact PCP were <0.01 for all crops, suggesting little PCP uptake. Thus, food-chain crop PCP uptake in these alkaline soils should not limit land application of sludge.

Keywords: *Sewage sludge, *Sludge disposal, *Soil contamination, *Plants(Botany), Farm crops, Pesticides, Chlorine organic compounds, Waste disposal, Path of pollutants, Land pollution, Ground disposal, Food chains, Toxic substances, Reprints, *Phenol/pentachloro.

PB91-177329/REB PC **A02**/MF **A01**
Environmental Protection Agency, Cincinnati, OH. Risk Reduction Engineering Lab.
Adsorption, Degradation, and Plant Availability of 2,4-Dinitrophenol in Sludge-Amended Calcareous Soils. Journal article.
New Mexico State Univ., Las Cruces. Dept. of Agronomy and Horticulture.
G. A. O'Connor, J. R. Lujan, and Y. Jin. c1990, 9p EPA/600/J-90/451
Pub. in Jnl. of Environmental Quality, v19 p587-593 1990. Sponsored by Environmental Protection Agency, Cincinnati, OH. Risk Reduction Engineering Lab.

2,4-Dinitrophenol (DNP) is a moderately weak acid that is expected to be highly labile (leachable and plant available) in high-pH soils. The adsorption and degradation behavior of DNP in two sludge-amended, calcareous soils was determined and used to explain DNP uptake by plants grown in the soils in the greenhouse. The DNP adsorption was minor in both soils and was only slightly affected by sludge. The DNP degradation was rapid in both soils and was unaffected by sludge. Thus, despite limited soil adsorption, plant uptake of DNP was minor in all crops and plant parts owing to rapid soil DNP degradation. Even if a municipal sludge highly contaminated with DNP was identified (an unlikely occurrence), concerns over possible plant contamination should not limit sludge applications to calcareous soils or leaching of DNP to groundwater, given careful water management.

Keywords: *Industrial wastes, *Sludge disposal, *Soil contamination, *Soil analysis, *Plants(Botany), Waste disposal, Adsorption, Degradation, pH, Nitrogen organic compounds, Toxic substances, Path of pollutants, Reprints, *Phenol/dinitro.

PB91-177337/REB PC **A03**/MF **A01**
Using Powdered Activated Carbon: A Critical Review. Journal article.
Environmental Protection Agency, Cincinnati, OH. Drinking Water Research Div.
I. N. Najm, V. L. Snoeyink, B. W. Lykins, and J. Q. Adams. cJan 91, 14p EPA/600/J-91/005
Pub. in Jnl. of American Water Works Association, v83 n1 p65-76 Jan 91.

Because the performance of powdered activated carbon (PAC) for uses other than taste and odor control is poorly documented, the purpose of the article is to critically review uses that have been reported and to analyze means of employing PAC more efficiently. The extent of adsorption of synthetic organic chemicals on PAC is strongly dependent on the type of compound being removed. The reported removals of trihalomethanes and trihalomethane precursors by PAC range from poor to very good. In selecting the point of addition of PAC, consideration must be given to the degree

of mixing, the contact time between the PAC and the water, the PAC residence time, and the minimization of interference of adsorption by treatment chemicals. One of the main advantages of PAC is its low capital cost.

Keywords: *Water treatment, *Potable water, Activated carbon treatment, Organic compounds, Reviews, Halomethanes, Performance evaluation, Adsorption, Capitalized costs, Cost analysis, Taste, Odor control, Reprints, *Powdered activated carbon.

PB91-177345/REB PC **A02**/MF **A01**
Conference Summary: Practical Aspects of the Design and Use of GAC. Journal article.
Environmental Protection Agency, Cincinnati, OH. Drinking Water Research Div.
J. L. Oxenford, and B. W. Lykins. c1991, 8p EPA/600/J-91/006
Pub. in Jnl. American Water Works Association, v83 n1 p58-64 Jan 91.

A conference on the design and use of granular activated carbon (GAC) was cosponsored May 9-10, 1989, by the AWWA Research Foundation (AWWARF) and the U.S. Environmental Protection Agency (USEPA) in Cincinnati, Ohio. Twenty-one US experts presented papers that focused on practical issues associated with GAC system design and use. The article is a synopsis of that conference and discusses some of the major points a utility should consider when evaluating GAC. The information presented here comes directly from the manuscripts prepared for the conference presentations.

Keywords: *Granular activated carbon treatment, *Meetings, *Water treatment, *Water pollution control, *Potable water, Design criteria, Performance evaluation, Oil spills, Chemical spills, Waste disposal, Substitutes, Comparison, Chemical removal(Water treatment), Reprints.

PB91-177352/REB PC **A03**/MF **A01**
Effects of Phosgene Exposure on Lung Arachidonic Acid Metabolism. Journal article.
North Carolina Univ. at Chapel Hill. Center for Environmental Medicine and Lung Biology.
M. C. Madden, M. Friedman, L. L. Keyes, H. S. Koren, and G. R. Burleson. c1991, 20p EPA/600/J-91/007
Contract EPA-68-02-4450
Pub. in Inhalation Toxicology, v3 p73-90 Jan 91. Prepared in cooperation with North Carolina Univ. at Chapel Hill. Center for Environmental Medicine and Lung Biology, and Health Effects Research Lab., Research Triangle Park, NC.

Phosgene is a pulmonary toxicant that can produce lung edema, bronchoconstriction, and immune suppression following an acute exposure. In the report, the effects of acute in vivo and in vitro phosgene exposure on lung arachidonic acid metabolism were examined. Fischer-344 rats were exposed either to air or to phosgene (0.05-1.0 ppm) for 4 hr and the lungs lavaged at 0.4, 20, and 44 hr post exposure. Leukotriene B4 (LTB4), leukotrienes C4, D4, and E4 (LTC4/D4/E4), and prostaglandin E2 (PGE2) were measured in lavage fluid by radioimmunoassay. With the exception of the LTC4/D4/E4 concentration in 1.0 ppm phosgene-exposed rats, in vivo phosgene exposure at > or = 0.1 ppm produced significant decreases in the concentrations of PGE2, LTB4, and LTC4/D4/E4 in the lavage fluid collected immediately after exposure. Temporally associated with the decreased eicosanoid production was a smaller number of alveolar macrophages recovered in the lavage fluid of phosgene-exposed rats. Dose response studies were performed. Phosgene exposure in vitro of rat and human alveolar macrophages was then performed to determine if the toxicant could directly inhibit the formation of eicosanoids by alveolar macrophages.

Keywords: *Phosgene, *Toxicity, *Lung, *Arachidonic acids, Metabolism, Bronchoalveolar lavage fluid, Macrophages, Pulmonary alveoli, Eicosanoids, Leukotrienes, Prostaglandins, In vitro analysis, High pressure liquid chromatography, Statistical analysis, Radioimmunoassay, Dose-response relationships, Reprints.

PB91-177360/REB PC **A03**/MF **A01**
High Doses of Aspartame Have No Effects on Sensorimotor Function or Learning and Memory in Rats. Journal article.
Health Effects Research Lab., Research Triangle Park, NC.
H. A. Tilson, J. S. Hong, and T. S. Sobotka. c30 Apr 90, 11p EPA/600/J-91/008
Pub. in Neurotoxicology and Teratology, v13 p27-35 Jan 91. Prepared in cooperation with National Inst. of Environmental Health Sciences, Research Triangle Park, NC., and Food and Drug Administration, Washington, DC. Center for Food Safety and Applied Nutrition.

Acute or repeated (14 days) intragastric administration of L-d-aspartyl-L-phenyla-lanine methyl ester suspended in saline and Tween-80 in doses of up to 1,000 mg/kg had no significant effect in male Fischer-344 rats on routine measures of sensorimotor function, including spontaneous motor activity, acoustic startle reflex and prepulse inhibition. Other experiments found that aspartame (500 or 1,000 mg/kg) had no significant effect on acquisition of passive or active avoidance or a spatial, reference memory task in the Morris water maze. A series of separate studies found that aspartame had no effects in rats fasted 24 hours prior to testing, or if it were suspended in carboxymethylcellulose or administered by the intraperitoneal route. Under the conditions of these experiments, large doses of aspartame have no significant neurobiological effects in adult rats as measured by procedures known to be sensitive to the neurobiological effects of neurotoxicants, including convulsants, organochlorine insecticides and heavy metals.

Keywords: *Aspartame, *Learning, *Memory, *Psychomotor performance, Rats, Dose-response relationships, Avoidance learning, Spatial discrimination, Startle reaction, Statistical analysis, Reprints.

PB91-177378/REB PC **A03**/MF **A01**
Corvallis Environmental Research Lab., OR.
Climatic Sensitivity of California Water Resources. Journal article.
Washington Univ., Seattle. Dept. of Civil Engineering.
D. P. Lettenmaier, and D. P. Sheer. c1991, 11p EPA/600/J-91/009
Pub. in Jnl. of Water Resources Planning and Management, v117 p108-125 Jan/Feb 91. Prepared in cooperation with Water Resources Management, Inc., Columbia, MD. Sponsored by Corvallis Environmental Research Lab., OR.

The possible effects of climate change on the combined Central Valley Project-California State Water Project (CVP/SWP) were evaluated using a three-stage approach. In the first stage, runoff from four headwater 'study catchments' was simulated using rainfall/snowmelt-runoff models, with climatic input taken from CO2 doubling scenarios from three general circulation models (GCMs). In the second stage, long-term inflows to the CVP/SWP reservoir system were simulated, conditioned on the study catchment flows, using a stochastic disaggregation model. In the third stage, a system simulation model was used to evaluate the performance of the reservoir system. For all of the alternative climate scenarios, runoff would be shifted from the spring to the winter. Significantly lower water deliveries from the SWP would occur under the CO2 doubling scenarios. The reduced deliveries would occur because some of the increased winter runoff would be spilled from the reservoirs instead of being stored in the snowpact, even though the mean annual runoff increased slightly under some climate scenarios.

Keywords: *Climatic changes, *Runoff, *Water supply, Catch basins, Rainfall, Snowmelt, Mathematical models, Carbon dioxide, Atmospheric circulation, Stochastic processes, Reservoirs, Water flow, Winter, Spring season, Performance evaluation, California, Central Valley Project, State Water Project.

PB91-177386/REB PC **A02**/MF **A01**
CH2M/Hill, Reston, VA.
Evaluating the Effectiveness of Ground Water Extraction Systems. Journal article.
Robert S. Kerr Environmental Research Lab., Ada, OK.
J. L. Haley, B. Hanson, C. Enfield, and J. Glass. c1991, 8p EPA/600/J-91/010
Pub. in Ground Water Monitoring Review, v11 n1 p119-124, Winter 1991. Sponsored by CH2M/Hill, Reston, VA.

The most common process for remediating contaminated ground water is extraction and treatment. Data from 19 on-going and completed ground water extraction systems were collected and analyzed to evaluate the effectiveness of this process in achieving cleanup concentration goals for ground water. This analysis indicated several trends including: containment of ground water plumes was usually achieved; contaminant concentrations dropped significantly initially followed by a leveling out; after the period of initial rapid decline, the continued decreases in concentration were usually slower than anticipated; and certain data important to optimizing system design and operation had often not been collected during the site characterization phase. Factors limiting the achievement of cleanup concentration goals fell into four basic categories: hydrogeological factors; contaminant-related factors; continued migration from source areas and the size of the plume itself; and system design factors. The findings of the study indicate that ground water extraction is an effective method for preventing additional migration of contaminant plumes and achieving risk reduction. However, the findings indicate that in many situations, it may not be practicable to rely solely on ground water extraction and treatment to achieve health-based cleanup concentrations throughout the contaminated zone and fulfill the primary goal of returning ground water to beneficial use. This suggests several recommendations for improving ground water response actions including: actions to contain contaminant plumes should be initiated early; data on vertical variation of hydraulic conductivity, distribution of the contaminant mass, and partitioning of contaminants to soil or a stationary phase in the saturated zone should generally be collected as part of the site characterization process; remedial actions should be implemented in stages to better utilize information on aquifer response as the system is being designed and implemented; remedial actions should be monitored and modified during operation to optimize system efficiency; and methods to enhance extraction effectiveness and efficiency should be considered.

Keywords: *Water pollution control, *Ground water, *Extraction, Waste disposal, Remedial action, Performance evaluation, Hydrogeology, Environmental transport, Soil contamination, Industrial wastes, Superfund, Plumes, Aquifers, Operating, Case studies, Site characterization, Reprints, *Cleanup operations, Remedial response, Resource Conservation and Recovery Act.

PB91-177394/REB PC **A01**/MF **A01**
Assay for beta-Glucuronidase in Species of the Genus 'Escherichia' and Its Applications for Drinking-Water Analysis. Journal article.
Environmental Protection Agency, Cincinnati, OH. Risk Reduction Engineering Lab.
E. W. Rice, M. J. Allen, D. J. Brenner, and S. C. Edberg. c1991, 4p EPA/600/J-91/011
Pub. in Applied and Environmental Microbiology, v57 n2 p592-593 Feb 91. Prepared in cooperation with American Water Works Association Research Foundation, Denver, CO., Centers for Disease Control, Atlanta, GA., and Yale Univ., New Haven, CT. School of Medicine.

Recently species of the genus Escherichia other than E. coli have been isolated from potable water. Environmental isolates as well as clinical isolates of E. adecarboxylata, E. blattae, E. fergusonii, E. hermannii and E. vulneris were assayed for the enzyme Beta-glucuronidase using EC MUG medium and the Colilert system. None of the isolates were positive for the enzyme by either method. (Copyright (c) 1991 American Society for Microbiology.)

Keywords: *Escherichia, *Water microbiology, *Potable water, *Glucuronidase, Species specificity, Culture media, Bacteriologic techniques, Reprints.

PB91-178418/REB PC **A06**/MF **A01**
Strawman II. Recommendations for a Regulatory Program for Mining Waste and Materials under Subtitle D of the Resource Conservation and Recovery Act. Final rept.
Environmental Protection Agency, Washington, DC. Office of Solid Waste.
21 May 90, 119p

The package, referred to as 'Strawman II', is a working document that represents EPA's latest staff position on an effective program to regulate wastes and other materials uniquely associated with noncoal mining. Strawman II does not represent a proposed rule. The package consists of two parts: (1) the Foreward, which describes the pre-rulemaking Strawman process, a background and overview of the mining waste program as envisioned in the package, and discussions of major issues concerning the program and its scope; and (2) the Regulatory Approach, presented as '40 CFR XXX, XXY, and XXZ' to reflect how the program might appear in regulatory language. Discussions and amplifications of specific points are also interspersed throughout the Regulatory Approach. EPA encourages all interested parties to convey their views on any and all aspects of the program concept.

Keywords: *Mine wastes, *Pollution regulations, *Pollution abatement, *Waste management, Legislation, US EPA, State programs, State implementation plans, Mineral wastes, Standards, Performance standards, Financing, Administrative procedures, Law enforcement, *Strawman II, Resource Conservation and Recovery Act.

PB91-178996/REB PC **A03**/MF **A01**
Environmental Radiation Data. Report 61, January-March 1990. Quarterly rept.
National Air and Radiation Environmental Lab., Montgomery, AL.
Sep 90, 41p EPA/520/5-90/031
See also PB90-182197.

Environmental Radiation Data (ERD) contains data from the Environmental Radiation Ambients Monitoring System (ERAMS). Date from similar networks operated by contributing States, Canada, Mexico, and the Pan American Health Organization are reported in the ERD when available. The ERAMS is comprised of nationwide sampling stations that provide air, surface and drinking water and milk samples from which environmental radiation levels are derived. Sampling locations are selected to provide optimal population coverage while functioning to monitor fallout from nuclear devices and other forms of radioactive contamination of the environment. The radiation analyses performed on these samples include gross alpha and gross beta levels, gamma analyses for fission products and specific analyses for uranium, plutonium, strontium, iodine, radium krypton, and tritium.

Keywords: *Radioactive contaminants, *Environmental monitoring, *Air pollution, *Water pollution, Radioactive wastes, Potable water, Milk, Food contamination, Plutonium, Uranium, Carbon-14, Tritium, Strontium-90, Krypton-85, Tables(Data), Fallout, Alpha particles, Beta particles.

PB91-179002/REB PC **A03**/MF **A01**
NAREL Standard Operating Procedures for Radon-222 Measurement Using Diffusion Barrier Charcoal Canisters. Final rept.
National Air and Radiation Environmental Lab., Montgomery, AL.
D. J. Gray, and S. T. Windham. Nov 90, 36p EPA/520/5-90/032
See also PB87-215877.

The passive nature of activated charcoal allows both adsorption and desorption of radon, and since the adsorbed radon under goes radioactive decay during the exposure period, the ability of the non-diffusion barrier (open-faced) canister to uniformly integrate over the entire exposure period can be impaired. To help alleviate the problem, the EPA open-face canister was modified by inserting a polyethylene membrane between the retaining screen and the carbon bed. This decreased the water vapor and radon adsorbed by the carbon, reduced the rate of adsorption/desorption between the carbon and the environmental, and improved integration capability.

Keywords: *Radon, *Charcoal, *Adsorption, *Activated carbon, Measurement, Standards, Radioactive isotopes, Equipment, Exposure, Polyethylene, Membranes, Water vapor, Desorption, Laboratories, *Indoor air pollution, Canisters, Radon 222.

PB91-179010/REB PC **A03**/MF **A01**
Improving the Viability of Existing Small Drinking Water Systems.
Environmental Protection Agency, Washington, DC. Office of Drinking Water.
Jun 91, 50p EPA/570/9-90/004

The report investigates options for assisting failing drinking water systems by (1) contracting for operations and maintenance services, (2) establishing cooperatives, (3) encouraging satellite management, and (4) acquisition and merger with successful systems.

Keywords: *Potable water, *Water pollution standards, *Viability, State implementation plans, Standards compliance, Operation and maintenance, Cooperatives, Satellite observation, Technology utilization, Recommendations, Permits, Financing, Performance standards, *Small systems, Safe Drinking Water Act of 1986.

PB91-179028/REB PC **A04**/MF **A01**
Establishing Programs to Resolve Small Drinking Water System Viability: A Summary of the Federal/State Workshop. Held in Scottsdale, Arizona on September 22-24, 1990.
Environmental Protection Agency, Washington, DC. Office of Drinking Water.
Feb 91, 60p EPA/570/9-91/002

The report summarizes activities and presentations given at the Federal/State Workshop on small drinking water system viability held in Scottsdale, Arizona, September 22-24, 1990. The report is intended to be used as a reference guide for other states interested in taking a similar approach to developing viability programs.

Keywords: *Meetings, *Potable water, *Viability, *Water pollution standards, Guidelines, National government, State implementation plans, Cooperatives, Pollution regulations, Cost analysis, Technology utilization, Financial assistance, Permits, *Small systems, Safe Drinking Water Act of 1986.

PB91-179036/REB PC **A01**/MF **A01**
Environmental Protection Agency, Cincinnati, OH. Risk Reduction Engineering Lab.
Waste Minimization Assessment for a Manufacturer of Printed Plastic Bags. Research brief.
University City Science Center, Philadelphia, PA.
F. W. Kirsch, and G. P. Looby. Dec 90, 5p EPA/600/M-90/017
Sponsored by Environmental Protection Agency, Cincinnati, OH. Risk Reduction Engineering Lab.

The U.S. Environmental Protection Agency (EPA) has funded a pilot project to assist small- and medium-size manufacturers who want to minimize their generation of hazardous waste but who lack the expertise to do so. Waste Minimization Assessment Centers (WMACs) were established at selected universities and procedures were adapted from the EPA Waste Minimization Opportunity Assessment Manual (EPA/625/7-88/003, July 1988). The WMAC team at the University of Tennessee performed an assessment at a plant manufacturing printed plastic bags for snack foods--approximately 1.8 million lb/yr. Plastic stock is ink printed and oven cured. To make single-layer bags, a heat seal process is used, and the bags are then packaged and shipped. For certain products, a plastic or metalized film is laminated to the printed plastic film, the rolls are slit to obtain individual bags, and the bags are packaged and shipped. The team's report, detailing findings and recommendations, indicated the most waste was generated in the lamination process and that the greatest savings could be obtained by installing an automatic adhesive/solvent mixing system to reduce (75%) the waste from the unused metalized film adhesive/solvent mixture.

Keywords: *Hazardous materials, *Plastic bags, *Waste management, Assessments, Industrial wastes, Laminated plastics, Laminates, Manufacturing, Adhesives, *Waste minimization, Source reduction, SIC 20-39.

PB91-179044/REB PC **A03**/MF **A01**
Bioassay Protocol for Lethal and Sub-Lethal Effects of Fungal Pathogens on 'Chrysoperla carnea' (Neuroptera: Chrysopidae).
Corvallis Environmental Research Lab., OR.
K. Donegan, and B. Lighthart. Apr 91, 18p EPA/600/3-91/025
Prepared in cooperation with ManTech Environmental Technology, Inc., Corvallis, OR.

The protocol describes procedures for evaluating the lethal and sublethal effects of exposure to fungal pathogens on larvae and adults of the predatory insect Chrysoperla carnea (Stephens). The protocol was developed and tested with the fungal insect pathogen Beauveria bassiana (Balsamo) under environmental conditions selected to maximize insect susceptibility to the pathogen. The procedures have not been performed with viral or protozoan preparations and only in part with bacterial pathogens. Successful execution of the procedures will require training in microbiological techniques, arthropod rearing and elementary statistical analysis.

Keywords: *Biological pest control, *Fungi, *Insects, *Pathogens, Bacteria, Viruses, Protozoa, Bacteria, Bioassay, Quality control, Lethal dosage, *Chrysoperla carnea, Beauveria bassiana.

PB91-179051/REB PC **A03**/MF **A01**
Design of Shoreline Surveys for Aquatic Litter Pollution.
Corvallis Environmental Research Lab., OR.
C. A. Ribic. Apr 91, 23p EPA/600/3-91/026

Recently there has been legislation to limit the discharge of litter into the aquatic environment. The U.S. EPA Office of Water has responded by implementing pilot studies to detect changes in trends of litter in the aquatic environment associated with the implementation of legislation. A general survey design for detecting changes in trend of aquatic litter on the nation's shorelines was presented. Specific recommendations for number of survey units and frequency of sampling depend on required confidence and power as well as study-specific economic constraints. The particular model used for sample size calculation is based on normally distributed errors and efforts should be made to validate the model. With a planned survey, impacts of legislation and educational efforts in reducing aquatic litter can be evaluated.

Keywords: *Ocean waste disposal, *Litter, *Beaches, *Land pollution, Waste disposal, *Surface waters, *Legislation, Water pollution, Case studies, Quality assurance, Quality control, Pollution regulations, Trends, Water quality, Field tests, Sampling.

PB91-179069/REB PC **A03**/MF **A01**
Investigation of the Indoor Air Quality of the North Carolina Department of Environment, Health, and Natural Resources Located at 3800 Barrett Drive, Raleigh, North Carolina. Final rept.
Environmental Protection Agency, Research Triangle Park, NC. Atmospheric Research and Exposure Assessment Lab.
V. R. Highsmith, and A. B. Lindstrom. Dec 90, 39p EPA/600/9-91/008

A limited-scale indoor air quality investigation was conducted over a 4 day period at the North Carolina Department of Environment, Health, and Natural Resources' offices located at 3800 Barrett Drive, Raleigh, NC. Integrated 9 hour particle, aldehyde, and volatile organic compound samples were collected at three different monitoring sites during normal office hours. Continuous temperature, relative humidity, and carbon dioxide measurements were also recorded. The limited study results indicate that the office's indoor air quality during the monitoring study was acceptable. However, periods when indoor temperatures and carbon dioxide levels reached or exceeded the American Society of Heating Refrigerating and Air Conditioning Engineers' guidelines were noted. Targeted volatile organic compound and aldehyde concentrations were low, with all species concentrations well below any established exposure limit. In many cases, the organic species concentrations were at or below the analytical detection limit. Commonly observed species (e.g., trichloroethylene, toluene, formaldehyde) were measured at concentrations similar to the levels reported by other indoor air investigators in office buildings. The study results suggests no significant sources of indoor air contaminants. Minor modifications to the heating and ventilation system may be needed to increase the percentage of outside air, provide increased total air flow, and provide better control for indoor temperatures.

Keywords: *Indoor air pollution, *Volatile organic compounds, *Air pollution monitoring, *Aldehydes, Air quality, Carbon dioxide, Humidity, Ambient temperature, Air conditioning, Raleigh(North Carolina).

PB91-179077/REB PC **A08**/MF **A01**
Corvallis Environmental Research Lab., OR.
Final Quality Assurance Report: Connecticut Wetlands Study.
ManTech Environmental Technology, Inc., Corvallis, OR.
A. Sherman. Apr 91, 160p EPA/600/3-91/030
Contract EPA-68-C8-0006
See also PB91-179101. Sponsored by Corvallis Environmental Research Lab., OR.

The report examines the data quality achieved during a field study implemented by the EPA's Wetland Research Program (WRP) at the Environmental Research Laboratory in Corvallis, Oregon. The project was conducted by Connecticut College as part of the WRP's ongoing research on created wetlands. It was one of three pilot projects aimed at developing methods for comparing natural wetlands with created wetlands. Soils, vegetation, hydrology, and site morphology data were recorded. Root specimens were collected and tested for the presence of vescular-arbuscular mycorrhizae. In addition, each site was surveyed, mapped, and photographed. One objective of the study was to identify field procedures which correctly differentiated wetlands based on their structural characteristics. High quality field data is required to distinguish environmental differences between sites, s extensive data quality assessments were included. Wherever possible, field procedures were evaluated for data errors occurring during sample collection, data recording, sample storage, and analysis. The report outlines the data quality assessment procedures used and summarizes the results of the assessment.

Keywords: *Wetlands, *Quality assurance, *Data analysis, *Mitigation, *Water pollution abatement, *Site characterization, Connecticut, US EPA, Field tests, Soil surveys, Forms(Paper), Auditing, Sampling, Comparison, Law enforcement, Environmental policy, EPA Wetlands Research Program.

PB91-179085/REB PC **A05**/MF **A01**
Environmental Research Lab., Gulf Breeze, FL.
Alternative Biological Treatment Processes for Remediation of Creosote-and PCP-Contaminated Materials: Bench-Scale Treatability Studies.
Southern BioProducts, Inc., Pendleton, SC.
J. G. Mueller, S. E. Lantz, B. O. Blattman, D. P. Middaugh, and P. J. Chapman. Mar 91, 97p
Contract EPA-68-033479
Prepared in cooperation with Technical Resources, Inc., Gulf Breeze, FL. Sponsored by Environmental Research Lab., Gulf Breeze, FL.

Bench-scale biotreatability studies were performed to determine the most effective of two bioremediation application strategies to ameliorate creosote- and pentachlorophenol (PCP)-contaminated soils present at the American Creosote Works Superfund site, Pensacola, Florida: solid-phase bioremediation or slurry-phase bioremediation. When indigenous microorganisms were employed as biocatalysts, solid-phase bioremediation was slow and ineffective (8-12 weeks required to biodegrade >50% of resident organics). Biodegradation was limited to lower-molecular-weight constituents rather than the more hazardous, higher-molecular-weight (HMW) compounds; PCP and HMW polycyclic aromatic hydrocarbons (PAHs) containing 4 or more fused rings resisted biological attach. Moreover, supplementation with aqueous solution of inorganic nutrients had little effect on the overall effectiveness of the treatment strategy. Alternatively, slurry-phase bioremediation was much more effective: >50% of targeted organics were biodegraded in 14 days. Again, however, more persistent contaminants, such as PCP and HMW PAHs, were not extensively degraded when subjected to the action of indigenous microorganisms.

Keywords: *Biological treatment, *Remedial action, *Creosote, *Superfund, *Waste disposal, Wood preservatives, Aromatic polycyclic hydrocarbons, Microorganisms, Substitutes, Soil contamination, Catalysts, Biodeterioration, Chlorine organic compounds, Bench-scale experiments, *Phenol/pentachloro, Pensacola(Florida).

PB91-179093/REB PC **A04**/MF **A01**
Corvallis Environmental Research Lab., OR.
National Surface Water Survey: Eastern Lake Survey - Phase 2 Northeastern Lakes, Database Dictionary.
Systems Applications, Inc., San Rafael, CA.
M. M. Jimenez, R. G. Johnson, T. C. Myers, T. R. Whittier, and A. T. Herlihy. 15 Mar 91, 74p
Contracts EPA-68-03-3439, EPA-68-C8-0006
See also DE87011956. Prepared in cooperation with ManTech Environmental Technology, Inc., Corvallis, OR., and Utah State Univ., Logan. Sponsored by Corvallis Environmental Research Lab., OR.

The purpose of the data dictionary is to provide information pertaining to the contents and structure of the Eastern Lakes Survey-Phase II (ELS-II) chemistry database. The data dictionary does not describe the design, protocols, or findings of the study, which are described in Herlihy et al. (1991). Section 2 describes the overall design and development of the ELS-II database. Section 3 is a summary of data quality. Section 4 identifies all variables in the database, and Section 5 provides detailed definitions of the variables. Section 6 describes 'tags' and 'flags' which are two types of data qualifiers.

Keywords: *Lakes, *Information systems, *Seasonal variations, *Water pollution effects, *Dictionaries, Surface waters, Data base management, Chemical properties, Physical properties, Water chemistry, Spring season, Summer, Autumn, Error analysis, Acid neutralizing capacity, Hydrologic data, *Northeast Region(United States), Eastern Lake Survey, National Acid Precipitation Assessment Program.

PB91-179101/REB PC **A07**/MF **A01**
Corvallis Environmental Research Lab., OR.
Quality Assurance Project Plan: Connecticut Wetlands Study.
ManTech Environmental Technology, Inc., Corvallis, OR.
A. Sherman, and S. Gwin. Apr 91, 138p EPA/600/3-91/029
Contract EPA-68-C8-0006
See also PB91-179077. Prepared in cooperation with Connecticut Coll., New London. Dept. of Botany. Sponsored by Corvallis Environmental Research Lab., OR.

EPA's Wetland Research Program has supported a major effort to study wetlands mitigation projects in the field. The field studies were designed to: (1) evaluate the project plans; (2) compare the projects with natural wetlands in the same land use setting; and (3) describe the development of the projects over time. The information from the studies will be used as technical guidance for setting performance criteria and developing design guidelines for mitigation projects. Pilot studies have been conducted in Oregon, Washington, Florida, and Connecticut. The report presents the methods and associated quality assurance procedures used during the Connecticut study. A major objective of the pilot study was to evaluate the field procedures and the data quality assessment protocols used. The authors are in the process of performing that evaluation. They anticipate that in some cases they will adopt the procedure, while others will be refined or discarded. Therefore, the authors caution the user of the document that, at this point, the EPA makes no claims or endorsement of the use of the field, laboratory, or data quality assessment procedures associated with the study.

Keywords: *Wetlands, *Water pollution abatement, *Site characterization, *Mitigation, *Data analysis, *Quality assurance, Guidelines, Connecticut, US EPA, Auditing, Sampling, Research and development, State programs, Management planning, Vegetation, Hydrology, Environmental policy, Pollution regulations, Law enforcement, Personnel development, EPA Wetlands Research Program.

PB91-179119/REB PC **A14**/MF **A02**
Proceedings of the St. Michaels Workshop on Residual Radioactivity and Recycling Criteria. Held in St. Michaels, Maryland, on September 27-28, 1989.
Office of Radiation Programs, Washington, DC.
A. B. Wolbarst, H. Terada, and A. C. B. Richardson.
Sep 89, 305p EPA/520/1-90/013
Prepared in cooperation with Japan Atomic Energy Research Inst., Tokai.

The report is the Proceeding of a Workshop sponsored jointly by the Office of Radiation Programs of EPA and the Japan Atomic Energy Research Institute. Topics for discussion fell into five general categories: Extent of the Clean-up Problem; Impacts of Clean-up Technologies and Economics of Criteria; Health Effects; Desirable Characteristics of Criteria; and Recycling of Materials and Equipment.

Keywords: *Radioactive materials, *Meetings, *Remedial action, *Pollution regulations, Standards compliance, Waste recycling, Site surveys, Decontamination, Decommissioning, Public health, US EPA, Japan, Biological effects, Radioactive wastes, Environmental protection, Technology utilization, Economic analysis, *Cleanup, Foreign technology.

PB91-179168/REB PC **A21**/MF **A03**
State Program Advisory Number 8. Directive (Final).
Environmental Protection Agency, Washington, DC. Office of Solid Waste and Emergency Response.
1 Mar 91, 483p EPA/530/SW-91/047, OSWER DIRECTIVE-9541.00-13

The directive discusses State and Regional Programs Branch, which has periodically issued State Programs Advisories (SPAs) to update the 'State Consolidated Authorization Manual' (SCRAM) as new RCRA program policies, regulations, and self-implementing statutory provisions come into effect. Since the SCRAM was recently replaced by the State Authorization Manual (SAM) which includes RCRA program changes through 6/30/89, current SPAs (SPA 8 and higher) will now update the SAM. SPA 8, covers RCRA program changes for the period 7/1/89 - 12/31/89. Included are 7 new revision checklists, model Attorney General's Statement language for the changes covered by the SPA, and other revised materials. A revision to the First Third Scheduled Wastes is included here. SPA 8 introduces Revision Checklist 70 which covers changes to Part 124 which were inadvertently not included as checklists in previous guidance.

Keywords: *State programs, *Guidelines, *Superfund, *Waste management, Revisions, State implementation plans, Pollution regulations, Tables(Data), Listings, Hazardous materials, *Office of Solid Waste and Emergency Response, Resource Conservation and Recovery Acts, State Authorization Manual.

PB91-179697/REB PC **A21**/MF **A03**
Feasibility of Environmental Monitoring and Exposure Assessment for a Municipal Waste Combustor: Rutland, Vermont Pilot Study. Appendices.
Environmental Protection Agency, Cincinnati, OH. Environmental Criteria and Assessment Office.
Jan 91, 492p* EPA/600/8-91/007A

In response to a Congressional mandate, a study was undertaken by the Office of Research and Development to monitor several metal and organic pollutants in air and other environmental media near the Rutland, Vermont Municipal Waste Combustor (MWC) facility; and to estimate the magnitude of any increases in health risk. As data became available, it became apparent that there was no obvious relationship between the operation of the MWC and ambient air pollution levels. Therefore, the focus of the study shifted from one of health risk assessment to one of more sophisticated statistical analysis to determine whether any influence of the MWC was detectable. The final report (EPA/600/8-91/007) was intended as a summary of the study undertaken in Rutland, Vermont and some practical applications of the feasibility of conducting environmental monitoring and exposure assessment of such facilities. These Appendices support the final report by providing the monitoring data and analyses used in the report.

Keywords: *Public health, *Incinerators, *Hazardous materials, Monitoring, Organic compounds, Exposure, Industrial wastes, Metals, Sediments, Municipalities, Toxicity, Tables(Data), Concentration(Composition), Sites, Feasibility studies, *Air pollution, *Rutland(Vermont), Risk assessment, Soil contamination.

PB91-180174/REB PC **A99**/MF **A04**
Environmental Protection Agency, Philadelphia, PA. Region III.

Cleaning Up Our Coastal Waters: An Unfinished Agenda. A Regional Conference. Held in Riverdale, New York on March 12-14, 1990.
Dynamac Corp., Rockville, MD.
M. T. Southerland, and K. Swetlow. 1990, 611p
Contract EPA-68-C8-0052
Also available from Supt. of Docs. Sponsored by Environmental Protection Agency, Philadelphia, PA. Region III, and Manhattan Coll., Bronx, NY.

The U.S. Environmental Protection Agency is currently funding three major water quality management planning efforts for the coastal waters in the New York-New Jersey-Connecticut region: The Long Island Sound Study; The New York-New Jersey Harbor Estuary Program; and The New York Bight Restoration Plan. Each of these efforts is overseen by a Management Conference established by the Administrator of the Agency. Since the Sound, Harbor, and Bight function, in many respects, as a single ecosystem, and since the regulated community will be required to implement provisions contained in all three plans, there is a compelling need for inter-plan coordination. For this reason, on March 12-14, 1990, the Management Conferences, in conjunction with Manhattan College and their 50th anniversary of environmental engineering, sponsored the regional conference: (Cleaning Up Our Coastal Waters: An Unfinished Agenda.) The ultimate purpose of the conference was to guide the continued deliberations of the Management Conferences overseeing the Long Island Sound Study, the New York-New Jersey Harbor Estuary Program, and the New York Bight Restoration Plan.

Keywords: *Coastal zone management, *Water pollution control, *Meetings, Regional analysis, Remedial action, Pollution sources, New Jersey, New York, Water pollution abatement, Ocean waste disposal, Marine biology, Toxic substances, Regulations, Habitats, Ecosystems, Dredge spoil, *Cleanup, Long Island Sound, New York-New Jersey Harbor Estuary Program, New York Bight Restoration Plan.

PB91-181586/REB PC **A05**/MF **A01**
Landfill and Surface Impoundment Performance Evaluation Manual (Revised Edition).
Environmental Protection Agency, Washington, DC. Office of Solid Waste and Emergency Response.
Apr 83, 84p EPA/530/SW-00/869R, EPA/SW-869R
See also PB81-166357.

The technical resource document provides recommended procedures for evaluating the effectiveness of liquid transmission control systems for hazardous waste landfill and surface impoundments. The procedures described allow an evaluator to determine the performance of (1) compacted clay liners intended to impede the vertical flow of liquids, (2) sand or gravel drainage layers used to convey liquids laterally into collection systems (3) slopes on such liner/drain layers, and (4) spacings of collector drain pipes. The mathematical principles that describe the transport of liquids through hazardous waste landfills and surface impoundments are technically complex. Faced with the situation, it is tempting to circumvent these difficulties by reverting to empiricism or rules of thumb. In the manual, however, this has been avoided by using linearized versions of complicated mathematical equations and by using simplified boundary conditions. Thus, the evaluator is able to assess the performance of a design using algebraic equations.

Keywords: *Earth fills, *Surface impoundments, *Linings, *Land pollution control, *Waste disposal, Revisions, Performance evaluation, Leaching, Design criteria, Drainage, Hazardous materials.

PB91-181743/REB PC **A04**/MF **A01**
Environmental Protection Agency, Research Triangle Park, NC. Atmospheric Research and Exposure Assessment Lab.
Study on Distributions and Recoveries of Tetrachlorodibenzo-p-Dioxin and Octachlorodibenzo-p-Dioxin in a MM5 Sampling Train.
Southern Research Inst., Birmingham, AL.
J. M. Finkel, R. H. James, and K. W. Baughman. Dec 90, 55p EPA/600/3-91/033
Contract EPA-68-02-4442
Sponsored by Environmental Protection Agency, Research Triangle Park, NC. Atmospheric Research and Exposure Assessment Lab.

(14)C-dioxin tracers were used to evaluate whole MM5 sampling train recoveries of dioxin and to determine the distribution of dioxins spiked into a sampling train that was concurrently sampling emissions from a burn of either natural gas ('clean' burn) or kerosene ('dirty' burn). The spike tests were made with a pilot-scale furnace constructed and operated in the laboratory. Recovery of (14)C-dioxin from the MM5 sampling train was determined by scintillation spectrometry. The experimental results indicate that the amount of spiked TCDD-(14)C recovered was approximately 85% during a natural gas test and 83% during a kerosene test. The amount of spiked OCDD-(14)C recovered was approximately 88% during a kerosene test. Also, the data indicate that during the kerosene tests OCDD-(14)C is collected primarily in the front half of the sampling train but TCDD-(14)C is often found in the XAD and the rear filter bell, riser and condenser of the sampling train. During the natural gas tests, TCDD-(14)C was primarily in the XAD. The distribution of the TCDD-(14)C in the kerosene tests was dependent on the rigid operation of the sampling train. The information from the study will be used to determine procedural areas that need improvements or modifications to allow the efficient collection and accurate determination of trace levels of dioxins and furans using the MM5 Method.

Keywords: *Furans, *Dioxins, *Air sampling, Effluents, Incinerators, Natural gas, Kerosene, Isotopic labeling, Laboratory tests, Tables(Data), Technology assessment.

PB91-181750/REB PC **A05**/MF **A01**
Forced Air Ventilation for Remediation of Unsaturated Soils Contaminated by VOC.
Robert S. Kerr Environmental Research Lab., Ada, OK.
J. S. Cho. May 91, 91p EPA/600/2-91/016

Parameters which were expected to control the removal process of VOCs from contaminated soil during the SVE operation were studied by means of numerical simulations and laboratory experiments in the project. Experimental results of SVE with soil columns in the laboratory indicated that the removal efficiency of VOCs from soil columns was a complicated function of air flow and the hydrogeometry inside. The partition process between air and the immobile liquid was not an equilibrium one, and the interfacial mass transfer varied with the residual amount of VOCs in the soil. Additional experiments under various conditions should be conducted to obtain further insight into SVE process. Two computer models were developed to study soil air and VOC movement during the SVE process. The first one was an analytical approximate model which could be used for the simulation of air movement in the SVE operation with multiple wells in homogeneous soil media. The second one was a numerical model in three-dimensional geometry which used a finite difference solution scheme. A simple pneumatic pump test was conducted, and part of test data were used for the validation of the simple analytical model.

Keywords: *Land pollution control, *Volatile organic compounds, *Remedial action, Soil contamination, Mathematical models, Experimental design, Air flow, Computerized simulation, Three-dimensional calculations, Performation evaluation, Finite difference theory, *Soil vacuum extraction, Cleanup operations.

PB91-181768/REB PC **A03**/MF **A01**
Environmental Protection Agency, Cincinnati, OH. Risk Reduction Engineering Lab.
Toxic Treatments 'In-situ' Steam/Hot-Air Stripping Technology. Applications Analysis Report.
Rept. for Jun 89-Jun 90.
Science Applications International Corp., San Diego, CA.
T. Jackson. Mar 91, 49p EPA/540/A5-90/008
Contract EPA-68-03-3485
Sponsored by Environmental Protection Agency, Cincinnati, OH. Risk Reduction Engineering Lab.

A SITE Demonstration of the Toxic Treatment (USA) Inc. in-situ steam/hot-air stripping technology (Detoxifier) was conducted beginning in the fall of 1989 at the GATX Annex Terminal site located in San Pedro, CA. The chemical storage and transfer facility was contaminated with various solvents due to spillage and a fire. Contamination extended into the salt water table (1.8 meters). Based on the SITE Demonstration and other data, it was concluded that 85% of the volatile organic compounds and 50% of the semivolatile organic compounds were removed from the soil. Fugitive air emissions are very low, and lateral and downward migration of contaminants due to the treatment were minimal. Finally, it was concluded that this in-situ process is cost competitive.

Keywords: *Superfund, *Soil treatment, *Land pollution control, *Waste management, *Stripping, *Remedial action, Soil contamination, Soil mechanics, Technology utilization, Volatile organic compounds, Performance evaluation, Steam, In-situ processes, Operating, Economic analysis, *TTUSA process, Cleanup operations, Toxic treatments(USA).

PB91-181776/REB PC **A06**/MF **A01**
Environmental Monitoring Systems Lab., Las Vegas, NV.
Field Comparison of Ground-Water Sampling Devices for Hazardous Waste Sites: An Evaluation Using Volatile Organic Compounds. Summary rept. Jan 87-Sep 90.
Nevada Univ. System, Las Vegas. Water Resources Center.
K. F. Pohlmann, R. P. Blegen, and J. W. Hess. May 91, 114p EPA/600/4-90/028
Sponsored by Environmental Monitoring Systems Lab., Las Vegas, NV.

To determine whether ground-water contamination has occurred or remediation efforts have been effective, it is necessary to collect ground-water samples in such a way that the samples are representative of ground-water conditions. Unfortunately, formation of stagnant water within conventional monitoring wells requires that these wells be purged prior to sampling, a procedure that may introduce significant bias into the determination of concentrations of sensitive constituents such as volatile organic compounds (VOCs). The use of in situ ground-water sampling devices, which minimize or eliminate the need for well purging, may help alleviate some of the difficulties associated with sampling ground-water at hazardous waste sites. In the study, several ground-water sampling devices, including two in situ systems, were field-tested to determine their capability for yielding representative VOC data. Sampling devices included a bladder pump, a bladder pump below an inflatable packer, a bailer, a bailer with a bottom-emptying device, an in situ Westbay MP System, two in situ BAT devices, and a prototype BAT well probe. The devices were field-tested at a site contaminated by a VOC plume, and the comparison was based on the ability of the devices to recover representative concentrations of the VOCs. The results of the study indicate that the tested in situ devices may eliminate the need for well purging prior to sample collection and that the resulting samples are at least as representative as those collected with a bladder pump in a conventional monitoring well.

Keywords: *Water pollution sampling, *Hazardous materials, *Waste disposal, *Samplers, Volatile organic compounds, Remedial action, Concentration(Composition), Performance evaluation, Best technology, Diaphragms(Mechanics), Field tests, Comparison, Site surveys, Experimental design, Ground water, Westbay MP System, Bailers, Bladder pumps.

PB91-181784/REB PC **A07**/MF **A01**
Environmental Protection Agency, Research Triangle Park, NC. Atmospheric Research and Exposure Assessment Lab.
National Dry Deposition Network: Third Annual Progress Report (1989).
Environmental Science and Engineering, Inc., Gainesville, FL.
E. S. Edgerton, T. F. Lavery, and H. S. Prentice. Jul 91, 142p EPA/600/3-91/018
Contract EPA-68-02-4451
See also PB90-187238. Sponsored by Environmental Protection Agency, Research Triangle Park, NC. Atmospheric Research and Exposure Assessment Lab.

The National Dry Deposition Network is ultimately to provide long-term estimates of dry acidic deposition across the continental United States. Fifty sites operated during 1989, 41 in the east and 9 in the west. Weekly average atmospheric concentrations of sulfate, nitrate, ammonium, sulfur dioxide, and nitric acid were measured (using three stage filter packs) throughout the year, while sodium, potassium, calcium, and magnesium were measured from January through September. Results showed species-dependent variability in atmospheric concentrations from site to site, season to season, and day to night. In general SO4(-2), NH4(+), SO2, and HNO3 concentrations were

much higher (factor 5-10) at eastern sites than at western. On the other hand, NO3(-), Na(+), K(+), Ca(+2), and Mg(+2) concentrations were frequently comparable at eastern and western sites. Average SO4(-2), NH4(+), and HNO3 concentrations were typically highest during summer and lowest during fall. In contrast, SO2 and NO3(-) were highest in winter and lowest in summer. Day/night variability was low for aerosols, but frequently pronounced for SO2 and HNO3, especially during the summer and at sites surrounded by complex terrain. Ozone data for 1988 and 1989 showed marked differences between years, with notably higher concentrations in 1988. Approximations of annual dry deposition rates for SO4(-2), SO2, NO3(-), and HNO3 suggest that gaseous deposition greatly exceeds aerosol deposition and that dry fluxes are similar to wet deposition at numerous sites in the eastern U.S. Application of site-specific dry deposition models are needed to refine these estimates.

Keywords: *Deposition, *Air pollution sampling, *Dry methods, Meteorology, Air quality data, Quality control, Long term effects, Concentration(Composition), Study estimates, Site surveys, Seasonal variations, Ozone, Aerosols, Data quality, Diurnal variations, *National Dry Deposition Network.

PB91-181792/REB PC **A12**/MF **A02**
Environmental Protection Agency, Seattle, WA. Region X.
Everett Harbor Action Plan: Data Summaries. Draft rept.
Tetra Tech, Inc., Bellevue, WA.
Sep 85, 263p TETRAT-TC-3991-03, EPA/910/9-88/195
Sponsored by Environmental Protection Agency, Seattle, WA. Region X.

The report provides a synthesis of information describing the geographic extent and severity of chemical contamination in Everett Harbor within Puget Sound in Washington State. Summaries of existing data are provided for chemical contamination of sediment and biota, biological effects, contaminant sources, and beneficial uses associated with the estuarine study area. Original, summarized, tabulated, and mapped data are presented. The objective of the Data Summaries and Problem Identification report is to provide a mechanism for comprehensively evaluating pollution problems in the more urbanized embayments and for providing a basis for prioritizing corrective actions. A decision making framework is presented for evaluating and prioritizing both sub-areas and specific contaminant sources. The decision making framework includes (1) a review and quality assurance check of all available environmental data; (2) analyses of spatial and temporal trends of chemical contamination; (3) a limited ranking of the problem areas; and (4) identification of data gaps and provision of recommendations for improved characterization of specific pollution sources.

Keywords: *Everett Harbor, *Water pollution sampling, *Water pollution effects, *Chemical compounds, Biological indicators, Sediments, Biota, Pollution sources, Biological effects, Tables(Data), Puget Sound, Toxicity, Fish diseases, Bioassay, Quality assurance, Spatial distribution, Temporal distribution, Ranking, Data processing, Reviews.

PB91-181800/REB PC **A05**/MF **A01**
Environmental Protection Agency, Seattle, WA. Region X.
Sampling and Analysis Design for Development of Elliott Bay Toxics Action Plan. Final rept.
Tetra Tech, Inc., Bellevue, WA.
Jul 85, 94p TETRAT-TC-3991-01, EPA/910/9-88/196
Sponsored by Environmental Protection Agency, Seattle, WA. Region X.

The report is one component of an urban Bay action program. The program identifies existing problems of toxic contamination and associated biological effects within the study area, identifies historic and ongoing sources of pollution, and identifies appropriate remedial actions and agency responsibilities for implementing defined corrective actions. The objective of the report is to provide the design for a sampling effort which will fill specific data and information gaps. This step was identified as being necessary for completing the interagency action plan. Specific components of the report include objectives for a sediment quality survey and biological effects studies (including bioassays, benthic invertebrate communities, bioaccumulation, and fish pathology), identification of sample variables, sampling methods, and laboratory analyses.

Keywords: *Elliott Bay, *Water pollution sampling, *Water pollution effects, Pollution sources, Remedial action, Biological effects, Bioaccumulation, Bioassay, Design criteria, Sediments, Fish diseases, Data processing, Toxicity, Seattle(Washington).

PB91-181818/REB PC **A14**/MF **A02**
Environmental Protection Agency, Cincinnati, OH. Risk Reduction Engineering Lab.
Feasibility of Hydraulic Fracturing of Soil to Improve Remedial Actions.
Cincinnati Univ., OH.
L. C. Murdoch, G. Losonsky, P. Cluxton, B. Patterson, and I. Klich. Apr 91, 308p EPA/600/2-91/012
Contract EPA-68-03-3379
Sponsored by Environmental Protection Agency, Cincinnati, OH. Risk Reduction Engineering Lab.

Hydraulic fracturing, a method of increasing fluid flow within the subsurface, should improve the effectiveness of several remedial techniques, including pump and treat, vapor extraction, bio-remediation, and soil-flushing. The technique is widely used to increase the yields of oil wells, but is untested under conditions typical of contaminated sites. The project consisted of laboratory experiments, where hydraulic fractures were created in a triaxial pressure cell, and two field tests, where fractures were created at shallow depths in soil. The lab tests showed that hydraulic fractures are readily created in clayey silt, even when it is saturated and loosely-consolidated. Many of the lab observations can be explained using parameters and analyses based on linear elastic fracture mechanics. Following the field tests, the vicinity of the boreholes was excavated to reveal details of the hydraulic fractures. Maximum lengths of the fractures, as measured from the borehold to the leading edge, averaged 4.0 m, and the average area was 19 sq m. Maximum thickness of sand ranged from 2 to 20 mm, averaging 11 mm. As many as four fractures were created from a single borehold, stacked one over the other at vertical spacing of 15 to 30 cm.

Keywords: *Remedial action, *Land pollution control, *Hydraulic fracturing, *Hazardous materials, *Chemical compounds, Soil contamination, Soil environment, Water pollution control, Biological treatment, Fluid flow, Soil mechanics, Boreholes, Field tests, Feasibility studies, Technology utilization, Soil flushing.

PB91-181826/REB PC **A06**/MF **A01**
Status of Selected Air Pollution Control Programs, May 1990.
Environmental Protection Agency, Research Triangle Park, NC. Office of Air Quality Planning and Standards.
May 90, 123p EPA/450/2-90/008

The collection of status reports has been prepared in order to provide a timely summary of selected EPA air pollution control activities to those individuals who are involved with the implementation of these programs. The report contains ozone/CO programs, air toxics programs, PM-10/lead/visibility implementation programs, NSR/PSD program, acid rain/stack heights/SO2 programs, compliance/enforcement program, information transfer activities, and other programs.

Keywords: *Air pollution control, *Research programs, *Air pollution abatement, Prevention of Significant Deterioration Regulations, Ozone, Carbon monoxide, Toxic substances, Risk assessment, State programs, Particles, Stacks, Information transfer, Law enforcement, Acid rain, Visibility, Lead(Metal), State implementation plans, Sulfur dioxide, Standards compliance, New Source Review.

PB91-181834/REB PC **A04**/MF **A01**
Environmental Protection Agency, Washington, DC. Office of Technology Transfer and Regulatory Support.
Ground-Water Research: Technical Assistance Directory. Third Edition. Directory revision.
Environmental Management Support, Silver Spring, MD.
Mar 91, 53p EPA/600/9-91/006
Contract EPA-68-D0-0171
Sponsored by Environmental Protection Agency, Washington, DC. Office of Technology Transfer and Regulatory Support.

This is the third revision on the Directory, originally published by ORD, in March 1987. It is intended to foster communication among scientists and engineers throughout EPA's Office of Research and Development (ORD) and among EPA, state, and local personnel involved in the protection and management of ground-water resources. In addition to listing ORD researchers by location and subject matter, the Directory provides brief organizational descriptions of the ground-water research programs for each ORD office. These descriptions may aid in locating assistance in areas not covered by the subject indices. To ensure cross-office integration of research programs, in 1987 ORD designated a Ground-Water Research Matrix Manager to coordinate ORD, Program Office, and Regional Input on issues and priorities in the areas of prediction, monitoring, and cleanup.

Keywords: *Research projects, *Ground water, *Directories, Water resources, Protection, Scientists, Engineers, Technical assistance, Monitoring, EPA regions, Listings, Cleanup.

PB91-181842/REB PC **A06**/MF **A01**
Environmental Protection Agency, Research Triangle Park, NC. Office of Air Quality Planning and Standards.
Locating and Estimating Air Emissions from Sources of Formaldehyde (Revised).
Midwest Research Inst., Cary, NC.
C. Vaught. Mar 91, 125p EPA/450/4-91/012
See also PB84-200633. Sponsored by Environmental Protection Agency, Research Triangle Park, NC. Office of Air Quality Planning and Standards.

To assist groups interested in inventorying air emissions of various potentially toxic substances, EPA is preparing a series of documents such as this to compile available information on sources and emissions of these substances. The document deals specifically with formaldehyde. Its intended audience includes Federal, State and local air pollution personnel and others interested in locating potential emitters of formaldehyde and in making gross estimates of air emissions therefrom. The document presents information on (1) the types of sources that may emit formaldehyde, (2) process variations and release points that may be expected within these sources, and (3) available emissions information indicating the potential for formaldehyde release into the air from each operation. The document updated a report published in 1984.

Keywords: *Formaldehyde, *Air pollution, *Toxic substances, Sources, Sampling, Chemical analysis, Industrial wastes, Design criteria, State government, National government, Air pollution control, Emission factors.

PB91-181859/REB PC **E99**/MF **E99**
Corvallis Environmental Research Lab., OR.
MAGIC/DDRP Final Report and Results.
Virginia Univ., Charlottesville. Dept. of Environmental Sciences.
May 91, 1073p-in 5v
Set includes PB91-181867 through PB91-181909. Prepared in cooperation with Oak Ridge National Lab., TN. Environmental Sciences Div., and Geological Survey, West Trenton, NJ. Water Resources Div. Sponsored by Corvallis Environmental Research Lab., OR.

No abstract available.

PB91-181867/REB PC **A11**/MF **A02**
Corvallis Environmental Research Lab., OR.
MAGIC/DDRP Final Report. Models, Calibration, Results, Uncertainty Analyses, QA.QC. Volume 1.
Virginia Univ., Charlottesville. Dept. of Environmental Sciences.
B. J. Cosby, G. M. Hornberger, P. F. Ryan, and D. M. Wolock. May 91, 232p EPA/600/3-91/034A
See also Volume 2, PB91-181875. Prepared in cooperation with Oak Ridge National Lab., TN. Environmental Sciences Div., and Geological Survey, West Trenton, NJ. Water Resources Div. Sponsored by Corvallis Environmental Research Lab., OR.
Also available in set of 5 reports PC E99/MF E99, PB91-181859.

The report is a completion of the project Predictive Modeling of Longterm Dynamics of the Effects of Acidic Deposition on surface Water Quality of Selected Intensively Studied Catchments. MAGIC= Model of Acidification of Groundwater In Catchments. It con-

sists of five volumes. This volume discusses Models, Calibration, Results, Uncertainty Analyses, and quality assurance/quality control (QA/QC). The document contains Description of the Chemical Response Model (MAGIC), Description of the Hydrological Model (TOPMODEL), Coupling of MAGIC and TOPMODEL, Model Calibration Procedure, and Results, Uncertainty, QA/QC.

Keywords: *Water quality, *Computerized simulation, *Deposition, *Watersheds(Basins), *Water pollution, *Acidification, Calibrating, Quality assurance, Quality control, Long term effects, Soil surveys, Water chemistry, Dry methods, Wet methods, pH, Chemical reactions, Air pollution, Hydrology, Runoff, Surface waters, Surface-groundwater relationships, Air water interactions, *Model of Acidification of Groundwater In Catchments, *MAGIC, Cooperative agreements, TOPMODEL.

PB91-181875/REB PC **A09**/MF **A02**
Corvallis Environmental Research Lab., OR.
MAGIC DDRP Final Report: Regional Analyses of Results (Summary Tables and Plots). Volume 2.
Virginia Univ., Charlottesville. Dept. of Environmental Sciences.
B. J. Cosby, G. M. Hornberger, P. F. Ryan, and D. M. Wolock. May 91, 199p EPA/600/3-91/034B
See also Volume 1, PB91-181867 and Volume 3, PB91-181883. Prepared in cooperation with Oak Ridge National Lab., TN. Environmental Sciences Div., and Geological Survey, West Trenton, NJ. Water Resources Div. Sponsored by Corvallis Environmental Research Lab., OR.
Also available in set of 5 reports PC E99/MF E99, PB91-181859.

The volume contains five appendices analyzing the results of MAGIC calibrations for the DDRP catchments. The analyses in the volume are regional in that they are presented across all catchments in the northeastern and southeastern regions. A separate volume contains summaries of the calibration results for individual catchments within each region. The analyses are performed across all catchments in each region for which successful calibrations of MAGIC were obtained. The catchment data are drawn from the results files forwarded to Corvallis. Each appendix contains tables summarizing the statistics of the distributions of a number of variables for each region (both unweighted and weighted using the inverses of the DDRP inclusion probabilities). Each appendix also contains plots of the distributions of the variables for each region (both unweighted and weighted using the inverses of the DDRP inclusion probabilities). Each appendix contains an index and begins with a brief description of the tables, plots and variables presented.

Keywords: *Water quality, *Computerized simulation, *Deposition, *Watersheds(Basins), *Water pollution, *Acidification, Air water interactions, Air pollution, Region analysis, Tables(Data), Graphs(Charts), Statistical analysis, Surface-groundwater relationships, Hydrology, Soil surveys, *Model of Acidification of Groundwater In Catchments, *MAGIC, Northeast Region(United States), Southeast Region(United States).

PB91-181883/REB PC **A09**/MF **A01**
Corvallis Environmental Research Lab., OR.
MAGIC DDRP Final Report: Summary of Results for Individual Catchments. Volume 3.
Virginia Univ., Charlottesville. Dept. of Environmental Sciences.
B. J. Cosby, G. M. Hornberger, P. F. Ryan, and D. M. Wolock. May 91, 177p EPA/600/3-91/034C
See also Volume 2, PB91-181875 and Volume 4, PB91-181891. Prepared in cooperation with Oak Ridge National Lab., TN. Environmental Sciences Div., and Geological Survey, West Trenton, NJ. Water Resources Div. Sponsored by Corvallis Environmental Research Lab., OR.
Also available in set of 5 reports PC E99/MF E99, PB91-181859.

The volume contains summary results of MAGIC calibrations for the DDRP catchments. The summaries are presented for individual catchments within the northeastern and southeastern regions. A separate volume contains regional analyses of the results across all catchments in the northeastern and southeastern regions. The summaries are given for all catchments in each region for which successful calibrations of MAGIC were obtained. The catchment data are drawn from the results files forwarded to Corvallis. The calibration protocol for MAGIC applied to the DDRP catchments involved multiple calibrations for each catchment. Ten calibrations were attempted for each catchment. A catchment was not considered calibrated until at least three calibrations were successful. The multiple calibrations were performed in order to estimate the uncertainty in the calibrated model for each catchment. The procedure is described in detail in another volume. Because multiple calibrations are available for each catchment, the results summarized here for simulated values (or changes in simulated values) are the median (MED) values of all calibrations for an individual catchment. The uncertainies in simulated values (or changes in simulated values) are presented as the difference in the maximum and minimum (MX-MN) values resulting from the multiple calibrations.

Keywords: *Water quality, *Computerized simulation, *Deposition, *Watersheds(Basins), *Water pollution, *Acidification, Calibrating, Regional analysis, Statistical analysis, Air water interactions, Air pollution, Surface-groundwater relationships, Tables(Data), Concentration(Composition), Average, Hydrology, Soil surveys, *Model of Acidification of Groundwater In Catchments, *MAGIC, Northeast Region(United States), Southeast Region(United States).

PB91-181891/REB PC **A09**/MF **A02**
Corvallis Environmental Research Lab., OR.
MAGIC DDRP Final Report: Processing Stream, I/O Files and Formats, Deliverables. Volume 4.
Virginia Univ., Charlottesville. Dept. of Environmental Sciences.
B. J. Cosby, G. M. Hornberger, P. F. Ryan, and D. M. Wolock. May 91, 200p EPA/600/3-91/034D
See also Volume 3, PB91-181883 and Volume 5, PB91-181909. Prepared in cooperation with Oak Ridge National Lab., TN. Environmental Sciences Div., and Geological Survey, West Trenton, NJ. Water Resources Div. Sponsored by Corvallis Environmental Research Lab., OR.
Also available in set of 5 reports PC E99/MF E99, PB91-181859.

The volume contains five appendices describing the processing stream and input/output files for calibration and simulation of the DDRP catchments using MAGIC. A flow chart for the processing of data is included. Examples and formats of all intermediate files produced in the processing stream are given. The edited input data (as used in the calibration/simulation process) are listed for each of the DDRP catchments. The deliverables provided to Corvallis and Battelle (in the form of computer readable files) are also summarized. The volume forms part of the QA/QC report for the project. All files transmitted from UVa to the sponsors or their agents are listed. These files were transmitted twice to each recipient to insure data integrity during the transmission process. The input data used by UVa are listed here for future reference and to provide a ready check against other reports generated using these data in the DDRP project.

Keywords: *Water quality, *Computerized simulation, *Deposition, *Watersheds(Basins), *Water pollution, *Acidification, Air pollution, Air water interactions, Data processing, Calibrating, Tables(Data), Soil surveys, Hydrology, Data base management, Input/output routines, Quality assurance, Quality control, Data quality, Statistical analysis, Surface-groundwater relationships, *Model of Acidification of Groundwater In Catchments, *MAGIC.

PB91-181909/REB PC **A12**/MF **A02**
Corvallis Environmental Research Lab., OR.
MAGIC DDRP Final Report: Processing Stream, Program Listings. Volume 5.
Virginia Univ., Charlottesville. Dept. of Environmental Sciences.
B. J. Cosby, G. M. Hornberger, P. F. Ryan, and D. M. Wolock. May 91, 265p EPA/600/3-91/034E
See also Volume 4, PB91-181891. Prepared in cooperation with Oak Ridge National Lab., TN. Environmental Sciences Div., and Geological Survey, West Trenton, NJ. Water Resources Div. Sponsored by Corvallis Environmental Research Lab., OR.
Also available in set of 5 reports PC E99/MF E99, PB91-181859.

The volume contains five appendices describing the processing stream and programs for calibration and simulation of the DDRP catchments using MAGIC. A flow chart showing the interrelationships of the programs and data files is included. The appendices are Processing stream for the MAGIC calibration and simulation programs, MAGIC calibration and multiple-run programs, MAGICIN file preparation program, TOPMODEL calibration and simulation programs, and TOPOGEN topographic index program. The volume forms part of the QA/QC report for the project. All programs used in the calibration and simulation of the DDRP catchments are listed in their entirety.

Keywords: *Water quality, *Computerized simulation, *Deposition, *Watersheds(Basins), *Water pollution, *Acidification, Air water interactions, Air pollution, Surface-groundwater relationships, Hydrology, Soil surveys, Input/output routines, Data base management, Flow charts, Calibrating, Data processing, Statistical analysis, Computer programming, Quality assurance, Quality control, *Model of Acidification of Groundwater In Catchments, TOPMODEL, TOPOGEN computer program, *MAGIC.

PB91-181917/REB PC **A14**/MF **A02**
Feasibility of Environmental Monitoring and Exposure Assessment for a Municipal Waste Combustor: Rutland, Vermont Pilot Study. Final rept.
Environmental Protection Agency, Cincinnati, OH. Environmental Criteria and Assessment Office.
C. Sonich-Mullin. Jan 91, 308p ECAO-CIN-753, EPA/600/8-91/007

The purpose of the multipollutant, multimedia study was to determine levels of contaminants in the ambient air, soil, sediment, water and agricultural products attributable to operation of the municipal waste combustor (MWC) in Rutland, Vermont. Samples were collected between October 1987 and February 1989 at or near locations predicted to have maximum deposition. The measured pollutant concentrations could not be correlated with the emissions or operation of the MWC. Evidence for this conclusion comes from both qualitative and quantitative evaluation of the measured pollutant concentrations in the ambient air and environmental media, as well as comparison with predicted ambient air concentrations of the pollutants using local meteorologic information.

Keywords: *Environmental monitoring, *Waste disposal, *Municipal wastes, *Incineration, Polychlorinated dibenzodioxins, Concentration(Composition), Meteorological data, Air pollution sampling, Water pollution sampling, Sediments, Polychlorinated dibenzofurans, Polychlorinated biphenyls, Soil analysis, Land pollution, Agricultural products, Deposition, Vermont, Atmospheric diffusion, Environmental transport, Metals, Rutland(Vermont).

PB91-181925/REB PC **A06**/MF **A01**
Texas Univ. Health Science Center at Houston.
Arsenic(3) and Arsenic(5) Removal from Drinking Water in San Ysidro, New Mexico. Final rept.
Environmental Protection Agency, Cincinnati, OH. Drinking Water Research Div.
D. Clifford, and C. C. Lin. Apr 91, 119p EPA/600/2-91/011
Sponsored by Texas Univ. Health Science Center at Houston.

The removal of a natural mixture of As(III) (31 micrograms/L) and As(V) (57 micrograms/L) from a groundwater high in total dissolved solids (TDS), and also containing fluoride (2.0 mg/L), was studied in San Ysidro, NM using the University of Houston (UH)/U.S. Environmental Protection Agency (EPA) Mobile Drinking Water Treatment Research Facility. The objective of the study was to establish a cost-effective means of removing As(III), As(V), and fluoride from this and similar waters. Arsenic adsorption into fine-mesh activated alumina gave better-than-expected results. Approximately 9000 bed volumes (BV) could be treated at pH 6 before the arsenic maximum contaminant level (MCL) (0.05 mg/L) was reached. At the natural pH of 7.2, however, only 1900 BV could be treated before exceeding the MCL. Reverse Osmosis (RO) treatment resulted in >97% arsenic removal and >94% TDS removal. Electrodialysis (ED) removed 73% of the arsenic and was able to meet the arsenic MCL on the City Water containing 89 micrograms/L total arsenic; however, ED removed only 28% of the As(III) from a new well containing 100% As(III) at a level of 230 micrograms/L. Chloride-form anion exchange also performed better-than-expected (200 BV) but not well enough for it to be considered seriously for treatment. Point-of-use (POU) RO treatment was effected in re-

moving >91% of the arsenic and >94% of the TDS at low (<15%) water recovery.

Keywords: *Arsenic, *Fluorides, *Potable water, *Ground water, *Chemical removal(Water treatment), Water pollution, Laboratories, Mobile equipment, Adsorption, Electrodialysis, Ion exchanging, Aluminum oxide, Technology assessment, Reverse osmosis.

PB91-181933/REB PC **A07**/MF **A01**
State Drinking Water Administrative Penalty Programs: An Inventory of State Practices.
Environmental Protection Agency, Washington, DC. Office of Drinking Water.
Jan 91, 144p EPA/570/9-91/001

The report presents an overview of state enforcement practices, provides case-study descriptions of six states with administrative penalty authority, includes a comparative analysis of state programs, and discusses and provides examples of legislative authority language for administrative penalty assessment powers.

Keywords: *Water pollution abatement, *Pollution regulations, *Law enforcement, State programs, Penalties, Case studies, Administrative procedures, Legislation, Comparison, National government, Assessments, Safe Drinking Water Act.

PB91-181941/REB PC **A03**/MF **A01**
Sorption of Ionizable Organic Compounds to Sediments and Soils.
Environmental Research Lab., Athens, GA. Office of Research and Development.
C. T. Jafvert, and E. J. Weber. Mar 91, 31p EPA/600/3-91/017

The sorption of ionizable organic compounds to sediments and saturated soils is examined. The sorption of pentachlorophenol to two sediment silt-clay fractions as a function of pH is described. Sorption of both the neutral and the ionic species was shown to occur; results were quantitatively interpreted by accounting for sorption of both the neutral and ionic species and by accounting for acid dissociation in the aqueous phase. In addition, factors influencing the sorption of several organic bases to sediments are described, as well as some of the inherent difficulties encountered in applying phenomenological data to distinguish among various physical and chemical processes. Finally, processes influencing the distribution of neutral and anionic surfactants are discussed briefly.

Keywords: *Pentachlorophenol, *Anilines, *Soils, *Sediments, *Sorption, pH, Ionization, Organic compounds, Organic acids, Surfactants, Reprints, Organic bases.

PB91-181958/REB PC **A03**/MF **A01**
Microbial Transformation Rate Constants of Structurally Diverse Man-Made Chemicals.
Environmental Research Lab., Athens, GA.
W. C. Steen. Mar 91, 19p EPA/600/3-91/016

To assist in estimating microbially mediated transformation rates of man-made chemicals from their chemical structures, all second order rate constants that have been measured under conditions that make the values comparable have been extracted from the literature and combined with rate constants not reported before to compile a comprehensive list of second order rate constants for chemicals of diverse structures. Chemicals for which constants are presented include seven chlorinated carboxylic acid esters of 2,4-dichlorophenoxyacetic acid (2,4-D), phenol and seven substituted phenols, three phthalate esters, three anilines, seven amides, and seven acetanilides. The 35 constants were measured in the laboratory by a protocol that measures disappearance of the chemical substrate as a function of time in the presence of suspended natural populations from unpolluted aquatic systems. Second order rate constants, k2 (L/org/hr), range from 4.2 x 10 to the -8 for the hexyl acid ester of 2,4-D to 4.2 x 10 to the -15 for the di-ethylhexyl phthalate ester.

Keywords: *Biodeterioration, *Reaction kinetics, *Phenols, *Amines, *Amides, *Acetanilides, *Anilines, Toxic substances, Bacteria, Herbicides, Water pollution, United States, Tables(Data), *Chlorophenoxyacetic acids.

PB91-181966/REB PC **A12**/MF **A02**
Environmental Protection Agency, Research Triangle Park, NC. Office of Air Quality Planning and Standards.
Cost and Feasibility of the Temporary Total Enclosure Method for De rmining Capture Efficiency. Final rept.
Midwest Research Inst., ry, NC.
S. W. Edgerton. Nov 90, p EPA/450/3-91/005
Contract EPA-68-02-43
Sponsored by Environ al Protection Agency, Research Triangle Park, Office of Air Quality Planning and Standards.

The document present findings of a study of the cost and feasibility of determining VOC capture efficiency using the gas/gas temporary total enclosure method. For the study, fi e coating and printing facilities were visited, and site-specific cost and feasibility analyses were conducted. The five site visit reports and individual cost and feasibility analyses are appended.

Keywords: *Environmental tests, *Air pollution, *Cost analysis, Feasibility studies, Standards, Test methods, Facilities, Printing, Coatings, Sites, Regulations, Compliance, Diagrams, Design criteria, Industrial plants, Exhaust gases, Incinerators, Drying apparatus, Ovens, Performance evaluation, *Volatile organic compounds, Temporary total enclosure, *Capture efficiency, Fugitive exhaust.

PB91-181982/REB PC **A04**/MF **A01**
Environmental Radiation Data: Report 59, July-September 1989. Quarterly rept.
National Air and Radiation Environmental Lab., Montgomery, AL.
Mar 90, 54p EPA/520/5-90/003
See also PB90-182197.

Environmental Radiation Data (ERD) contains data from the Environmental Radiation Ambients Monitoring System (ERAMS). Data from similar networks operated by contributing States, Canada, Mexico, and the Pan American Health Organization are reported in the ERD when available. The ERAMS is comprised of nationwide sampling stations that provide air, surface and drinking water and milk samples from which environmental radiation levels are derived. Sampling locations are selected to provide optimal population coverage while functioning to monitor fallout from nuclear devices and other forms of radioactive contamination of the environment. The radiation analyses performed on these samples include gross alpha and gross beta levels, gamma analyses for fission products, and specific analyses of uranium, plutonium, stronium, iodine, radium, krypton, and tritium.

Keywords: *Radiation monitoring, *Environmental monitoring, *Radioisotopes, Tritium, Krypton, Radioecological concentration, Concentration(Composition), Tables(Data), Air pollution, Water pollution, Radium, Iodine, Uranium, Plutonium, Stronium, Land pollution, Fission product release, Ecology, *Radioactive pollutants.

PB91-181990/REB PC **A03**/MF **A01**
Environmental Radiation Data, Report 60: October-December 1989. Quarterly rept.
National Air and Radiation Environmental Lab., Montgomery, AL.
Jun 90, 42p EPA/520/5-90/018

In 1973, the U.S. Environmental Protection Agency's Office of Radiation Programs established the Environmental Radiation Ambient Monitoring System (ERAMS) to provide continuous, accurate, and usable environmental radiation data to the public. For completeness, ERAMS data for all specific radionuclide analyses are reported as the calculated results indicate, whether the numbers are negative, zero, or positive. Frequently, there is little or no radioactivity in environmental media. Thus, the results of laboratory analyses should statistically show a distribution of negative and positive numbers about zero. A negative value occurs when a previously determined background value is subtracted from a sample value that is less than that of the background. Prior to July 1975, ERAMS data were not reported numerically when the results were less than a specified reporting level or minimum detectable level. The present reporting procedure allows all the data to be reported and evaluated statistically without an arbitrary cutoff of small or negative numbers. The approach will facilitate estimates of bias in the nuclide analyses and will allow better evaluation of distributions and trends in environmental data.

Keywords: *Radiation monitoring, *Environmental monitoring, *Radioisotopes, Tritium, Krypton, Radioecological concentration, Concentration(Composition), Tables(Data), Air pollution, Water pollution, Radium, Iodine, Uranium, Plutonium, Strontium, Land pollution, Fission product release, Ecology, *Radioactive pollutants.

PB91-182006/REB PC **A05**/MF **A01**
Carbon Adsorption for Control of VOC Emissions: Theory and Full Scale System Performance.
Environmental Protection Agency, Research Triangle Park, NC. Office of Air Quality Planning and Standards.
Aug 88, 84p EPA/450/3-88/012

The report presents the results of an investigation into the performance and operation of vapor phase carbon adsorption systems. The investigation was initiated as a result of comments recieved by the E.P.A. in reference to the draft new source performance standards (NSPS) for control of VOC emissions from the manufacture of magnetic tape. In order to respond to these comments, the EPA requested additional information from manufacturers and users of carbon adsorber systems to further investigate system performance and costs. The EPA also again reviewed information obtained from previous studies by the agency. Section 2 presents the conclusions of the study. Section 3 presents a description of the vapor phase adsorption process, discusses impacts of changes in inlet vent stream characteristics on adsorber performance, and presents supporting test data. Section 4 presents a description of the carbon adsorber system which the commenter used as a basis for developing their comments, and a discussion of the design and operation of that system.

Keywords: *Adsorption, *Activated carbon treatment, *Volatile organic compounds, Coating processes, Emission factors, Air pollution control equipment, Technology assessment, Magnetic tapes.

PB91-182014/REB PC **A04**/MF **A01**
How to Develop Your Own UST Field Citation Program.
Environmental Protection Agency, Washington, DC. Office of Underground Storage Tanks.
Feb 91, 65p EPA/530/UST-91/014

The handbook provides the steps involved in designing, setting up and implementing a field citation program. Also, a variety of streamlined enforcement techniques are provided that might be valuable for any UST Program faced with the problem of how to enforce UST preventive requirements.

Keywords: *Land pollution abatement, *Underground storage, *Storage tanks, *Pollution regulations, Guidelines, Law enforcement, Inspection, Field tests, Legal aspects, Penalties, Notice of probable violation, Design criteria, Revisions, Administrative procedures, Decision making, *Field citation program.

PB91-182022/REB PC **A04**/MF **A01**
Environmental Protection Agency, Research Triangle Park, NC. Air Risk Information Support Center.
Health Hazard Assessment Summary: Steel Mill Emissions.
Radian Corp., Research Triangle Park, NC.
Sep 90, 61p DCN-89-239-009-07-02, EPA/450/3-90/026
Contract EPA-68-D9-0011
Sponsored by Environmental Protection Agency, Research Triangle Park, NC. Air Risk Information Support Center.

Report contains information residing in EPA's Integrated Risk Information System (IRIS). It was prepared to assist State and local air pollution control officials in the identification of possible health hazards associated with steel mill emissions. One objective is to present the Lowest Observed Effect Levels (LOEL) and the No Observed Effect Levels (NOEL) for the noncancer health effects associated with exposure to steel mill emissions. For some pollutants, these effects are used to calculate a Reference Dose (RfD). Information is also presented on the carcinogenic potential of steel mill emissions.

Keywords: *Risk assessment, *Air pollution effects(Humans), *Environmental surveys, *Public health, Steel plants, Air pollution control, Exposure, Metals, Coking, Industrial wastes, Inhalation, Carcinogens, Organic matter, Epidemiology, Toxicity, Lowest Observed Effect Levels, No Observed Effect Levels.

PB91-182048/REB PC **A02**/MF **A01**
Environmental Protection Agency, Research Triangle Park, NC. Air and Energy Engineering Research Lab.
Fly Ash Recycle in Dry Scrubbing. Journal Article.
Texas Univ. at Austin. Dept. of Chemical Engineering.
W. Jozewicz, and G. T. Rochelle. c1986, 8p EPA/600/J-86/553
Pub. in Environmental Progress, v5 n4 p219-224 Nov 86. See also PB86-119088. Sponsored by Environmental Protection Agency, Research Triangle Park, NC. Air and Energy Engineering Research Lab.

The paper describes the effects of fly ash recycle in dry scrubbing. (Previous workers have shown that the recycle of product solids improves the utilization of slaked lime--Ca(OH)2--for sulfur dioxide (SO2) removal by spray dryers with bag filters.) In laboratory-scale experiments with a packed-bed reactor, utilization was increased several-fold when the Ca(OH)2 was first slurried with one of several different fly ashes. The enhancement increased with the higher loading of fly ash--g fly ash/g Ca(OH)2. Much higher Ca(OH)2 utilization was achieved when silic acid was used instead of fly ash. Scanning electron microscopy supports the explanation that Ca(OH)2 and silica dissolve and reprecipitate as a more reactive calcium silicate. Other major constituents of fly ash have less or no effect at all on Ca(OH)2 utilization. The amount of calcium in the fly ash did not affect the overall SO2 removal after Ca(OH)2 was added. Slurrying for longer than 2 hours at higher than 60 C can improve the utilization of Ca(OH)2 slurried with fly ash.

Keywords: *Fly ash, *Calcium oxides, *Scrubbers, *Recycling, Air pollution control, Sulfur dioxide, Stationary sources, Inorganic silicates, Slurries, Spray drying, Reprints.

PB91-182055/REB PC **A03**/MF **A01**
Corvallis Environmental Research Lab., OR.
Generalized Soft Water Acidification Model. Journal article.
Iowa Univ., Iowa City.
N. P. Nikolaidis, H. Rajaram, J. L. Schnoor, and K. P. Georgakakos. c1988, 16p EPA/600/J-88/565
Pub. in Water Resources Research, v24 n12 p1983-1996 Dec 88. Sponsored by Corvallis Environmental Research Lab., OR.

A generalized soft water acidification model has been developed. The enhanced trickle-down (ETD) model is driven by precipitation, evaporation, acidity, sulfate, and chloride loading time series daily input data. The hydrologic component simulates snowmelt, interflow, overland flow, groundwater flow, frozen ground processes, seepage, and evapotranspiration. Physicochemical and biological processes that affect the alkalinity or sulfate balance and are included in the formulation are cation exchange, chemical weathering, sulfate sorption, and sulfate reduction. The system of 20 ordinary differential equations is solved by using a variable time step fourth-order predictor-corrector numerical scheme. Shown here is calibration of the ETD model for two lakes in the Adirondack Park of New York. ETD is relatively simple and requires limited input data, and yet it accounts for the predominant hydrologic and biochemical processes of the ecosystem. (Copyright (c) 1988 by the American Geophysical Union.)

Keywords: *Acidification, *Mathematical models, *Hydrology, *Surface waters, *Ecosystems, *Water pollution effects, Time series analysis, Deposition, pH, Air water interactions, Snowmelt, Lake Woods, Lake Panther, Watersheds, Water chemistry, Physicochemical properties, Water flow, Evapotranspiration, New York, Case studies, Biochemistry, Reprints, *Enhanced Trickle-Down Model, Soft water, Adirondack Park.

PB91-182063/REB PC **A03**/MF **A01**
Toxicity of Complex Waste Mixtures: A Comparison of Observed and Predicted Lethality. Journal article.
Health Effects Research Lab., Research Triangle Park, NC.
J. E. Simmons, and E. Berman. c1989, 13p EPA/600/J-89/524
Pub. in Jnl. of Toxicology and Environmental Health, v27 p275-286 Aug 89.

The ability to predict the biological effect of complex waste mixtures from chemical characterization data was examined by comparing observed mortality to that predicted by a mathematical additivity model with literature LD50 values for the chemicals identified in the mixtures. Male F344 rats were exposed to one of ten samples of complex industrial waste by gavage. Seven of the ten waste samples caused death within 24 hours of administration at dosages ranging from 1 to 5 ml/kg body weight. Two of the seven lethal waste samples produced 100% mortality at a dosage of 2.5 ml/kg; another two waste samples produced 100% mortality at 5 ml/kg. The partial chemical analysis, although providing more extensive information on chemical composition than might normally be available for most complex waste mixtures, was not sufficient to distinguish lethal from nonlethal waste samples or to indicate lethal potency.

Keywords: *Hazardous wastes, *Toxic substances, Predictive value of tests, Lethal dose 50, Mixtures, Pharmacokinetics, Dose-response relationships, Incinerators, Drug interactions, Rats, Reprints.

PB91-182071/REB PC **A03**/MF **A01**
Corvallis Environmental Research Lab., OR.
Modeling of Long-Term Lake Alkalinity Responses to Acid Deposition. Journal article.
Iowa Univ., Iowa City.
N. P. Nikolaidis, J. L. Schnoor, and K. P. Georgakakos. c1989, 14p EPA/600/J-89/523
Pub. in Jnl. Water Pollution Control Federation, v61 n2 p188-199 1989. Sponsored by Corvallis Environmental Research Lab., OR.

A watershed acidification model for two New York state lakes was verified by simulating an additional year of field data that was excluded during the calibration period. The findings confirmed calibration and indicated that the most sensitive physicochemical and biochemical processes were chemical weathering, ion exchange, sulfate reduction by lake sediments, and sulfate adsorption by the terrestrial compartments. Long-term simulations showed that both lakes will reach steady state after a change in loading in fewer than 10 years. It was determined that 25 to 50% of the exchangeable bases in the upper soil will be depleted in the next 50 years without chemical weathering to resupply the base exchange complex. The sulfate sorption mechanism is the only one that could delay watershed response after a change in loading. Some alkalinity in one lake could be recovered if acid deposition was decreased by a factor of two. The other would remain alkaline even with twice as much acid deposition; however, in spring snowmelt events, lakes would become more acidic.

Keywords: *Mathematical models, *Acidification, *Hydrology, *Lakes, *Ecosystems, *Water pollution effects, Alkalinity, Deposition, Time series analysis, Long term effects, Lake Woods, Lake Panther, New York, Acid rain, Snowmelt, Physicochemical properties, Water chemistry, Soil surveys, pH, Graphs(Charts), Reprints, *Enhanced Trickle-Down Model, Adirondack Park.

PB91-182089/REB PC **A03**/MF **A01**
Corvallis Environmental Research Lab., OR.
Recursive Parameter Estimation of Hydrologic Models. Journal article.
Iowa Univ., Iowa City.
H. Rajaram, and K. P. Georgakakos. c1989, 16p EPA/600/J-89/522
Pub. in Water Resources Research, v25 n2 p281-294 Feb 89. Sponsored by Corvallis Environmental Research Lab., OR.

Proposed is a nonlinear filtering approach to recursive parameter estimation of conceptual watershed response models in state-space form. The conceptual model state is augmented by the vector of free parameters which are to be estimated from input-output data, and the extended Kalman filter is used to recursively estimate and predict the augmented state. The augmented model noise covariance is parameterized as the sum of two components: one due to errors in the augmented model input and another due to errors in the specification of augmented model constants that were estimated from other than input-output data. These components depend on the sensitivity of the augmented model to input and uncertain constants. Such a novel parameterization allows for non-stationary model noise statistics that are consistent with the dynamics of watershed response as they are described by the conceptual watershed response model. Prior information regarding uncertainty in input and uncertain constants in the form of degree-of-belief estimates of hydrologists can be used directly within the proposed formulation. Even though model structure errors are not explicitly parameterized in the present formulation, such errors can be identified through the examination of the one-step ahead predicted normalized residuals and the parameter traces during convergence. The formulation is exemplified by the estimation of the parameters of a conceptual hydrologic model with data from the 2.1-sq km watershed of Woods Lake located in the Adirondack Mountains of New York. (Copyright (c) 1989 by the American Geophysical Union.)

Keywords: *Water management(Applied), *Hydrology, *Mathematical models, *Watersheds, Environmental effects, Spatial distribution, Temporal distribution, Water pollution, Flood forecasting, Data quality, Probability theory, Case studies, Study estimates, Reprints, Enhanced Trickle Down Model.

PB91-182097/REB PC **A02**/MF **A01**
EPA Site Demonstration of the Terra Vac In situ Vacuum Extraction Process in Groveland, Massachusetts. (Site Program Update: Part VII). Journal article.
Environmental Protection Agency, Cincinnati, OH. Risk Reduction Engineering Lab.
M. K. Stinson. c1989, 10p EPA/600/J-89/520
Pub. in Jnl. of the Air Pollution Control Association, v39 n8 p1054-1062 Aug 89.

The paper presents an EPA evaluation of the patented Terra Vac, Inc.'s in situ vacuum extraction process that was field-demonstrated on a trichloroethylene (TCE) contaminated soil in Groveland, MA, under the EPA Superfund Innovative Technology Evaluation (SITE) program. The Terra Vac process employs vacuum for removal and venting of volatile organic compounds (VOCs), such as TCE, from the subsurface soil without excavation. The demonstration site was a property of an operating machine shop in Groveland, MA. The site was contaminated with VOCs, mainly TCE, which had been used as a degreasing solvent. The Terra Vac system was designed, installed, and operated by Terra Vac, Inc. Evaluation of the process was performed by EPA based on the results from an extensive sampling and analytical program and on daily observation of the operations.

Keywords: *Remedial action, *Land pollution control, *Volatile organic compounds, Extraction, Soil contamination, Ethylene/trichloro, Field tests, Vacuum apparatus, In-situ processes, Design criteria, Performance evaluation, US EPA, Soil gases, Reprints, *Superfund Innovative Technology Evaluation Program, *Terra Vac System, *Soil vacuum extraction, Soil venting, Groveland(Massachusetts), Cleanup operations.

PB91-182105/REB PC **A02**/MF **A01**
Corvallis Environmental Research Lab., OR.
Lake Acidification Studies: The Role of Input Uncertainty in Long-Term Predictions. Journal article.
Iowa Univ., Iowa City.
K. P. Georgakakos, G. M. Valle-Filho, N. P. Nikolaidis, and J. L. Schnoor. c1989, 10p EPA/600/J-89/521
Pub. in Water Resources Research, v25 n7 p1511-1518 Jul 89. Sponsored by Corvallis Environmental Research Lab., OR.

An assessment of the importance of input uncertainty in long-term predictions of lake acidification is presented. Mathematical models that simulate the behavior of hydrologic catchments under acid deposition require input data of precipitation, temperature, and deposition chemistry. In long-term studies of lake acidification it is necessary to hypothesize a scenario of future input to the mathematical models. The present study indicates that uncertainty in precipitation amount and acid concentrations can be very important in the characterization of future lake alkalinity levels. It also suggests that the natural day-to-day variability present in precipitation and other weather variables significantly affects long-term predictions of lake alkalinity in watersheds with short response time, even more than weta nd dry

weather cycles do. (Copyright (c) 1989 by the American Geophysical Union.)

Keywords: *Acidification, *Mathematical models, *Lakes, *Hydrology, *Water pollution effects, Alkalinity, Long term effects, Alkalinity, pH, Deposition, Water chemistry, Monte Carlo method, Weather, Air water interactions, Wet methods, Dry methods, Meteorology, Precipitation(Meteorology), Probability theory, Reprints.

PB91-182113/REB PC **A02**/MF **A01**
Health Effects Research Lab., Research Triangle Park, NC.
Induction of Micronuclei in Cultured Human Bronchial Epithelial Cells by Direct-Acting Carcinogens. Journal article.
Environmental Health Research and Testing, Inc., Research Triangle Park, NC.
P. G. Andrews, S. E. Owens, and J. M. Siegfried.
c1990, 9p EPA/600/J-90/479
Contract EPA-68-02-4456
Pub. in Jnl. of Toxicology in Vitro, v4 n6 p735-743 Nov 90. Prepared in cooperation with Pittsburgh Univ., PA. School of Medicine. Sponsored by Health Effects Research Lab., Research Triangle Park, NC.

The sensitivity of human bronchial epithelial cells to induction of micronuclei was determined in cultures derived from different donors. Two direct-acting carcinogens, (+ or -)-7,8 -dihydroxy-9,10-epoxy-7,8,9,10- tetrahydrobenzo (a)- pyrene (BPDE) and N-methyl-N'-nitro-N-nitrosoguanidine (MNNG) were used to induce micronuclei. Both agents increased the incidence of micronuclei in a concentration-dependent fashion, even at concentrations which did not produce cytotoxicity. Cytokinesis was blocked with cytochalasin B so that micronuclei were counted only in binucleate cells, thereby decreasing the total number of cells that need to be examined and also eliminating variations due to possible differences in cell growth rates. The results demonstrate the potential usefulness of the micronucleus assay as a sensitive measure of genetic damage in human epithelial cells. (Copyright (c) 1990 Pergamon Press plc.)

Keywords: *Micronucleus tests, *Bronchi, *Carcinogens, Epithelium, Cultured cells, Methylnitronitrosoguanidine, Cell survival, Cytokinetics, Fluorescence microscopy, Reprints, Dihydroxyepoxytetrahydrobenzo(a)pyrenes.

PB91-182121/REB PC **A03**/MF **A01**
Sources of Mutagenic Activity in Urban Fine Particles. Journal article.
Health Effects Research Lab., Research Triangle Park, NC.
R. K. Stevens, C. W. Lewis, T. G. Dzubay, L. T. Cupitt, and J. Lewtas. c1990, 16p EPA/600/J-90/478
Pub. in Toxicology and Industrial Health, v6 n5 p81-94 Sep 90. See also PB89-222632.

Samples were collected during the winter of 1984-1985 in the cities of Albuquerque, New Mexico and Raleigh, North Carolina as part of a US Environmental Agency study to evaluate methods to determine the emission sources contributing to the mutagenic properties of extractable organic matter (EOM) present in fine particles. Data derived from the analysis of the composition of these fine particles served as input to a multi-linear regression (MLR) model used to calculate the relative contribution of wood burning and motor vehicle sources to mutagenic activity observed in the extractable organic matter. At both sites the mutagenic potency of EOM was found to be greater (3-5 times) for mobile sources when compared to wood smoke extractable organics. Carbon-14 measurements which give a direct determination of the amount of EOM that originated from wood burning were in close agreement with the source apportionment results derived from the MLR model. (Copyright (c) 1990 Princeton Scientific Publishing Co., Inc.)

Keywords: *Air pollution sampling, *Pollution sources, *Organic matter, *Mutagens, *Particles, *Air pollution effects(Humans), Urban areas, Wood fuels, Exhaust emission, Regression analysis, Fines, North Carolina, New Mexico, Aerosols, Mathematical models, Concentration(Composition), Mobile pollutant sources, Reprints, Albuquerque(New Mexico), Raleigh(North Carolina).

PB91-182139/REB PC **A03**/MF **A01**
Coupled Mass and Energy Transport Phenomena in Aerosol/Vapor-Laden Gases-1. Theory of the Hygroscopic Aerosol Effects on Temperature and Relative Humidity Patterns of Inspired Air. Journal article.
Health Effects Research Lab., Research Triangle Park, NC.
A. D. Eisner, R. C. Graham, and T. B. Martonen. c1990, 18p EPA/600/J-90/477
Pub. in Jnl. of Aerosol Science, v21 n7 p833-848 Dec 90. Prepared in cooperation with Northrop Services, Inc., Research Triangle Park, NC.

A quantitative theory has been developed to predict coupled energy and mass transport phenomena during inhalation of hydroscopic aerosol-laden air. It is shown that hygroscopic particle-induced vapor scavenging will influence temperature and relative humidity patterns within the respiratory system. Consequently, particle growth kinetics will depend on its number concentration. Monodisperse hygroscopic aerosol will become polydisperse and stratified, which may subsequently affect the deposition probabilities. (Copyright (c) 1990 Pergamon Press.)

Keywords: *Energy transfer, *Mass transfer, *Aerosols, *Respiration, *Mathematical models, Hygroscopicity, Respiratory system, Temperature, Humidity, Kinetics, Reprints, Particle growth, Vapor scavenging.

PB91-182147/REB PC **A03**/MF **A01**
Inertial Impaction and Gravitational Deposition of Aerosols in Curved Tubes and Airway Bifurcations. Journal article.
Health Effects Research Lab., Research Triangle Park, NC.
I. Balashazy, T. B. Martonen, and W. Hofmann. c1990, 16p EPA/600/J-90/476
Pub. in Aerosol Science and Technology, v13 n3 p308-321 Oct 90. Prepared in cooperation with Duke Univ. Medical Center, Durham, NC. Center for Extrapolation Modelling.

A theoretical model of the simultaneous action of inertial impaction and gravitational forces on a particle moving in three dimensional circular bends is presented. Deposition efficiencies are computed for three different idealized flow patterns: (1) uniform; (2) radially-dependent, or rotational; and (3) parabolic. The bend is in a vertical plane, the inclusive angle of the bend is a variable, and its inlet can be at any angle of alignment to the horizontal. The results of these new simulations are compared with available experimental data and theoretical computations. The differential distributions of deposition along the length of the tubes are examined. The relative contributions of the inertial impaction and sedimentation mechanisms to total (i.e., simultaneous) deposition are studied. The applicability of simple pipe bend models, and their appropriate limits, are examined for the deposition of aerosols in human tracheobronchial bifurcations. The conceptual model is further developed for the case in which an airway bifurcation is characterized as a contiguous system of straight and bent tubes. The results of different bifurcation simulations are compared with each other and laboratory data published in the open literature. (Copyright (c) 1990 Elsevier Science Publishing Co., Inc.)

Keywords: *Anatomy, *Trachea, *Gravity, Humans, Aerosols, Respiration, Mathematical models, Reprints, *Airway bifurcations.

PB91-182154/REB PC **A02**/MF **A01**
National Institutes of Health, Bethesda, MD.
Hormonal Regulation of Gonadotropin-Releasing Hormone Receptors and Messenger RNA Activity in Ovine Pituitary Culture. Journal article.
Health Effects Research Lab., Research Triangle Park, NC.
S. C. Sealfon, S. C. Laws, J. C. Wu, G. Boaz, and W. L. Miller. c1990, 10p EPA/600/J-90/475
Grants NIH-HD-10773, USDA-86-CRCR-1-2181
Pub. in Molecular Endocrinology, v4 n12 p1980-1987 Dec 90. Prepared in cooperation with Mount Sinai School of Medicine, New York. Dept. of Neurology, and North Carolina State Univ. at Raleigh. Dept. of Biochemistry. Sponsored by National Institutes of Health, Bethesda, MD., and Department of Agriculture, Washington, DC.

Previous studies demonstrate that gonadotroph responsiveness to GnRH, GnRH binding, and the apparent number of GnRH receptors are all increased by 17 beta-estradiol (E) or inhibin (IN) in ovine pituitary cultures. Progesterone attenuates these effects. To explore differences between the effects of IN and E on GnRH binding, a detailed time-course was performed. The results indicate that after 48 h IN had a greater effect on binding of a GnRH agonist (5-fold increase) than E (3-fold increase), but was slower to act initially. A combined treatment of IN and E gave a partially additive effect at 48 h (6.5-fold increase). The mechanism of receptor regulation in this system is not known, but could involve synthesis, recycling, or modification of GnRH receptors. To investigate the contribution of altered receptor biosynthesis to the regulation of receptor levels, a functional Xenopus oocyte-based assay for GnRH receptor mRNA activity was employed. After 48 h of treatment, IN or E each led to a 7 to 8-fold increase in GnRH receptor mRNA activity. Treatment with both hormones led to a 19-fold increase. The increase in mRNA activity induced by either hormone was greatly attenuated by progesterone. (Copyright (c) 1990 by The Endocrine Society.)

Keywords: *Hormones, *Gonadoliberin receptors, *Messenger RNA, *Pituitary gland, Sheep, Cultured cells, Estradiol, Inhibin, Progesterone, Xenopus, Ovum, Reprints.

PB91-182162/REB PC **A02**/MF **A01**
Corvallis Environmental Research Lab., OR.
PIRLA 2 Project: Regional Assessment of Lake Acidification Trends. Journal article.
Indiana Univ. at Bloomington.
D. F. Charles, and J. P. Smol. c1990, 9p EPA/600/J-90/474
Pub. in Verh. Internat. Verein. Limnol. v24 p474-480. Prepared in cooperation with Queen's Univ., Kingston (Ontario). Sponsored by Corvallis Environmental Research Lab., OR.

PIRLA II (Paleoecological Investigation of Recent Lake Acidification) is the first paleolimnological study designed to make statistically based regional population estimates of lake acidification. It is also the first project in which only tops and bottoms of cores are analyzed so that a large number of lakes can be studied. The PIRLA II project consists of several components that are designed to address specific questions and are integrally related to several other projects. PIRLA II builds on the foundation laid by PIRLA I; together they make up one of the largest paleolimnological projects in terms of number of lakes investigated (over 120 lakes analyzed stratigraphically). PIRLA has made and will continue to make important contributions to the understanding of lake acidification and to the development of the field of paleolimnology. (Copyright (c) 1990 E. Schweizerbart'sche Verlagsbuchhandlung.)

Keywords: *Acidification, *Lakes, *Water pollution effects, *Water chemistry, *Paleolimnology, Regional analysis, Statistical analysis, Trends, Deposition, Air water interactions, pH, New York, Acid neutralizing capacity, Diatoms, Chrysophyta, Reprints, *Paleoecological Investigation of Recent Lake Acidification Project, National Acid Precipitation Assessment Program, Adirondack Park.

PB91-182170/REB PC **A03**/MF **A01**
Corvallis Environmental Research Lab., OR.
Effects of Parameter Uncertainty on Long-Term Simulations of Lake Alkalinity. Journal article.
Iowa Univ., Iowa City.
S. Lee, K. P. Georgakakos, and J. L. Schnoor. c1990, 11p EPA/600/J-90/473
Pub. in Water Resources Research, v26 n3 p459-467. Sponsored by Corvallis Environmental Research Lab., OR.

A first-order second-moment uncertainty analysis has been applied to two lakes in the Adirondack Park, New York, to assess the long-term response of lakes to acid deposition. Uncertainty due to parameter error and initial condition error was considered. Because the enhanced trickle-down (ETD) model is calibrated with only 3 years of field data and is used to simulate a 50-year period, the uncertainty in the lake alkalinity prediction is relatively large. When a best estimate of parameter uncertainty is used, the annual average alkalinity is predicted to be -11 + or - 28 microeq/L for Lake Woods and 142 + or - 139 microeq/L for Lake Panther after 50 years. Hydrologic parameters and chemical weathering rate constants contributed most to the uncertainty of the simulations. Results indicate that the

uncertainty in long-range predictions of lake alkalinity increased significantly over a 5- to 10-year period and then reached a steady state. (Copyright (c) 1990 by the American Geophysical Union.)

Keywords: *Alkalinity, *Lakes, *Water chemistry, *Water pollution effects, *Probability theory, New York, Acidification, Deposition, Lake Woods, Lake Panther, pH, Case studies, Wet methods, Dry methods, Soil surveys, Air water interactions, Weathering, Reaction kinetics, Reprints, Adirondack Park, Enhanced Trickle-Down Model.

PB91-182188/REB PC **A03**/MF **A01**
Corvallis Environmental Research Lab., OR.
Gas Exchange in 'Quercus rubra' (Northern Red Oak) during a Drought: Analysis of Relations among Photosynthesis Transpiration, and Leaf Conductance. Journal article.
Michigan Univ., Ann Arbor.
J. A. Weber, and D. M. Gates. c1990, 11p EPA/600/J-90/472
Pub. in Tree Physiology, v7 p215-225. Sponsored by Corvallis Environmental Research Lab., OR.

Development of water stress in leaves of mature Quercus rubra L. caused a marked midday depression in photosynthesis (A) and transpiration (E). At external CO2 partial pressures of 100-110 Pa, a constant temperature of 30 C and a constant photosynthetic photon flux density of about 1000 micromol/sq m/s, A was 8 micromol/sq m at low leaf water potentials (-1.5 to -2.0 MPa), whereas it was 20 micromol/sq m/s in nonstressed leaves (-1.0 ,Pa). At lower external CO2 partial pressures, the effect of low leaf water potential on A was less. The midday depression in gas exchange was relieved by an overnight rain of 2.5 cm. No difference in carboxylation efficiency or CO2 compensation point was found between leaves before and after rain. The relationship between A and E was linear for a given external CO2 partial pressure, but the slope varied with CO2 concentration. Modification of the model of stomatal response proposed by Ball et al. (1987) produced a linear relationship between leaf conductance and a factor incorporating A, relative humidity, and CO2. (Copyright (c) 1990 Heron Publishing - Victoria, Canada.)

Keywords: *Photosynthesis, *Transpiration, *Droughts, *Trees, Plant physiology, Carbon dioxide, Leaves(Botany), Humidity, Reprints, *Gas exchange, *Quercus rubra.

PB91-182196/REB PC **A02**/MF **A01**
Survival and Degradative Capacity of 'Pseudomonas putida' Induced or Constitutively Expressing Plasmid-Mediated Degradation of 2,4-Dichlorophenoxyacetate (TFD) in Soil. Journal article.
Corvallis Environmental Research Lab., OR.
K. A. Short, R. J. Seidler, and R. H. Olsen. c1990, 8p EPA/600/J-90/471
Pub. in Canadian Jnl. of Microbiology, v36 n12 p821-826 1990. Prepared in cooperation with Michigan Univ., Ann Arbor.

The survival of genetically altered Pseudomonas putida strains harboring an inducible plasmid, pR0101, or a constitutive plasmid, pR0103, was compared. These plasmids encode for the degradation of 2,4-dichlorophenoxyacetate (TFD) to 2-chloromaleylacetate, and the maintenance of either plasmid did not alter survival of P. putida PPO301(pRO101) or PPO301(pRO103) in an unamended agricultural soil. Moreover, in TFD-amended soil, survival of PPO301, PPO301(pRO101), and PPO301(pRO103) was statistically the same after 50 days. Reapplication of TFD to soil 50 days after the original application did not change the numbers of PPO301(pRO101) or PPO301(pRO103), which cannot use TFD as a sole source of carbon. However, a mutant strain, PPO301KS(pRO101), which is able to use TFD as a sole source of carbon, was stimulated by the second addition of TFD:PPO301KS(pRO101) cfu/g soil increased by greater than 20-fold. Although the microbiota indigenous to the study soil was capable of degrading TFD, the addition of plasmid-bearing PPO301 had a dramatic effect on TFD degradation. In a parallel study, Raphanus sativus (radish) seeds failed to germinate in uninoculated and PPO301-inoculated soil amended with 500 ppm TFD. Seed germination was 53 and 80% in soils inoculated with PPO301(pRO101) and PPO301(pRO103), respectively ($P > 0.001$). However, the difference in the rate of TFD degradation between the native soil and soil inoculated with plasmid-bearing P.putida was probably related to the relatively high inoculum density of P.putida strains (10 to the eighth power cfu) and the relatively low population density of TFD metabolizers indigenous to the soil.

Keywords: *Biodeterioration, *Soil contamination, Plasmids, Bacterial genes, Genetic engineering, Brassica, Plant growth, Statistical analysis, Cell survival, Reprints, *Pseudomonas putida, *Dichlorophenoxyacetic acid, Chloromaleylacetic acid.

PB91-182204/REB PC **A02**/MF **A01**
Design Stream Flows Based on Harmonic Means. Journal article.
Environmental Protection Agency, Cincinnati, OH. Risk Reduction Engineering Lab.
L. A. Rossman. c1990, 7p EPA/600/J-90/470
Pub. in Jnl. of Hydraulic Engineering, v116 n7 p946-950 Jul 90.

Design streamflows are frequently used in water quality studies to provide adequate protection against pollutant exposure periods of a given duration. By analyzing the effect that simple streamflow dilution has on x-day average exposure levels of a pollutant, it appears that the x-day harmonic mean flow is a more meaningful statistic to use in computing design flows than is the customary arithmetic mean flow. The significance of the result was examined by computing design flows for sixty rivers throughout the country. For 7- and 30-day average annual low flows the impact was minimal. Substantial differences were found for the overall mean daily flow--a design flow suggested for use with water quality criteria based on protecting human health against lifetime exposures. The overall harmonic mean daily flow is typically 20 to 60 percent as large as the arithmetic mean daily flow. For ungaged streams it can be estimated from estimates of the arithmetic mean flow and the 7-day, 10-year low flow by regional regression analysis.

Keywords: *Stream flow, *Water quality, *Water pollution standards, *Fourier analysis, *Mathematical models, Concentration(Composition), Statistical analysis, Risk assessment, Water pollution effects, Rivers, Water flow, Environmental protection, Public health, Study estimates, Reprints.

PB91-182212/REB PC **A03**/MF **A01**
Health Effects Research Lab., Research Triangle Park, NC.
Technique for Controllable Vapor-Phase Deposition of 1-Nitro(14C)pyrene and Other Polycyclic Aromatic Hydrocarbons onto Environmental Particulate Matter. Journal article.
Battelle Columbus Labs., OH.
S. V. Lucas, K. W. Lee, C. W. Melton, J. Lewtas, and L. M. Ball. c1991, 16p EPA/600/J-91/042
Contract EPA-R-811817
Pub. in Aerosol Science and Technology, v14 n2 p210-223 Feb 91. Prepared in cooperation with North Carolina Univ. at Chapel Hill. Dept. of Environmental Sciences and Engineering. Sponsored by Health Effects Research Lab., Research Triangle Park, NC.

To produce environmental particles fortified with a polycyclic aromatic hydrocarbon (PAH) for toxicology studies, an experimental apparatus was devised for deposition of the desired chemical species onto particles in a controlled and reproducible manner. The technique utilized consists of dispersion of the particles on a gaseous stream at a controlled rate, thermal vaporization of a solution of PAH, delivery of the vaporized PAH into the aerosol of particles at a controlled rate, subsequent condensation of the PAH onto the particles, and final recovery of the coated particles. The effectiveness of this approach was demonstrated by vapor-coating a 14C-labeled PAH (1-nitro(14C)-pyrene) onto diesel engine exhaust particles that had previously been collected by tunnel dilution sampling techniques. Using the 14C label as a tracer, the coated particles were characterized with respect to degree of coating, integrity of particle structure and absence of chemical decomposition of the coating substrate. The study demonstrates that the described method provides a controllable means for depositing a substance uniformly and with a high coating efficiency onto aerosolized particles. The technique was also used to vapor-coat benzo(a)pyrene onto diesel engine exhaust and urban ambient air particulate matter, and 2-nitrofluoranthene onto urban ambient air particulate matter. Coating efficiencies of about 400 micrograms/g particulate matter were routinely obtained on a single coating run, and up to 1200 micrograms/g (1200 ppm) were achieved after a second pass through the process. The coated particles were subsequently utilized in biological fate, distribution and metabolism studies.

Keywords: *Air pollution detection, *Tracer studies, *Aerosol generators, *Aromatic polycyclic hydrocarbons, *Diesel engine exhaust, Experimental design, Gas chromatography, Carbon 14, Exhaust emissions, Benzopyrene, Chemical analysis, Toxicology, Coatings, Substrates, Design criteria, Particles, Mass spectroscopy, Urban area, Biological effects, Metabolism, Reprints, Pyrene/nitro, Fluoranthene/nitro.

PB91-182220/REB PC **A02**/MF **A01**
Health Effects Research Lab., Research Triangle Park, NC. Genetic Toxicology Div.
International Programme on Chemical Safety's Collaborative Study on Plant Test Systems. Status rept.
Research Triangle Inst., Research Triangle Park, NC.
S. S. Sandhu, F. J. deSerres, H. N. B. Gopalan, W. F. Grant, and J. Veleminsky. c1991, 9p EPA/600/J-91/041
Grant EPA-R-814700
Pub. in Mutation Research, v257 n1 p19-25 Jan 91. Prepared in cooperation with Nairobi Univ. (Kenya), Macdonald Coll., Ste. Anne de Bellevue (Quebec), and Ceskoslovenska Akademie Ved, Prague. Ustav Experimentalni Botaniky. Sponsored by Health Effects Research Lab., Research Triangle Park, NC. Genetic Toxicology Div.

The article presents the status report on the International Program's Collaborative Study On Plant Test Systems. In the first phase of this program, 16 laboratories submitted data on the genetic effects of EMS evaluated in three bioassays; i.e., Vicia faba root hair, Tradescantia micronuclei, and Arabidopsis embryo assays. In general, all participating laboratories obtained positive results with EMS, but some laboratories yielded data that showed significantly higher levels of spontaneous mutagenic effects, perhaps due to contaminants in the water or air. Research is in progress on evaluating the genotoxic effects of four additional chemicals. The first phase of this project is scheduled to be completed in December 1990. Upon the evaluation of the results of the first phase, recommendations will be made regarding the initiation of the second phase. (Copyright (c) 1991 Elsevier Science Publishers B.V. (Biomedical Division).)

Keywords: *Toxic substances, *Mutagenicity tests, *Plants(Botany), Bioassay, Carcinogens, Ethane methanesulfonate, Mutations, Chromosome abberrations, Micronucleus tests, Reprints, Vicia root-tip assay, Arabidopsis embryo assay, Tradescantia stamen hair assay.

PB91-182238/REB PC **A03**/MF **A01**
Health Effects Research Lab., Research Triangle Park, NC. Genetic Toxicology Div.
Stage-Specific Damage to Synaptonemal Complexes and Metaphase Chromosomes Induced by X Rays in Male Mouse Germ Cells. Journal article.
Environmental Health Research and Testing, Inc., Research Triangle Park, NC.
L. C. Backer, M. R. Sontag, and J. W. Allen. c1991, 12p EPA/600/J-91/040
Contract EPA-68-01-4456
Pub. in Radiation Research, v125 n1 p187-196 Jan 91. Prepared in cooperation with Duke Univ. Medical Center, Durham, NC. Sponsored by Health Effects Research Lab., Research Triangle Park, NC. Genetic Toxicology Div.

Synaptonemal complexes (SCs) reveal mutagen-induced effects in germ cell meiotic chromosomes. The study was aimed at characterizing relationships between SC and metaphase I chromosome damage following radiation exposure at various stages of spermatogenesis. Male mice were irradiated with doses of 0, 2, or 4 Gy, and spermatocytes were harvested at times consistent with earlier exposures as spermatogonial stem cells, preleptotene cells (premeiotic DNA synthesis), or meiotic prophase cells. After stem-cell exposure, twice as many rearrangements were observed in SCs as in metaphase I chromosomes. Irradiation during premeiotic DNA synthesis resulted in dose-related increases in SC breakage and rearrangements (including novel forms) and in metaphase chromosomal aberrations. Following prophase exposure, various types and levels of SC and metaphase damage were observed. Irradiation of zygotene cells

led to high frequencies of chromosome multivalents in metaphase I without a correspondingly high level of damage in preceding prophase SCs. Thus, irradiation of premeiotic and meiotic cells results in variable relationships between SC and metaphase chromosome damage.

Keywords: *Synaptonemal complex, *Chromosome aberrations, *Metaphase, *X rays, *Spermatozoa, Mice, Mutagens, Deoxyribonucleic acids, Cell cycle, Electron microscopy, Reprints.

PB91-182246/REB PC **A03**/MF **A01**
Environmental Research Lab., Athens, GA.
Environmental Factors Affecting Toluene Degradation in Ground Water at a Hazardous Waste Site. Journal article.
Georgia Univ., Athens. Dept. of Microbiology.
A. Q. Armstrong, R. E. Hodson, H. M. Hwang, and D. L. Lewis. c1991, 14p EPA/600/J-91/037
Pub. in Environmental Toxicology and Chemistry, v10 n2 p147-158 Feb 91. Sponsored by Environmental Research Lab., Athens, GA.

The microbial ecology of pristine and contaminated ground water at a chemical waste disposal site was investigated. Recently, it was determined that ground water downslope from the disposal site contained elevated levels of toxic pollutants, including benzene, toluene, xylene and methylene chloride, as well as iron and manganese. Microbial mineralization and uptake of radio-labeled glucose and amino acids indicated a metabolically active microflora in both pristine (upslope from the contamination) and contaminated groundwater samples collected from monitoring wells at the site. However, microbial uptake and mineralization of glucose and amino acids were up to fourfold slower in the contaminated well water than in the control well. Rates of mineralization and uptake of toluene were easily measurable in water from the contaminated but were negligible in water from the pristine well, suggesting that the subsurface microflora in the contaminated region had adapted to degrade toluene. Additions of the inorganic nutrients N, K, and P enhanced toluene mineralization in water from the contaminated well, with the addition of K and P enhancing mineralization twofold. The addition of these inorganic nutrients, therefore, presents an opportunity for biorestoration of the site. An increase in the incubation temperature also enhanced toluene mineralization; however manipulation of pH and dissolved oxygen concentration had no measureable effects.

Keywords: *Water pollution, *Ground water, *Environmental effects, *Toxic substances, *Biodeterioration, Waste disposal, pH, Dissolved oxygen, Nutrients, Mineralization, Hazardous materials, Benzene, Toluene, Xylenes, Methylene chloride, Reprints.

PB91-182253/REB PC **A03**/MF **A01**
Modelling Bioaccumulation of Organic Pollutants in Fish with an Application to PCBs in Lake Ontario Salmonids. Journal article.
Environmental Research Lab., Athens, GA.
M. C. Barber, L. A. Suarez, and R. R. Lassiter. c1991, 22p EPA/600/J-91/036
Pub. in Canadian Jnl. of Fisheries and Aquatic Science, v48 n2 p318-337 Feb 91.

A model describing passive accumulation of organic chemicals from the aqueous environment and contaminated food in fish is developed. The model considers both biological attributes of the fish and physicochemical properties of the chemical that determines diffusive exchange across gill membranes and intestinal mucosa. Important biological characteristics addressed by the model are the fish's gill morphometry, feeding and growth rate, and fractional aqueous, lipid, and nonlipid organic composition. Relevant physicochemical properties are the chemical's molar volume and noctanol/water partition coefficient (Kow), which are used to estimate the chemical's aqueous diffusivity and partitioning to the fish's lipid and nonlipid organic fractions, respectively. The model is used to describe and to analyze the bioaccumulation of polychlorinated biphenyls (PCBs) in Lake Ontario alewife (Alosa pseudoharengus), coho salmon (Oncorhynchus kisutch), rainbow trout (Oncorhynchus mykiss), brown trout (Salmo trutta), and lake trout (Salvelinus namaycush).

Keywords: *Water pollution effects(Animals), *Lake Ontario, *Organic compounds, *Bioaccumulation, *Salmonids, Mathematical models, Great Lakes, Biological effects, Physicochemical properties, Polychlorinated biphenyls, Ecosystems, Fish physiology, Fishes, Reprints.

PB91-182261/REB PC **A03**/MF **A01**
Evaluating the Costs of Packed-Tower Aeration and GAC for Controlling Selected Organics. Journal article.
Environmental Protection Agency, Cincinnati, OH. Risk Reduction Engineering Lab.
J. Q. Adams, and R. M. Clark. c1991, 11p EPA/600/J-91/035
Pub. in Jnl. of the American Water Works Association, v83 n1 p49-57 Jan 91.

The article focuses on a preliminary cost analysis that compares liquid-phase granular activated carbon (GAC) treatment with packed-tower aeration (PTA) treatment, with and without air emissions control. The sensitivity of cost to design and operating variables is also discussed. For most of the contaminants examined, PTA appears to be more cost-effective than liquid-phase GAC, even when vapor-phase GAC is required in the stripping system.

Keywords: *Potable water, *Activated carbon treatment, *Aeration, *Water pollution, *Cost anylysis, Chemical removal(Water treatment), Air pollution control, Chlorine organic compounds, Hydrocarbons, Reprints.

PB91-182279/REB PC **A02**/MF **A01**
Environmental Protection Agency, Cincinnati, OH. Risk Reduction Engineering Lab.
EPA Site Demonstration of BioTrol Aqueous Treatment System. Journal article.
Science Applications International Corp., Paramus, NJ.
M. K. Stinson, T. J. Chresand, and H. S. Skorronek. c1991, 9p EPA/600/J-91/034
Pub. in Jnl. of the Air Pollution Control Association, v41 n2 p228-233 Feb 91. Prepared in cooperation with BioTrol, Chaska, MN. Sponsored by Environmental Protection Agency, Cincinnati, OH. Risk Reduction Engineering Lab.

BioTrol's pilot scale, fixed-film biological system was evaluated, under the EPA's SITE program, for its effectiveness at removing pentachlorophenol from groundwater. The demonstration was performed in the summer of 1989 at a wood preserving site in New Brighton, Minnesota. The system employs indigenous microorganisms amended with a specific pentachlorophenol-degrading bacterium. Groundwater from a well on the site was fed to the system at 1, 3, and 5 gpm with no pretreatment other than pH adjustment, nutrient addition, and temperature control. Each flowrate was maintained for about two weeks while samples were collected for extensive analyses. At 5 gpm, the system was capable of eliminating about 96 percent of the pentachlorophenol in the groundwater and producing effluent with pentachlorophenol concentrations to about 1 ppm. At the lower flows (1 and 3 gpm) removal was higher (about 99 percent) and effluent pentachlorophenol concentrations were well below 0.5 ppm. The system consistently produced a completely nontoxic effluent at all three flowrates. Review of other data provided by BioTrol indicates that the process is also effective on other hydrocarbons, including solvents and fuels. The system appears to be a compact and cost-effective treatment for contaminated wastewaters requiring minimal operating attention once acclimated. (Copyright (c) 1991--Air & Waste Management Association.)

Keywords: *Biological treatment, *Water pollution control, *Ground water, *Waste disposal, Minnesota, Microorganisms, Performance evaluation, Cost effectiveness, Operating, Wood preservatives, Superfund, Aromatic polycyclic hydrocarbons, Design criteria, Reprints, *BioTrol aqueous treatment system, *Superfund Innovative Technology Evaluation Program, New Brighton(Minnesota).

PB91-182287/REB PC **A03**/MF **A01**
Environmental Protection Agency, Cincinnati, OH. Risk Reduction Engineering Lab.
Conditional Simulation of Flow and Transport. Journal article.
Agricultural Research Service, University Park, PA. Northeast Watershed Research Center.
A. S. Rogowski, J. K. Wolf, and D. E. Simmons. c1991, 29p EPA/600/J-91/033
Pub. in Jnl. of Contaminant Hydrology, v7 p95-121 1991. Sponsored by Environmental Protection Agency, Cincinnati, OH. Risk Reduction Engineering Lab.

Leachate and outflow below a compacted layer of clay subsoil were sampled and compared with conditionally simulated flux based on standard methods and 1:1 soil-water extracts. Results showed that infiltration rates based on double ring infiltrometer and total chemical loads based on 1:1 extracts and respective flux can be used to provide spatially distributed outflow and leachate quality in a compacted clay layer derived from a subsoil. (Copyright (c) 1991--Elsevier Science Publishers B.V.)

Keywords: *Leachates, *Environmental transport, Clays, Soils, Ground water, Fluid infiltration, Extraction, Simulation, Reprints, Infiltrometry.

PB91-182295/REB PC **A02**/MF **A01**
RBC Nitrification of High Ammonia Leachates. Journal article.
Environmental Protection Agency, Cincinnati, OH. Risk Reduction Engineering Lab.
E. J. Opatken, and J. J. Bond. 1991, 6p EPA/600/J-91/032
Pub. in Environmental Progress, v10 n1 p60-63 Feb 91.

A study was conducted on treating a simulated leachate that contained high concentrations of ammonia-nitrogen ranging between 20 and 1000 mg/L. A pilot sized rotating biological contractor (RBC) was used to treat a surrogate leachate composed of primary effluent that was adjusted with glucose and ammonium chloride to achieve various concentrations of dissolved organic carbon and ammonia-nitrogen. Experiments were conducted to determine: The rate of ammonia conversion; The drop in pH at high ammonia concentrations; The effect of low pH on ammonia conversion; The effect of high ammonia levels (1000 mg/L) on ammonia conversion, and The effect of temperature on the reaction rate constant. The results from these experiments and the applicability of a RBC to treat leachates containing high concentrations of ammonia-nitrogen are reported.

Keywords: *Leachates, *Nitrification, *Ammonia, *Pollution control, Ground water, Environmental transport, pH, Reaction kinetics, Waste water, Biomass, Bacteria, Technology assessment, Reprints, *Rotating biological contractors.

PB91-182303/REB PC **A02**/MF **A01**
Evaluation of Methods for Sampling, Recovery, and Enumeration of Bacteria Applied to the Phylloplane. Journal article.
Corvallis Environmental Research Lab., OR.
K. Donegan, C. Matyac, R. Seidler, and A. Porteous. c1991, 8p EPA/600/J-91/031
Pub. in Applied and Environmental Microbiology, v57 n1 p51-56. Prepared in cooperation with NSI Technology Services Corp., Corvallis, OR.

Determining the fate and survival of genetically-engineered microorganisms released into the environment requires the development and application of accurate and practical methods of detection and enumeration. Several experiments were performed to examine quantitative recovery methods that are commonly used or that have potential applications. In these experiments, Erwinia herbicola and Enterobacter cloacae were applied in greenhouses to Blue Lake bush beans (Phaseolus vulgaris) and Cayuse oats (Avena sativa). Sampling indicated that the variance in bacterial counts among leaves increased over time and that this increase caused an overestimation of the mean population size by bulk leaf samples relative to single leaf samples. An increase in the number of leaves in a bulk sample, above a minimum number, did not significantly reduce the variance between samples. Experiments evaluating recovery methods demonstrated that recovery of bacteria from leaves was significantly better with stomacher blending, than with blending, sonication, or washing and that the recovery efficiency was constant over a range of sample inoculum densities. Delayed processing of leaf samples, by storage in a freezer, did not significantly lower survival and recovery of microorganisms when storage was short term and leaves were not stored in buffer. The drop plate technique for enumeration of bacteria did not significantly differ from the spread plate method. Results of

these sampling, recovery, and enumerations experiments indicate a need for increased development and standardization of methods used by researchers as there are significant differences among, and also important limitations to, some of the methods used. (Copyright (c) 1991 American Society for Microbiology.)

Keywords: *Bacteria, *Genetic engineering, Environmental monitoring, Erwinia, Enterobacter, Beans, Oats, Microbial colony count, Freezing, Reprints.

PB91-182311/REB PC **A03**/MF **A01**
Remediation of Sites Contaminated with TCE. Journal article.
Robert S. Kerr Environmental Research Lab., Ada, OK.
H. H. Russell, J. E. Matthews, and G. W. Sewell.
c1991, 19p EPA/600/J-91/030
Pub. in Remediation, Winter 1990/91, p167-183.

Widespread use of trichloroethylene (TCE) in the U.S. has resulted in its frequent detection in soil and groundwater. TCE can become a health hazard after being processed in the human liver; or reductive dehalogenation in the environment may result in production of vinyl chloride, a known carcinogen. This has generated a high degree of interest in efficient and cost-efficient technologies that can be used to remediate soil and groundwater contaminated with TCE. The purpose of the paper is to present and discuss relevant physicochemical properties and reactive mechanisms of TCE, and to delineate and discuss promising remediation methodologies that have been proposed and/or demonstrated for restoring contaminated subsurface environments. The information in the article has been funded wholly or in part by the U.S. EPA under contract No. 68-C8-0058 to Dynamac Corporation; it has been subjected to the Agency's peer and administrative review process and approved for publication.

Keywords: *Remedial action, *Land pollution control, *Water pollution control, *Ground water, *Ethylene/trichloro, Physicochemical properties, Site surveys, Chemical spills, Waste disposal, Technology utilization, Biological treatment, Biodeterioration, Reprints, *Cleanup operations, Chemical reaction mechanisms.

PB91-182329/REB PC **A02**/MF **A01**
Development and Use of Site-Specific Chemical and Biological Criteria for Assessing New Bedford Harbor Pilot Dredging Project. Journal article.
Environmental Research Lab., Narragansett, RI.
W. G. Nelson, and D. J. Hansen. c1991, 10p EPA/600/J-91/029, ERLN-1090
Pub. in Environmental Management, v15 n1 p105-112 1991.

Numerical site-specific chemical and biological criteria were established to assess the impact of a pilot dredging project on water quality at the New Bedford Harbor, Massachusetts, USA, Superfund site. Because most existing chemical concentrations in the water column and indigenous biota exceeded federal and state water quality limits, the derivation of site-specific criteria was required. Prior to any operational phases of the project (i.e., dike construction, dredging), criteria values were developed from background concentrations of PCBs and metals in water and biota, as well as for the toxic effects of water quality on the biota. During each operational phase of the project, water samples were collected, analyzed within 16 h, and the data supplied to a management committee in order to assess the environmental impact of the previous days operation. The ambient unfiltered water concentration of PCBs and metals were the only chemical or biological criteria exceeded. Modification of the next days' operations resulted in a return of these concentrations to background levels. The combined use of site-specific criteria and a real-time decision making management process allowed for successful completion of the project with a minimal effect on water quality. (Copyright (c) 1991 Springer-Verlag New York Inc.)

Keywords: *Water quality management, *Water pollution, *Dredging, *Biological effects, *Water chemistry, Superfund, Water pollution effects, Waste disposal, Water pollution sampling, Concentration(Composition), Ecology, Decision making, Polychlorinated biphenyls, Massachusetts, Reprints, *New Bedford Harbor, National Priorities List.

PB91-182337/REB PC **A03**/MF **A01**
Environmental Protection Agency, Cincinnati, OH. Environmental Criteria and Assessment Office.
Comparative Analysis of Health Risk Assessments for Municipal Waste Combustors. Journal article.
Alliance Technologies Corp., Lowell, MA.
A. Levin, D. B. Fratt, A. Leonard, R. J. F. Bruins, and L. Fradkin. c1991, 14p EPA/600/J-91/039
Contract EPA-68-02-4396
Pub. in Jnl. of Air Waste Management Association, v41 n1 p20-31 1991. Prepared in cooperation with ChemCycle Corp., Boston, MA. Sponsored by Environmental Protection Agency, Cincinnati, OH. Environmental Criteria and Assessment Office.

Quantitative health risk assessments have been performed for a number of proposed municipal waste combustor (MWC) facilities over the past several years. The article presents the results of a comparative analysis of a total of 21 risk assessments, focusing on seven of the most comprehensive methodologies. The analysis concentrates on stack emissions of noncriteria pollutants and is comparative rather than critical in nature. Overall, the risk assessment methodologies used were similar whereas the assumptions and input values used varied from study to study. Some of the variability results directly from differences in site-specific characteristics, but much of it is due to absence of data, lack of field validation, lack of specific guidelines from regulatory agencies, and reliance on professional judgment. The results indicate that carcinogenic risks are more significant than chronic noncarcinogenic risks. In most instances polychlorodibenzodioxins, polychlorodibenzofurans, and cadmium contribute more significantly to the total carcinogenic risk from MWC stack emissions than other contaminants. In addition, the contribution to total risk of all indirect routes of exposure (ingestion and dermal contact) exceeds that of the direct inhalation route for most studies reviewed. (Copyright (c) 1991-Air & Waste Management Association.)

Keywords: *Risk assessment, *Air pollution effects(Humans), *Public health, *Waste disposal, *Municipal wastes, Exposure, Ingestion(Biology), Skin(Anatomy), Carcinogens, Comparison, Deposition, Atmospheric diffusion, Toxicity, Incineration, Permits, New Source Performance Standards, Standards compliance, Aromatic polycyclic hydrocarbons, Reprints.

PB91-182345/REB PC **A05**/MF **A01**
Robert S. Kerr Environmental Research Lab., Ada, OK.
Denitrification in Nonhomogeneous Laboratory Scale Aquifers: 4. Hydraulics, Nitrogen Chemistry, and Microbiology in a Single Layer. Final rept.
Oregon State Univ., Corvallis. Dept. of Soil Science.
F. T. Lindstrom, L. Boersma, D. Myrold, and M. Barlaz. Apr 91, 91p EPA/600/2-91/014
See also PB90-186305. Sponsored by Robert S. Kerr Environmental Research Lab., Ada, OK.

A two-dimensional mathematical model for simulating the transport and fate of organic chemicals in a laboratory scale, single layer aquifer is presented. The aquifer can be nonhomogeneous and anisotropic with respect to its fluid flow properties. The physical model has open inlet and outlet ends and is bounded by impermeable walls on all sides. Fully penetrating injection and/or extraction wells can be placed anywhere in the flow field. The inlet and outlet boundaries have user prescribed hydraulic pressure fields. The steady state hydraulic pressure field is obtained first by using the two-dimensional Darcy flow law and the continuity equation. The chemical transport and fate equation is then solved in terms of user stipulated initial and boundary conditions. The model accounts for the major physical processes of storage, dispersion, and advection, and also can account for linear equilibrium sorption, first-order loss processes, microbial denitrification, irreversible sorption and/or dissolution into the organic phase, metabolism in the sorbed state, and first order loss in the sorbed state.

Keywords: *Aquifers, *Mathematical models, *Organic compounds, *Environmental transport, *Denitrification, *Water pollution, Ground water, Boundary layer flow, Nitrates, Hydraulics, Environmental models, Laboratory equipment.

PB91-182352/REB PC **A07**/MF **A01**
Preliminary Risk Assessment for Parasites in Municipal Sewage Sludge Applied to Land.
Environmental Protection Agency, Cincinnati, OH. Environmental Criteria and Assessment Office.
Mar 91, 126p EPA/600/6-91/001

Section 405 of the Clean Water Act requires the U.S. Environmental Protection Agency to develop and issue regulations that identify: (1) uses for sludge including disposal; (2) specific factors (including costs) to be taken into account in determining the measures and practices applicable for each use or disposal; and (3) concentrations of pollutants that interfere with each use or disposal. To comply with the mandate, the U.S. EPA has embarked on a program to develop four major technical regulations: Land application, including distribution and marketing; landfilling; incineration and surface disposal. The development of these technical regulations requires a consideration of pathogens as well as chemical constituents of sludge. Public concern related to the reuse and disposal of municipal sludge often focuses on the issue of pathogenic organisms. The purpose of the report is to use the pathogens methodology, Pathogen Risk Assessment for Land Application of Municipal Sludge, to develop a preliminary assessment of risk to human health posed by parasites in municipal sewage sludge applied to land as fertilizer or soil conditioner. The preliminary risk assessment includes a description of the most critical data gaps that must be filled before development of a definitive risk assessment and recommends research priorities.

Keywords: *Risk assessment, *Parasites, *Sewage sludge, *Ground disposal, *Public health, Pollution regulations, Fertilizers, Pathogens, Municipal wastes, Mathematical models, Waste treatment, Environmental transport, Exposure, Epidemiology, On-site investigations.

PB91-182451/REB PC **A04**/MF **A01**
Corvallis Environmental Research Lab., OR.
Predicting and Forecasting Surface Water Acidification: A Plan for Assessing Data Aggregation Effects.
ManTech Environmental Technology, Inc., Corvallis, OR.
M. G. Johnson, P. W. Shaffer, D. L. Stevens, K. W. Thornton, and R. S. Turner. Apr 91, 66p EPA/600/3-91/024
Prepared in cooperation with FTN Associates, Little Rock, AR., and Oak Ridge National Lab., TN. Sponsored by Corvallis Environmental Research Lab., OR.

A major goal of the Direct/Delayed Response Project (DDRP), a project within the U.S. Environmental Protection Agency's (EPA) Aquatic Effects Research Program (AERP) is to project potential changes in surface water chemistry in lakes in the northeastern U.S. and streams in the Mid-Appalachians and southeastern U.S., over the next 50 years as a function of current and alternative levels of acidic deposition. The DDRP projection are based on various types of simulations models that predict surface water and soil chemistry. All models- statistical, empirical, mechanistic, logical or others - represent a simplification or abstraction of the real world. A major question associated with the application of an model is how to prepare subset, and aggregate, or lump, data so that they will represent the processes and system being simulated. The models used in the DDRP require physical and chemical data on watershed soils as part of the model inputs. In conjunction with the DDRP, soil surveys were conducted in selected watersheds in each of the three regions. The document describes and discusses the approaches used in the DDRP for aggregating soil chemical and physical data for use in the various DDRP analyses.

Keywords: *Water pollution effects, *Surface waters, *Acidification, *Soil surveys, *Agglomeration, Simulation, Soil science, Forecasting, Deposition, Watersheds, Mathematical models, Hydrology, US EPA, Adsorption, Sulfates, Cations, Water chemistry, Regional analysis, Physical properties, Chemical properties, *Direct/Delayed Response Project, Northeast Region(United States), Southeast Region(United States), Appalachian Mountain Region(United States).

PB91-182469/REB PC **A06**/MF **A01**
MINTEQA2/PRODEFA2, A Geochemical Assessment Model for Environmental Systems: Version 3.0 User's Manual.
Environmental Research Lab., Athens, GA.
J. D. Allison, D. S. Brown, and K. J. Novo-Gradac. Mar 91, 117p EPA/600/3-91/021
Prepared in cooperation with Computer Sciences Corp., Athens, GA., and AScI Corp., Athens, GA.

The attention of environmental decision makers is increasingly being focused on the movement of pollutants into ground water. Of particular importance is the transport and speciation of metals. The MINTEQA2 model is a versatile, quantitative tool for predicting the equilibrium behavior of metals in a variety of chemical environments. MINTEQA2 is a geochemical speciation model capable of computing equilibria among the dissolved, adsorbed, solid, and gas phases in an environmental setting. MINTEQA2 includes an extensive database of reliable thermodynamic data that is also accessible to PRODEFA2, an interactive program designed to be executed prior to MINTEQA2 for the purpose of creating the required MINTEQA2 input file. The report describes how to use the MINTEQA2 model. The chemical and mathematical structure of MINTEQA2 and the structure of the database files also are described. The use of both PRODEFA2 and MINTEQA2 are illustrated through the presentation of an example PRODEFA2 dialogue reproduced from interactive sessions and the presentation of MINTEQA2 output files and error diagnostics. The content and format of database files also are explained.

Keywords: *User manuals(Computer programs), *Computerized simulation, *Geochemistry, *Chemical equilibrium, *Environment management, Information systems, Thermodynamics, Oxidation reduction reactions, Electrostatics, Adsorption, Path of pollutants, Environmental transport, Probability theory, Decision making, Water pollution, Water chemistry, *MINTEQA2 model, PRODEFA2 model, Activity coefficients.

PB91-182477/REB PC **A04**/MF **A01**
Corvallis Environmental Research Lab., OR.
PC BEEPOP (Personal Computer Honey Bee Population Dynamics Model) for Ecological Assessments. User's Guide.
Montana Univ., Missoula. Div. of Biological Sciences.
J. J. Bromenshenk. Apr 91, 68p EPA/600/3-91/032
Sponsored by Corvallis Environmental Research Lab., OR.

PC BEEPOP is a computer model that simulates honey bee (Apis mellifera L.) colony population dynamics. The model consists of a system of interdependent elements, including colony condition, environmental variability, colony energetics, and contaminant exposure. It includes a mortality module (BEEKILL) and a chemical-toxicity data base (BEETOX). PC BEEPOP builds upon BEEPOP, a mainframe-based colony dynamics model. PC BEEPOP is a research and assessment tool for assessing the responses of honey bees as ecological indicators of environmental condition. The combination of BEETOX, BEEKILL, and BEEPOP provides a means of examining the influence of xenobiotics on colony population dynamics, including energetics, and not just adult or brood mortality. The authors simulations indicate that PC BEEPOP is capable of making plausible predictions of colony structure, size, and energetics. In addition, the model can help identify probable causes of colony growth and decline.

Keywords: *User manuals(Computer programs), *Computerized simulation, *Biological indicators, *Bees, *Environmental surveys, Risk assessment, Population dynamics, Exposure, Pollution, Toxicity, Probability theory, Waste disposal, Hazardous materials, Ecology, Mortality, Dose-response relationship, Pesticides, *PC BEEPOP model, BEEKILL data base, BEETOX data base.

PB91-182493/REB PC **A04**/MF **A01**
Environmental Protection Agency, Cincinnati, OH. Risk Reduction Engineering Lab.
Operations and Research at the U.S. EPA Incineration Research Facility: Annual Report for FY90.
Acurex Corp., Jefferson, AR.
L. R. Waterland, and J. W. Lee. Apr 91, 67p EPA/600/9-91/010
Contract EPA-68-C9-0038
See also report for FY89, PB90-186339. Sponsored by Environmental Protection Agency, Cincinnati, OH. Risk Reduction Engineering Lab.

The U.S. Environmental Protection Agency's Incineration Research Facility in Jefferson, Arkansas, is an experimental facility that houses two pilot-scale incinerators and the associated waste handling, emission control, process control, and safety equipment; as well as onsite laboratory facilities. During fiscal year 1990, two major test programs were completed at the facility: an evaluation of the thermal-stability-based principal organic hazardous constituent incinerability ranking for the Office of Solid Waste (OSW), and an incinerability evaluation of five contaminated materials from the Purity Oil Sales and the McColl Superfund sites for Region 9 and the Office of Emergency and Remedial Response (OERR). In addition, results of two test programs completed in FY89 were reported: an evaluation of the fate of trace metals fed to a rotary kiln incinerator equipped with a single-stage ionizing wet scrubber for air pollution control for OSW, and an incinerability evaluation of arsenic and pesticide contaminated soils from the Baird and McGuire Superfund site for Region 1 and OERR. Several facility and equipment construction and upgrade efforts were also completed.

Keywords: *Incineration, *Waste disposal, *Hazardous materials, *Air pollution control equipment, *Environmental research, US EPA, Superfund, Soil contamination, Incinerators, Performance evaluation, Ranking, Thermal stability, Combustion efficiency, Scrubbers, Principal organic hazardous constituent, EPA region 1, EPA region 9.

PB91-182618/REB PC **A02**/MF **A01**
Pesticide Fact Sheet No. 221: Sumithrin.
Environmental Protection Agency, Washington, DC. Office of Pesticides and Toxic Substances.
Nov 87, 7p EPA/540/FS-91/131

The document contains up-to-date chemical information, including a summary of the Agency's regulatory position and rationale, on Sumithrin, an industrial and agricultural insecticide. A Fact Sheet is issued after one of the following actions has occurred: (1) Issuance or reissuance of a registration standard; (2) Issuance of each special review document; (3) Registration of a significantly changed use pattern; (4) Registration of a new chemical; or (5) An immediate need for information to resolve controversial issues relating to a specific chemical or use pattern.

Keywords: *Pesticides, *Insecticides, *Toxic substances, Pyrethrins, Hazardous materials, Chemical properties, Regulations, Toxicology, Ecology, Agricultural products, Path of pollutants, Chemical information fact sheet, Science findings, Use patterns, CAS 26002-80-2, *Sumithrin.

PB91-182626/REB PC **A03**/MF **A01**
Pesticide Fact Sheet No. 75.1: Captan.
Environmental Protection Agency, Washington, DC. Office of Pesticides and Toxic Substances.
10 Feb 89, 12p EPA/540/FS-91/132

The document contains up-to-date chemical information, including a summary of the Agency's regulatory position and rationale, on Captan, a fungicide. A Fact Sheet is issued after one of the following actions has occurred: (1) Issuance or reissuance of a registration standard; (2) Issuance of each special review document; (3) Registration of a significantly changed use pattern; (4) Registration of a new chemical; or (5) An immediate need for information to resolve controversial issues relating to a specific chemical or use pattern.

Keywords: *Pesticides, *Fungicides, *Toxic substances, Hazardous materials, Chemical properties, Regulations, Toxicology, Ecology, Agricultural products, Path of pollutants, *Captan, *n-trichloromethylthio-4-cyclohexene-1,2-dicarboximide, Chemical information fact sheet, Science findings, Use patterns, CAS 133-06-2.

PB91-182634/REB PC **A02**/MF **A01**
Pesticide Fact Sheet No. 220: Cadmium Chloride.
Environmental Protection Agency, Washington, DC. Office of Pesticides and Toxic Substances.
1 Apr 91, 7p EPA/540/FS-91/130

The document contains up-to-date chemical information, including a summary of the Agency's regulatory position and rationale, on cadmium chloride, a fungicide. A Fact Sheet is issued after one of the following actions has occurred. (1) Issuance or reissuance of a registration standard, (2) Issuance of each special review document, (3) Registration of a significantly changed use pattern, (4) Registration of a new chemical, or (5) An immediate need for information to resolve controversial issues relating to a specific chemical or use pattern.

Keywords: *Pesticides, *Fungicides, *Cadmium chloride, *Toxic substances, Hazardous materials, Chemical properties, Regulations, Toxicology, Ecology, Agricultural products, Path of pollutants, Chemical information fact sheet, Science findings, Use patterns, CAS 13-5.

PB91-182642/REB PC **A03**/MF **A01**
Environmental Protection Agency, Research Triangle Park, NC. Air and Energy Engineering Research Lab.
Assessment of Trace Organic Emissions Test Results from the Montgomery County South MWC in Dayton, Ohio.
Energy and Environmental Analysis, Inc., Durham, NC.
W. S. Lanier, T. R. von Alten, and J. D. Kilgroe. 1990, 18p EPA/600/D-91/051
Contract EPA-68-03-3365
Presented at the American Flame Research Committee Meeting, 1990 Fall International Symposium, NOx Control, Waste Incineration and Oxygen Enriched Combustion, San Francisco, CA., October 8-10, 1990. Sponsored by Environmental Protection Agency, Research Triangle Park, NC. Air and Energy Engineering Research Lab.

The paper gives results of an evaluation of the formation and removal of polychlorinated dibenzo-p-dioxins and polychlorinated dibenzofurans (PCDD/PCDF) at various locations throughout the Montgomery County South municipal waste incinerator in Dayton, OH. It is a mass burn refractory incinerator, consisting of an ignition chamber, rotary kiln, mixing chamber, water quench chamber, electrostatic precipitator (ESP), and stack. Three tests at each of six test conditions were used to evaluate the effects of ESP inlet temperature, sorbent injection, and combustion temperature on pollutant formation and emission. Test results indicated two sources of PCDD/PCDF formation: the combustor upstream of the mixing chamber and the ESP. PCDD/PCDF leaving the combustor appears to be associated predominantly with entrained particulate matter (PM) with particles larger than 10 micrometers. Increases in PCDD/PCDF concentrations across the ESP were found at lower temperatures (148 C) than previously reported. Indicated PCDD/PCDF formation rates in the ESP were highly dependent on ESP inlet temperature.

Keywords: *Organic compounds, *Incinerators, *Air pollution control, Waste disposal, Halohydrocarbons, Furans, Dioxins, Tests, Electrostatic precipitators, Temperature control, Stationary sources, Dayton(Ohio).

PB91-182659/REB PC **A02**/MF **A01**
Integrated Approach to Research on the Impact of Sources on Indoor Air Quality.
Environmental Protection Agency, Research Triangle Park, NC. Air and Energy Engineering Research Lab.
L. E. Sparks, M. D. Jackson, B. A. Tichenor, J. B. White, and J. D. Dorsey. 1990, 8p EPA/600/D-91/052
Presented at the International Conference on Indoor Air Quality and Climate (5th), Toronto, Canada, July 29-August 3, 1990.

The paper describes an approach for analyzing the impact of sources of indoor air quality (IAQ) based on chamber studies, modeling, and test house studies. Source emission factors are developed in chamber studies. The emission factors are used in an IAQ model that incorporates room-to-room air movement, sinks, and air exchange with the outdoors to predict indoor air pollution concentrations from the source. Test house experiments are used to verify the model and identify unmodeled factors. The agreement between model predictions based on chamber emission factors and test house data is excellent.

Keywords: *Indoor air pollution, *Emission factors, *Mathematical models, Houses, Test chambers, Volatile organic compounds, Air quality, Stationary sources.

PB91-182667/REB PC **A03**/MF **A01**
EPA's Global Climate Change Program. Program Plan for Methane Emissions from Landfills and Other Waste Disposal Facilities.
Environmental Protection Agency, Research Triangle Park, NC. Air and Energy Engineering Research Lab.
S. A. Thorneloe. 26 Mar 91, 19p EPA/600/D-91/053
Presented at the Solid Waste Association Meeting of North America's Annual International Landfill Gas Symposium (14th), San Diego, CA., March 26, 1991.

The paper discusses a portion of EPA's global climate change program, a program plan for methane emissions from landfills and other waste disposal facilities. In response to concerns about global climate change, the U.S. EPA's Office of Research and Development (ORD) has initiated an emissions and mitigation program. ORD's Air and Energy Engineering Research Laboratory (AEERL) has begun research on greenhouse gas emission estimation, biomass and methane utilization, tropospheric ozone, and evaluation of potential mitigation opportunities for emissions contributing to global climate change. The emissions program has begun to identify and quantify emission sources of greenhouse gases for anthropogenic sources including landfills, coal mines, natural gas production/distribution, cookstoves, and biomass burning. Development of enhanced emission estimates will improve the understanding of atmospheric chemistry and feedback effects, target mitigation opportunities, and ensure cost-effective mitigation strategies. The focus of the paper is on AEERL's research efforts on global landfill methane.

Keywords: *Climatic changes, *Air pollution, *Waste disposal, *Methane, Global aspects, Greenhouse effect, Earth fills, US EPA, Pollution sources, Municipal wastes, Atmospheric chemistry.

PB91-182675/REB PC **A03**/MF **A01**
Biomass and Fossil Fuel to Methanol and Carbon via the Hydrocarb Process: A Potential New Source of Transportation and Utility Fuels.
Environmental Protection Agency, Research Triangle Park, NC. Air and Energy Engineering Research Lab.
R. H. Borgwardt, M. Steinberg, E. W. Grohse, and Y. Tung. 1991, 29p EPA/600/D-91/054
Presented at the Conference on Energy from Biomass and Wastes (15th), held in Washington, DC. on March 27, 1991. Prepared in cooperation with Brookhaven National Lab., Upton, NY. Dept. of Applied Science, and Hydrocarb Corp., New York.

The paper discusses the production of methanol and carbon from biomass and fossil fuels, utilizing the Hydrocarbon process. The process has the potential to minimize dependence on imported fuels for the transportation and utility sectors by increasing the yield and reducing the cost of methanol obtainable from domestic natural gas. This is accomplished by utilizing biomass as a co-feedstock in an energy-efficient, three-step conversion. An equally important product of the process is a carbon that is free of ash, sulfur, and nitrogen. The carbon can be used as a clean industrial and utility fuel to eliminate the pollution associated with the use of coal and reduce the cost of emission controls. The possibility of global climate change implies that CO2 emissions should be taken into account when assessing options for producing future alternative fuels. From this, as well as the other environmental standpoints, Hydrocarb offers advantages.

Keywords: *Methyl alcohol, *Carbon, *Air pollution abatement, Biomass, Fossil fuels, Alcohol fuels, Cost effectiveness, Alternative fuels, Performance standards, Fuel supplies, Energy source development, *Hydrocarb process.

PB91-182683/REB PC **A03**/MF **A01**
Exposure to Lead in U.S. Drinking Water. Symposium paper.
Environmental Protection Agency, Cincinnati, OH. Risk Reduction Engineering Lab.
R. Levin, M. R. Schock, and A. Marcus. c1991, 28p EPA/600/D-91/055
Presented at the Annual Conference on Trace Substances in Environmental Health (23rd), May 30-June 1, 1989. Prepared in cooperation with Battelle, Research Triangle Park, NC. Statistics and Data Analysis Systems.

In the US, lead occurs primarily as a corrosion by-product in public drinking water supplies. That is, its source is the corrosive action of the water upon the materials used in the water distribution system and private plumbing. Historically, drinking water has not been a major source of lead exposure for most Americans. However, as other sources of lead exposure continue to decline in this country, particularly decreased airborne lead from reduced use of leaded gasoline and decreased dietary lead, the relative contribution of drinking water as an exposure source has increased. This has occurred simultaneously with increasing evidence that lead's health effects occur at lower exposure levels, levels previously thought to be 'safe'. There is, however, no single, available data base for assessing exposure to lead in drinking water. In the article, the authors use a variety of data sources to develop a profile of lead levels in US public drinking water supplies, providing some upper and lower bound estimates of likely exposures as well as identifying some risk factors.

Keywords: *Lead(Metal), *Potable water, Plumbing, Pipes(Tubes), Hazards, Exposure, United States, Information systems, pH, Reprints.

PB91-182691/REB PC **A03**/MF **A01**
Current State of Corrosion Control: Technologies and Costs.
Environmental Protection Agency, Cincinnati, OH. Risk Reduction Engineering Lab.
R. Levin, M. R. Schock, and R. M. Clark. c1991, 33p EPA/600/D-91/056
Presented at the American Water Works Association Water Quality Technology Conference, Philadelphia, PA., November 12-16, 1989.

Corrosion control has been known both as a cost-saving and as a health protection method for almost a century. But, surprisingly, relatively little field and laboratory research has been conducted contrasting alternative approaches or presenting results before and after such water treatment programs were implemented. A thorough review of chemical treatment strategies and engineering technologies, a presentation and analysis of field trials, and a summary of costs incurred for various treatment approaches is needed. Unfortunately, the data are far from complete. However, all water systems across the country, public and private, are being required now to address both the health risks of drinking water contaminated by corrosion by-products and the cost-reducing potential of corrosion treatment. The paper presents a snapshot summary of the state of current knowledge about control of internal corrosion, focussing particularly on lead and copper corrosion.

Keywords: *Corrosion prevention, *Water treatment, *Cost analysis, Potable water, Lead(Metal), Copper, Pipes(Tubes), Tables(Data), Plumbing, Carbonates, Reprints.

PB91-182709/REB PC **A03**/MF **A01**
Polyphosphate Water-Treatment Products: Their Effects on the Chemistry and Solubility of Lead in Potable Water Systems.
Environmental Protection Agency, Cincinnati, OH. Risk Reduction Engineering Lab.
T. R. Holm, S. H. Smothers, Z. Xiaofeng, and R. R. Schock. c1991, 16p EPA/600/D-91/057
Presented at the Water Quality Conference held in Philadelphia, PA. on November 12-16, 1989. Prepared in cooperation with Illinois State Water Survey Div., Champaign.

Three commercial polyphosphate-containing water treatment products were evaluated for their ability to affect lead solubility in drinking water. A 'Competing-Ligand Spectrophotometry' Technique was used to characterize Pb(2+) complexation at 20 degrees C in ionic strength of 0.1, pH = 8, and calcium concentration of .001 mol/L. The pH was buffered by HEPES, and the colorimetric reagent was 4-(2-pyridylazo)-resourcinol (PAR). Results were also compared to a DPASV method. The data was fit by a 2- ligand model. The experiments suggested a significant ability to enhance lead solubility by complexation at the pH and hardness tested.

Keywords: *Potable water, *Lead(Metal), *Complex ions, *Mathematical models, *Water pollution, *Water chemistry, Phosphorus polymers, Water treatment, Water softening, Toxic substances, Solubility, Chemical equilibrium, Plumbing, Corrosion inhibitors, Reprints.

PB91-182717/REB PC **A03**/MF **A01**
Using Linear and Polynomial Models to Examine the Environmental Stability of Viruses (Chapter 7).
Book chapter.
Environmental Protection Agency, Cincinnati, OH. Risk Reduction Engineering Lab.
C. J. Hurst. c1991, 27p EPA/600/D-91/058
Pub. in Modeling the Environmental Fate of Microorganisms, p137-164 1991. Prepared in cooperation with American Society for Microbiology, Washington, DC.

The article presents the development of model equations for describing the fate of viral infectivity in environmental samples. Most of the models were based upon the use of a two-step linear regression approach. The first step employs regression of log base 10 transformed viral titer ratios from various sampling dates as the dependent variable versus the length of time that the viruses were incubated in the test material as the independent variable. The slope values derived from this first step of the regression technique are then used as the dependent variable in the second step of the analysis, when they are linearly regressed against either a single independent variable such as soil moisture level or incubation temperature, or against a set of independent variables in a multiple regression. A variety of examples based upon experimental data were used to demonstrate the application and benefits of this two-step regression technique.

Keywords: *Viruses, *Statistical models, Regression analysis, Water microbiology, Soil microbiology, Waste water, Sewage, Soil water, Soil chemistry, Reprints, *Environmental stability.

PB91-182725/REB PC **A03**/MF **A01**
Environmental Protection Agency, Cincinnati, OH. Risk Reduction Engineering Lab.
Control of Transient Incinerator Emissions with an Oxygen Based Combustion System. Symposium paper.
Union Carbide Industrial Gases, Inc., Tarrytown, NY.
M. D. Ho, R. Rossi, J. P. Stumbar, J. M. Perdek, and F. J. Freestone. 1990, 25p EPA/600/D-91/059
Contract EPA-68-03-3255
Presented at the Haztech International '90 held in Houston, TX. on May 8-10, 1990. Prepared in cooperation with Foster Wheeler Envirespons, Inc., Edison, NJ. Sponsored by Environmental Protection Agency, Cincinnati, OH. Risk Reduction Engineering Lab.

The subject of the paper is the experience with a novel and field-proven method for the enhanced control of transient emissions from rotary kiln incinerators using oxygen enrichment. When high-BTU content wastes are fed into rotary kiln incinerators in an intermittent mode (typical of ram feed systems), the transient combustion behavior of these materials creates unsteady releases of combustible gases which may momentarily deplete the oxygen content of kiln gases. These temporary oxygen-deficient conditions could cause the release of products of incomplete combustion (PICs). Release of PICs from incinerators has raised public concern and has been the subject of research projects sponsored by the EPA. The enhanced control of transient emissions was demonstrated by the field operation of the EPA Mobile Incineration System (MIS) at the Denney Farm Superfund Site in McDowell, Missouri. During the field operation of the MIS, large quantities of high-BTU content wastes were burned periodically. These materials were ram-fed into the rotary kiln at a frequency of about twice a minute. To respond to the transient oxygen demand resulting from the burning of these materials, a unique oxygen feedforward-feedback control logic was designed into the LINDE Oxygen Combustion System (OCS) which was retrofitted into the MIS in 1987. After implementation of the OCS, transient upset conditions were significantly reduced during the operation of the MIS. Low NOx emissions were also achieved.

Keywords: *Air pollution control, *Incineration, *Kilns, *Combustion efficiency, *Waste disposal, Performance evaluation, Case studies, Nitrogen oxides, Design criteria, Combustion products, Hazardous materials, Portable equipment, Field tests, Reprints, *Oxygen combustion system, Principal organic hazardous constituent, Destruction and removal efficiency.

PB91-182733/REB PC **A03**/MF **A01**
Environmental Protection Agency, Cincinnati, OH. Risk Reduction Engineering Lab.

Evaluation of the Thermal Stability POHC Incinerability Ranking in a Pilot-Scale Rotary Kiln Incinerator.
Acurex Corp., Jefferson, AR.
J. W. Lee, L. R. Waterland, W. E. Whitworth, and G. J. Carroll. 1991, 18p EPA/600/D-91/060
Contract EPA-68-C9-0038
Presented at the Annual Air and Waste Management Association Meeting (84th), Vancouver, BC., June 16-21, 1991. Sponsored by Environmental Protection Agency, Cincinnati, OH. Risk Reduction Engineering Lab.

A series of pilot-scale incineration tests was performed at EPA's Incineration Research Facility to evaluate the thermal stability-based POHC incinerability ranking. In the tests, mixtures of 12 POHCs with predicted incinerability spanning the range of most to least difficult to incinerate class were combined with a clay-based sorbent and batch-fed to the facility's pilot-scale rotary kiln incinerator via a fiberpack drum ram feeder. Kiln operating conditions were varied to include a baseline operating condition, three modes of attempted incineration failure, and a worst case combination of the three failure modes. Kiln exit POHC DREs were in the 99.99 percent range for the volatile POHCs for the baseline, mixing failure (increased charge mass), and matrix failure (decreased feed H/C) tests. Semivolatile POHCs were not detected in the kiln exit for these tests; corresponding DREs were generally greater than 99.999 percent. The thermal failure (low kiln temperature) and worst case (combination of thermal, mixing, and matrix failure) tests resulted in substantially decreased kiln exit POHC DREs. These ranged from 99 percent or less for Freon 113 to greater than 99.999 percent for the less stable-ranked semivolatile POHCs. General agreement between relative kiln exit POHC DRE and predicted incinerability class was observed.

Keywords: *Incineration, *Waste disposal, *Air pollution control, *Combustion efficiency, *Kilns, Ranking, Pollution regulations, Pilot plants, Performance standards, Thermal stability, Baseline measurements, *Principal organic hazardous constituent, *Destruction and removal efficiency.

PB91-182741/REB PC **A03**/MF **A01**
Treatment of Hazardous Waste with Solidification/Stabilization. Symposium paper.
Environmental Protection Agency, Cincinnati, OH. Risk Reduction Engineering Lab.
C. C. Wiles. 1991, 13p EPA/600/D-91/061
Pub. in APCA Specialty Conference Proceedings 'Performance and Costs of Alternatives to Land Disposal of Hazardous Wastes', p60-70.

The paper describes the use of solidification/stabilization (S/S) technology for treating hazardous waste. Although it has been used for 20 or more years to treat U.S. industrial waste, the banning of selected untreated waste to the land has resulted in an increased interest in the technology. S/S involves the addition of binders (e.g., portland cement, lime, fly ash, etc.) to the waste to alter the waste form and decrease the mobility of the pollutants. Advantages and disadvantages of S/S vary with the process, the binders, the waste, site conditions and other factors. As an alternative treatment technology, S/S best potential use is to treat wastes that are banned from land disposal. However, there are important factors which will affect the use of S/S. These include waste characteristics, process types, S/S waste treatment and management objectives, regulatory requirements, and economics. These and other specific factors must be carefully considered to ensure acceptable S/S performance.

Keywords: *Waste treatment, *Hazardous materials, *Solidification, *Stabilization, *Waste forms, Industrial wastes Technology utilization, Environmental transport, Binders, Waste management, Substitutes, Pollution regulations, Performance standards, Reprints.

PB91-182758/REB PC **A03**/MF **A01**
Risk Assessment for Organic Micropollutants: U.S. Point of View.
Environmental Protection Agency, Cincinnati, OH. Risk Reduction Engineering Lab.
R. L. Chaney, J. A. Ryan, and G. A. O'Connor. c1991, 21p EPA/600/D-91/062
Presented at the EEC Symposium on the Treatment and Use of Sewage Sludge and Liquid Agricultural Wastes, Athens, OH., September 1990. Prepared in cooperation with Agricultural Research Service, Beltsville, MD. Soil-Microbial System Lab., and Florida Univ., Gainesville. Dept. of Soil Science.

Basic research and monitoring of sludge utilization programs have identified specific Pathways by which potentially toxic constituents of sewage sludge can reach and cause toxicity to livestock, humans, plants, soil biota, wildlife, etc. In the process of preparing a new regulation for land application of sewage sludge in the US, a Pathway approach to risk assessment was undertaken. Two Pathways were found to comprise the greatest risk from persistent lipophilic organic compounds such as PCBs: (1) direct ingestion of sludge by children; and (2) adherence of sludge to forage/pasture crops from surface application of fluid sludge, followed by grazing and ingestion of sludge by livestock used as human food. Each Pathway considers risk to Most Exposed Individuals (MEIs) who have high exposure to sludge. Because 1990 sewage sludges contain very low levels of PCBs, the estimated risk level to MEIs was less 0.0001, low sludge PCBs and low probability of simultaneously meeting all the constraints of the MEI indicate that MEIs are at less 0.0000001 lifetime risk. The authors conclude that quantitative risk assessment for potentially toxic constituents in sewage sludge can be meaningfully conducted because research has provided transfer coefficients from sludges and sludge-amended soils to plants and animals needed for many organic compounds.

Keywords: *Risk assessment, *Sewage sludge, *Toxic substances, *Environmental surveys, Ground disposal, Path of pollutants, Ecosystems, Waste disposal, Sludge disposal, Organic compounds, Ingestion(Biology), Polychlorinated biphenyls, Food chains, Grazing, Soil contamination.

PB91-182766/REB PC **A03**/MF **A01**
Pesticide Removal by Membrane Processes.
Environmental Protection Agency, Cincinnati, OH. Risk Reduction Engineering Lab.
C. A. Frank, and D. Baker. 1991, 26p EPA/600/D-91/063
Presented at the 1990 Annual Conference, American Water Works Association held in Cincinnati, OH. on June 17-21, 1990. Prepared in cooperation with Heidelberg Coll., Tiffin, OH. Water Quality Lab.

Approximately 21 billion pounds of pesticides have been applied to United States farmlands since 1964. In agricultural regions, high pesticide concentrations occur in surface and groundwaters because of spring runoff or leaching. Because many of these compounds pose health risks, the United States Environmental Protection Agency (USEPA) has a mandate, under the Safe Drinking Water Act Amendments of 1986, to regulate several of these compounds. Others will be undergoing regulatory scrutiny because they are included in EPA's First Drinking Water Priority List, as well as the National Pesticide Survey. In an attempt to understand possible compliance problems, an investigation was conducted on river water containing Alachlor, Atrazine, Cyanazine, Linuron, Metolachlor, Metribuzin, and Simazine. The purpose of the study was to determine to what extent several treatment processes such as reverse osmosis were able to remove pesticides from the Sandusky River at the Tiffin, Ohio Water Treatment Plant. In addition pilot scale studies were conducted using several different types of polymeric membranes to remove pesticides from spiked groundwater.

Keywords: *Water pollution control, *Pesticides, *Membranes, *Polymeric films, Ground water, Surface water, Leaching, Environmental transport, Agricultural runoff, Water pollution abatement, Pollution regulations, Water treatment plants, Reverse osmosis, Potable water, Reprints, Safe Drinking Water Act.

PB91-182774/REB PC **A03**/MF **A01**
Removal of Glyphosate from Drinking Water.
Environmental Protection Agency, Cincinnati, OH. Drinking Water Research Div.
T. F. Speth. c1991, 17p EPA/600/D-91/064
Presented at the 1990 Annual Conference, American Water Works Association held in Cincinnati, Ohio on June 17-21, 1990.

The effectiveness of granulated activated carbon (GAC), packed activated carbon (PAC), conventional treatment, membranes, and oxidation for removing glyphosate from natural waters is evaluated. Results indicate that GAC and PAC are not effective in removing glyphosate, while oxidation with chlorine was very effective.

Keywords: *Potable water, *Herbicides, *Chemical removal(Water treatment), Activated carbon treatment, Oxidation, Chlorine, Ohio River, Isotherms, Water pollution, Reprints, *Glyphosate.

PB91-182782/REB PC **A03**/MF **A01**
Safe Drinking Water for the Little Guy: Options and Alternatives. Symposium paper.
Environmental Protection Agency, Cincinnati, OH. Risk Reduction Engineering Lab.
J. A. Goodrich, B. W. Lykins, and R. M. Clark. c1990, 24p EPA/600/D-91/065
Pub. in AWWA Annual Conference Proceedings, Cincinnati, OH., June 17-21, 1990, p1111-1132.

The Safe Drinking Water Act (SDWA) and its Amendments sets regulations applicable to all community water systems that have 15 or more service connections and/or serve at least 25 people. At first glance, this may appear most inclusive, but in reality there are numerous private homeowners, non-community, and transient populations potentially at risk to contaminated drinking water. In addition, the tens of thousands of very small community systems (approximately 500 population served) currently regulated have little chance of complying with the ever increasing number of regulated contaminants or instituting Best Available Technology (BAT). Their problems are well documented as is the lack of resources to correct those problems. Therefore, the purpose of the paper is to provide a practical overview to the 'little guy' attempting to provide safe drinking water. The overview will present the advantages, disadvantages, and costs of several treatment technologies focusing on those aspects of cost, reliability, and ease of operation for those technologies that make them more amenable to package plant and Point-of-Use/Point-of-Entry (POU/POE) operation rather than traditional full-scale central treatment plants.

Keywords: *Water treatment, *Potable water, *Water pollution abatement, Performance evaluation, Operating, Design criteria, Best technology, Pollution regulations, Technology utilization, Cost analysis, Reprints, *Small systems, Safe Drinking Water Act.

PB91-182790/REB PC **A03**/MF **A01**
Toxicity Assessment of Dredged Materials: Acute and Chronic Toxicity as Determined by Bioassays and Bioaccumulation Tests. Proceedings of the International Seminar on the Environmental Aspects of Dredging Activities (Actes du Seminaire International sur les Aspects Environnementaux lies aux Activities de Dragages).
Environmental Research Lab., Narragansett, RI.
B. D. Melzian. c1990, 25p EPA/600/D-91/066, ERLN-1123
Proceedings of the International Seminar of the Environmental Aspects of Dredging Activities, Nantes, France, November 27-December 1, 1989, Session 1, p49-64.

Whenever dredged materials are disposed into the ocean, the potential effects of the materials on human health, fishery resources, and marine ecosystems may range from being negligible or unmeasureable to important. Because these effects may differ greatly at each dredged material extraction or disposal site, each site must be evaluated on a case-by-case basis. In the United States, the manual entitled Ecological Evaluation of Proposed Discharge of Dredged Material into Ocean Waters: Implementation Manual for Section 103 of Public Law 92.532 (Marine Protection, Research, and Sanctuaries Act of 1972) (the 'Implementation Manual' or 'Green Book') was published in 1977 to give guidance on determining the potential biological effects caused by dredging operations. The Green Book provides detailed guidance on the conduct of the required bioassays on the liquid, suspendEd particulate, and solid phases of a dredged material. In addition, guidance is given on how to conduct the bioassays and bioaccumulation tests. The U.S. Environmental Protection Agency (EPA) recently published a manual that gives guidance on the appropriate length of the bioaccumulation tests (i.e., 28 days), recommended teSt speCIes, and conduct of the tests. In the past, the U.S. Food and Drug Administration's 'Action Limits' and international fish and shellfish standards have occasionally been used in the interpretation of dredged material bioaccumulation data. Even though

they may be useful in some cases, there are limitations to using Action Limits and international standards when evaluating bioaccumulation test data.

Keywords: *Ocean waste disposal, *Water pollution effects, *Dredge spoil, *Toxicity, *Risk assessment, Bioaccumulation, Bioassay, Biological effects, Guidelines, Ecosystems, Site surveys, Sediments, Standards, Food chains, Public health, Fishes, Reprints, Green book, Marine Protection Research and Sanctuaries Act of 1972.

PB91-182808/REB PC **A03**/MF **A01**
Application of a Hazard-Assessment Research Strategy for Waste Disposal at 106-Mile Ocean Disposal Site (Chapter 14). Book chapter.
Environmental Research Lab., Narragansett, RI.
J. F. Paul, V. J. Bierman, H. A. Walker, J. H. Gentile, and D. W. Hood. c1989, 15p EPA/600/D-91/067, ERLN-1215
Pub. in Oceanic Processes in Marine Pollution, Chapter 14, v4 p149-160 1989. Also pub. as Environmental Research Lab., Narragansett, RI. rept. no. CONTRIB-412. Prepared in cooperation with Washington Univ., Seattle, and National Oceanic and Atmospheric Administration, Washington, DC.

An application of a hazard-assessment research strategy was made using waste disposal at Deepwater Dumpsite-106 (DWD-106) as an example. The strategy involved the synthesis of results from separate exposure and effects components in order to provide a scientific basis for estimating the risk to the aquatic environment. The exposure assessment related source inputs of contaminants to environmental concentration fields through considerations of transport and fate. The effects assessment related environmental contaminant concentration fields to biological effects through considerations of toxicity and bioaccumulation. The implementation of the hazard-assessment strategy for 106-Mile Site was made with the currently available information. Upper bounds on the time-averaged concentration fields for selected contaminants in the water column were developed corresponding to the physical transport patterns that occur in the vicinity of the site.

Keywords: *Ocean waste disposal, *Risk assessment, *Water pollution effects, Water quality, Biological effects, Environmental transport, Exposure, Toxicity, Bioaccumulation, Deep water, New Jersey, Chemical compounds, Sewage sludge, Oceanography, Reprints.

PB91-182816/REB PC **A03**/MF **A01**
Effects of Pond Characteristics on Biotic Exposures.
Environmental Research Lab., Athens, GA.
L. A. Burns, and F. B. Taub. 1991, 48p EPA/600/D-91/069
Prepared in cooperation with Washington Univ., Seattle. School of Fisheries.

Different aquatic communities, although apparently equivalent, can exhibit a variety of responses when challenged with the same initial total toxicant concentration. Differences in realized actual exposure concentrations can result from differences in physical morphology, water and sediment chemistry, and physical transport processes. Seasonal differences in climatology and biological community structure also alter ecosystem responses. Simulation models and comparative studies provide methods for extrapolation.

Keywords: *Water pollution effects(Animals), *Toxic substances, *Ponds, Seasonal variations, Water chemistry, Sediments, Climate, Aquatic ecosystems, Tables(Data), Graphs(Charts), Dose-response relationships.

PB91-182824/REB PC **A03**/MF **A01**
Review of NAPAP Integrated Assessment: Visibility.
Environmental Protection Agency, Research Triangle Park, NC. Atmospheric Research and Exposure Assessment Lab.
R. K. Stevens, and T. L. Vossler. 1991, 12p EPA/600/D-91/070

The National Acid Precipitation Program (NAPAP) Integrated Assessment discussion of visibility, and its more detailed supporting document, State-of-Science/Technology (SOS/T) Report 24, have been reviewed with regard to completeness in their discussion of visibility measurement methods, chemical analysis procedures to determine the species responsible for visibility impairment and methods to calculate light extinction b(sub ext) budgets. The supporting document, SOS/T Report 24, contains citations and substantial discussion and interpretation of past and ongoing research and monitoring associated with visibility. While both documents are a masterpiece in terms of compiling abbreviated discussions, some aspects of the documents reflect the biases of the authors, as evidenced by omissions of discussions related to visibility studies performed by the U.S. Environmental Protection Agency at Research Triangle Park, NC. The work by the EPA group is of substantial significance in that important complex problems associated with uncertainties in b(sub ext) budgets were addressed and methodology developed to minimize or estimate the uncertainties. The b(sub ext) budget protocols developed by the EPA group should be incorporated into the modeling and methods interpretation sections. More emphasis should be given to the status of measurement technologies which support visibility assessments. In particular, the shortcomings of elemental carbon measurements need to be emphasized.

Keywords: *Visibility, *Air pollution detection, *Air pollution monitoring, *Aerosols, *Atmospheric effects, Assessments, Chemical analysis, Luminous intensity, Technology utilization, Particles, Extinction, Carbon, Light transmission, Fines, Absorption, Reviews, Atmospheric composition, *National Acid Precipitation Assessment Program.

PB91-182832/REB PC **A03**/MF **A01**
Source Apportionment of Mutagenic Activity of Fine Particle Organics in Boise, Idaho.
Environmental Protection Agency, Research Triangle Park, NC. Atmospheric Research and Exposure Assessment Lab.
C. W. Lewis, R. K. Stevens, R. B. Zweidinger, L. D. Claxton, and D. Barraclough. 1991, 14p EPA/600/D-91/071
Proceedings of the A&WMA Annual Meeting (84th), Vancouver B.C., Canada, June 16-21, 1991. Prepared in cooperation with National Inst. of Standards and Technology, Gaithersburg, MD.

A multiple linear regression receptor model has been used to apportion ambient concentrations of fine particle extractable organic matter (EOM) and associated mutagenicity (Salmonella typhimurium TA98 +S9), measured in Boise ID during the 1986-1987 winter. Extensive (14)C measurements were also employed to verify the accuracy of the woodsmoke contribution estimate given by the regression approach. In general the Boise results are found to be consistent with those of earlier studies in Albuquerque NM and Raleigh NC, with mutagenic potencies of about 1 and 3 revertants per microgram of EOM for woodsmoke and mobile source emissions, respectively. The measurements were performed as part of the U.S. EPA's Integrated Air Cancer Project.

Keywords: *Air pollution sampling, *Pollution sources, *Organic matter, *Mutagens, *Particles, *Air pollution effects(Humans), Regression analysis, Aerosols, Mathematical models, Mobile pollutant sources, Idaho, Wood fuels, Combustion products, Concentration(Composition), Exhaust emissions, Boise(Idaho).

PB91-182840/REB PC **A03**/MF **A01**
Environmental Protection Agency, Research Triangle Park, NC. Atmospheric Research and Exposure Assessment Lab.
Sector Sampling for VOC's during Remediation of Superfund Site at Shaver's Farm, Georgia.
ManTech Environmental Technology, Inc., Research Triangle Park, NC.
J. D. Pleil, G. M. Russwurm, and K. D. Oliver. 1991, 18p EPA/600/D-91/072
Contract EPA-68-D0-0106
Sponsored by Environmental Protection Agency, Research Triangle Park, NC. Atmospheric Research and Exposure Assessment Lab.

The sector sampling approach for the determination of the spatial contributions of volatile organic compounds to the ambient air was employed at a Superfund site under remediation. Two canister based sampling systems were deployed and whole air samples were collected at the Shaver's Farm Superfund Site in northwest Georgia near Chattanooga, Tennessee, while chemical waste drums were excavated and repackaged. The method is based upon the collection of a constant stream of air into one of two SUMMA polished canisters depending on wind direction; when the wind comes towards the sampler from the suspected emissions area, sample is routed into the 'IN' sector canister, otherwise, sample is collected in the 'OUT' sector canister. Upon analysis, the comparison between the IN and OUT sample results indicates compounds that are emitted from the suspected source area. Data from the week-long Shaver's Farm field study are presented along, with a mathematical method for interpretation.

Keywords: *Air pollution sampling, *Superfund, *Waste disposal, *Waste storage, *Volatile organic compounds, *Remedial action, Spatial distribution, Georgia, Chemical compounds, Wind direction, Experimental design, Data processing, Field tests, Tables(Data), Concentration(Composition), Shavers Farm.

PB91-182857/REB PC **A03**/MF **A01**
Total Volatile Organic Concentrations in 2700 Personal, Indoor, and Outdoor Air Samples Collected in the US EPA TEAM Studies.
Environmental Protection Agency, Research Triangle Park, NC. Atmospheric Research and Exposure Assessment Lab.
L. Wallace, E. Pellizzari, and C. Wendel. Dec 90, 37p EPA/600/D-91/073

Sick Building Syndrome may be caused in part by volatile organic compounds (VOCs). One hypothesis is that the total volatile organic concentration (TVOC), rather than individual compounds, is a main factor in the syndrome. The TVOC level at which symptoms occur has been estimated to be in the range of 1-2 mg/cum, based on measurements employing GC-FID techniques. Very few measured data are available to determine the frequency with which homes and buildings in the United States may approach TVOC levels of this magnitude. However, data on 12-hour average values of individual VOCs from 750 homes and 10 buildings were available from EPA's TEAM Studies (1981-88). An initial study to determine the feasibility of obtaining a TVOC value from stored GC/MS data showed that TVOC estimated could be obtained with satisfactory precision ((+ or -) 30-60%). Therefore TVOC values were calculated from about 2700 personal, indoor, and outdoor air samples collected in the TEAM Studies.

Keywords: *Air pollution sampling, *Volatile organic compounds, *Public health, *Occupational safety and health, Personnel monitoring, Indoor air pollution, Concentration(Composition), Residential buildings, Buildings, Exposure, Graphs(Charts), Tables(Data), Seasonal variations, Diurnal variattions, Site surveys, Baseline measurements, Air pollution detection, *Sick Building Syndrome, Microenvironments.

PB91-182865/REB PC **A03**/MF **A01**
Environmental Protection Agency, Research Triangle Park, NC. Atmospheric Research and Exposure Assessment Lab.
Identification of Polar Volatile Organic Compounds in Consumer Products and Common Microenvironments.
Research Triangle Inst., Research Triangle Park, NC.
L. A. Wallace, W. C. Nelson, E. Pellizzari, J. H. Raymer, and K. W. Thomas. 1 Mar 91, 16p EPA/600/D-91/074
Contract EPA-68-02-4544
Presented at the Annual Meeting of the Air and Waste Management Association (84th), Vancouver, BC., June 16-21, 1991. Sponsored by Environmental Protection Agency, Research Triangle Park, NC. Atmospheric Research and Exposure Assessment Lab.

Polar volatile organic compounds were identified in the headspace of 31 fragrance products such as perfumes, colognes and soaps. About 150 different chemicals were identified in a semiquantitative fashion, using two methods to analyze the headspace: direct injection into a gas chromatograph and collection by an evacuated canister, each followed by GC-MS analysis. The canister method displayed low recoveries for most of the 25 polar chemical standards tested. However, reconstructed ion chromatograms (RICs) from the canister showed good agreement with RICs from the direct injection method except for some high boiling point compounds. Canister samples collected in 15 microenvironments expected to contain the fragrance products tested (potpourri stores, fragrance sections of department stores, etc.) showed

relatively low concentrations of most of these polar chemicals compared with certain common nonpolar chemicals. The results presented will be useful for models of personal exposure and indoor air quality.

Keywords: *Air pollution detection, *Volatile organic compounds, Indoor air pollution, Consumer products, Air quality, Gas chromatography, Mass spectroscopy, Polarization(Charge separation), Containers, Concentration(Composition), Exposure, Construction materials, Enclosures, Sample preparation, Microenvironments.

PB91-182873/REB PC **A03**/MF **A01**
Environmental Protection Agency, Research Triangle Park, NC. Atmospheric Research and Exposure Assessment Lab.
US EPA TEAM Study of Inhalable Particles (PM10): Study Design, Response Rate, and Sampler Performance.
Research Triangle Inst., Research Triangle Park, NC.
L. Wallace, E. Pellizzari, J. Spengler, P. Jenkins, and L. Sheldon. 1 Mar 91, 14p EPA/600/D-91/075
Contract EPA-68-02-4544
Presented at the Annual Meeting of the Air and Waste Management Association (84th), Vancouver, BC., June 16-21, 1991. Sponsored by Environmental Protection Agency, Research Triangle Park, NC. Atmospheric Research and Exposure Assessment Lab.

The US EPA studied the exposures of 175 residents of Riverside, CA to inhalable particles (< 10 micrometers diameter) in the early fall of 1990. Participants were probabilistically selected to represent most of the Riverside nonsmoking population over the age of 10. They wore a newly-designed personal monitor (4 Lpm pump and filter) for two consecutive 12-hour periods (day and night) to determine their exposure to PM-10. Exposure to nicotine was also determined by a citric acid treated filter. Indoor and outdoor samples were collected concurrently at each home. Air exchange rates were determined for each household for the day and night periods. The response rate of the population was about 50%, roughly comparable to previous TEAM Studies. The personal and fixed particle monitors showed excellent precision of about 4% RSD.

Keywords: *Air pollution effects(Humans), *Particles, *Public health, *Air pollution monitors, Indoor air pollution, Inhalation, Houses, Air samplers, Performance evaluation, Exposure, Nicotine, Air flow, Quality control, Public information.

PB91-182881/REB PC **A03**/MF **A01**
Overview of the Technical Implications of Methanol and Ethanol as Highway Motor Vehicle Fuels.
Environmental Protection Agency, Research Triangle Park, NC. Atmospheric Research and Exposure Assessment Lab.
F. M. Black. 1991, 32p EPA/600/D-91/076

The characteristics of methanol and ethanol as highway motor vehicle fuels are contrasted with those of conventional gasolines and diesel fuels. The implications of the physical and chemical differences of these fuels for motor vehicle design and emissions are discussed. Potential material compatibility concerns, such as elastomer swelling and metal corrosion, and safety concerns, such as fire hazard, flame luminosity, and human toxicity are examined. A number of possible air quality impacts are examined including changes in ozone, carbon monoxide, oxides of nitrogen, particulate matter, toxic compounds (benzene, aldehydes, 1,3-butadiene), and global climate 'greenhouse' gases (carbon dioxide, methane, nitrous oxide).

Keywords: *Methanol, *Ethanol, *Automotive fuels, Air pollution, Combustion products, Environmental impacts, Technology assessment, US EPA, Safety engineering, Automobile exhaust.

PB91-182899/REB PC **A03**/MF **A01**
Environmental Protection Agency, Research Triangle Park, NC. Atmospheric Research and Exposure Assessment Lab.
Determination of Routes of Exposure of Infants and Toddlers to Household Pesticides: A Pilot Study. Rept. for Mar 90-Mar 91.
Research Triangle Inst., Research Triangle Park, NC.
R. G. Lewis, A. E. Bond, R. C. Fortmann, L. S. Sheldon, and D. E. Camann. 1991, 18p EPA/600/D-91/077
Contract EPA-68-02-4544
Prepared in cooperation with Southwest Research Inst., San Antonio, TX. Sponsored by Environmental Protection Agency, Research Triangle Park, NC. Atmospheric Research and Exposure Assessment Lab.

The U.S. EPA recently completed a study of nonoccupational exposure to household pesticides. During that study, house dust and yard soil were recognized to be potential major sources of exposure for infants and toddlers. Consequently, a pilot study was initiated in the fall of 1990 to evaluate exposure methodology and obtain preliminary comparative data on routes of exposure for the susceptible population. Nine homes with children aged six months to five years were selected on the basis of pesticide use. House dust was collected using a newly-designed cyclone vacuum system. Dislodgeable residues were collected from floors by means of a polyurethane foam (PUF) roller weighted to simulate a 9 kg child. Investigator's hand-presses and child's hand rinses were performed for comparison to the PUF roller. Soil and entry-way dirt samples were collected and air was sampled at 12 cm and 75 cm above the floor. All samples were analyzed for a list of 30 common household pesticides. Questionnaires were administered to participants regarding pesticide usage, child activities (including frequency of hand-to-mouth contact), and dietary habits.

Keywords: *Pesticides, *Infants, *Children, *Toxicity, *Environmental exposure pathway, Dust, Susceptibility, Soil contamination, Organochlorine insecticides, Indoor air pollution, Pesticide residues.

PB91-182907/REB PC **A02**/MF **A01**
Protocol for the Field Validation of Stationary Source Emission Measurements. Technical rept.
Environmental Protection Agency, Research Triangle Park, NC. Atmospheric Research and Exposure Assessment Lab.
J. E. Knoll. 1991, 8p EPA/600/D-91/078

A protocol has been developed to enable source operators to comply with provisions of Title III of the Clean Air Act Amendments of 1990 which allows certain exemptions if reductions in emissions can be demonstrated and validated source emission test methods are not available. Essentially, the procedures consist in determining the method's bias and precision, the former by using known concentrations of analyte, and the latter by means of collocated sampling trains. The use of isotopically-labelled materials, comparisons with a validated method, or analyte spiking are techniques that may be employed. There is a requirement tht the analyst use an EPA audit material. Equations are given to calculate precision, to determine if bias is statistically significant, and to calculate correction factors if applicable. The protocol disallows the use of test methods having a bias greater than 30% or a precision greater than 50% at the level of the applicable standard.

Keywords: *Air pollution sampling, *Stationary sources, Field tests, Standards compliance, Concentration(Composition), Pollution sources, Air pollution control, Air pollution abatement, Pollution regulations, Auditing, Statistical analysis, Clean Air Act of 1990.

PB91-182915/REB PC **A03**/MF **A01**
Criteria to Protect Wetland Ecological Integrity.
Environmental Research Lab.-Duluth, MN.
W. Sanville. 1991, 19p EPA/600/D-91/080

Wetlands have been a minor element in EPA's water quality regulatory frame but their importance will expand following their mandatory inclusion into Waters of the States in 1993 (EPA 1990). They have historically been regulated under Section 404 of the Clean Water Act, and although water quality is an issue in 404 decisions, it has not been the driving variable. The presentation is based on the premise that a range of criteria are necessary to protect wetland ecological integrity from a range of stressors. The author will discuss possible protective criteria, some in use in existing regulatory programs and others under development. The order of presentation is biological, aquatic life, hydrologic, sediments and wildlife criteria. In the conclusion, the author briefly discusses using landscape approaches to extrapolate criteria to spatial scales beyond the traditional site-specific analysis used in most water quality decisions.

Keywords: *Wetlands, *Ecology, *Environmental protection, *Water pollution abatement, *Pollution regulations, Aquatic biology, Water quality, Biological effects, Hydrology, Sediments, Wildlife, Spatial distribution, Habitats, Clean Water Act.

PB91-182923/REB PC **A02**/MF **A01**
Aquatic Information and Retrieval (Aquire) Database System.
Environmental Research Lab.-Duluth, MN.
R. Hunter, G. Niemi, A. Pilli, and G. Veith. 1991, 9p EPA/600/D-91/079
Pub. in International Society for Environmental Protection (ISEP), p42-48. Proceedings of the Computer Workshop on Environmental Systems, Vienna, October 25-26, 1990. Prepared in cooperation with Computer Sciences Corp., Duluth, MN., and Minnesota Univ.-Duluth. Natural Resources Research Inst.

The AQUIRE database system is one of the foremost international resources for finding aquatic toxicity information. Information in the system is organized around the concept of an 'aquatic toxicity test.' A toxicity test record contains information about the chemical, species, endpoint, endpoint concentrations, and test conditions under which the toxicity test was conducted. For the past 10 years aquatic literature has been reviewed and entered into the system. Currently, the AQUIRE database system contains data on more than 2,400 species, 160 endpoints, 5,000 chemicals, 6,000 references, and 104,000 toxicity tests.

Keywords: *Water pollution effects, *Toxicity, *Toxic substances, *Information systems, *Water quality, Concentration(Composition), Chemical compounds, Data processing, Aquatic animals, Ecosystems, Risk assessment, Public health, Reprints, *AQUIRE database system.

PB91-183046/REB PC **A08**/MF **A01**
Textile Dye Weighing Monitoring Study.
Environmental Protection Agency, Washington, DC. Office of Toxic Substances.
Apr 90, 171p EPA/560/5-90/009

Dye weighers in textile dyeing and printing plants are involved in the weighing and transfer of relatively small quantities of numerous powder dyes and other chemicals. The results in a potential exposure to a diverse range of chemicals which exhibit a broad spectrum of toxicological properties. In order to gain more detailed information about workplace exposure to powder dyes, a study has been conducted to measure concentrations of dyes in the workplace air, and to characterize worker activities and industrial hygiene practices. The study was unique in that both government (U.S. Environmental Protection Agency) and industry (American Textile Manufacturers Institute and Ecological and Toxicological Association of Dyestuffs Manufacturing Industry) collaborated on an impartial basis and the dyehouses studies participated on a strictly voluntary basis. The study included a survey of 24 randomly selected textile dyeing or printing sites which used power dyes. At each site, one worker was observed for an 8-hour shift; personal monitoring and area sampling data were taken. Certified industrial hygienists recorded worker activities, duration of potential exposure, personal and engineering controls in use, and quantities and frequency of use of each dye that was handled during the monitoring period. Bulk samples of each dyes were also taken. The particulates collected on the air monitoring filters were analyzed for commercial dye content using a spectrophotometric method developed for the study.

Keywords: *Textile processes, *Air pollution monitoring, *Occupational safety and health, *Industrial hygiene, *Dyeing, Weight measurement, Air pollution detection, Concentration(Composition), Occupational exposure, Particles, Spectrophotometry, Data analysis, Quality control, Statistical analysis, Site characterizations.

PB91-183053/REB PC **A07**/MF **A01**
Textile Dye Weighing Monitoring Study. Supplement.
Environmental Protection Agency, Washington, DC. Office of Toxic Substances.
Apr 90, 150p EPA/560/5-90/010

Dye weighers in textile dyeing and printing plants are involved in the weighing and transfer of relatively small quantities of numerous powder dyes and other chemicals. This results in a potential exposure to a diverse

range of chemicals which exhibit a broad spectrum of toxicological properties. In order to gain more detailed information about workplace exposure to powder dyes, a study has been conducted to measure concentrations of dyes in the workplace air, and to characterize worker activities and industrial hygiene practices. The study was unique in that both government (U.S. Environmental Protection Agency) and industry (American Textile Manufacturers Institute and Ecological and Toxicological Association of Dyestuffs Manufacturing Industry) collaborated on an impartial basis and the dyehouses studies participated on a strictly voluntary basis. The document contains quality assurance project plans, data quality objectives, letters to encourage plant participation, first phase questionnaire, and in-plant questionnaire.

Keywords: *Textile processes, *Air pollution monitoring, *Occupational safety and health, *Industrial hygiene, *Dyeing, Weight measurement, Quality assurance, Data processing, Questionnaires, Air pollution detection, Concentration(Composition), Occupational exposure, Chemical analysis.

PB91-183079/REB PC **A06**/MF **A01**
MINTEQA2/PRODEFA2, A Geochemical Assessment Model for Environmental Systems: Version 3.0 User's Manual.
Environmental Research Lab., Athens, GA. Office of Research and Development.
J. D. Allison, D. S. Brown, and K. J. Novo-Gradac. Mar 91, 117p EPA/600/3-91/021
Prepared in cooperation with Computer Sciences Corp., Athens, GA., and ASci Corp., Athens, GA.

MINTEQA2 is a geochemical equilibrium speciation model capable of computing equilibria among the dissolved, adsorbed, solid, and gas phases in an environmental setting. MINTEQA2 includes an extensive database of reliable thermodynamic data that is also accessible to PRODEFA2, an interactive program designed to be excuted prior to MINTEQA2 for the purpose of creating the required MINTEQA2 input file. The report describes how to use the MINTEQA2 model. The chemical and mathematical structure of MINTEQA2 and the structure of the database files also are described. The use of both PRODEFA2 and MINTEQA2 are illustrated through the presentation of an example PRODEFA2 dialogue reproduced from interactive sessions and the presentation of MINTEQA2 output files and error diagnostics. The content and format of database files also are explained.

Keywords: *Environmental impact assessments, *Computerized simulation, *Geochemistry, *Chemical equilibrium, *Metals, Phase rule, Oxidation reduction reactions, Adsorption, Error analyses, Data processing, Thermodynamics, Data base management, User manuals(Computer programs), *MINTEQA2 model, PRODEFA2 model.

PB91-183160/REB PC **A02**/MF **A01**
Human Impacts to Minnesota Wetlands. Journal article.
Environmental Research Lab.-Duluth, MN.
C. A. Johnston. c1989, 6p EPA/600/J-89/519, CONTRIB-46
Pub. in Jnl. of the Minnesota Academy of Science, (special issue on Minnesota's water resource), p120-124 Oct 89.

Minnesota's 3.6 million ha of wetlands have been impacted by a variety of human activities, including agricultural drainage, urbanization, water control, and nonpoint source pollution. More than half of Minnesota's wetlands have been destroyed since the first European settlers arrived, an average loss of about 35,600 ha/yr. Drainage for agriculture is the major cause of wetland loss in Minnesota, particularly in southern Minnesota and the Red River Valley. In addition to impacting wetlands directly, wetland drainage affects downstream areas by increasing flood flows, and releasing sediment and nutrients. Urban development and highway construction affect a smaller proportion of Minnesota's wetlands, but substantially alter their physical, chemical, and biological properties. Hydrology has a major influence on the structure and function of wetlands, so changes in the frequency, duration, depth, and timing of wetland flooding can severely impact wetlands. While wetlands can assimilate low levels of sediment and nutrient enrichment, excessive inputs can be detrimental. Peat harvesting is not currently extensive in Minnesota, but could cause substantial impacts. Cumulative impact, the incremental impact of an action when added to other past, present, and reasonably forseeable future actions, is becoming an area of increasing concern.

Keywords: *Man environment interactions, *Wetlands, *Water pollution, *Drainage effects, *Land use, Minnesota, Hydrology, Urbanization, Agriculture, Nonpoint sources, Peat, Water quality, Forests, Reprints.

PB91-183178/REB PC **A03**/MF **A01**
Environmental Protection Agency, Cincinnati, OH. Risk Reduction Engineering Lab.
Evaluation of Ozonation By-Products from Two California Surface Waters. Journal article.
North Carolina Univ., Chapel Hill. Dept. of Environmental Sciences and Engineering.
W. H. Glaze, M. Koga, D. Cancilla, K. Wang, and M. J. McGuire. c1989, 11p EPA/600/J-89/518
Pub. in Jnl. of the American Water Works Association, v81 n8 p66-73 Aug 89. Sponsored by Environmental Protection Agency, Cincinnati, OH. Risk Reduction Engineering Lab., Southern California Metropolitan Water District, Los Angeles, National Science Foundation, Washington, DC., and California Univ., Los Angeles. Toxic Substances Research and Teaching Program.

Ozonation by-products were analyzed for two surface water sources in Southern California--Los Angeles Aqueduct Water (LAAW) and State Project Water (SPW). Included are data obtained when LAAW was being treated at the Los Angeles Aqueduct Filtration Plant and similar data obtained during a two-day experiment in which the plant was treating SPW. Some batch-scale ozonation studies are also reported. Ozonation by-products were monitored using three methods: closed-loop stripping analysis, nonionic resin accumulation, and a direct aqueous derivatization method for low-molecular-weight aldehydes, each followed by gas chromatography-mass spectrometry analysis of the extracts. The major neutral by-products appear to be aliphatic aldehydes, but the levels are unexpectedly low in SPW compared with LAAW treated under similar conditions. Low levels of several other compounds were found in ozonated water, including bromoform and some compounds tentatively identified as ketones.

Keywords: *Surface waters, *Ozonization, Water treatment, Chemical analysis, Field tests, Laboratory tests, Byproducts, Contaminants, Aqueducts, Aldehydes, Ketones, Bromoform, Reprints, Southern Region(California).

PB91-183186/REB PC **A03**/MF **A01**
Environmental Protection Agency, Cincinnati, OH. Risk Reduction Engineering Lab.
Advanced Oxidation Processes. Test of a Kinetic Model for the Oxidation of Organic Compounds with Ozone and Hydrogen Peroxide in a Semibatch Reactor. Journal article.
California Univ., Los Angeles.
W. H. Glaze, and J. W. Kang. c1989, 11p EPA/600/J-89/517
Pub. in Industrial Engineering Chemistry Research, v28 n11 p1580-1587 1989. Sponsored by Environmental Protection Agency, Cincinnati, OH. Risk Reduction Engineering Lab., Los Angeles City Dept. of Water and Power, CA., and National Science Foundation, Washington, DC.

Experimental data are presented to test a kinetic model of the OE/H2O2 process in a semibatch reactor. The effect of bicarbonate and carbonate ions is measured and found to be in concurrence with model predictions. The effect of pH in the ozone mass-transfer-limited region was examined in bicarbonate-spiked distilled water. Since the reaction is mass transfer limited, the primary effect above pH 7 is the result of changes in the distribution of inorganic carbon species which are OH-radical scavengers. Below pH 7, there is a lag period during which ozone and peroxide increase until the chain reaction begins. The effects of chloride ion and the concentration of radical scavengers other than carbonate species in ground waters are also measured. The mass-transfer/reaction rate model has been used to estimate rate constants for the reaction of hydroxyl radicals with trichloroethylene, 1,2-dibromoethane, 1,2-dibromo-3-chloropropane, carbon tetrachloride, and two bicyclic alcohols, 2-methylisoborneol and geosmin. While the model developed for the distilled water system was successful in predicting the rate of tetrachloroethylene (PCE) oxidation and the concentration of residual ozone and peroxide in regions I and III, respectively, there are several features of the model that remain unresolved when the matrix is changed to a real surface or ground water. This and subsequent papers will investigate these effects.

Keywords: *Reaction kinetics, *Mathematical models, *Oxidation, *Organic compounds, Water pollution effects, Experimental design, Surface waters, Ground water, Ozone, Hydrogen peroxide, Hydroxyl radicals, Mass transfer, Bicarbonates, pH, Reprints.

PB91-183194/REB PC **A03**/MF **A01**
Environmental Protection Agency, Cincinnati, OH. Risk Reduction Engineering Lab.
Advanced Oxidation Processes. Description of a Kinetic Model for the Oxidation of Hazardous Materials in Aqueous Media with Ozone and Hydrogen Peroxide in a Semibatch Reactor. Journal article.
California Univ., Los Angeles. Office of Environmental Science and Engineering.
W. H. Glaze, and J. W. Kang. c1989, 11p EPA/600/J-89/516
Pub. in Industrial Engineering Chemistry Research 28, n11 p1573-1580 1989. Prepared in cooperation with North Carolina Univ. at Chapel Hill. Dept. of Environmental Sciences and Engineering. Sponsored by Environmental Protection Agency, Cincinnati, OH. Risk Reduction Engineering Lab., Los Angeles City Dept. of Water and Power, CA., and National Science Foundation, Washington, DC.

A model is presented that describes the kinetics of the oxidation of micropollutants in water with the combination of ozone and hydrogen peroxide in a sparged, semibatch reactor. The model is based on known reactions of the O3/H2O2 system plus mass-transfer characteristics of the reactor. The principal kinetic species for micropollutant oxidation is assumed to be the hydroxyl radical. The model is tested and validated in distilled water spiked with an excess of bicarbonate, a known hydroxyl radical scavenger.

Keywords: *Water pollution control, *Oxidation, *Reaction kinetics, *Ozone, *Hydrogen peroxide, Laboratory tests, Organic compounds, Hydroxyl radicals, Technology assessment, Bicarbonates, Reprints.

PB91-183202/REB PC **A02**/MF **A01**
Corvallis Environmental Research Lab., OR.
Water Relations of Differentially Irrigated Cotton Exposed to Ozone. Journal article.
California Univ., Riverside.
P. J. Temple. c1990, 9p EPA/600/J-90/469
Pub. in Agronomy Jnl., v82 n4 p800-805 1990. Sponsored by Corvallis Environmental Research Lab., OR.

The field study was conducted to test the hypothesis that plants chronically exposed to O3 may be more susceptible to drought because O3 typically inhibits root growth and increases shoot-root ratios in plants. Cotton was grown in open-top chambers on Hanford coarse sandy loam in Riverside, CA. Plants were grown under three irrigation regimes: optimum water for lint production (OW), suboptimum or moderate drought stress (SO), and severely drought stressed (SS) and were exposed to seasonal 12 h (0800-2000) O3 concentrations of 0.015, 0.074, 0.094, or 0.111/microLL. Leaf xylem pressure potentials Psi(sub 1) and soil water content Theta(sub v) were measured weekly from June to October. Mean seasonal Psi(sub 1) increased from -1.89 MPa to -1.72 MPa in low to high O3 treatments, averaged across soil water regimes. Ozone had no effect on seasonal water use of cotton, but water use efficiency was significantly reduced by O3 in OW and SO, but not in SS treatments. Drought-stressed plants extracted proportionally greater amounts of water from deeper in the soil profile than OW cotton, and O3 had no apparent effect on this redistribution of roots in the soil. Since O3 had no apparent effect on the ability of drought-stressed cotton to maintain Psi(sub 1) and to increase root growth relative to shoot growth, this suggests that O3 may have little or no effect on the potential of cotton to adapt to or tolerate drought.

Keywords: *Air pollution effects(Plants), *Ozone, *Soil-water-plant relationship, *Drought tolerance, *Cotton plants, Field tests, Biological stress, Crop production, Growth inhibitors, Exposure, Plant growth, Soil water, Irrigation, Agronomy, Water utilization, Reprints, Riverside(California).

PB91-183210/REB PC **A03**/MF **A01**
Significance of the Surface Microlayer to the Environmental Fate of Di(2-ethylhexyl)phthalate Predicted from Marine Microcosms. Journal article.
Environmental Research Lab., Narragansett, RI.
E. W. Davey, K. T. Perez, A. E. Soper, N. F. Lackie, and G. E. Morrison. c1990, 38p EPA/600/J-90/468, ERLN-942
Also pub. as Environmental Research Lab., Narragansett, RI. rept. no. CONTRIB-942. Pub. in Marine Chemistry, v31 p231-269 1990. Prepared in cooperation with Science Applications International Corp., Narragansett, RI., and Rhode Island Univ., Kingston. Dept. of Statistics.

The quanitative significance of the surface microlayer (SML) to the environmental fate of the industrial plasticizer di(2-ethylhexyl)phthalate (DEHP), in marine coastal systems was established by the use of experimental microcosms. The effects of season, sea-state and associated solvents were investigated. The results demonstrated that the SML community rapidly degraded DEHP to such an extent that under certain treatment conditions biodegradation was the dominant removal process compared with physical transport. Biodegradation of DEHP by the SML biota was estimated to account for at least 30% of the total budget. Extrapolation of the laboratory results to the simulated field system (the West Passage of Narragansett Bay, RI), is discussed within the context of potential artifacts of the marine microcosms. (Copyright (c) 1990-Elsevier Science Publishers B.V.)

Keywords: *Aquatic ecosystems, *Surface layers, *Air water interactions, *Water pollution effects, Marine atmosphere, Plasticizers, Physicochemical properties, Environmental transport, Industrial wastes, Biodeterioration, Toxicology, Marine biology, Biota, Reprints, *Phthalic acid/di(ethylhexyl-ester), *Microcosms.

PB91-183228/REB PC **A03**/MF **A01**
Spatio-Temporal Fluctuations in the Distribution and Abundance of Demersal Fish and Epibenthic Crustaceans in Yaquina Bay, Oregon. Journal article.
Environmental Research Lab.-Narragansett, Newport, OR. Mark O. Hatfield Marine Science Center.
W. A. De Ben, W. D. Clothier, G. R. Ditsworth, and D. J. Baumgartner. c1990, 12p EPA/600/J-90/467, ERLN-N043
Also pub. as Environmental Research Lab.-Narragansett, Newport, OR. Mark O. Hatfield Marine Science Center rept. no. CONTRIB-N043. Pub. in Estuaries, v13 n4 p469-478 Dec 90.

A total of over 32,000 demersal fish and epibenthic crustaceans belonging to 62 species were caught in 42 biweekly trawls from 10 stations in Yaquina Bay, Oregon, during 1967 and 1968. English sole, Parophrys vetulus, was the most abundant species. Seventeen species (13 fishes and 4 crustaceans) constituted 95% of the catch. Total numerical abundances of both individuals (mainly juvenile fishes) and species were greatest in the lower 12 km of the estuary during summer and early fall, a period of water mass stability and increased water temperature and salinity. This section of the estuary is used by many immature fishes and crustaceans as a 'nursery area.' These fishes generally emigrate from the estuary as subadults in the fall around the onset of the rainy season. The fewest species were taken in January 1968 from the central, upper-estuarine, and riverine areas of the bay, this being a time when high rainfall and river discharge result in low salinity and temperature. Crustaceans (shrimp and subadult crabs) were generally most abundant in late winter and early spring throughout the estuary. Changes in diversity indices reflected variations in community structure, the influences of migratory species and juvenile fishes, and seasonal changes in dominance. Year-to-year fluctuations in abundance may be due, in part, to local hydrographic and meteorological conditions along the central Oregon coast. (Copyright (c) 1990 Estuarine Research Federation.)

Keywords: *Crustacea, *Yaquina Bay, *Fishes, Species diversity, Seasonal variations, Population density, Abundance, Salinity, Temperature, Oregon, Reprints, *Demersal fish.

PB91-183236/REB PC **A02**/MF **A01**
Environmental Research Lab., Narragansett, RI.
Preliminary Field Verification of Daily Growth Increments in the Lapillar Otoliths of Juvenile Cunners. Journal article.
Rhode Island Univ., Kingston. Agricultural Experiment Station.
T. R. Gleason, and C. Recksiek. c1990, 6p CONTRIB-2426, EPA/600/J-90/466 , , ERLN-X181
Sponsored by Environmental Research Lab., Narragansett, RI.

Seventy-five field-captured juvenile cunners Tautogolabrus adspersus were immersed for 2 hours in solution of tetracycline hydrochloride (500mg/L) and monovalent salts nearly isotonic to seawater. After immersion, the 64 surviving cunners were released on an artificial reef in Narragansett Bay, Rhode Island. Eight tetracycline-marked juvenile cunners were recaptured 13-19 days after release. Ultraviolet and bright-field microscopy confirmed the presence of daily growth increments in the lapillar otoliths of five of these recaptured fish. (Copyright (c) 1990 American Fisheries Society.)

Keywords: *Marine biology, *Growth, *Narrangansett Bay, Tetracycline, Sea water, Ultraviolet rays, Rhode Island, Reprints, *Juvenile cunners, Tautogolabrus adspersus.

PB91-183244/REB PC **A02**/MF **A01**
Environmental Protection Agency, Research Triangle Park, NC. Atmospheric Research and Exposure Assessment Lab.
Infrared Method for Plume Rise Visualization and Measurement. Journal article.
Washington State Univ., Pullman. Lab. for Atmospheric Research.
C. Rickel, B. Lamb, A. Guenther, and E. Allwine. c1990, 6p EPA/600/J-90/465
Grant EPA-R-812775
Pub. in Atmospheric Environment, v24A n11 p2835-2838 1990. Sponsored by Environmental Protection Agency, Research Triangle Park, NC. Atmospheric Research and Exposure Assessment Lab.

An infrared video camera and recording system were used to record near-source plume rise from a low turbine stack on an oil-gathering center at Prudhoe Bay, Alaska. The system provided real-time, continuous visualization of the plume using a color monitor while the images were recorded with a standard video tape recorder. Following the field study, single frame images were digitized using a micro-computer video system. As part of the digitization, the plume centerline was captured as well as an isotherm of the plume outline. In the application, one frame from each two-minute period in the record was captured and digitized. The results were used to calculate the variability in plume centerline during each hour. During strong winds with blowing snow, the mean plume rise for the hour at 15 m downwind was 6 + or - 2 m. The observed plume rise from the turbine stack was greater than that calculated using momentum-only, buoyancy-only, or combined momentum-buoyancy plume rise models.

Keywords: *Plumes, *Dispersing, *Infrared cameras, Pollution transport, Diffusion, Atmospheric circulation, Arctic regions, Field tests, Isotherms, Sulfur hexafluoride, Chimneys, Reprints, *Image analysis, Prudhoe Bay(Alaska), Tracer gas.

PB91-183251/REB PC **A03**/MF **A01**
Environmental Protection Agency, Research Triangle Park, NC. Atmospheric Research and Exposure Assessment Lab.
Comparison of Mutagenic Activities of Several Peroxyacyl Nitrates. Journal article.
NSI Technology Services Corp., Research Triangle Park, NC.
T. E. Kleindienst, P. B. Shepson, D. F. Smith, E. E. Hudgens, and C. M. Nero. c1990, 13p EPA/600/J-90/464
Contract EPA-68-02-4443
Pub. in Environmental and Molecular Mutagenesis, v16 p70-80 1990. Sponsored by Environmental Protection Agency, Research Triangle Park, NC. Atmospheric Research and Exposure Assessment Lab.

Salmonella typhimurium strain TA100 was exposed to a series of peroxyacyl nitrates including peroxyacetyl nitrate (PAN), peroxypropionyl nitrate (PPN), peroxybutyryl nitrate (PBN), peroxybenzoyl nitrate (PBzN), and chloroperoxyacetyl nitrate (CPAN). Gas phase concentrations for the individual exposures were in the high ppbv range. The dose was determined from the deposition rate and measured from the net decrease of the test compound in the exposure chamber and the exposure time. The mutagenic activity for each compound determined from the dose-response relationship gave values ranging from 250 (PBN) to 6570 (PBzN) revertants/micromol. The difficulties of quantifying the actual gas-phase chemical dose the bacteria are exposed to in this variant of the Ames Test are delineated. (Copyright (c) 1990 Wiley-Liss, Inc.)

Keywords: *Mutagens, Comparative evaluations, Dose-response relationships, Salmonella typhimurium, Mutagenicity tests, Reprints, *Peroxyacyl nitrates.

PB91-183269/REB PC **A03**/MF **A01**
Environmental Protection Agency, Research Triangle Park, NC. Atmospheric Research and Exposure Assessment Lab.
Elevated Plume Transport and Diffusion: 20-150 km Downwind of Beijing, P.R.C. Journal article.
Washington State Univ., Pullman. Lab. for Atmospheric Research.
B. Lamb, Z. X. Fu, R. E. Eskridge, R. Benner, and H. Westberg. c1990, 11p EPA/600/J-90/463
Grants EPA-R-810230-01, EPA-R-812632-01
Pub. in Atmospheric Environment, v24A n4 p859-870 1990. Prepared in cooperation with Academia Sinica, Beijing (China), and Computer Sciences Corp., Research Triangle Park, NC. Sponsored by Environmental Protection Agency, Research Triangle Park, NC. Atmospheric Research and Exposure Assessment Lab.

Three mobile continuous analyzers and an array of fixed sequential syringe samplers were used to measure plume dispersion rates of SF6 released from a 300 m tower in Beijing during strong, steady winds with neutral conditions. The plume trajectories over the flat, open terrain downwind of Beijing were relatively straight. Predicted plume trajectories based on interpolated wind fields from surface and upper air data exhibited a mean separation error of 4 km at 70 km downwind. Maximum predicted concentrations from a Gaussian puff model agreed within a factor of two with observed surface profiles when the source was given an initial vertical distribution to account for the effects of wind shear upon horizontal dispersion. Short-term (i.e., 10 to 20 min averaging time) horizontal dispersion rates were essentially equal to the neutral Pasquill-Gifford curve. Dispersion coefficients from hourly-averaged concentration profiles were 30% larger than the PG neutral curve, but 50% smaller than a linear neutral curve based upon dispersion data collected downwind of a power plant.

Keywords: *Plumes, *Dispersing, Atmospheric circulation, Pollution transport, Simulation, Diffusion, Sulfur hexafluoride, Field tests, Mathematical models, Gauss equation, Reprints, Tracer gas, Beijing(Peoples Republic of China).

PB91-183277/REB PC **A02**/MF **A01**
Determination of Organic Emissions from New Carpeting. Journal article.
Environmental Protection Agency, Research Triangle Park, NC. Atmospheric Research and Exposure Assessment Lab.
J. D. Pleil, and R. S. Whiton. c1990, 9p EPA/600/J-90/462
Pub. in Appl. Occup. Environ. Hyg., v5 n10 p693-702 Oct 90. Prepared in cooperation with Northrop Services, Inc., Research Triangle Park, NC.

New carpeting has been the source of a number of indoor air health and odor complaints. Investigations of a variety of carpet samples have shown that there is a diversity of organic emissions among carpet types; some of the compounds found have been listed in the NIOSH Registry of Toxic Effects of Chemical Substances. The paper describes two complementary analytical methods for screening carpet samples: a 'headspace' method for volatile emissions and a Soxhlet extraction method using methylene chloride for the semi-volatile and non-volatile compounds. The analytical results from seven carpet types are presented with special emphasis on the compound 4-phenylcyclohexene, one of the causes of 'new carpet smell,' which has also been anectdotally linked to adverse short term health effects. Other compounds of possible interest that were found include dichlorobenzene, bis(2-ethylhexyl)-phthalate, triethyl phosphate, epsilon-caprolactam, and methylene-bis(4-isocyanatobenzene).

Keywords: *Indoor air pollution, *Carpets, *Air pollution detection, *Air pollution sampling, Volatile organic compounds, Organic compounds, Odors, Solvent extraction, Design criteria, Performance evaluation, Concentration(Composition), Reprints, Headspace delivery system, Cyclohexene/phenyl, Benzene/dichloro, Phthalic acid/bis(ethylhexyl-ester), Phosphoric acid/(triethyl-ester), Caprolactam, Benzene/methylene-bis(isocyanato).

PB91-183285/REB PC **A03**/MF **A01**
Use of Scavenging Ratios for the Inference of Surface-Level Concentrations and Subsequent Dry Deposition of Ca(2+), Mg(2+), Na(1+), and K(1+). Journal article.
Environmental Protection Agency, Research Triangle Park, NC. Atmospheric Research and Exposure Assessment Lab.
B. K. Eder, and R. L. Dennis. c1990, 22p EPA/600/J-90/461
Pub. in Water, Air, and Soil Pollution, v52 p197-216 1990.

The importance of the dry deposition of aerosols as a pathway for the transfer of alkaline material to ecosystems is discussed, as is the difficulty investigators face when trying to measure such deposition. Accordingly, an inference technique is developed which allows for the estimation of the annual and monthly dry deposition of Ca(2+), Mg(2+), Na(+) and K(+), based upon the linear relationship exhibited between the measured surface concentrations and wet deposition at 23 stations in Ontario, Canada for the period 1983-1985. Theoretically, this inference technique is based upon the premise that precipitation efficiently scavenges the aerosols, resulting in a strong correlation between concentrations within precipitation and the surface air concentrations. Because of the stochastic nature of such an approach, care must be taken to ensure that the assumptions inherent to precipitation scavenging and therefore this inference technique are carefully considered. Under such considerations, annual and monthly dry deposition of the alkaline aerosols can be estimated at many locations across North America where wet deposition measurements are routinely made. (Copyright (c) 1990 Kluwer Academic Publishers.)

Keywords: *Aerosols, *Air pollution, *Deposition, *Dry methods, *Ecosystems, Air water interactions, Land pollution, Concentration(Composition), Water pollution, Wet methods, Calcium ions, Magnesium ions, Potassium ions, Sodium ions, Alkalinity, Comparison, North America, Precipitation(Meteorology), Path of pollutants, Reprints.

PB91-183293/REB PC **A03**/MF **A01**
Velocity Oscillations and Plume Dispersion in a Residential Neighborhood during Wintertime Nights. Journal article.
Environmental Protection Agency, Research Triangle Park, NC. Atmospheric Research and Exposure Assessment Lab.
R. E. Eskridge, B. Lamb, and E. Allwine. c1990, 18p EPA/600/J-90/460
Pub. in Atmospheric Environment, v24A n7 p1781-1796 1990. Prepared in cooperation with Washington State Univ., Pullman. Lab. for Atmospheric Research.

Measurements of velocity and tracer plume concentrations during stable atmospheric conditions were obtained in the Boise river valley as part of the EPA Integrated Air Cancer Project during December, 1986. Wind speed, temperature, and wind direction were measured at two levels on a 30 m tower. Spectral and autocorrelation analyses of the velocity component data clearly indicate the occurrence of wave-like oscillations in the flow and almost complete lack of turbulent energy. The predominate wave-like motion had an oscillation period of about 1000 s. Hourly averaged horizontal dispersion coefficients were very large compared to the Pasquill-Gifford curves and the urban McElroy-Pooler dispersion curves. The time-averaged dispersion coefficients formed an upper bound on very short-term dispersion coefficients obtained from mobile traverses of the tracer plume with a continuous SF6 analyzer. Vertical dispersion rates were slightly smaller than the Pasquill-Gifford class F curve. Results from a single tracer release from a side canyon near the neighborhood showed that drainage flow from the tributary impacted the main residential sampling site at Elm Grove Park and represented a significant fraction of the upstream air flow at Elm Grove Park. For sources with equal emission rates, a source in the tributary adds about 10% to the mean of the concentration caused by a neighborhood source.

Keywords: *Plumes, *Dispersing, Atmospheric circulation, Pollution transport, Simulation, Smoke, Wind velocity, Oscillations, Mathematical models, Urban areas, Field tests, Sulfur hexafluoride, Valleys, Meteorological data, Reprints, US EPA Integrated Air Cancer Project, Boise(Idaho), Tracer gas.

PB91-183301/REB PC **A02**/MF **A01**
Summary of the 1990 EPA/A and WMA International Symposium: Measurement of Toxic and Related Air Pollutants. Journal article.
Environmental Protection Agency, Research Triangle Park, NC. Atmospheric Research and Exposure Assessment Lab.
R. K. M. Jayanty, and B. W. Gay. c1990, 9p EPA/600/J-90/459
Pub. in Jnl. of the Air Pollution Control Association, v40 n12 p1631-1637 Dec 90. See also PB90-197757. Presented at the Air and Waste Management Association and the Atmospheric Research and Exposure Assessment Symposium (5th), Raleigh, NC., May 1-4, 1990. Prepared in cooperation with Research Triangle Inst., Research Triangle Park, NC.

The technical program consisted of 187 presentations held in 20 separate sessions on recent advances in the measurement and monitoring of toxic and related pollutants found in ambient, source, and indoor atmospheres. The symposium covered a wide range of measurement topics and was supported by 66 exhibitors of instrumental and consulting services. More than 850 attendees from the United States and other countries attended. An overview of selected highlights from the technical presentations is given in this summary.

Keywords: *Meetings, *Air pollution, Radon, Air pollution control, Air pollution monitoring, Acid rain, Atmospheric chemistry, Toxic substances, Indoor air pollution, Ecology, Site surveys, Nicotine, Superfund, Air pollution effects(Plants), Occupational exposure, Reprints, Tobacco smoke.

PB91-183319/REB PC **A01**/MF **A01**
Health Effects Research Lab., Research Triangle Park, NC. Genetic Toxicology Div.
Stability of the Mutagenicity in Stored Cigarette Smokers' Urine and Extract. Journal article.
Environmental Health Research and Testing, Inc., Research Triangle Park, NC.
R. W. Williams, R. Watts, J. Inmon, T. Pasley, and L. Claxton. c1990, 5p EPA/600/J-90/458
Contract EPA-68-02-4456
Pub. in Environmental and Molecular Mutagenesis, v16 p246-249 Sep 90. Sponsored by Health Effects Research Lab., Research Triangle Park, NC. Genetic Toxicology Div.

Urine from cigarette smokers was analyzed for the effect upon mutagenic activity when stored for as long as 175 days. Frozen aliquots of urine were thawed out at various time points in the study and prepared for bioassay. These urine extracts were not bioassayed immediately, but rather refrozen until all of the unprocessed urine samples had eventually been prepared for bioassay. All extracts were obtained using cyanopropyl solid phase extraction techniques. At the end of 175 days, all extracts were bioassayed using a microsuspension assay of Salmonella typhimurium TA98. Urine from smokers was found to be mutagenic (14.4-30.9 revertants/ml equivalent) while a control set of urine from nonsmokers was not. Data from the storage study when analyzed by analysis of variance techniques indicated no statistical loss of mutagens occurred over the 175-day period although near significance was observed ($P = 0.054$). This near significance was the result of decreasing mutant response as storage time increased for two of the higher doses tested. (Copyright (c) 1990 Wiley-Liss, Inc.)

Keywords: *Mutagens, *Smoking, *Urine, Liquid chromatography, Mutagenicity tests, Bioassay, Salmonella typhimurium, Dose-response relationships, Reprints.

PB91-183327/REB PC **A02**/MF **A01**
Ester Hydrolysis Rate Constant Prediction from Infrared Interferograms. Journal article.
Environmental Research Lab., Athens, GA.
T. W. Collette. c1990, 8p EPA/600/J-90/456
Pub. in Environmental Science and Technology, v24 n11 p1671-1676 Nov 90.

A method for predicting reactivity parameters of organic chemicals from spectroscopic data is being developed to assist in assessing the environmental fate of pollutants. The prototype system, which employs multiple linear regression analysis using selected points from the Fourier transforms of mid-infrared gas-phase spectra, has been applied to the prediction of the alkaline hydrolysis rate constants (kOH) of 41 carboxylic acid esters. True predictions (calculations made for compounds not used to generate the calibration equation on which the prediction is made) of log kOH average within 43% of the experimental value for 36 of the esters (about 88% of the data set). For these compounds, a plot of calculated versus predicted log kOH values yields a correlation coefficient of 0.887.

Keywords: *Esters, *Reaction kinetics, *Hydrolysis, *Predictions, *Infrared spectra, Spectrum analysis, Regression analysis, Accuracy, Chemical reactivity, Reprints, Environmental reactivity.

PB91-183335/REB PC **A03**/MF **A01**
Environmental Research Lab., Athens, GA.
DO Model Uncertainty with Correlated Inputs. Journal article.
Nanjing Univ. (China).
Q. Song, and L. C. Brown. c1990, 19p EPA/600/J-90/457
Pub. in Jnl. of Environmental Engineering, v116 n6 p1164-1180 Nov/Dec 90. Prepared in cooperation with Tufts Univ., Medford, MA. Dept. of Civil Engineering. Sponsored by Environmental Research Lab., Athens, GA.

The effect of correlation among the input parameters and variables on the output uncertainty of the Streeter-Phelps water quality model is examined. Three uncertainty analysis techniques are used: sensitivity analysis, first-order error analysis, and Monte Carlo simulation. A modified version of the Streeter-Phelps model that includes nitrification, net algal oxygen production, and sediment oxygen demand is used. Analyses are performed for a wide variety of simulated stream flow conditions. Results show that the standard deviation of the predicted dissolved oxygen deficit (DOD) with correlated inputs potentially can be 20-40% larger than with independent inputs. Under conditions of moderate to high velocity, the reaeration and bio-oxidation coefficients are the dominant contributors to DOD uncertainty, while net oxygen production from algal activity and sediment oxygen demand are the major factors at low velocity. The largest effect of input correlation on DOD occurs in the vicinity of the sag point. Uncertainty results from first-order analysis differ by at most 10% from those of a Monte Carlo simulation for both correlated and independent inputs. (Copyright (c) 1990, ASCE.)

Keywords: *Water quality, *Computerized simulation, *Mathematical models, Nitrification, Biochemical oxygen demand, Monte Carlo method, Algae, Sediments, Oxygenation, Stream flow, Reprints, *Streeter-Phelps water quality model.

PB91-183343/REB PC **A03**/MF **A01**
Reductive Dechlorination of Dichlorophenols by Nonadapted and Adapted Microbial Communities in Pond Sediments. Journal article.
Environmental Research Lab., Athens, GA.
D. D. Hale, J. E. Rogers, and J. Wiegel. c1990, 14p EPA/600/J-90/455
Pub. in Microbial Ecology, v20 p185-196 Sep/Oct 90. Prepared in cooperation with Technology Applications, Inc., Athens, GA., and Georgia Univ., Athens. Dept. of Microbiology.

Fresh and dichlorophenol (DCP)-adapted sediments from two ponds near Athens GA exhibited distinctly different dechlorinating activities. These differences centered on the relative rates of reductive dechlorination in both fresh and adapted sediments and on the substrate specificity of the adapted sediments. Fresh Cherokee Trailer Park Pond sediment dechlorinated 2,3-, 2,4- and 2,6-DCP to monochlorophenols at a faster rate and after a shorter lag period than fresh Bolton's Pond sediment. Lag periods were not observed in either Cherokee or Bolton's sediments that had been adapted to dechlorinate either 2,3-, 2,4- or 2,6-DCP. Adapted Cherokee sediments exhibited faster dechlorinating rates and a broader substrate specificity than the adapted Bolton's sediments. The broad substrate specificity of each of the adapted Cherokee sediments contrasted sharply with the

narrow specificity of the 2,6-DCP-adapted Bolton's sediment. The preference for reductive dechlorination was ortho>meta or para in sediments from both ponds. (Copyright (c) Springer-Verlag New York Inc. 1990.)

Keywords: *Dechlorination, *Water pollution control, *Anaerobic processes, *Sediments, *Ponds, *Microbial degradation, Biodeterioration, DCP 2-4 herbicide, Chlorine organic compounds, Sewage sludge, Sediment-water interfaces, Soil surveys, Aquifers, Reprints, *Phenol/dichloro.

PB91-183350/REB PC **A03**/MF **A01**
Environmental Research Lab., Athens, GA.
Remobilization of Toxic Heavy Metals Adsorbed to Bacterial Wall-Clay Composites. Journal article.
Guelph Univ. (Ontario). Dept. of Microbiology.
C. A. Flemming, F. G. Ferris, T. J. Beveridge, and G. W. Bailey. c1990, 15p EPA/600/J-90/454
Grant EPA-R-813605
Pub. in Applied and Environmental Microbiology, v56 n10 p3191-3203 Oct 90. Sponsored by Environmental Research Lab., Athens, GA.

Significant quantities of Ag(I), Cu(II), and Cr(III) were bound to isolated Bacillus subtilis 168 walls, Escherichia coli K-12 envelopes, kaolinite and smectite clays, and the corresponding organic material-clay aggregates (1:1, wt/wt). These sorbed metals were leached with HNO3, Ca(NO3)2, EDTA, fulvic acid, and lysozyme at several concentrations over 48 h at room temperature. The remobilization of the sorbed metals depended on the physical properties of the organic and clay surfaces and on the character and concentration of the leaching agents. Cr was very stable in the wall, clay, and composite systems; pH 3.0, 500 microM EDTA, 120-ppm (mg/liter) fulvic acid, and 160-ppm Ca remobilized less than 32% (wt/wt) of sorbed Cr. Ag (45 to 87%) and Cu (up to 100%) were readily removed by these agents. Although each leaching agent was effective at mobilizing certain metals, elevated Ca or acidic pH produced the greatest overall mobility. The organic chelators were less effective. Lysozyme digestion of Bacillus walls remobilized Cu from walls and Cu-wall-kaolinite composites. but Ag, Cr, and smectite partially inhibited enzyme activity, and the metals remained insoluble. The extent of metal remobilization was not always dependent on increasing concentrations of leaching agents; for example, Ag mobility decreased with some clays and some composites treated with high fulvic acid, EDTA, and lysozyme concentrations. It is apparent that remobilization of toxic heavy metals in sediments, soils, and the vadose zone is a complicated issue.

Keywords: *Heavy metals, *Environmental transport, *Bacteria, *Waste disposal, Earth fills, Soil science, Desorption, Adsorption, Organic matter, Clays, Microbiology, pH, Leaching, Toxic substances, Sediments, Vadose water, Water pollution, Land pollution, Reprints.

PB91-183368/REB PC **A03**/MF **A01**
Distribution of Hydrophobic Ionogenic Organic Compounds between Octanol and Water: Organic Acids. Journal article.
Environmental Research Lab., Athens, GA.
C. T. Jafvert, J. C. Westall, E. Grieder, and R. P. Schwarzenbach. c1990, 11p EPA/600/J-90/453
Pub. in Environmental Science and Technology, v24 n12 p1795-1803 Dec 90. Prepared in cooperation with Oregon State Univ., Corvallis. Dept. of Chemistry, and Eidgenoessische Anstalt fuer Wasserversorgung, Abwasserreinigung und Gewaesserschultz, Duebendorf (Switzerland).

The octanol-water distributions of 10 environmentally significant organic acid compounds were determined as a function of aqueous-phase salt concentration (0.05-0.2 M LiCl, NaCl, KCl, CaCl2, or MgCl2) and pH. The compounds were pentachlorophenol, 2,3,4,5-tetrachlorophenol, (2,4,5-trichlorophenoxy)acetic acid, 4-chloro-alpha-(4-chlorophenyl)benzeneacetic acid, 2-methyl-4,6-dinitrophenol, (2,4-dichlorophenoxy)acetic acid, 4-(2,4-dichlorophenoxy)butanoic acid, 3,6-dichloro-e-methoxybenzoic acid, 2,3,6-trichlorobenzeneacetic acid, and 2-(2,4,5-trichlorophenoxy)propionic acid. The experimental results were interpreted quantitatively with an equilibrium model that accounts for acid dissociation in the aqueous phase and partitioning into the octanol phase by the neutral organic species, free inorganic and organic ions, and ion pairs. The partition constants for the neutral ion pairs correlate well with the partition constants of the neutral acids. Two experiments address the applicability of these octanol-water distribution data to the distribution of ionogenic compounds in the environment: the distribution of 2-methyl-4,6-dinitrophenol on a natural sorbent as a function of salt concentration (NaCl and CaCl2) and pH, and competitive adsorption of pentachlorophenol and 2,3,4,5-tetrachlorophenol on an environmental sorbent. (Copyright (c) 1990 American Chemical Society.)

Keywords: *Water pollution, *Sorbents, *Organic compounds, *Water chemistry, *Environmental research, Sediments, Soil science, Ion exchanging, Adsorption, Desorption, Mathematical models, pH, Chemical equilibrium, Octanol, Chlorine organic compounds, Acids, Reaction kinetics, Reprints, Chemical reaction mechanisms, Phenol/methyl-dinitro, Activity coefficients, CAS Registry No: 7732-18-5, 111-87-5.

PB91-183376/REB PC **A02**/MF **A01**
Environmental Protection Agency, Research Triangle Park, NC. Air and Energy Engineering Research Lab.
Apparatus for Short Time Measurements in a Fixed-Bed Gas/Solid Reactor. Journal article.
Acurex Corp., Research Triangle Park, NC.
B. K. Gullett, K. R. Bruce, and R. M. Machilek. c1990, 8p EPA/600/J-90/452
Contract EPA-68-02-4701
Pub. in Review of Scientific Instruments, v61 n2 p904-906 Feb 90. Sponsored by Environmental Protection Agency, Research Triangle Park, NC. Air and Energy Engineering Research Lab.

The article describes an apparatus for the exposure of a solid to reactive process gas. The switch makes possible short time exposures (equal to or greater than 0.3 s) in a fixed-bed reactor for kinetic studies of rapid reactions.

Keywords: *Chemical reactors, *Air pollution control, Reaction kinetics, Design, Sorbents, Technology assessment, Reactivity, Calcium hydroxides, Sulfur dioxide, Calcium sulfates, Laboratory tests, Stationary sources, Reprints, *Fixed bed reactors, Gas solid reactions.

PB91-183384/REB PC **A02**/MF **A01**
Environmental Protection Agency, Research Triangle Park, NC. Atmospheric Research and Exposure Assessment Lab.
Isotopic Exchange between Carbon Dioxide and Ozone via O((sup 1)D) in the Stratosphere. Journal article.
California Inst. of Tech., Pasadena.
Y. L. Yung, W. B. DeMore, and J. P. Pinto. c1991, 6p
CONTRIB-4889, EPA/600/J-91/027
Grants EPA-R-816418, EPA-9D4-25-NALX
Pub. in Geophysical Research Letters, v18 n1 p13-16 Jan 91. Prepared in cooperation with Jet Propulsion Lab., Pasadena, CA. Sponsored by Environmental Protection Agency, Research Triangle Park, NC. Atmospheric Research and Exposure Assessment Lab., and National Aeronautics and Space Administration, Washington, DC.

The authors propose a novel mechanism for isotopic exchange between CO2 and O3 via O ((1)D) + CO2 -> CO3 followed by CO3 -> CO2 + O((3)P). A one-dimensional model calculation shows that the mechanism can account for the enrichment in 18O in the stratospheric CO23 observed by Gamo et al. (1989), using the heavy O3 profile observed by Mauersberger (1981). The implication of the mechanism for other stratospheric species and as a source of isotopically heavy CO2 in the troposphere are briefly discussed.

Keywords: *Atmospheric chemistry, *Stratosphere, *Carbon dioxide, *Ozone, *Isotopic exchange, Molecular energy levels, Reaction kinetics, Photochemical reactions, Air pollution, Troposphere, One-dimensional calculation, Mathematical models, Reprints, Chemical reaction mechanisms.

PB91-183392/REB PC **A02**/MF **A01**
Particulate Characteristics and Visual Effects of the Atmosphere at Research Triangle Park. Journal article.
Environmental Protection Agency, Research Triangle Park, NC. Atmospheric Research and Exposure Assessment Lab.
W. D. Conner, R. L. Bennett, W. S. Weathers, and W. E. Wilson. c1991, 9p EPA/600/J-91/026
Pub. in Jnl. of Air and Waste Management Association, v41 p154-160 1991.

During a one-month period in the fall of 1987 a wide range in the visual quality of the atmosphere at Research Triangle Park, NC, was observed. During the period, the light scatter coefficient; SO2, NO2, and O3 concentrations; temperature; relative humidity; and radiation intensity of the atmosphere were continuously monitored. In addition, 60 filter samples were intermittently collected with two dichotomous (large and small particle) size-selective samplers. The dichotomous samplers were operated concurrently to obtain samples on Teflon and quartz filters for different analyses. Also collected were six impactor samples for sulfate size distribution analysis; and at selected times during the study, long-path measurements were made of the atmospheric extinction coefficient and the extinction of contrast by the atmosphere. (Copyright (c) 1991--Air & Waste Management Association.)

Keywords: *Aerosols, *Atmospheric effects, *Visibility, *Light scattering, *Particle size distribution, Sulfur, Carbon, Sulfates, Meteorological data, Atmospheric chemistry, Reprints, *Research Triangle Park(North Carolina).

PB91-183400/REB PC **A03**/MF **A01**
Particle Transmission Characteristics of an Annular Denuder Ambient Sampling System. Journal article.
Environmental Protection Agency, Research Triangle Park, NC. Atmospheric Research and Exposure Assessment Lab.
C. W. Lewis, Y. Ye, C. J. Tsai, and D. Y. H. Pui. c1991, 12p EPA/600/J-91/025
Pub. in Aerosol Science and Technology, v14 p102-111 1991. Prepared in cooperation with Minnesota Univ., Minneapolis. Particle Technology Lab.

Transmission measurements have been performed on University Research Glassware, Inc. model 2000-30B glass annular denuders at 10 L/min using monodisperse particles in the 0.01-1-micrometer diameter size range. Through control of the aerosol charge state, particle losses due to diffusion and electrostatic effects were separately measured and theoretical descriptions of both were developed. For Boltzmann charged (atmospheric) particles in the important 0.1-1-micrometer diameter size range total losses averaged only a few percent or less. Particle transmission measurements also confirmed the design value of 2.5 micrometer for the 50% cutpoint diameter of the URG 2000-30EN cyclone inlet used with these annular denuders. (Copyright (c) 1991 Elsevier Science Publishing Co., Inc.)

Keywords: *Air samplers, *Aerosols, Charged particles, Air pollution, Surface properties, Laboratory tests, Performance evaluation, Electrostatics, Diffusion, Transmission, Scattering loss, Annular nozzles, Reprints, *Annular denuders.

PB91-183418/REB PC **A03**/MF **A01**
Chemical Reactions and Transport of Alkanes and Their Products in the Troposphere. Journal article.
Environmental Protection Agency, Research Triangle Park, NC. Atmospheric Research and Exposure Assessment Lab.
A. P. Altshuller. c1991, 45p EPA/600/J-91/024
Pub. in Jnl. of Atmospheric Chemistry, v12 p19-61 1991.

The product distributions have been calculated for the more abundant alkanes contributing most of the carbon atoms in the alkane fraction of an ambient air hydrocarbon mixture reasonably representative of U.S. emissions. The effects of ambient temperatures on product yields has been calculated for a range of temperatures from 250K to 330K. Chemical lifetimes are estimated at 300K under summertime conditions for hydrocarbons and for products of alkane photooxidation in the atmosphere. The calculations predict a substantial effect of temperature on product yields. A large decrease in alkyl nitrate yields and a smaller decrease in ketone yields occurs with increasing temperature. The yields of the short-lived more reactive aldehydes undergo substantial increases with increasing temperature. Four lower molecular weight oxygenated products account for over half of the total alkane carbon atoms converted to products. The effects of increased temperature on product reactivity and radical production may also influence O3 production.

Keywords: *Alkanes, *Air pollution, *Pollution transport, Urban areas, *Photochemical reactions, United States, Troposphere, Reaction kinetics, Hydroxyl radicals, Temperature, Summer, Aldehydes, Reactivity, Tables(Data), Reprints, Alkyl nitrates.

PB91-183426/REB PC **A02**/MF **A01**
Accumulation Factors for Eleven Polychlorinated Biphenyl Congeners. Journal article.
Environmental Research Lab.-Narragansett, Newport, OR. Mark O. Hatfield Marine Science Center.
S. P. Ferraro, H. Lee, L. M. Smith, R. J. Ozretich, and D. T. Specht. c4 Jul 90, 9p EPA/600/J-91/028, ERNL-N107
Pub. in Environmental Contamination and Toxicology, v46 p276-283 1991.

According to the fugacity approach (Mackay 1979), pollutant uptake by an organism is determined by the chemical fugacity differential between the organism and its environment. The Accumulation Factor (AF = (concentration of pollutant in animal tissue, C(sub t) (nanograms/g dry wt)/animal lipid (%/100))/(concentration of pollutant in sediment, C(sub s) (nanograms/g dry wt)/sediment total organic carbon, TOC (%/100))) is a simple, fugacity-based model which has been shown to be useful for predicting the bioaccumulation potential of hydrophobic neutral organic compounds in sediment-dwelling animals (Rubinstein et al. 1987; McElroy and Means 1988; Clarke et al. 1988; Ferraro et al. 1990). The theoretical basis for the AF model is discussed in Mackay (1979), Mackay and Paterson (1981, 1982), McFarland (1984), McFarland and Clarke (1986), and Lake et al. (1987). The model assumes chemical equilibrium or steady-state in the animals and the sediments to which they are exposed, no chemical transformation or phase transfer resistance, and chemical partitioning primarily between the organic pool in the sediment and the lipid pool in the animal.

Keywords: *Water pollution effects, *Bioaccumulation, *Polychlorinated biphenyls, *Sediments, *Aquatic animals, *Mathematical models, Exposure, Concentration(Composition), Tissues(Biology), Biological effects, Toxicity, Reprints, *Accumulation factors, *Chemical fugacity.

PB91-183434/REB PC **A02**/MF **A01**
Identification of Nonpolar Toxicants in Effluents Using Toxicity-Based Fractionation with Gas Chromatography/Mass Spectrometry. Journal article.
National Effluent Toxicity Assessment Center, Duluth, MN.
L. P. Burkhard, E. J. Durhan, and M. T. Lukasewycz. c1991, 8p EPA/600/J-91/023
Pub. in Analytical Chemistry, v63 p227-283 1991. Prepared in cooperation with AScI Corp., Duluth, MN.

A toxicity-based method to identify nonpolar organic toxicants in effluents has been developed. The method has low artifactual toxicity and excellent detection limits, allows multiple toxicant situations to be easily handled, and features the use of cladocerans and fishes as test organisms and gas chromatography/mass spectrometry (GC/MS) to identify the toxicants. The method uses reverse-phase chromatography techniques to extract and fractionate the nonpolar organic toxicants from the effluent. GC/MS analyses are performed on the toxic fractions, and lists of tentative compound identifications are made by interpretation of the mass spectra and elution information from the chromatographic separations. These initial lists are refined by assembling and then comparing toxicity data of the identified chemicals to the toxicity of the fraction. The refined lists of suspect chemicals are further evaluated by pure chemical toxicity testing, and this process ultimately leads to toxicant identification. The fractionation scheme, instrumental parameters, the toxicant identification process, an example illustrating the method, and discussion relevant to the method are presented. (Copyright (c) 1991 American Chemical Society.)

Keywords: *Toxicology, *Effluents, *Organic compounds, *Water pollution, *Liquid chromatography, *Mass spectroscopy, Aquatic animals, Fractionation, Lethal dosage, Validation, Reprints.

PB91-183442/REB PC **A02**/MF **A01**
Ecology of Quiescent Microbes. Viewing Microbial Habitats as Interacting Zones of Proliferation and Quiescence Can Give New Insights into the Operation of Microbial Communities in the Environment. Journal article.
Environmental Research Lab., Athens, GA.
D. L. Lewis, and D. K. Gattie. c1991, 8p EPA/600/J-91/022
Pub. in ASM News, v57 n1 p27-32 Jan 91. Prepared in cooperation with Technology Applications, Inc., Athens, GA.

Viewing microbial habitats as interacting zones of proliferation and quiescence can give new insights into the operation of microbial communities in the environment. Microorganisms proliferate in diverse circumstances and are the principal mediators of many processes affecting the world. However, not all microorganisms are reproducing. The total microbial biomass, in fact, includes many cells in a state of suspended animation, or quiescence. Although scant attention is usually given to this 'sleeping' portion of the microbial community, quiescent microbes may be critically important in ecosystems, especially in system-level responses to environmental changes. Quiescent microbes play roles in processes such as photosynthesis, nutrient cycling, and productivity. Thus, from the perspective of ecological studies, it is particularly important to expand the research focus beyond the traditional examination of what microorganisms are doing when they are doing something. This expanded approach would include studies of where, when, and how quiescent microbial forms occur in the environment and the ramifications of temporarily storing various fractions of microbial populations in a quiescent state.

Keywords: *Microorganisms, *Ecology, Water microbiology, Soil microbiology, Cell division, *Quiescent microbes.

PB91-183459/REB PC **A02**/MF **A01**
Effects of 3,4-Methylenedioxymethamphetamine on Autonomic Thermoreregulatory Responses of the Rat. Journal article.
Health Effects Research Lab., Research Triangle Park, NC.
C. J. Gordon, W. P. Watkinson, J. P. O'Callaghan, and D. B. Miller. c1991, 8p EPA/600/J-91/021
Pub. in Pharmacology Biochemistry and Behavior, v38 p339-344 1991.

3,4-methylenedioxymethamphetamine (MDMA), a substituted amphetamine analogue which stimulates serotonin release in the CNS, has been shown to induce near lethal elevations in core temperature in the rat. To characterize the effects of MDMA on temperature regulation, the study measured metabolic rate (MR), evaporative water loss (EWL), motor activity (MA), and colonic temperature (Tc) in male, Long-Evans rats at 60 min following 30 mg/kg (s.c.) MDMA or saline at ambient temperatures (Ta) of 10, 20, and 30C. MDMA caused an elevation in MR at Ta's of 20 and 30C but had no effect at 10C. At a Ta of 30C, MR of the MDMA group was double that of the saline group. EWL was elevated by MDMA, an effect which was potentiated with increasing Ta. MDMA also elicited an increase in MA at all three Ta's. MDMA led to a 3.2C increase in Tc at 30C, no change in Tc at 20C, and a 2.0C decrease in Tc at 10C. The data suggest that, at relatively warm Ta's, MDMA-induced stimulation of serotonergic pathways causes an elevation in MR and peripheral vasoconstriction, thus producing life-threatening elevations in Tc. The increase in EWL following MDMA partially attenuates the hyperthermia at warm Ta's and leads to hypothermia in the rat maintained at a cold Ta of 10C.

Keywords: *Toxicology, *Body temperature regulation, *Autonomic nervous system, Rats, Vasoconstriction, Hypothermia, Hyperthermia, Sodium chloride, Motor activity, Heart rate, Metabolism, Reprints, *Methylenedioxyamphetamines.

PB91-183467/REB PC **A02**/MF **A01**
Comparative Effects of Hypoxia on Behavioral Thermoregulation in the Rats, Hamsters, and Mice. Journal article.
Health Effects Research Lab., Research Triangle Park, NC.
C. J. Gordon, and L. Fogelson. 1991, 8p EPA/600/J-91/020
Pub. in American Jnl. of Physiology, v260 n1 pt2 pR120-R125 Jan 91.

Recent studies using reptiles and other ectothermic species have shown that hypoxia lowers the set-point for the control of body temperature. This is characterized by a preference for cooler ambient (T(sub a)) and deep body temperatures (T(sub b)) when placed in a temperature gradient. To elucidate the presence of this effect in mammals, the selected T(sub a) and T(sub b) of three rodent species, mouse, hamster, and rat, were measured while subjected to graded hypoxia in a temperature gradient. Individual animals were placed in the gradient for 30 min. Percentage O2 of air entering the gradient was then reduced to a constant level for a period of 60 min by dilution with nitrogen. T(sub b) was significantly reduced in all species at O2 levels of 5.5 to 10%. Selected T(sub a) was significantly reduced in the mouse at O2 levels of 5.5 and 7.3%. Selected T(sub a) of the hamster and rat were reduced slightly at percentage O2 levels of 5.8 and 7.4%, respectively; however, the effect was not statistically significant. Both species exhibited a significant reduction in selected T(sub a) during hypoxia concomitant with hypothermia. These data support the hypothesis that hypoxia lowers the set-point for the control of body temperature in rodents.

Keywords: *Hypoxia, *Animal behavior, *Body temperature regulation, Rats, Mice, Hamsters, Statistical analysis, Species diversity, Comparative evaluations, Oxygen, Reprints.

PB91-183475/REB PC **A03**/MF **A01**
Comparison of Mutagenicity Results for Nine Compounds Evaluated at the 'hgprt' Locus in the Standard and Suspension CHO Assays. Journal article.
Health Effects Research Lab., Research Triangle Park, NC.
M. M. Moore, L. Parker, J. Huston, K. Harrington-Brock, and K. L. Dearfield. c1991, 11p EPA/600/J-91/019
Pub. in Mutagenesis, v6 n1 p77-85 Jan 91. Prepared in cooperation with Environmental Health Research and Testing, Inc., Research Triangle Park, NC.

The Chinese hamster ovary (CHO) assay, which measures newly induced mutations at the hypoxanthine-guanine phosphoribosyltransferase (hgprt) locus, has been widely used for mutagenesis testing. The insensitivity of the standard assay to some genotoxic agents has been speculated to be due to the relatively small number of cells used in the assay. The present study compares the standard monolayer assay with a suspension adapted assay which uses cell numbers comparable to that of the L5178Y mouse lymphoma assay. Nine compounds, ethyl methanesulfonate (EMS), methyl methanesulfonate (MMS), 2-methoxy-6-chloro-9-(3-(ethyl-2-chloroethyl)-aminopropylamino)-acridine 2HCl (ICR 170), methyl acrylate, ethyl acrylate, tetraethylene glycol diacrylate, trimethylolpropane triacrylate, 2-ethylhexyl acrylate, and dicyclopentenyloxyethyl methacrylate were evaluated in the monolayer and suspension assays. Both assays gave the same overall positive/negative evaluation for the test compounds. There were some quantitative differences in the mutant frequency for the three compounds found to be mutagenic (EMS, MMS, and ICR 170). The acrylates (many of which appear to exert their genotoxic effect through a clastogenic mechanism) were negative in both test systems. The use of the suspension assay did not improve the ability of the hgprt locus to detect the genotoxicity of the acrylates.

Keywords: *Mutagens, *Chromosome mapping, *Hypoxanthine phosphoribosyltransferase, Mutagenicity tests, Chinese hamsters, Comparative evaluations, Acrylates, Ethyl methanesulfonate, Methyl methanesulfonate, Acridines, Tables(Data), Dose-response relationships, Thymidine kinase, Reprints, Mouse lymphoma assay.

PB91-183483/REB PC **A03**/MF **A01**
Functional Deficits Produced by 3-Methylindole-Induced Olfactory Mucosal Damage Revealed by a Simple Olfactory Learning Task. Journal article.
Health Effects Research Lab., Research Triangle Park, NC.
D. B. Peele, S. D. Allison, B. Bolon, J. D. Prah, and K. F. Jensen. c1991, 14p EPA/600/J-91/018
Pub. in Toxicology and Applied Pharmacology, v107 n2 p191-201 Feb 91. Prepared in cooperation with Northrop Services, Inc., Research Triangle Park, NC., and Chemical Industry Inst. of Toxicology, Research Triangle Park, NC.

Methods for assessing functional consequences of olfactory mucosal damage were examined in rats exposed to 3-methylindole (3-MI). Treatment with 3-MI (400 mg/kg) induced severe degeneration of olfactory sensory epithelium followed by regeneration, fibrous adhesions and osseous remodeling of the nasal passages. At 100 mg/kg, there was mild Bowman's gland hypertrophy while the sensory epithelium remained intact. Rats treated with 3-MI demonstrated a dosage-related deficit in acquiring an olfactory learning task which was not due to altered cognitive abilities, as determined by subsequent testing in a step-through passive avoidance task. The results confirm the conclusion that alterations in functional indices resulted from 3-MI-induced anosmia and demonstrate the utility of simple learning tasks in assessing functional capacity following olfactory epithelial damage in rats. (Copyright (c) 1991 Academic Press, Inc.)

Keywords: *Toxicology, *Skatole, *Nasal mucosa, Rats, Sensory thresholds, Cognition, Animal behavior, Pathology, Reprints, *Olfactory learning.

PB91-183491/REB PC **A03**/MF **A01**
Murine Susceptibility to Organophosphorus-Induced Delayed Neuropathy (OPIDN). Journal article.
Health Effects Research Lab., Research Triangle Park, NC. Neurotoxicology Div.
B. Veronesi, S. Padilla, K. Blackmon, and C. Pope.
c1991, 16p EPA/600/J-91/017
Pub. in Toxicology and Applied Pharmacology, v107 n2 p311-324 Feb 91. Prepared in cooperation with North Carolina Univ. at Chapel Hill.

The study reports that CD-1 strain mice are neuropathologically and biochemically responsive to acute doses of tri-ortho-cresyl phosphate (TOCP). Young (25-30 g) male and female animals were exposed (po) to a single dose of TOCP (580-3480 mg/kg) and sampled for neurotoxic esterase (NTE) activity at 24 and 44 hr postexposure and for neuropathic damage 14 days later. Biochemically, high intragroup variability existed at the lower doses, and at higher levels of TOCP exposure (i.e., > or = 1160 mg/kg), mean brain NTE inhibition never exceeded 68%. Hen and mouse brain NTE activity, assayed in vitro for sensitivity to inhibition by tolyl saligenin phosphate (TSP), the active neurotoxic metabolite of TOCP, showed similar IC50 values. Histologically, highly variable spinal cord damage was recorded throughout treatment groups and mean damage scores followed a dose-response pattern with no apparent correlation to threshold (i.e., > or = 65%) inhibition of brain NTE activity. Topographically, axonal degeneration in the mouse spinal cord predominated in the lateral and ventral columns of the upper cervical cord. Unlike the rat, which displays degeneration in the upper cervical cord's dorsal columns (i.e., gracilis fasciculus) in response to TOCP intoxication, treated mice showed minimal damage to this tract. To examine this discrepancy further, ultrastructural morphometric analysis of axon diameters in the cervical cord was performed in control mice and rats. These results indicated that in both species, the largest diameter (> or = 4 microm) axons are housed in the ventral columns of the cervical spinal cord, suggesting that axon length and diameter may not be the only criteria underlying fiber tract vulnerability in OPIDN. (Copyright (c) 1991 Academic Press, Inc.)

Keywords: *Toxicology, *Disease susceptibility, *Tritolyl phosphates, Mice, Histology, Spinal cord, Axons, Esterases, Enzyme inhibitors, Reprints, *Organophosphorus-induced delayed neuropathy(OPIDN).

PB91-183509/REB PC **A03**/MF **A01**
Analysis of the Genotoxicity of Anthraquinone Dyes in the Mouse Lymphoma Assay. Journal article.
Health Effects Research Lab., Research Triangle Park, NC.
K. Harrington-Brock, L. Parker, C. Doerr, M. C. Cimino, and M. M. Moore. c1991, 14p EPA/600/J-91/016
Pub. in Mutagenesis, v6 n1 p35-46 Jan 91. Prepared in cooperation with Environmental Health Research and Testing, Inc., Research Triangle Park, NC.

Despite their widespread use and potential for significant human exposure, genotoxicity data on anthraquinones and other dyes are generally limited. The study examined 16 anthraquinones and one azo dye (Solvent Red 1) using the thymidine kinase (tk) locus and micronucleus (MN) analysis in L5178Y/TK(sup +/-) -3.7.2C mouse lymphoma cells. Disperse Blue 7, 2-aminoanthraquinone, 1-amino-2-methylanthraquinone, Disperse Blue 3, and Disperse Red 11 were genotoxic. Reactive Blue 19 was weakly mutagenic. Vat Yellow 4 and Solvent Red 1, with exogenous activation, were also mutagenic. With activation 1-nitro-2-methylanthraquinone was judged to give an equivocal mutagenicity response. Those chemicals that did not induce mutation or cytotoxicity at the limits of solubility were classified separately. Compounds which were not evaluated without exogenous activation because of insolubility but were evaluated with activation include 1-nitro-2-methylanthraquinone, Solvent Red 1, and Vat Yellow 4. Compounds which were not evaluated either with or without S-9 activation because of their insolubility in the culture medium include 1-amino-2,4-dibromoanthraquinone, D&C Green, Disperse Blue 1, Disperse Red 60, Vat Blue 4, Vat Blue 20, Vat Brown 1, and Vat Brown 3.

Keywords: *Anthraquinones, *Dyes, *Mutagenicity tests, Thymidine kinase, Metabolic activation, Carcinogenicity tests, Mutation, Tables(Data), Cell survival, Reprints, *Mouse lymphoma assay.

PB91-183517/REB PC **A02**/MF **A01**
Physiological Consequences of Early Neonatal Growth Retardation: Effects of alpha-Difluoromethylornithine on Renal Growth and Function in the Rat. Journal article.
Health Effects Research Lab., Research Triangle Park, NC. Perinatal Toxicology Branch.
J. A. Gray, and R. J. Kavlock. c1991, 10p EPA/600/J-91/015
Pub. in Teratology, v43 n1 p19-26 Jan 91.

The physiological consequences of early neonatal growth retardation in the kidney were investigated using DFMO (alpha-difluoromethylornithine), a specific irreversible inhibitor of ornithine decarboxylase (ODC), a key enzyme in the biosynthesis of polyamines. The study administered 500 mg/kg/day DFMO, or saline, to Sprague-Dawley rat pups from the day of birth through postnatal day (PD) 6 and evaluated renal function on PD 4, 7, 10, and 13 using tests of basal renal clearance and urinary concentrating ability. Kidney weights and gross pathology were also obtained. On PD 39, serum chemistries and organ weights were determined. In a second experiment, the study evaluated concentrating ability on PD 7-10, and basal renal function, concentrating ability, diuretic response, serum chemistries and organ weights on PD 132-140. DFMO selectively inhibited renal growth, but did not inhibit glomerular and tubular functional maturation. The rates of filtration and reabsorption (per g renal tissue), and concentrating ability were increased in treated pups. The renal growth retardation induced by neonatal administration of DFMO was associated with an apparent precocious maturation of function in the early postnatal period and dysfunction in adulthood, thus demonstrating that the physiological consequences of growth retardation are not always obvious and predictable, and must be evaluated on a case by case basis.

Keywords: *Alpha-difluoromethylornithine, *Enzyme inhibitors, *Growth disorders, Kidney, Organ weight, Ornithine decarboxylase, Kidney function tests, Blood chemical analysis, Kidney concentrating ability, Rats, Reprints.

PB91-183525/REB PC **A03**/MF **A01**
Environmental Monitoring Systems Lab., Las Vegas, NV.
RCRA Ground-Water Monitoring Decision Procedures Viewed as Quality Control Schemes. Journal article.
Nevada Univ., Las Vegas. Environmental Research Center.
T. H. Starks, and G. T. Flatman. c1991, 21p EPA/600/J-91/014
Grant EPA-R-814342
Pub. in Environmental Monitoring and Assessment, v16 p19-37 1991. Sponsored by Environmental Monitoring Systems Lab., Las Vegas, NV.

The problems of developing and comparing statistical procedures appropriate to the monitoring of ground water at hazardous waste sites are discussed. It is suggested that these decision procedures should be viewed as quality control schemes and compared in the same way that industrial quality control schemes are compared. The results of a Monte Carlo simulation study of run-length distribution of a combined Shewhart-CUSUM quality control scheme are reported. (Copyright (c) 1991 Kluwer Academic Publishers.)

Keywords: *Water pollution sampling, *Hazardous materials, *Waste disposal, *Ground water, Quality control, Statistical analysis, Decision making, Comparison, Monte Carlo method, Pollution regulations, Reprints, Resource Conservation and Recovery Act.

PB91-183533/REB PC **A02**/MF **A01**
Army Biomedical Research and Development Lab., Fort Detrick, MD.
Multilaboratory Evaluation of Methods for Detecting Enteric Viruses in Soils. Journal article.
Environmental Protection Agency, Cincinnati, OH. Risk Reduction Engineering Lab.
C. J. Hurst, S. A. Schaub, M. D. Sobsey, S. R. Farrah, and C. P. Gerba. cFeb 91, 9p EPA/600/J-91/013
Pub. in Applied and Environmental Microbiology, v57 n2 p395-401 Feb 91. Prepared in cooperation with North Carolina Univ. at Chapel Hill. Dept. of Environmental Sciences and Engineering, Florida Univ., Gainesville. Dept. of Microbiology and Cell Science, and Arizona Univ., Tucson. Dept. of Microbiology and Immunology. Sponsored by Army Biomedical Research and Development Lab., Fort Detrick, MD.

Two candidate methods for the recovery and detection of viruses in soil were subjected to round robin comparative testing by members of the American Society for Testing and Materials D19:24:04:04 Subcommittee Task Group. Selection of the methods was based upon results of an initial screening which indicated that both met basic criteria considered essential by the task group. Both methods utilized beef extract solutions to achieve desorption and recovery of viruses from representative soils: a fine sand soil; an organic muck soil; a sandy loam soil; and a clay soil. The Berg method seemed to produce slightly higher virus recovery values, however the differences in virus assay titers for samples produced by the two methods were not statistically significant ($p < \text{or} = 0.05$) for any one of the four soils. Despite this lack of a Method Effect, there was a statistically significant Laboratory Effect exhibited by assay titers from the independent versus reference laboratories for two of the soils, the sandy loam and clay.

Keywords: *Enteroviruses, *Soil microbiology, pH, Statistical analysis, Soil chemistry, Wastewater, Water microbiology, Reprints.

PB91-183541/REB PC **A03**/MF **A01**
Environmental Protection Agency, Cincinnati, OH. Risk Reduction Engineering Lab.
Incineration Treatment of Arsenic-Contaminated Soil. Journal article.
Acurex Corp., Mountain View, CA.
L. R. Waterland, C. King, M. K. Richards, and R. C. Thurnau. c1991, 13p EPA/600/J-91/012
Contract EPA-68-C9-0038
Pub. in Remediation, p227-237 Spring 1991. Sponsored by Environmental Protection Agency, Cincinnati, OH. Risk Reduction Engineering Lab.

An incineration test program was conducted at the US Environmental Protection Agency's Incineration Research Facility to evaluate the potential of incineration as a treatment option for contaminated soils at the Baird and McGuire Superfund site in Holbrook, Massachusetts. The purpose of these tests was to evaluate the incinerability of these soils in terms of the fate of arsenic and lead and the destruction of organic contaminants during the incineration process. The test program consisted of a series of bench-scale experiments with a muffle furnace and a series of incineration tests in a pilot-scale rotary kiln incinerator system. The study reported in the paper was funded by the Environmental Protection Agency under Contract 68-C9-0038 to Acurex Corporation. It has been subjected to the Agency's review and has been approved for publication. Mention of trade names or commercial products does not constitute endorsement or recommendation for use.

Keywords: *Incineration, *Remedial action, *Soil contamination, *Waste management, *Superfund, *Air pollution control, Organic compounds, Lead(Metal), Arsenic, Land pollution control, Pesticides, Performance evaluation, Soil treatment, Reprints, Holbrook(Massachusetts), EPA region 1, Cleanup operations.

PB91-183566/REB PC **A11**/MF **A02**
Office of Radiation Programs, Washington, DC.

National Radon Contractor Proficiency (RCP) Program. Proficiency Report, June 1991.
ICF, Inc., Fairfax, VA.
Jun 91, 234p EPA/520/1-91/016
Contract EPA-68-D-90170
See also PB91-131300. Sponsored by Office of Radiation Programs, Washington, DC.

The primary objective of the U.S. Environmental Protection Agency's (EPA) efforts to address the indoor radon problem is to reduce radon levels in buildings throughout the country. Achieving the objective requires a nationwide supply of capable radon mitigation contractors. In the Indoor Radon Abatement Act of 1988, Congress authorized EPA to establish a program to evaluate radon mitigation contractors and to provide the information to the public in cooperation with the States. The Radon Contractor Proficiency (RCP) Program was developed to assist States, EPA Regions, local government officials, and the public in selecting contractors who have demonstrated their proficiency in reducing indoor radon levels. The program is managed by the EPA Office of Radiation Programs' Radon Division. Under the voluntary program, radon contractors demonstrate their proficiency by meeting specific Program requirements. Individual contractors who meet these requirements are then listed in periodic RCP Proficiency Reports.

Keywords: *Air pollution control, *Indoor air pollution, *Radon, *Radionuclide migration, *Contractors, State government, US EPA, Buildings, Public information, Performance standards, Regional analysis, Tables(Data), Information transfer, *Radon Contractor Proficiency Program, Cooperative agreements, Indoor Radon Abatement Act of 1988.

PB91-186965/REB PC **A20**
Biological Assessment of Toxicity Caused by Chemical Constituents Eluted from Site Soils Collected at the Drake Chemical Superfund Site, Lock Haven, Clinton Co., Pennsylvania.
Corvallis Environmental Research Lab., OR.
J. Greene. Feb 91, 456p EPA/600/3-91/011
Portions of this document are not fully legible.

The site was used to manufacture specialty intermediate chemicals for the producers of dyes, pharmaceuticals, cosmetics, herbicides, and pesticides. The herbicide Fenac (2,3,6-trichlorophenylacetic acid) is a major on- and off-site contaminant. One-hundred-twenty-eight soils were collected. Elutriates were prepared for toxicity evaluation of water extractable constituents. The chemical nature of the elutriates was so complex that it was impossible to determine chemical cause/biological effect relationships based on chemical analyses alone. Bioassays identified locations of toxicity on the site without identifying the causative agents; important because numerical criteria are not available for many organic chemicals and there is little understanding of the affects of mixtures of chemicals in complex wastes on test organisms or the environment. The measured response represents an actual assessment of any synergistic or antagonistic interactions. Fifty-nine percent of the 128 elutriates were toxic to the algae Selenastrum capricornutum and 43 percent were toxic to Daphnia magna. Both organisms indicated that toxic sample numbers increased with depth of sampling. The Toxi-chromotest (bacteria) revealed toxicity in 2.3% of the 128 elutriates; all had been identified by algae and Daphnia. Ten elutriates were toxic only to Daphnia and 30 only to S. capricornutum. Fifty-one were toxic to both algae and Daphnia, but Daphnia was most sensitive in only 8 elutriates. If one test was used, 10 to 30 toxic elutriates would have not been identified, depending on the test organism selected.

Keywords: *Biological effects, *Chemical compounds, *Superfund, *Land pollution, *Waste disposal, Soil contamination, Toxicity, Microorganisms, Site surveys, Bioassay, Herbicides, Toxic substances, Chemical analysis, Hazardous materials, Algae, Bacteria, Pesticides, Dyes, Drugs, Cosmetic industry, Fenac, Clinton County(Pennsylvania).

PB91-187062/REB PC **A02**/MF **A01**
Pesticide Fact Sheet No. 222: Fenamiphos.
Environmental Protection Agency, Washington, DC. Office of Pesticides and Toxic Substances.
Jun 87, 10p EPA/540/FS-91/133

The document contains up-to-date chemical information, including a summary of the Agency's regulatory position and rationale, on a specific pesticide or group of pesticides. A Fact Sheet is issued after one of the following actions has occurred which are: Issuance or reissuance of a registration standard; Issuance of each special review document; Registration of a significantly changed use pattern; Registration of a new chemical; or An immediate need for information to resolve controversial issues relating to a specific chemical or use pattern.

Keywords: *Regulations, *Pesticides, Nematocides, Pest control, Nematoda, Farm crops, Vegetable crops, Fruit crops, Utilization, Toxicology, Toxicity, Mammals, Spraying, Soils, Irrigation, Emulsions, Granular materials, Birds, Phosphorus organic compounds, *Fenamiphos, CAS: 22224-926.

PB91-187500/REB PC **A07**/MF **A01**
Toxic Release Inventory, 1989. Magnetic Tape Documentation.
Environmental Protection Agency, Washington, DC. Office of Toxic Substances.
1989, 130p EPA/DF/MT-91/085A
For system on magnetic tape, see PB91-507509.

Section 313 of the Emergency Planning and Community Right-to-Know Act (also known as Title III) of the Superfund Amendments and Reauthorization Act (SARA) of 1986 (Public Law 99-499) requires EPA to establish an inventory of toxic chemical emissions from certain facilities. Facilities subject to this reporting requirement are required to complete a Toxic Chemical Release Form (Form R) for specified chemicals. The form must be submitted to EPA and those state officials designated by the govenor, on or before July 1, 1988, and annually thereafter on July 1. The reports should reflect releases during the preceding calendar year. The purpose of the reporting requirement is to inform the public and government officials about routine and accidental releases of toxic chemicals to the environment. It will also assist in research and the development of regulations, guidelines, and standards.

Keywords: *Toxic substances, *Environmental surveys, Documentation, Chemical compounds, Pollution regulations, Superfund, Public information, Management planning, Standard industrial classification, *Toxic Release Inventory, Emergency Planning and Community Right-to-Know Act, Emission inventories.

PB91-187575/REB PC **A99**/MF **A04**
Environmental Protection Agency, Research Triangle Park, NC. Office of Air Quality Planning and Standards.
NATICH Data Base Report on State, Local and EPA Air Toxics Activities. Interim rept.
Radian Corp., Austin, TX.
T. K. Moody, C. E. Oldham, and C. E. Norris. Jul 90, 662p* DCN-90-203-099-27-06, EPA/450/3-90/012
Contract EPA-68-D8-0065
Supersedes PB90-131459. Sponsored by Environmental Protection Agency, Research Triangle Park, NC. Office of Air Quality Planning and Standards.

The purpose of the report is to inform State and local agencies and other Clearinghouse users of current research and regulatory development projects underway at the EPA, NIOSH, ATSDR, and State and local agencies, and to help them identify sources of specific air toxics information. Every effort has been made to ensure accuracy as of March 31, 1990, the date that compilation of project information was collected.

Keywords: *Research and development, *Air pollution, *Toxic substances, *Public health, *Information transfer, US EPA, State government, Local government, Risk assessment, Information systems, Pollution regulations, Air pollution standards, Pollution sources, Permits, Concentration(Composition), *National Air Toxics Information Clearinghouse, Emission inventories.

PB91-187583/REB PC **A09**/MF **A02**
Environmental Protection Agency, Ann Arbor, MI. Office of Mobile Sources.
Assessment of Unregulated Emissions from Gasoline Oxygenated Blends.
Southwest Research Inst., San Antonio, TX.
M. A. Warner-Selph, and L. R. Smith. Mar 91, 199p EPA/460/3-91/002
Contract EPA-68-C9-0004
Sponsored by Environmental Protection Agency, Ann Arbor, MI. Office of Mobile Sources.

Four gasoline or gasoline-oxygenate blend fuels were used in the evaluation of regulated and unregulated emissions for five test vehicles. The fuels listed below were all prepared from a common base gasoline and were blended to have equal octane ratings. They were Baseline, aromatic-enriched, 10% Ethanol blend, 16.4% Methyl tertiary-butyl ether (MTBE) blend, and 19.1% Ethyl tertiary-butyl ether (ETBE) blend. The five test vehicles represented different types of emissions control technology: pre-catalyst, oxidation catalyst, three-way catalyst with closed-loop carburetor operation and an air pump, three-way catalyst with throttle body fuel injection, and three-way catalyst with port fuel injection. Each vehicle was operated with each fuel over the Federal Test Procedure (including evaporative emissions) for a total of 15 tests per vehicle. Several unregulated exhaust emissions were measured including ethylene, 1,3-butadiene, isobutylene, benzene, toluene, o-, m-, and p-xylenes, formaldehyde, acetaldehyde, ethanol, MTBE, and nitrous oxide. In addition, evaporative emissions were analyzed for MTBE, benzene, and ethanol. The emission data from tests using the ethanol, MTBE, and ETBE blends were compared to emissions produced from tests using the aromatic-enriched baseline fuel to determine if there were any statistically significant differences associated with the use of the blends.

Keywords: *Air pollution control, *Exhaust emissions, *Fugitive emissions, *Fuels, Federal test procedures, Baseline measurements, Motor vehicles, Blends, Assessments, Air pollution detection, Statistical analysis, Quality assurance, Gasoline, Light duty vehicles, Ether/methyl-butyl, Ether/ethyl-butyl.

PB91-190850/REB PC **A01**/MF **A01**
CERCLA Removal Actions at Methane Release Sites. Directive.
Environmental Protection Agency, Washington, DC. Office of Solid Waste and Emergency Response.
23 Jan 86, 4p OSWER DIRECTIVE-9360.0-08

The directive clarifies OERR policy on the appropriateness of removal actions at methane gas release sites under authority of CERCLA. CERCLA responses to methane gas releases should be carefully evaluated on a case-by-case basis. Although the proposed removal action is authorized under CERCLA 104(a)(1), the responsible party may not be liable under section 107 for removal action costs.

Keywords: *Air pollution control, *Superfund, *Waste disposal, *Methane, Earth fills, Pollution regulations, Case studies, Cost analysis, Environmental policy, *Office of Solid Waste and Emergency Response, Comprehensive Environmental Response Compensation and Liability Act.

PB91-190959/REB PC **A07**/MF **A01**
Approximate Multiphase Flow Modeling by Characteristic Methods. Summary rept. Oct 88-Sep 90.
Robert S. Kerr Environmental Research Lab., Ada, OK.
J. W. Weaver. May 91, 129p EPA/600/2-91/015

The flow of petroleum hydrocarbons, organic solvents and other liquids that are immiscible with water presents the nation with some of the most difficult subsurface remediation problems. One aspect of contaminant transport associated releases of such liquids is the transport as a water-immiscible liquid phase. In the document approximate models of immiscible flow are presented for two- and three-phase flow. The approximations are constructed by representing the flow by hyperbolic equations which have method of characteristics solutions. This approximation has the additional benefit of being based on the fundamental wave behavior of the flow, which is revealed by the solutions of the models. An important result is that for three-phase flow, two flow regimes exist. The first is characterized by the displacement of one of the liquids into a bank which moves ahead of the other liquid. The second is characterized by almost complete bypassing of a liquid by the other. The occurrence of the flow regimes is dependent on the organic liquid properties, soil type and the initial amounts of the fluids present.

Keywords: *Water pollution, *Environmental models, *Mathematical models, *Pollution transport, Fluid flow, Organic solvents, Hydrocarbons, Groundwater, Petroleum, Immiscible liquids.

PB91-190975/REB PC **A05**/MF **A01**
Environmental Protection Agency, Washington, DC. Office of Emergency and Remedial Response.
Air/Superfund National Technical Guidance Study Series. Emission Factors for Superfund Remediation Technologies.
Radian Corp., Austin, TX.
P. Thompson, A. Inglis, and B. Eklund. Mar 91, 91p EPA/450/1-91/001
Contract EPA-68-02-4392
Sponsored by Environmental Protection Agency, Washington, DC. Office of Emergency and Remedial Response.

The report contains procedures and example calculations for estimating air emissions that occur from treating contaminated material at Superfund sites. Emission factors for six treatment technologies are presented. These are: (1) Thermal Treatment, (2) Air Stripping, (3) Soil Vapor Extraction, (4) Solidification and Stabilization, (5) Physical and Chemical Treatment, and (6) Biotreatment and Land Treatment. For each of the six technologies, a literature review was conducted to develop a flow diagram and identify emission points, as well as to analyze available air emissions data. For most of the technologies examined, emission factors were based on available data as well as assumed 'typical' operating conditions. Where possible, however, emission factors were presented on actual operating data from the site studies. Emission factors are presented for volatile organic compounds (VOC), metals, particulate matter, SO2, NOx, CO, HCl, and HF. The report also contains an extensive bibliography related to waste treatment technologies.

Keywords: *Superfund, *Emission factors, *Remedial action, *Waste treatment, *Air pollution, Guidelines, Toxic substances, Technology utilization, Soil treatment, Incineration, Metals, Sulfur dioxide, Nitrogen oxides, Solidification, Stabilization, Stripping, Soil gases, Extraction, Biological treatment, Physical treatment, Carbon monoxide, Hydrogen chloride, Hydrogen fluoride, *Superfund, Chemical treatment.

PB91-190983/REB PC **A08**/MF **A01**
Guidance on the Application of Refined Dispersion Models for Air Toxics Releases. Final rept.
Environmental Protection Agency, Research Triangle Park, NC. Office of Air Quality Planning and Standards.
J. S. Touma, D. Guinnup, and T. Spicer. Mar 91, 163p EPA/450/4-91/007
See also PB89-134340 and PB86-245248. Prepared in cooperation with Arkansas Univ. at Little Rock.

Refined air toxics models are increasingly being used to assess the impact of toxic air pollutants released into the atmosphere. The purpose of the guidance document is to provide general guidance considerations for applying dispersion models to such releases and to show the thought process required by the non-expert user to develop all model input parameters. Two example applications for each model are provided with a step-by-step explanation of all model input parameters and model output. Four specific models are currently included in the document. These are the DEGADIS, HEGADAS, and SLAB models appropriate for denser-than-air releases and the AFTOX model for neutrally buoyant releases of toxic air pollutants.

Keywords: *Air quality dispersion models, *Toxic substances, *Computerized simulation, *Atmospheric diffusion, *Air pollution, Guidelines, Mathematical models, Meteorological data, Density(Mass/volume), Environmental transport, Atmospheric chemistry, Physical properties, Chemical properties, Plumes, Wind(Meteorology), Dense gas dispersion model, Heavy gas dispersion model, Gaussian plume models, Air force toxic chemical dispersion model, SLAB model.

PB91-190991/REB PC **A03**/MF **A01**
Radon Concentrations Around the L-Bar Uranium Mill Site.
Office of Radiation Programs, Las Vegas, NV.
R. J. Lyon, F. H. F. Au, and J. M. Hans. Oct 88, 29p EPA/520/6-88/059

The report gives the results of measurements of radon concentrations that were made in the vicinity of the uranium mill tailings pile of SOHIO L-Bar site near Seboyeta, New Mexico, using passive Environmental Radon Monitors. Radon concentrations were determined monthly and the results of the data showed that radon concentrations decreased with distance from the centroid of the tailings pile.

Keywords: *Radon, *Tailings, *Air pollution abatement, *Air pollution control, Concentrations(Composition), Radiation monitoring, Uranium ores, Ore processing, Standards compliance, Pollution standards, Licenses, Radioactive waste disposal, Seboyeta(New Mexico), Uranium Mill Tailings Radiation Control Act.

PB91-191007/REB PC **A02**/MF **A01**
Basic Concepts of Contaminant Sorption at Hazardous Waste Sites (Ground Water Issue).
Robert S. Kerr Environmental Research Lab., Ada, OK.
M. D. Piwoni, and J. W. Keeley. Oct 90, 9p EPA/540/4-90/053

The Regional Superfund Ground Water Forum is a group of ground-water scientists, representing EPA's Regional Superfund Offices, organized to exchange up-to-date information related to ground-water remediation of Superfund sites. One of the major issues of concern to the Forum is the transport and fate of contaminants in soil and ground water as related to subsurface remediation. Processes which influence the behavior of contaminants in the subsurface must be considered both in evaluating the potential for movement as well as in designing remediation activities at hazardous waste sites. Such factors not only tend to regulate the mobility of contaminants, but also their form and stability. Sorption is often the paramount process controlling the behavior of contaminants in the subsurface. The paper summarizes the basic concepts of sorption in soil and ground water with emphasis on nonpolar organic contaminants.

Keywords: *Ground water, *Hazardous materials, *Sorption, *Superfund, *Remedial action, *Waste disposal, *Water pollution control, Soil chemistry, pH, Soil contamination, Land pollution control, Organic compounds, Chemical reactions, Solubility, Reduction(Chemistry), Oxidation, Environmental transport, Path of pollutants, Subsurface investigations, Design criteria, Water chemistry.

PB91-191015/REB PC **A02**/MF **A01**
Fate Constants for Some Chlorofluorocarbon Substitutes. Environmental research brief.
Environmental Research Lab., Athens, GA.
H. P. Kollig, and J. J. Ellington. Mar 91, 8p EPA/600/M-91/007

The availability of fate constants for 16 aqueous cleaners and terpenes is addressed. These compounds are likely substitutes for chlorinated solvents and chlorofluorocarbons. Comparison of fate data available from EPA's Office of Toxic Substances, the database CHEMFATE, and additional fate data computed for the report shows how few experimental values are currently published. Almost all can be estimated, however, using computational techniques.

Keywords: *Environmental research, *Environmental chemical substitutes, *Fluorohydrocarbons, Chlorohydrocarbons, Cleaners, Solvents, Henrys law, Information systems, Information transfer, Solubility, Constants, Dissociation, Chemical reactions, Terpene hydrocarbons, Tables(Data), CHEMFATE data base.

PB91-191049/REB PC **A03**/MF **A01**
Directory of OAQPS Information Services.
Environmental Protection Agency, Research Triangle Park, NC. Office of Air Quality Planning and Standards.
J. Padgett. Nov 90, 16p EPA/450/2-91/001

The EPA Office of Air Quality Planning and Standards (OAQPS) provides various types of information services to EPA Regional Offices, State and local agencies, consultants, industry, and the public. The directory provides a brief listing of these services so that users can more easily determine what is available and how to obtain it. Information is grouped into four major activities. These are (1) pollutant/program, (2) technical support, (3) administrative support, and (4) compliance. Each major activity is further divided into subcategories; within each, line items describing information services are categorized by the type of delivery mechanism used. These include electronic bulletin boards, clearinghouses, conferences, telecasts, reports and manuals, newsletters, support centers, workshops, and direct training such as classroom and self-instructional courses. Each line item contains a brief description of the information available and, most important, the name and telephone number of a contact person who will help you to obtain it.

Keywords: *Directories, *Information services, *Air pollution abatement, *Air pollution control, *Air quality, Tables(Data), US EPA, Information transfer, Technology transfer, Information industry, Regional analysis, State implementation plans, Information systems, State government, Administrative procedures, Compliance, Pollution regulations, Mathematical models, *Office of Air Quality Planning and Standards.

PB91-191056/REB PC **A03**/MF **A01**
Reductive Dehalogenation of Organic Contaminants in Soils and Ground Water. Ground Water Issue.
Robert S. Kerr Environmental Research Lab., Ada, OK.
J. L. Sims, J. M. Suflita, and H. H. Russell. Jan 91, 15p EPA/540/4-90/054

Introduction and large scale production of synthetic halogenated organic chemicals over the last 50 years has resulted in a group of contaminants which tend to persist in the environment and resist both biotic and abiotic degradation. The low solubility of these types of contaminants, along with their toxicity and tendency to accumulate in food chains, make them particularly relevant targets for remediation activities. Although the processes involved in dechlorination of many of these organic compounds are well understood in the fields of chemistry and microbiology, technological applications of these processes to environmental remediation are relatively new--particularly at pilot or field scale. It is well established, however, that there are several mechanisms which result in dehalogenation of some classes of organic contaminants, often rendering them less offensive environmentally. These include; stimulation of metabolic sequences through introduction of electron donor and acceptor combinations; addition of nutrients to meet the needs of dehalogenating microorganisms; possible use of engineered micro-organisms; and use of enzyme systems capable of catalyzing reductive dehalogenation.

Keywords: *Land pollution control, *Water pollution control, *Remedial action, *Superfund, *Waste disposal, *Dehalogenation, Environmental persistance, Subsurface investigations, Environmental transport, Ecosystems, Halogen organic compounds, Biological treatment, Microorganisms, Reduction(Chemistry), Biodeterioration, Soil contaminants, Ground water, Chemical reaction mechanisms.

PB91-191064/REB PC **A07**/MF **A01**
Environmental Protection Agency, Research Triangle Park, NC. Office of Air Quality Planning and Standards.
Designing and Implementing an Air Toxics Control Program: A Program Development Manual for State and Local Agencies.
Radian Corp., Research Triangle Park, NC.
M. H. Keating, and M. A. Trutna. Jul 90, 128p EPA-450/2-90/012
Sponsored by Environmental Protection Agency, Research Triangle Park, NC. Office of Air Quality Planning and Standards.

The manual is intended to assist State and local air pollution control agencies in making informed decisions about the development of air toxics control programs and to enhance consistency among the State and local program approaches. In particular, insight is provided into how to make critical decisions regarding program scope and stringency, evaluation of program impacts, and achievement of overall program goals. The manual addresses these issues by illustrating the experiences of State and local agencies and EPA in making air toxics program decisions. The manual was developed by seeking the advice and experiences of State and local agencies in various stages of their own program development. While the information does not represent EPA policy, it should prove useful to many State and local agencies now actively engaged in air toxics program development.

Keywords: *Air pollution control, *Planning, *Manuals, Government agencies, Local government, State government, Air pollution, Risk assessment, Project planning, Decision making, *Air toxics control programs.

PB91-191072/REB PC **A06**/MF **A01**
Environmental Protection Agency, Research Triangle Park, NC. Office of Air Quality Planning and Standards.
Evaluation of Dense Gas Simulation Models. Final rept.
TRC Environmental Consultants, Inc., East Hartford, CT.
J. G. Zapert, R. J. Londergan, and H. Thistle. May 91, 107p EPA/450/4-90/018
Contract EPA-68-02-4399
Sponsored by Environmental Protection Agency, Research Triangle Park, NC. Office of Air Quality Planning and Standards.

The report describes the approach and presents the results of an evaluation study of seven dense gas simulation models using data from three experimental programs. The models evaluated are two in the public domain (DEGADIS and SLAB) and five that are proprietary (AIRTOX, CHARM, FOCUS, SAFEMODE, and TRACE). The data bases used in the evaluation are the Desert Tortoise Pressurized Ammonia Releases, Burro Liquefied Natural Gas Spill Tests and the Goldfish Anhydrous Hydroflouric Acid Spill Experiments. A uniform set of performance statistics are calculated and tabulated to compare maximum observed concentrations and cloud half-width to those predicted by each model. None of the models demonstrated good performance consistently for all three experimental programs.

Keywords: *Air pollution, *Simulation, *Environmental models, *Pollution transport, Dispersing, Evaluation, Hazardous materials, Data bases, Ammonia, Hydrofluoric acid, Liquefied natural gas, *Dense gas models.

PB91-191080/REB PC **A04**/MF **A01**
Lake and Stream Indicators for U.S. EPA's Environmental Monitoring and Assessment Program. Symposium paper.
Corvallis Environmental Research Lab., OR.
R. M. Hughes, T. R. Whittier, S. A. Thiele, J. E. Pollard, and D. V. Peck. 24 Jan 91, 56p EPA/600/D-91/095
Proceedings of the International Symposium on Ecological Indicators, Ft. Lauderdale, FL., Oct 90. Prepared in cooperation with ManTech Environmental Technology, Inc., Corvallis, OR., and Lockheed Engineering and Sciences Co., Inc., Las Vegas, NV.

The paper summarizes the indicators proposed for a pilot study by the U. S. Environmental Protection Agency's (EPA) Environmental Monitoring and Assessment Program for lakes and streams (EMAP-LS). An additional lake and stream monitoring program is needed because current programs do not provide regional or national estimates of ecological condition or trends with known levels of confidence. Because national and regional monitoring must necessarily focus on spatial issues, the authors explain why and how they concentrate their sampling at particular index periods and in particular index locations. They provide 10 criteria for selecting response indicators and outline the 18 indicators selected and being developed for lakes and streams. Finally, the authors discuss how they propose to determine waterbody impairment through use of regional reference sites, regional experts, historical data, models, and empirical distributions of indicator values.

Keywords: *Water pollution effects, *Biological indicators, *Lakes, *Streams, *Aquatic ecosystems, US EPA, Regional analysis, Spatial distribution, Site surveys, Biological stress, Ecosystems, Habitats, Diatoms, Zooplankton, Benthos, Data processing, Statistical analysis, Water quality data, Surface waters, Fishes, *Environmental Monitoring and Assessment Program.

PB91-191098/REB PC **A03**/MF **A01**
Terrestrial Plants (Chapter 3). Book chapter.
Corvallis Environmental Research Lab., OR.
M. Tevini, A. H. Teramura, G. Kulandaivelu, M. M. Caldwell, and L. O. Bjoern. 1991, 15p EPA/600/D-91/096
Pub. in Report on the Environmental Effects of Ozone Depletion, United States Environment Programme, p25-39 1989.

Most of the authors knowledge concerning the effects of ultraviolet-B(UV-B) radiation was obtained with artificial UV radiation sources supplementing either artificial white light in growth chambers, or solar radiation in greenhouses and in the field. However, these artificial sources do not precisely match the solar spectrum. Few studies have documented the effects of UV-B on total plant yield under field conditions. One notable exception is a six-year field study with soybean demonstrating harvestable yield reductions under a simulated 25% ozone depletion. These effects are further modified by prevailing microclimatic conditions. Plants tend to be less sensitive to UV-B radiation under drought or mineral deficiency, while sensitivity increases under low levels of visible light. Further studies are needed to understand the mechanisms of UV-B effects and the interactions with present stresses and future projected changes in the environment.

Keywords: *Environmental effects, *Ozone depletion, *Ultraviolet radiation, *Plants(Botany), *Radiation effects, Air pollution, Test chambers, Experimental design, Crop yield, Solar radiation, Dose-response relationship, Plant growth, Plant reproduction, Plant pigments, Reprints.

PB91-191106/REB PC **A03**/MF **A01**
Evaluating Amphibian Responses in Wetlands Impacted by Mining Activities in the Western United States.
Corvallis Environmental Research Lab., OR.
G. Linder, J. Wyant, R. Meganck, and B. Williams. 1991, 41p EPA/600/D-91/097
Pub. in Proceedings: Thorne Symposium, Apr 91. Prepared in cooperation with ManTech Environmental Technology, Inc., Corvallis, OR.

An increasing awareness of declining amphibian populations in the United States requires that the authors develop strategies for evaluating anthropogenic impacts on wetlands and the biota dependent upon these habitats. For example, in the western United States, mining activities may impact a wetland and its biota directly through habitat destruction or run-off of sediments and contaminants generated during mining operations. Amphibians which frequent these transition zones between terrestrial and aquatic habitats may be key biological indicators of a wetland's status. Through a demonstration project located in the mining regions of western Montana, the authors are currently using laboratory and field methods for a wetland evaluation required within a Superfund ecological risk assessment.

Keywords: *Mining, *Environmental impacts, *Amphibia, *Habitability, *Water pollution, Populations, Responses, Mortality, Field tests, Damage assessment, Runoff, Sediments, Monitoring, Indicator species, Toxicity, Laboratories, Montana, *Wetlands, Western Region(United States), Case studies.

PB91-191114/REB PC **A01**/MF **A01**
Colloidal FE2O3 Transport Studies in Laboratory Model Systems Using Shallow Aquifer Material.
Robert S. Kerr Environmental Research Lab., Ada, OK.
R. W. Puls, and R. M. Powell. 1991, 5p EPA/600/D-91/098
Presented at the American Chemical Society National Meeting (201st), Atlanta, GA., April 14-19, 1991. Prepared in cooperation with NSI Technology Services Corp., Ada, OK.

The stability and transport of radio-labeled Fe2O3 colloids were studied using laboratory batch and column techniques. Core material collected from a shallow sand and gravel aquifer near Globe, Arizona was used as the column matrix material. Scintillation counting and laser light scattering with photon correlation spectroscopy (PCS) were used as means of colloid detection. PCS and scanning electron microscopy (SEM) were used to verify the size of the colloids and their stability. Variables in the study included flow rate, pH, ionic strength, electrolyte composition (anion/cation), colloid concentration, and colloid size. Transport was highly dependant upon colloidal stability. Iron oxide colloids in the 100-900 nm particle diameter range were not only mobile to a significant extent, but under some hydrogeochemical conditions were transported faster than a conservative tracer, tritium. The rate of colloid transport was over 21 times that of the dissolved arsenate. Extent of breakthrough was dependant upon a complex variety of parameters, however the highest statistical correlation was observed with particle size and anionic composition of the supporting electrolyte.

Keywords: *Iron oxides, *Aquifer systems, *Environmental transport, *Colloids, *Water pollution, Adsorption, Porous media, Experimental design, Tracer studies, Isotopic labeling, Statistical analysis, Flow rate, pH, Electrolytes, Particle size, Reprints, Globe(Arizona).

PB91-191122/REB PC **A03**/MF **A01**
IACP: Overview of the Boise, Idaho, and the Roanoke, Virginia, Field Studies. Symposium paper.
Environmental Protection Agency, Research Triangle Park, NC. Atmospheric Research and Exposure Assessment Lab.
V. R. Highsmith, A. J. Hoffman, R. B. Zweidinger, L. T. Cupitt, and D. B. Walsh. 26 Apr 91, 28p EPA/600/D-91/099
See also PB87-209235. Prepared in cooperation with Environmental Health Research and Testing, Inc., Research Triangle Park, NC.

Large-scale field studies were conducted initially in Boise, Idaho, and then in Roanoke, Virginia, during the 1986-87 and 1988-89 winter heating seasons, respectively, to evaluate the impact of residential wood combustion (RWC), residential distillate oil combustion (RDOC), and automotive emissions on the ambient and indoor air quality. Consecutive 12-h samples were collected over a 4-month period at three primary and four auxiliary fixed sampling sites in each city. Each ambient site consisted of one or more particulate, organic, and gaseous samplers as well as selected criteria pollutant and meteorological monitors. Twelve-hour particulate, organic, and gaseous samples were concurrently collected inside 10 pairs of residences in each city over a 4-day period (2 weekdays and 2 weekend days). Each pair of Boise residences consisted of one home with and one home without an operating RWC appliance. The pair of Roanoke residences consisted of one home with and one home without an operating RDOC appliance. Similar sample sets were collected immediately outside the residence without the RWC/RDOC appliance. The samples have been analyzed and the key results summarized herein along with an overview of the monitoring program.

Keywords: *Air pollution effects(Humans), *Air pollution sampling, US EPA, Pollution sources, Indoor air pollution, Air quality, Combustion effeciency, Field tests, Automobile exhaust, Concentration(Composition), Mobile pollutant sources, Wood burning appliances, Mutagens, Carcinogens, Public health, Site surveys, *IACP(Integrated Air Cancer Project), Boise(Idaho), Roanoke(Virginia).

PB91-191130/REB PC **A02**/MF **A01**
Modeling Carbon Monoxide (CO) Exposures within Microenvironments Given Personal Exposure Monitoring Data.
Environmental Protection Agency, Research Triangle Park, NC. Atmospheric Research and Exposure Assessment Lab.
J. S. Irwin, and W. P. Petersen. 1991, 10p EPA/600/D-91/100

Data collected at ambient fixed sites may not adequately reflect personal CO exposures, as they most often miss exposures resulting from CO emissions from sources in the immediate physical surroundings of individuals, such as within automobiles. The SHAPE model was proposed to account for this missing component of exposure and provides the basis for the model to be discussed. The viewpoint of the model construct is to follow a person over a 24 or 48 hour time interval. In the study, activity pattern data obtained in the Denver, CO and Washington, D.C. are used to define the sequence of microenvironments and durations within each microenvironment. The focus of the study is development of the concentration values experienced by individuals over 1-hour and 8-hour time periods.

Keywords: *Air pollution effects(Humans), *Carbon monoxide, Exposure, Mathematical models, Graphs(Charts), Smoking, Exhaust emissions, Field tests, District of Columbia, SHAPE model, Personal exposure monitors, Denver(Colorado).

PB91-191148/REB PC **A03**/MF **A01**
Receptor Modeling of Fine Particles in the Tacoma Tideflats Airshed.
Environmental Protection Agency, Research Triangle Park, NC. Atmospheric Research and Exposure Assessment Lab.
T. L. Conner, and R. K. Stevens. 1991, 18p EPA/600/D-91/101

A receptor modeling study was conducted in the Tacoma tideflats airshed. The tideflats area is a small but heavily industrial area adjacent to the Commencement Bay waterway of Puget Sound. It is surrounded by urban centers and rural and residential areas. Fine and coarse particles were sampled for 12 hours twice daily beginning at 7 AM and 7 PM from 12/5/89 through 12/15/89 and from 1/2/90 through 1/8/90. Concentrations of total fine particle mass, nitrate and sulfate ions, organic carbon, elemental carbon, and a suite of elements were measured in the fine particle samples. Organic carbon was by far the dominant species in the fine particle fraction. Gaseous species were collected in evacuated canisters concurrently with particulate samples to measure volatile organic species for the purpose of searching for potential motor vehicle tracers. Receptor modeling results indicate that residential woodsmoke, not industrial sources, was the primary contributor (greater than half) to the total fine particle mass. Other major sources identified by receptor modeling are, in order of predominance, aluminum production (one site only), residual oil boilers, motor vehicle exhaust, scrap metal fugitives, and hogged fuel boilers.

Keywords: *Air pollution monitoring, *Urban areas, *Fines, *Tidal marshes, Particles, Air pollution, Emission factors, Smoke, Carbon, Puget Sound, Washington(State), *Receptor modeling, Residential woodsmoke, Tacoma(Washington).

PB91-191155/REB PC **A03**/MF **A01**
Corvallis Environmental Research Lab., OR.
Regional Patterns in Three Biological Indicators of Stream Condition in Ohio.
ManTech Environmental Technology, Inc., Corvallis, OR.
T. R. Whittier, and E. T. Rankin. 14 Jan 91, 39p EPA/600/D-91/094
Contract EPA-68-C8-0006
Presented at the International Symposium on Ecological Indicators held in Ft. Lauderdale, FL. in October, 1990. Prepared in cooperation with Ohio State Environmental Protection Agency, Columbus. Sponsored by Corvallis Environmental Research Lab., OR.

There is an increasing awareness of the need to supplement site-specific environmental assessments with those done at regional and global scales. In the paper, the authors review some of the issues important to broad-scale assessments. They then develop a regional-scale assessment of environmental conditions using fish assemblage data collected between 1983 and 1989 by the Ohio Environmental Protection Agency from 2100 stream sites. They use Omernik's ecoregions as the geographic framework and minimally impacted regional reference sites as definitions of regional health. The authors evaluate native fish species richness, the Modified Index of Well-being, and the Index of Biotic Integrity to characterize regional patterns in fish assemblage condition (as part of a suite of potential indicators of environmental health). For these three indicators, values at reference sites in the Huron/Erie Lake Plain(HELP) were significantly lower than in the other four ecoregions, demonstrating a lower potential for supporting fish assemblages. Reference site values in the other four regions did not differ substantially. Difficulties related to determining a reference condition in regions with extensive land use impacts are discussed. Regional indicator scores for all sites (all levels of impacts) in the HELP were the lowest, when compared to all reference site values statewide. When index values from all sites were compared to their ecoregional reference site scores, the deviation in scores of HELP's index values were comparable to or higher than all other regions. Regional index values for all sites in the Erie/Ontario Lake Plain, which is heavily industrialized, were the second lowest compared to the statewide models, and the lowest when compared to its own regional model. In the study, the simplest indicator (species richness) produced essentially the same regional-scale assessment of environmental health as did more complex indicators. These results imply that valid assessments of ecological condition may be made at regional scales using simple indicators when more complex indices are not available.

Keywords: *Biological indicators, *Streams, *Water pollution effects(Animals), *Aquatic ecosystems, Ohio, Regional analysis, Biological stress, Environmental impact assessments, Fishes, Data processing, Environmental health, Pollution sources, Graphs(Charts), Environmental Monitoring and Assessment Program.

PB91-191163/REB PC **A04**/MF **A01**
Review of Treatment for Hazardous Waste Streams (Chapter 21). Book chapter.
Environmental Protection Agency, Cincinnati, OH. Hazardous Waste Engineering Research Lab.
D. W. Grosse. 1991, 74p EPA/600/D-91/088
Pub. in Library of Environmental Science, v3 Aug 90 and Advances in Environmental Technology and Management, Mar 90.

The publication will examine some of the practices being used or considered for use at on-site or commercial hazardous waste treatment, storage and disposal facilities (TSDF). Options for managing hazardous wastes containing heavy metals and/or cyanide compounds involve conventional treatment processes, recycle/reuse applications and waste minimization. Some of the technologies to be reviewed in this section include: precipitation applications such as hydroxide (e.g. lime, magnesium and iron oxyhydroxide), sulfide and carbonate systems; reduction techniques employing chromium, mercury and selenium reducing agents; adsorption/selection techniques using activated carbon ion exchange and hydrous solids; stabilization/fixation with discussion on applications, interferences and landfill design; cyanide destruction, including chemical oxidation (e.g. alkaline chlorination, ozonation/photolysis), electrolytic decompostion and incineration; and pollution prevention measures such as source reduction, recycling and reuse. Each of these options will be described in terms of effectiveness of treatment in removing the hazardous constituents of interest and characterization of the generated treatment residuals or in the case of waste minimization practices, the degree to which the constituents of concern are eliminated at the point of waste generation.

Keywords: *Waste management, *Hazardous materials, *Heavy metals, Reviews, Waste treatment, Waste disposal, Waste recycling, Waste utilization, Waste processing, Precipitation(Chemistry), Adsorption, Stabilization, Earth fills, Incineration, Pollution abatement, Pollution sources, Reprints, Waste minimization, Source reduction.

PB91-191171/REB PC **A02**/MF **A01**
Environmental Protection Agency, Research Triangle Park, NC. Air and Energy Engineering Research Lab.
Airborne Particle Sizes and Sources Found in Indoor Air. Rept. for Sep 89-Feb 90.
Research Triangle Inst., Research Triangle Park, NC.
M. K. Owen, D. S. Ensor, and L. E. Sparks. Feb 90, 8p EPA/600/D-91/081
Grant EPA-R81-4169-03
Presented at IAQ '90 held in Toronto (Canada) on July 29-August 3, 1990. Sponsored by Environmental Protection Agency, Research Triangle Park, NC. Air and Energy Engineering Research Lab.

The paper summarizes results of a literature search into the sources, sizes, and concentrations of particles in indoor air, including the various types: plant, animal, mineral, combustion, home/personal care, and radioactive aerosols. The information, presented in a summary figure, has been gathered for use in designing test methodologies for air cleaners and other mitigation approaches and ti aid in the selection of air cleaners. (NOTE: As concern about indoor air quality has grown, understanding indoor aerosols has become increasingly important so that control techniques may be implemented to reduce damaging health effects and soiling problems. Particle diameters must be known to predict dose or soiling and to determine efficient mitigation techniques.)

Keywords: *Indoor air pollution, *Particle size, *Pollution sources, *Air pollution control, *Aerosols, Concentration(Composition), Air pollution sampling, Mitigation, Radioactive materials, Environmental transport, Minerals, Plants(Botany), Air quality, Environmental surveys, Public health, Combustion products, Animals, Air cleaners.

PB91-191189/REB PC **A02**/MF **A01**
Environmental Protection Agency, Research Triangle Park, NC. Air and Energy Engineering Research Lab.
Quantification of Particluate Emission Rates from Vacuum Cleaners.
Research Triangle Inst., Research Triangle Park, NC.
D. D. Smith, R. P. Donovan, D. S. Ensor, and L. E. Sparks. 1989, 8p EPA/600/D-91/082
Presented at IAQ '90 held in Toronto (Canada) on July 29-August 3, 1990. Sponsored by Environmental Protection Agency, Research Triangle Park, NC. Air and Energy Engineering Research Lab.

Vacuum cleaner operations appear to be a significant source of indoor aerosol particles as shown by limited measurements carried out in randomly selected residences. The objective of the study is to measure aerosol particle emission rates under well-defined and controlled conditions that are representative of general vacuum cleaning operations. Residential upright carpet vacuum cleaners were studied. The authors determined from the data obtained by this procedure: (1) the total aerosol particle emission rate for the vacuuming process and (2) the particle size distribution of the reentrained particles.

Keywords: *Vacuum cleaners, *Indoor air pollution, *Particulates, *Emission factors, Dust, Particulate sampling, Aerosols, Laboratory tests, Particle size distribution.

PB91-191197/REB PC **A03**/MF **A01**
Use of Glial Fibrillary Acidic Protein in First-Tier Assessments of Neurotoxicity.
Health Effects Research Lab., Research Triangle Park, NC.
J. P. O'Callaghan. 1991, 29p EPA/600/D-91/050

Diverse neurotoxic insults result in proliferation and hypertrophy of astrocytes, a subtype of central nervous system glia. The hallmark of the response, often termed 'reactive gliosis', is the enhanced expression of the major intermediate filament protein of astrocytes, glial fibrillary acidic protein (GFAP). These morphological observations suggest that GFAP may be a useful biochemical indicator of neurotoxicity. To investigate the possibility the authors administered prototype neurotoxicants to experimental animals and then assessed the effects of these agents on the tissue content of GFAP, as determined by radioimmunoassay. The study found that assays of GFAP reveal dose-time- and region-dependent patterns of neurotoxicity at toxicant dosages below those that cause light microscopic evidence of cell loss or damage. No false positives have been seen following exposure to a variety of pharmacological agents. By using regional assessments of GFAP in a first-tier evaluation, it should be possible to localize areas of damage. A second-tier evaluation, using assays of proteins or transmitters associated with cells in the affected region, may reveal the cellular targets of neurotoxicity.

Keywords: *Toxicology, *Nervous system, *Glial fibrillary acidic protein, *Toxic substances, Brain chemistry, Radioimmunoassay, Dose-response relationships, Cell survival, Dopamine, Tyrosine hydroxylase, Enzyme-linked immunosorbent assay, Astrocytes.

PB91-191205/REB PC **A03**/MF **A01**
Environmental QA: A Plan for Consistency in the 90s.
Environmental Protection Agency, Research Triangle Park, NC. Quality Assurance Management Staff.
G. L. Johnson. 1991, 14p EPA/600/D-91/083
Presented at the Rocky Mountain Quality Conference held in June, 1991.

The mandatory quality assurance program requirements for the U.S. Environmental Protection Agency (EPA) have been in place for more than ten years, as have two critical pieces of guidance which described the development of QA Program Plans and QA Project Plans. During the period, the absence of a formal standard or criteria for QA by the EPA has led to varying interpretation of the guidance by different groups, both inside and outside the Agency. The situation has frequently created confusion and uncertainty among those who must prepare and implement the QA plans as well as among those who must review and approve them. EPA has been working with other Federal agencies and the private sector to develop a national consensus standard for QA/QC activities performed in support of environmental programs, which may be adopted and used Government-wide. In anticipation that a standard will emerge from the process, EPA has begun to reflect the proposed standard by revising old guidance and developing new guidance for use both by EPA and the general public. The paper discusses the current status of the standard and of EPA guidance, and how both will provide increased consistency and uniformity in the 1990s.

Keywords: *Environmental surveys, *Standards, *Guidelines, Federal agencies, US EPA, National government, Quality control, Pollution regulations, Performance standards, Waste management, Reprints, *Quality Assurance Program Plans, *Quality Assurance Project Plans, Total Quality Management.

PB91-191213/REB PC **A03**/MF **A01**
Wind Field Development for the EPA Regional Oxidant Model.
Environmental Protection Agency, Research Triangle Park, NC. Atmospheric Research and Exposure Assessment Lab.
C. J. Coats, and K. L. Schere. 1991, 18p EPA/600/D-91/084
Proceedings of the Annual Meeting of the Air and Waste Management Association (84th), Vancouver, BC., June 16-21, 1991. Prepared in cooperation with Computer Sciences Corp., Research Triangle Park, NC., and National Oceanic and Atmospheric Administration, Rockville, MD.

Regional scale (approximately 1000 km) air quality simulation models require hourly inputs of u and v wind components for each vertical layer of the model and for each grid cell in the horizontal. The standard North American meteorological observation network is used to derive the wind field inputs for the Regional Oxidant Model (ROM) and other regional models. While a fairly dense surface network with hourly observations exists, upper air data are obtained only twice per day at monitoring sites typically separated by 300-500 km distances. Using these data to derive the more spatially and temporally resolved gridded wind fields needed by the ROM introduces uncertainties and errors into the model. The authors present a method of developing gridded wind fields for the ROM that accounts for these non-deterministic features. The method produces a family of potential gridded wind fields allowing for the stochastic nature of the interpolation process. Examples of the derived wind fields are given for the Northeast U.S. Potential differences between the wind fields, in terms of their effects on air quality modeling, are inferred from following multi-day flow trajectories using various members of the wind field family.

Keywords: *Ozone, *Pollution transport, *Wind profiles, Mathematical models, Wind velocity, Wind direction, Simulation, Meteorological data, *Regional Oxidant Model, Northeastern Region(United States).

PB91-191221/REB PC **A02**/MF **A01**
Sensitivity Analysis of a Nested Ozone Air Quality Model.
Environmental Protection Agency, Cincinnati, OH. Environmental Criteria and Assessment Office.
G. Sistla, S. T. Rao, and J. Godowitch. 1991, 8p EPA/600/D-91/085
See also PB90-221920. Presented at the AMS/AWMA Conference on Application of Air Pollution Meteorology (7th), New Orleans, LA., January 14-18, 1991. Prepared in cooperation with New York State Dept. of Environmental Conservation, Albany.

A series of Urban Airshed Model (UAM) simulations were performed using inputs derived from Regional Oxidant Model (ROM) data files. The gridded ROM results employed in the UAM simulations included concentrations for specifying initial and boundary conditions, wind fields, other meteorological and surface geophysical parameters, and biogenic emissions. Two approaches were applied to nest the 3-D UAM grid (a four and a five level scheme) inside the regional model grid framework. The model sensitivity study was conducted with the variation in a single gridded input parameter or method in order to assess the impact on ozone concentrations for different high ozone days during 1980 over a domain covering the greater New York metropolitan area. Differences in the domain peak ozone and maximum ozone concentration at individual grid cells from the sensitivity runs are compared to base case simulations for each day. Maximum ozone levels were examined for different wind fields, with/without surface land use for the dry deposition method, with/without biogenic emissions, and the number of UAM vertical levels and nesting approach for initial and boundary concentrations. The magnitudes of peak ozone concentration changes from several sensitivity simulations were found to be comparable to those obtained from previous model runs with emissions control strategy reductions for the greater New York City urban domain.

Keywords: *Air quality, *Mathematical models, *Ozone, *Sensitivity analysis, *Air pollution, New York, Metropolitan areas, Concentration(Composition), Urban areas, Meteorological data, Three-dimensional calculations, Response functions, Natural emissions, Wind(Meteorology), Performance evaluation, Reprints, *Urban Airshed Model, *Regional Oxidant Model.

PB91-191239/REB PC **A03**/MF **A01**
Air Quality Monitoring in Atlanta with the Differential Optical Absorption Spectrometer.
Environmental Protection Agency, Research Triangle Park, NC. Atmospheric Research and Exposure Assessment Lab.
T. L. Conner, and R. K. Stevens. 1991, 16p EPA/600/D-91/086

The U.S. Environmental Protection Agency (EPA) evaluated a differential optical absorption spectrometer (DOAS) long path pollutant monitoring system during July and August of 1990 in Atlanta, GA. Federal Reference Method (FRM) instruments and a gas chromatograph (GC), which measure a number of gas phase air pollutants at a point, were operated concurrently as part of a larger US EPA study of ozone and its precursors in Atlanta. The DOAS was configured to measure the pollutant concentrations of SO2, NO2, O3, nitrous acid, formaldehyde, benzene, toluene and o-xylene over two open paths with 1099 m and 1824 m, respectively, between light source and light receiver. Nitric oxide (NO) and ammonia (NH3) were measured over a third path of only 143 m. In the communication the features of the DOAS system are described and results of the Atlanta, GA evaluation of the system are discussed. Comparisons are made between the DOAS open path measurements and FRM or GC measurements made concurrently at a location near the DOAS light receivers.

Keywords: *Air pollution monitoring, *Optical spectrometers, Standards, Field tests, Performance evaluation, Nitrogen oxides, Ozone, Sulfur dioxide, Formaldehyde, Benzene, Toluene, Xylenes, Nitrous acid, Gas chromatography, *Atlanta(Georgia), *Differential optical absorption spectrometry.

PB91-191247/REB PC **A02**/MF **A01**
Inventory of Constructed Wetlands for Municipal Wastewater Treatment in the U.S. Interim rept. Dec 89-Mar 91.
Environmental Protection Agency, Cincinnati, OH. Office of Research and Development.
D. S. Brown, and S. C. Reed. 1991, 9p EPA/600/D-91/087
Pub. in Proceedings, ASCE Nat. Env. Eng. Conference, July 1991.

The U.S. EPA's Risk Reduction Engineering Laboratory is conducting an inventory of constructed wetlands (CW) for muncipal wastewater treatment in the U.S. The inventory is one part of an effort to gather better data on which to base CW design. The inventory is being conducted in two phases; the paper presents data from the first phase. A total of 143 communities were identified as either considering or using CW. Of this total, 31 operating free water surface (FWS) and 26 operating subsurface flow (SF) systems were found. Systems range in size from 200 to 76,000 cu m/d (0.05 to 20 mgd) for FWS and from 5 to 11,400 cu m/d (0.001 to 3.0 mgd) for SF. Design approaches and performance goals vary widely; as a result hydraulic loading rates and costs vary widely. Limited flow data show hydraulic surface area loading rates range from 4 to 530 L/sq m/d (230 to 1.8 ac/mgd) for FWS systems and from 30 to 410 L/sq m/d (31 to 2.3 ac/mgd) for SF systems. Limited cost data show construction costs range from $16 to $770 per cu m/d ($0.06 to $2.90 per gpd) for FWS systems and from $60 to $790 per cu m/d ($0.23 to $3.00 per gpd) for SF systems. Because of the limited data, all of these figures should be viewed with caution.

Keywords: *Sewage treatment, *Wetlands, *Structural engineering, *Waste water, United States, Operating, Performance evaluation, Cost analysis, Construction costs, Design criteria, Biochemical oxygen demand, Sediments.

PB91-191254/REB PC **A03**/MF **A01**
Preparation Aids for the Development of Category IV: Quality Assurance Project Plans.
Environmental Protection Agency, Cincinnati, OH. Risk Reduction Engineering Lab.
G. F. Simes. Feb 91, 46p EPA/600/8-91/006
See also PB91-167569.

Data collection activities performed for the Risk Reduction Engineering Laboratory (RREL) of the U.S. Environmental Protection Agency are divided into four categories, depending on the intended use of the data. Quality Assurance (QA) Project Plans are written to ensure that project needs will be met and that quality control procedures are sufficient for obtaining data of known quality. The level of QA required, however, depends on the project category selected for a given project. Projects that produce results for the purpose of assessing suppositions are identified as Category IV projects. 'Pure' research and development projects frequently fit into the category. To assist professional scientists and engineers in preparing QA Project Plans, separate guidance manuals in an easy-to-read format have been developed for each category. The Category IV manual contains detailed descriptions of each of the 5 required elements of a Category IV QA Project Plan. Also included are definitions and explanations of frequently used terms, examples of QA forms and charts, sample equations and numerous types of tables suggested for summarizing information.

Keywords: *Manuals, *Environmental surveys, *Project planning, *Data processing, Research and development, Quality assurance, Quality control, Records management, Forms(Paper), Management planning, Sampling, *Quality Assurance Project Plans.

PB91-191262/REB PC **A03**/MF **A01**
Environmental Protection Agency, Cincinnati, OH. Risk Reduction Engineering Lab.
Diaper Industry Workshop Report.
Science Applications International Corp., McLean, VA.
May 91, 37p EPA/600/2-91/018
Contract EPA-68-C8-0061
Sponsored by Environmental Protection Agency, Cincinnati, OH. Risk Reduction Engineering Lab.

The report is the product of a one-day workshop on the diaper industry that was sponsored by the U.S. EPA. Four topics covered during the workshop were public health and safety, recycling, composting, and product life cycle analysis. The primary objective of the workshop was to identify areas within the diaper industry that need further research in order to lessen the adverse impacts that diapers have on the environment. Summaries of each of the four topics as well as summaries of discussion comments and research needs identified during the workshop are included in the report. A large number of research ideas were generated during the workshop. These ideas included determining the health risks associated with handling diapers, developing methods for improving the recyclability of plastics used in diapers, determining where diaper-related life cycle analysis should begin and end, and determining the economic viability of composting.

Keywords: *Recycling, *Environmental pollutants, *Meetings, Plastics, Health hazards, Composting, Life cycles, *Diaper industry.

PB91-191270/REB PC **A03**/MF **A01**
Critical Health Issues Associated with Review of the Scientific Criteria for Oxides of Nitrogen. Symposium paper.
Environmental Protection Agency, Research Triangle Park, NC. Environmental Criteria and Assessment Office.
D. J. Kotchmar, B. M. Comfort, and R. W. Elias. Jun 90, 18p EPA/600/D-91/093, ECAO-R-0386
Presented at the Annual Meeting of Air and Waste Management Association (83rd), Pittsburgh, PA., June 24-29, 1990.

The Clean Air Act (CAA) requires periodic review of existing criteria that form the basis for nitrogen oxides air quality standards. These air quality criteria are to reflect the latest scientific information useful indicating the kind and extent of all identifiable effects on public health that may be expected from the presence of nitrogen oxides in ambient air. In keeping with the requirements of the CAA, the U.S. Environmental Protection Agency is reviewing the criteria for nitrogen oxides. During the initial review, a number of critical issues germane to the review were identified and are presented here. Additional session papers provide more detailed discussion of these issues. The paper discusses specific health issues pertaining to: (1) mechanisms of action of nitrogen oxides; (2) exposure

assessment; and (3) specific health effects occurring in groups of individuals considered to be at greatest risk to nitrogen oxides at ambient or near-ambient exposure levels.

Keywords: *Public health, *Air pollution effects(Humans), *Risk assessment, *Nitrogen oxides, Air pollution standards, Air quality, Exposure, Pollution regulations, Reviews, Immunology, Respiratory infections, Children, Inhalation, Absorption, Respiratory system, Epidemiology, Respiratory diseases, Clean Air Act.

PB91-191288/REB PC **A03**/MF **A01**
Multimedia Risk Assessment for Environmental Risk Management.
Environmental Protection Agency, Research Triangle Park, NC. Environmental Criteria and Assessment Office.
S. D. Lee. Oct 89, 19p EPA/600/D-91/092, ECAO-R-0375

Through the combined experience of industrialized nations during the last two to three decades of environmental protection, the authors have gained a critical recognition of the limitations of the natural resources (air, water and land) around us. The authors have seen a continued rapid industrial development during the last 30-40 years; however, the authors have witnessed previous mistakes of industrialized countries being repeated. Such mistakes have resulted in overwhelming environmental deficits. These environmental debts became very obvious in many forms: the air in many industrial zones became so dirty it was deemed unhealthy; many lakes and rivers became too polluted for recreational use; and pesticides and other agricultural chemicals were exerting adverse effects on wildlife. In order to manage such crises, governmental agencies were established throughout the world to control environmental problems. In the United States, Congress enacted a series of laws to clean up the pollution. These accomplishments were very significant in light of a tremendous increase in population and economic growth during the same period. However, through our experience in approaches to remove contaminants from individual environmental media, the authors have come to recognize that we must accord more attention to cross-media approaches for controlling our pollution problems. Selected examples of current efforts in prevention oriented multimedia risk assessment and risk management will be discussed to emphasize the need for enhanced efforts in the area.

Keywords: *Risk assessment, *Environment management, *Pollution control, *Pollution abatement, Remedial action, Environmental protection, Cost effectiveness, Forecasting, Technology utilization, Information transfer, US EPA, Environmental impact assessments, Cleanup operations.

PB91-191296/REB PC **A02**/MF **A01**
Communicating Risk Information to State and Local Air Pollution Control Agencies via U.S. EPA's Air Risk Information Support Center (Air RISC). Symposium presentation.
Environmental Protection Agency, Research Triangle Park, NC. Environmental Criteria and Assessment Office.
W. Victery, K. Blanchard, and D. J. Guth. Jun 89, 10p EPA/600/D-91/091, ECAO-R-0311
Presented at the Annual Meeting of the Air Pollution Control Association (82nd), Anaheim, CA., June 25-30, 1989.

The Air Risk Information Support Center (Air RISC) has been organized by U.S. EPA's offices of Air Quality Planning and Standards and Health and Environmental Assessment. The center has been developed in cooperation with the State and Territorial Air Pollution Control Program Administrators and the Association of Local Air Pollution Control Officials. These officials are encouraged to contact Air RISC for assistance in obtaining health, exposure and risk assessment information on toxic air pollutants. Questions may be telephoned in via a Hotline and are referred to an appropriate EPA expert who will attempt to provide the information requested. EPA Health Assessment Documents, risk information databases, and other appropriate sources are used to provide rapid, scientifically-valid information. Technical assistance (defined as more in-depth review of a particular air toxics problem) is also provided, typically when there is no existing health documentation on a particular air toxic or when the requesting office needs assistance in reviewing risk assessment information provided to it. When there is a demonstrated need, Air RISC will provide technical guidance in the form of documents and workshops on health risk assessment methodology and toxicology. In each of these forms of assistance, it is anticipated that valuable lines of communication will be established between air toxics control officials and the EPA staff involved in the program.

Keywords: *Risk assessment, *Information transfer, *Air pollution effects(Humans), Air quality, Air pollution standards, Public health, Environmental impact assessments, Cooperation agreements, Exposure, Technology utilization, State government, Toxic substances, *Air Risk Information Support Center.

PB91-191304/REB PC **A03**/MF **A01**
Critical Health Issues Associated with Review of the Scientific Criteria for Carbon Monoxide. Symposium presentation.
Environmental Protection Agency, Research Triangle Park, NC. Environmental Criteria and Assessment Office.
J. A. Raub, and L. D. Grant. Jun 89, 18p EPA/600/D-91/090, ECAO-R-0308
Presented at the Annual Meeting and Exhibition of the Air and Waste Management Association (82nd), Anaheim, CA., June 25-30, 1989.

The Clean Air Act (CAA) requires periodic review of existing criteria that form the basis for carbon monoxide (CO) air quality standards. These air quality criteria are to reflect the latest scientific information useful in indicating the kind and extent of all identifiable effects on public health that may be expected from the presence of CO in ambient air. In keeping with the requirements of the CAA, the U.S. Environmental Protection Agency has started to review the criteria for CO. A number of critical issues germane to the review are presented. Additional session papers provide more detailed discussion of these issues. The paper discusses specific health issues pertaining to: (1) mechanisms of action of CO, particularly an evaluation of intracellular mechanisms secondary to impaired oxygen delivery caused by the formation of carboxyhemoglobin (COHb); (2) exposure assessment, including an evaluation of the accuracy and reliability of different methods for determining COHb; and (3) specific health effects occurring in groups of individuals considered to be at greatest risk to CO at ambient or near-ambient exposure levels including a reevaluation of previous dose-response functions for CO utilizing the information gained from recently completed studies. These critical issues will need to be resolved in order to determine the extent to which adverse effects are occurring in the population, particularly at the lower COHb levels of greatest interest to standard setting.

Keywords: *Air pollution standards, *Air quality, *Air pollution effects(Humans), *Carbon monoxide, *Public health, Exposure, Dose-response relationship, Carboxyhemoglobin, Anoxia, Risk assessment, Behavior disorders, Nervous system disorders, Quality control, Pollution regulations, Biological effects, Epidemiology, Toxicity, Cardiovascular system, *National Ambient Air Quality Standards, Clean Air Act.

PB91-191312/REB PC **A03**/MF **A01**
Environmental Protection Agency, Research Triangle Park, NC. Air and Energy Engineering Research Lab.
MOBILE4 Sensitivity Analysis. Final rept. Apr 90-Mar 91.
Alliance Technologies Corp., Chapel Hill, NC.
M. G. Smith, and T. T. Wilson. Apr 91, 46p EPA/600/8-91/032
Contract EPA-68-D9-0173
Sponsored by Environmental Protection Agency, Research Triangle Park, NC. Air and Energy Engineering Research Lab.

The report identifies the MOBILE4 input variables that can have significant impacts on highway vehicle emissions inventories and gives priorities for the development of improved guidance for specifying MOBILE4 inputs. Two major factors are considered: (1) the likelihood and potential range of variability in values for each MOBILE4 input; and (2) the potential magnitude of the effect of these variations, in terms of impact on typical mobile source inventories. The analysis updates previous work based on MOBILE3 by using MOBILE4 for the sensitivity analysis and by adding new MOBILE4 variables. The approach used in previous work is modified to address the specific concerns of the project--the State Implementation Plan (SIP) and National Emissions Data System (NEDS) inventory/guidance context. An additional level of detail is included for two critical variables (speed and temperature). Sensitivity to basic vehicle inspection/maintenance program specifications (waiver and compliance rate) is also considered. The primary sensitivity analysis is structured around two base cases representing ozone and carbon monoxide (C) season conditions. The report describes: (1) MOBILE4 input variable values for the ozone and CO base cases, (2) the variables and ranges or alternate values applied in the sensitivity analysis, (3) sensitivity analysis results, and (4) conclusions.

Keywords: *Mathematical models, *Highway transportation, *Ozone, *Carbon monoxide, *Emission factors, Vehicular traffic, Air pollution, Air pollution control, Analyzing, Graphs(Charts), Tables(Data), Velocity, Temperature, Maintenance, Inspection, *MOBILE4 model, *Sensitivity analysis.

PB91-191320/REB PC **A03**/MF **A01**
EMAP Monitor, January 1991 Edition.
Environmental Protection Agency, Washington, DC. Office of Modeling, Monitoring Systems and Quality Assurance.
C. G. Saint, P. Kellar, and A. Beach. Jun 91, 26p EPA/600/M-90/022

EMAP is a complex and diverse program that requires efficient communications to ensure continuity and consistency in the program and to avoid duplication. The Monitor is a regularly published document intended to provide an efficient and effective tool for EMAP managers to communicate the status and progress of the program to EPA and the scientific community and to transfer technical information to a broad audience. The first edition of the EMAP Monitor contains a feature article on the EMAP Near Coastal Demonstration Project in the Mid Atlantic region preformed in the spring and summer of 1990. It also contains a summary of the current activities of all EMAP components, a listing of recent publication and presentations, and recent and upcoming events.

Keywords: *Environmental monitoring, *Environmental impact assessments, *Information transfer, Estuaries, US EPA, Listings, Quality assurance, Quality control, Technology transfer, Management planning, Data processing, Natural resources management, Research and development, Integration, Coordination, *Environmental Monitoring and Assessment Program, Total Quality Management.

PB91-191338/REB PC **A05**/MF **A01**
State Revolving Fund (SRF) Interim Report to Congress: Financial Status and Operations of Water Pollution Control Revolving Funds.
Environmental Protection Agency, Washington, DC. Office of the Assistant Administrator for Water.
Apr 91, 95p EPA/430/09-9/004
See also PB88-169784.

The Report presents findings in the following areas: funding needs for the nine study States, the available sources of funding, the financing mechanisms used to meet their needs, how the States administer the SRF program, and the impacts of implementing the SRF program. The SRF program is a significant step in restoring responsibility for financing wastewater treatment from the Federal government to the States and municipalities.

Keywords: *Water pollution control, *Sewage treatment, Funds, Financing, State government, Congressional inquiries, Grants, Local government, National government, Operating, Financial assistance, Water quality management, State implementation plans, Comparison, Standards compliance, *Revolving funds, Clean Water Act, Publicly owned wastewater treatment works.

PB91-191346/REB PC **A10**/MF **A02**
Environmental Protection Agency, Cincinnati, OH. Risk Reduction Engineering Lab.
Factors Controlling Minimum Soil Liner Thickness.
Brown (K.W.) and Associates, Inc., College Station, TX.
D. C. Anderson, M. J. Lupo, J. A. Rehage, J. O. Sai, and R. L. Shiver. May 91, 223p EPA/600/2-91/008
Contract EPA-68-03-1816

Prepared in cooperation with Texas A and M Univ., College Station. Dept. of Soil and Crop Sciences, and Texas Univ. at Austin. Dept. of Civil Engineering. Sponsored by Environmental Protection Agency, Cincinnati, OH. Risk Reduction Engineering Lab.

The report describes a three-part study to gather information on liquid flow through soil liners in hazardous waste disposal facilities. In the first part of the study a model was developed to simulate flow occurring through discreet channels in lifts (a layer of compacted soil) and in the horizontal layer between lifts. The model indicated that high overall field hydraulic conductivity values may result from horizontal flow between lifts. In the second part of the study, laboratory tests using large 60-cm-diameter permeameters showed that the conductivity to water typically increased by one order of magnitude with depth in a 23-cm-thick lift of compacted clay. Clod sizes ranging from 2.5 to 7.5-cm had little influence on the hydraulic conductivity. Exposure of the compacted soil to the atmosphere for as little as 24 hr resulted in severe cracking and associated high conductivities resulting from flow through the desiccation cracks. Bulk density was a poor predictor of the conductivity of a compacted soil. Dye patterns in the permeameters also indicated flow through preferential channels and inter-clod spaces. In the third part, field studies of a 3-lift liner revealed that horizontal flow does indeed occur at the interface between the lifts when channels penetrate the overlying lift.

Keywords: *Land pollution control, *Linings, *Waste disposal, *Hazardous materials, *Dimensional measurement, Soil mechanics, Mathematical models, Performance standards, Fluid flow, Design criteria, Information systems, Strength, Leakage, Channel flow, Information transfer, Experimental design, Field tests, Soil compacting, Soil properties, Fluid infiltration, Hydraulic conductivity, Thickness.

PB91-191353/REB PC **A11**/MF **A02**
Environmental Monitoring Systems Lab., Las Vegas, NV.
Background Hydrocarbon Vapor Concentration Study for Underground Fuel Storage Tanks. Final rept.
Geoscience Consultants Ltd., Albuquerque, NM.
P. B. Durgin. Jun 91, 228p EPA/600/4-91/009
Contract EPA-68-03-3409
Sponsored by Environmental Monitoring Systems Lab., Las Vegas, NV.

The project was initiated to investigate the effectiveness of soil gas sampling in leak detection. Soil gas surveys were performed at 27 active gasoline service stations in three diverse geographic regions. Hydrocarbon vapor concentrations in the backfill surrounding the underground storage tanks were sampled and analyzed. The 27 gasoline service stations were selected as non-leaking sites and the three regions were selected for their active underground storage tank regulatory programs, as well as their differences in geology, hydrology and climate. A comparison was made with contaminated site data obtained from Tracer Research Corporation's historical records and significant differences can be seen between the two distributions. It was determined that the best approximation of total hydrocarbon (less light aliphatics) concentrations, based on available calibration data, was achieved using average response factor calculated from the daily response factors of benzene, toluene, ethylbenzene, and ortho-xylene.

Keywords: *Soil gases, *Land pollution, *Underground storage, *Storage tanks, *Hydrocarbons, Fuel storage, Soil contamination, Gas analysis, Sampling, Leakage, Quality assurance, Quality control, Climates, Hydrology, Geological surveys, Environmental transport, Service stations, Pollution regulations, Pollution abatement, Site surveys, Case studies, Concentration(Composition), Comparison.

PB91-191361/REB PC **A14**/MF **A02**
Risk Assessment and Risk Management. Journal article.
Environmental Protection Agency, Cincinnati, OH. Environmental Criteria and Assessment Office.
M. A. Mehlman, and S. D. Lutkenhoff. c1989, 304p
EPA/600/J-89/525, ISBN-0-911131-98-1
Pub. in Jnl. of Toxicology and Industrial Health, v5 n5 352p 1989 (Special Issue). Library of Congress catalog card no. 89-060644.

Risk assessment of mixtures of environmental pollutants has become a subject of increasing public and regulatory concern. Typically, assessment of mixtures has been based on aggregating the risks associated with the individual constituents of the mixture. This approach does not consider the potential synergistic and antagonistic effects of the components, and does not incorporate the risk associated with unidentified constituents or constituents for which the individual risks are not known. On June 7-9, 1988 the U.S. Environmental Protection Agency (EPA) held an 'International Symposium on Chemical Mixtures: Risk Assessment and Management' in Cincinnati, OH, to provide a forum where critical issues concerning assessment of mixtures could be presented and discussed. Approximately 200 scientists attended, representing a wide variety of disciplines, institutions, and countries. During the two-and-one-half days of the symposium, leaders in the multidisciplinary field of risk assessment presented state-of-the-art approaches and techniques for quantifying the potential health risks from exposure to chemical mixtures. They also addressed current knowledge in the various disciplines of risk assessment, as well as recent developments in sources of exposure, pharmacology, and toxicology. The symposium was dedicated to the memory of Dr. Jerry Strata, founder and director of the EPA Environmental Criteria and Assessment Office.

Keywords: *Risk assessment, *Meetings, *Chemical compounds, *Environmental surveys, *Toxic substances, *Health surveys, State of the art, Exposure, Toxicology, Public health, Mixtures, Bioassay, Occupational safety and health, Biological effects, Laboratory animals, Exhaust emissions, Industrial medicine, Regulations.

PB91-191379/REB PC **A03**/MF **A01**
New Approaches in the Derivation of Acceptable Daily Intake (ADI). Journal article.
Environmental Protection Agency, Cincinnati, OH. Environmental Criteria and Assessment Office.
M. L. Dourson. c1986, 16p EPA/600/J-86/554
Pub. in Comments Toxicology, v1 n1 p35-48 1986.

Current methods for estimating human health risks from exposure to threshold-acting toxicants in water or food, such as those established by the U.S. EPA, the FDA, the NAS, the WHO and the FAO, consider only chronic or lifetime exposure to individual chemicals. These methods generally estimate a single, constant daily intake rate which is low enough to be considered safe or acceptable. The intake rate is termed the acceptable daily intake (ADI). Two problems with the approach have been recognized. The first problem is that the method does not readily account for the number of animals used to determine the appropriate 'no-observed-effect-level' (NOEL). The second problem with the current approach is that the slope of the dose-response curve of the critical toxic effect is generally ignored in estimating the ADI. The report illustrates both a revised approach to estimate ADIs with all toxicity data which includes methods for partial lifetime assessment, and novel methods for ADI estimation with quantal or continuous toxicity data. The latter method addresses to a degree the common problems with the current approach.

Keywords: *Caloric intake, *Health hazards, *Toxicity, Water contamination, Food contamination, Mathematical models, Dose-response relationships, Reprints, *Acceptable Daily Intake.

PB91-191387/REB PC **A02**/MF **A01**
Environmental Protection Agency, Cincinnati, OH. Risk Reduction Engineering Lab.
Leachate Collection in Landfills: Steady Case. Journal article.
Army Engineer Waterways Experiment Station, Vicksburg, MS.
B. M. McEnroe, and P. R. Schroeder. c1988, 8p EPA/600/J-88/566
Pub. in Jnl. of Environmental Engineering, v114 n5 p1052-1062 Oct 88. Prepared in cooperation with Kansas Univ., Lawrence. Dept. of Civil Engineering. Sponsored by Environmental Protection Agency, Cincinnati, OH. Risk Reduction Engineering Lab.

The paper analyzes the performance of landfill leachate collection systems with low-permeability soil liners under steady-state conditions. Algebraic equations and graphs are presented for predicting the average and maximum saturated depth on the liner, the location of the maximum saturated depth, and the leakage rate. The equations and graphs are developed from numerical solutions of the governing differential equation. Some surprisingly simple relationships are shown to be applicable over much of the practical range. In general, saturated depth over the liner is sensitive to four parameters: the liner slope, the drainage length or drain spacing, the saturated hydraulic conductivity of the drain layer, and the difference between the impingement rate on the liner and the liner's hydraulic conductivity. Under normal conditions, leakage rate is sensitive only to the hydraulic conductivity of the liner. Within the practical range, liner thickness has little effect on either saturated depth or leakage rate.

Keywords: *Earth fills, *Leachates, *Linings, *Leakage, Subsurface drainage, Ground water, Mathematical models, Stabilization, Hydraulic conductivity, Environmental transport, Reprints.

PB91-191395/REB PC **A03**/MF **A01**
Environmental Protection Agency, Cincinnati, OH. Risk Reduction Engineering Lab.
Field Verification of HELP Model for Landfills. Journal article.
Army Engineer Waterways Experiment Station, Vicksburg, MS. Environmental Lab.
R. L. Peyton, and P. R. Schroeder. c1988, 14p EPA/600/J-88/567
Pub. in Jnl. of the Environmental Engineering, v114 n2 p247-269 Apr 88. Prepared in cooperation with Missouri Univ.-Columbia. Dept. of Civil Engineering. Sponsored by Environmental Protection Agency, Cincinnati, OH. Risk Reduction Engineering Lab.

Long-term simulations of 17 landfill cells from six sites are performed using the Hydrologic Evaluation of Landfill Performance (HELP) computer model. Results are compared with field data from a variety of landfills to verify the model and to identify shortcomings. The sites are located in California, Kentucky, and Wisconsin. Since site data are not available for some of the model input parameters, default values are used in many instances. It is found that model predictions are generally bracketed by field measurements. Good agreement between the predictions and measurements is obtained by calibrating the hydraulic conductivity of the cover materials while staying within the range of hydraulic conductivity values reported in the literature for these materials. The results indicate that the HELP model can be a very useful tool for designing and evaluating landfills.

Keywords: *Hydrology, *Earth fills, Performance evaluation, Hydraulic conductivity, Mathematical models, Sites, Runoff, Evapotranspiration, Water balance, Drainage, Soil water, Field tests, California, Kentucky, Wisconsin, Leachate.

PB91-191403/REB PC **A03**/MF **A01**
International Approaches to Developing Standards for Noncriteria Pollutants. Symposium paper.
Environmental Protection Agency, Research Triangle Park, NC. Environmental Criteria and Assessment Office.
S. D. Lee, and J. M. Kawecki. 1988, 17p EPA/600/J-88/568, ECAO-R-0127
Pub. in Toxic Air Pollutant Guidelines: Review of Recent Progress and Problems, p45-56. Presented at the American Conference of Governmental Industrial Hygienists, Cincinnati, OH., 1988.

Much of the initial interest in the control of pollutants, both in the United States and abroad, focused on such 'traditional' pollutants as sulfur dioxide, particulate matter, Total Suspended Particulate (TSP) and particulate matter, nitrogen oxides, carbon monoxide, ozone, and lead. While there is still substantial room for progress in the control of some of the criteria pollutants, substantial progress has been made in understanding the impact of these pollutants and in regulating most of them. At the same time, another new group of pollutants has come to the forefront of the scientific and regulatory community. These non-criteria pollutants include organic compounds such as chlorinated organics, dioxins, aldehydes, and polycyclic organic compounds, as well as heavy metals such as cadmium and mercury. For many of the uncommon noncriteria pollutants, relatively little is known about their effects on health and the environment, and many of the potential effects could take decades to emerge. Similarly, ambient air emissions of many of these substances have not been systematically regulated in the past. Because most of the elevated exposures to these chemi-

cals were thought to occur only in the workplace, widely divergent controls and regulations were enacted. Now that one realizes the pervasiveness of these pollutants in the ambient environment, they are grappling with ways to assess safe exposure levels to them. Cadmium is presented as an example of a standard-setting approach used to regulate noncriteria pollutants.

Keywords: *Air pollution standards, *Cadmium, *Planning, *Standards, Air pollution, Toxic substances, Air pollution control, Organic compounds, Metals, Exposure, Reprints, *Noncriteria air pollutants, World Health Organization.

PB91-191411/REB PC **A03**/MF **A01**
Environmental Protection Agency, Research Triangle Park, NC. Air and Energy Engineering Research Lab.
Combustion Control of Organic Emissions from Municipal Waste Combustors. Journal article Oct 88-Aug 89.
Energy and Environmental Research Corp., Durham, NC.
J. D. Kilgroe, L. P. Nelson, P. J. Schindler, and W. S. Lanier. c1990, 24p EPA/600/J-90/480
Contract EPA-68-03-3365
Pub. in Combustion Science and Technology, v74 p223-244 1990. Sponsored by Environmental Protection Agency, Research Triangle Park, NC. Air and Energy Engineering Research Lab.

The article (1) identifies specific combustion conditions which are postulated to lead to low emission of organics--components of good combustion practice (GCP), (2) summarizes experimental correlations between GCP components and organic emissions, and (3) briefly discusses strategies for applying GCP to ensure continuous control of organic emissions. Background information on chlorinated dibenzo-p-dioxin and -furan (CDD/CDF) formation theories is also presented and additional research needed to establish the effectiveness of combustion strategies for control of municipal waste combustor (MWC) organic emissions is discussed. (NOTE: GCP is defined as combustion conditions which lead to low emissions of trace organic pollutants.) CDD/CDF are some of the most widely studied organic compounds of environmental concern. EPA has announced that it intends to propose new rules for control of MWC air emissions. Technical background studies for these rules considered the control of CDD/CDF as a surrogate for controlling emission of 'MWC organics.' These studies on the control of CDD/CDF from MWC facilities provide useful information on strategies for controlling total organic emissions from combustion sources.

Keywords: *Air pollution abatement, *Municipal wastes, *Waste disposal, *Organic compounds, *Incineration, Combustion efficiency, Performance evaluation, Information transfer, Pollution regulations, Dioxins, Furans, Reprints.

PB91-191429/REB PC **A02**/MF **A01**
Control of PCDD/PCDF Emissions from Refuse-Derived Fuel Combustors. Journal article.
Environmental Protection Agency, Research Triangle Park, NC. Air and Energy Engineering Research Lab.
J. D. Kilgroe, T. G. Brna, A. Finkelstein, and R. Klicius. c1990, 9p EPA/600/J-90/481
Pub. in Chemosphere, v20 n10-12 p1809-1815 1990. Prepared in cooperation with Environment Canada, Ottawa (Ontario).

The paper presents preliminary results of performance tests conducted at the Mid-Connecticut Refuse-derived Fuel Facility in February 1989. Objectives of these tests were to evaluate the effects of combustion and flue gas cleaning process conditions on air pollution emissions and residue properties. A cursory analysis of test results support the following tentative conclusions: (1) Combustor emissions of CO and PCDD/PCDF as measured at the SDA inlet were sensitive to the amount and distribution of OFA. Combustion air distributions which result in poor mixing and low excess air margins are believed to be the primary causes of increased CO emissions. (2) PCDD/PCDF stack emissions of < 0.40 nanogram/standard cubic meter were achieved at the Mid-Connecticut Facility when good operating conditions were maintained on both the combustion and FGC processes. (3) FF outlet concentrations of PCDD/PCDF depend on SDA/FF operating conditions. The lowest emissions were associated with medium to low gas temperatures at the SDA outlet, while the SDA lime slurry flow rate was set to provide medium to low SO2 concentrations at the FF outlet.

Keywords: *Refuse derived fuels, *Air pollution control, *Polychlorinated dibenzodioxins, *Polychlorinated dibenzofurans, *Combustion products, Waste utilization, Flue gas, Performance evaluation, Concentration(Composition), Air pollution sampling, Calcium oxides, Carbon monoxide, Sulfur dioxide, Dioxins, Furans, Reprints, Overfire air.

PB91-191437/REB PC **A03**/MF **A01**
EPA's Control Technology Approach to Assisting States and Regions with Air Toxics Problems: Five Case Studies. Journal article Jan 87-Apr 88.
Environmental Protection Agency, Research Triangle Park, NC. Air and Energy Engineering Research Lab.
S. L. Nolen, and W. F. Dimmick. c1990, 13p EPA/600/J-90/482
Pub. in Toxicology and Industrial Health, v6 n5 p257-267 1990.

The paper discusses a new U.S. strategy to reduce public exposure to toxic air pollutants in the ambient air. The strategy calls for state and local authorities to take on more of the lead regulatory role. The shift in emphasis and responsibility prompted EPA's Offices of Research and Development (ORD) and Air Quality Planning and Standards (OAQPS) to develop and implement an innovative technical assistance program, called the Control Technology Center (CTC). It has since been expanded to include technical assistance in the areas of control of air toxics, particulate matter, and volatile organic compounds (VOCs); emission measurements; and other areas where expertise is available to ORD and OAQPS. Available through the CTC are three categories of technical assistance: telephone HOTLINE calls, direct engineering assistance, and technical guidance projects. The CTC HOTLINE is a special telephone number that state and local agencies can call for easy access to EPA personnel who can provide prompt assistance. Engineering assistance projects require more in-depth engineering analysis; these projects are short-term (less than 3 months) and specific in nature. Technical guidance projects result from problems identified by more than one agency; they are longer-term and of national interest. The paper discusses five CTC projects to illustrate the assistance provided.

Keywords: *Air pollution control, *Toxic substances, *Information transfer, Case studies, Particles, Volatile organic compounds, US EPA, State government, Air pollution abatement, Regional analysis, Research and development, Technology utilization, Permits, Stripping, Plastics, Reprints, *Control Technology Center.

PB91-191445/REB PC **A02**/MF **A01**
Environmental Protection Agency, Research Triangle Park, NC. Air and Energy Engineering Research Lab.
Bench-Scale Evaluation of Calcium Sorbents for Acid Gas Emission Control. Journal article Oct 88-Mar 89.
Acurex Corp., Research Triangle Park, NC.
W. Jozewicz, J. C. S. Chang, and C. B. Sedman. c1990, 8p EPA/600/J-90/483
Contract EPA-68-02-4701
Pub. in Environmental Progress, v9 n3 p137-142 Aug 90. See also PB89-221352. Sponsored by Environmental Protection Agency, Research Triangle Park, NC. Air and Energy Engineering Research Lab.

The paper gives results of an evaluation of calcium sorbents for acid gas emission control for effectiveness in removing SO2/HCl and SO2/NOx from simulated incinerator and boiler flue gases. All tests were conducted in a bench-scale fixed-bed reactor simulating fabric filter conditions in an acid gas removal process. Reagent grade Ca(OH)2 was used to establish baseline sorbent performance. The reactivity of reagent grade Ca(OH)2 with HCl from SO2/HCl mixtures gradually increased with decreasing approach to saturation temperature. SO2 reactivity toward Ca(OH)2 was very sensitive to approach to saturation. Novel calcium silicate sorbents were tested for reactivity with both SO2 and HCl. A thermal window for optimum NOx removal was found at 90 C when Ca(OH)2 was used at SO2/NO ratios of 1:1. Reactivity of Ca(OH)2 toward SO2 from SO2/NO mixtures was very sensitive to approach to saturation, while reactivity with NO was insensitive. Several additives were subsequently tested to determine optimum sorbent combinations for SO2/NO control. To date, the most promising additives are Mg(OH)2 and Na2HPO4 at 10 mol % concentrations. As with SO2/HCl, calcium silicate has been shown to be superior for SO2/NO capture. Some implications for larger-scale process configurations and sorbent selection for HCl/SO2/NO control are discussed.

Keywords: *Air pollution control, *Flue gases, *Sorbents, *Calcium hydroxides, Boilers, Incinerators, Performance evaluation, Fabric filters, Comparison, Baseline measurements, Additives, Sulfur dioxide, Hydrochloric acid, Nitrogen oxide(NO), Reprints.

PB91-191452/REB PC **A03**/MF **A01**
Fish Consumption Advisories: Toward a Unified, Scientifically Credible Approach. Journal article.
Environmental Protection Agency, Cincinnati, OH. Environmental Criteria and Assessment Office.
M. L. Dourson, and J. M. Clark. c1990, 19p EPA/600/J-90/484
Pub. in Regulatory Toxicology and Pharmacology 12, p161-178 1990.

A model is proposed for fish consumption advisories based on consensus-derived risk assessment values for common contaminants in fish and the latest risk assessment methods. The model accounts in part for the expected toxicity to mixtures of chemicals, the underlying uncertainties in the health and exposure data, and the amount of contaminated fish consumed. Application of the model to a larger number of chemicals is possible. Noncancer toxicity is used as an example, but this model is applicable for risks from cancer as well. A second related model is proposed that is useful for comparing potential risks among sites (e.g., rivers and lakes). (Copyright (c) 1990 Academy Press, Inc.)

Keywords: *Fishing industry, *Toxicology, *Health hazards, *Food contamination, Models, Risk assessment, Food consumption, Graphs(Charts), Public health, Toxic substances, Cancer, Contaminants, Criteria.

PB91-191460/REB PC **A03**/MF **A01**
Environmental Protection Agency, Cincinnati, OH. Risk Reduction Engineering Lab.
Evaluation of Landfill-Liner Designs. Journal article.
Missouri Univ.-Columbia. Dept. of Civil Engineering.
R. L. Peyton, and P. R. Schroeder. c1990, 11p EPA/600/J-90/485
Pub. in Jnl. of Environmental Engineering, v116 n3 p421-437 May/Jun 90. Prepared in cooperation with Army Engineer Waterways Experiment Station, Vicksburg, MS. Sponsored by Environmental Protection Agency, Cincinnati, OH. Risk Reduction Engineering Lab.

The effectiveness of landfill-liner designs is evaluated in terms of the slope, drainage length, and saturated hydraulic conductivity of the lateral drainage layer, the saturated hydraulic conductivity of the soil liner, and the fraction of the area under a synthetic liner where leakage is occurring. The evaluation is performed using Version 1 of the Hydrologic Evaluation of Landfill Performance (HELP) model. The effectiveness is quantified by comparing the lateral drainage rate to the vertical percolation rate expressed as percentages of the total inflow. The two multiple-liner systems specified in the Hazardous and Solid Waste Amendments (HSWA) minimum technology guidance are shown to have different leakage-detection characteristics. One system detects significant leakage before leakage percolates out of the landfill, whereas the other system detects leakage only after significant leakage percolates out of the landfill. Four other designs were also examined-two with single liners and two with double liners. The two HSWA designs detected leakage at lower synthetic-liner-leakage fractions, but all designs with composite liners were nearly equally effective in reducing leakage from landfills. (Copyright (c) 1990, ASCE.)

Keywords: *Linings, *Earth fills, *Land pollution control, *Hazardous materials, *Waste disposal, Design criteria, Performance evaluation, Hydraulic conductivity, Leakage, Mathematical models, Soil compacting, Subsurface drainage, Membranes, Slope, Reprints, Geosynthetic materials, Hydrologic Evaluation of Landfill Performance Model.

PB91-191478/REB PC **A02**/MF **A01**
Robert S. Kerr Environmental Research Lab., Ada, OK.

Production and Transport of Carbon Dioxide in a Contaminated Vadose Zone: A Stable and Radioactive Carbon Isotope Study. Journal article.
Arizona Univ., Tucson. Environmental Radioisotope Center.
K. H. Suchomel, A. Long, and D. K. Kreamer. c1990, 10p EPA/600/J-90/486
Grant EPA-R-812583
Pub. in Environmental Science and Technology, v24 n12 p1824-1831 1990. Prepared in cooperation with Nevada Univ. System, Las Vegas. Water Resources Center. Sponsored by Robert S. Kerr Environmental Research Lab., Ada, OK.

Analyses of soil gas compositions and stable and radioactive carbon isotopes in the vadose zone above an alluvial aquifer were conducted at an organic solvent disposal site in southeast Phoenix, AZ. The study investigated the source and movement of carbon dioxide above a plume of organic solvent contamination. Two soil gas monitor wells, each screened and grouted at four discrete depths above the water table, provided sampling access. One well penetrated the uncontaminated vadose zone, the other penetrated a contaminated area now covered with asphalt. Carbon dioxide concentrations in the uncontaminated area range from 1.45% at 8 ft to 3% at 19 ft below land surface. Isotopic evidence suggests root respiration and minor oxidation of organic matter as CO2 sources at this site. Carbon dioxide in soil gas samples from the contaminated area exceeded 15% while O2 levels were as low as 1%. Carbon dioxide concentrations and carbon isotope values are consistent with in situ aerobic biodegradation of the organic pollutants. (Copyright (c) 1990 American Chemical Society.)

Keywords: *Water pollution, *Vadose water, *Path of pollutants, *Isotopic labeling, *Tracer studies, Aquifers, Carbon dioxide, Organic solvent, Waste disposal, Biodeterioration, Aerobic processes, Volatile organic compounds, Environmental transport, Biological indicators, Reprints, *Soil gases.

PB91-191486/REB PC **A02**/MF **A01**
Ozone Concentration and Pulmonary Response Relationships for 6.6-Hour Exposures with Five Hours of Moderate Exercise to 0.08, 0.10, and 0.12 PPM. Journal article.
Health Effects Research Lab., Research Triangle Park, NC. Clinical Research Branch.
D. H. Horstman, L. J. Folinsbee, P. J. Ives, S. A. Salaam, and W. F. McDonnell. c1990, 8p EPA/600/J-90/487
Pub. in American Review of Respiratory Disease, v142 n5 p1158-1163 Nov 90.

The magnitudes of pulmonary responses the authors previously observed (1) following 6.6-h exposure to 0.12 ppm ozone (O3) suggested that responses would also occur with similar exposures at lower O3 concentrations. The objective of the study was to determine the extent of pulmonary function decrements, respiratory discomfort, and increased airway reactivity to methacholine induced by exposure to O3 below 0.12 ppm. Separate 6.6-h chamber exposures to 0.00, 0.08, 0.10, and 0.12 ppm O3 included six 50-min periods of moderate exercise (VE = 39 L/min, HR = 115 bpm, and VO2 = 1.5 L/min). Each exercise period was followed by 10 min of rest. A 35-min lunch break was included midway through the exposure. Although not intended as an exact simulation, the overall duration, intensity, and metabolic requirements of the exercise performed were representative of a day of moderate to heavy work or play. Preexposure FEV, averaged 4.39 L, and essentially no change (+0.03 L) occurred with exposure to 0.00 ppm O3. Significant decreases ($p<0.01$) of -0.31, -0.30, and -0.54 L were observed with exposures to 0.08, 0.10, and 0.12 ppm, respectively. The study concludes that exposure to O3 at levels often found in ambient air while engaged in activity representative of a typical day of moderate to heavy work or play induced clinically meaningful pulmonary responses.

Keywords: *Ozone, *Exercise, *Air pollution effects(Humans), Dose-response relationships, Respiratory function tests, Airway resistance, Exposure, Statistical analysis, Signs and symptoms, Reprints.

PB91-191494/REB PC **A02**/MF **A01**
Environmental Protection Agency, Research Triangle Park, NC. Air and Energy Engineering Research Lab.
Mechanisms of Inorganic Particle Formation during Suspension Heating of Simulated Aqueous Wastes. Journal article.
Massachusetts Inst. of Tech., Cambridge. Dept. of Chemical Engineering.
J. A. Mulholland, and A. F. Sarofim. c1991, 9p EPA/600/J-91/039
Contract EPA-68-02-4247
Pub. in Environmental Science and Technology, v25 n2 p268-274 1991. Sponsored by Environmental Protection Agency, Research Triangle Park, NC. Air and Energy Engineering Research Lab.

The paper gives results of measurements of metal partitioning between the fine condensation aerosol and the larger particles produced during rapid heating of polydisperse droplet streams of aqueous solutions containing nitrates of Cd, Pb, and Ni in a laboratory-scale furnace. Trimodal particle size distributions were observed. Partitioning of the larger particles between residual and intermediate modes is consistent with the dependence of particle porosity on condensed phase transformations during nitrate decomposition. In addition, ultrafine particles were produced. In the Ni tests, where vaporization is not a reasonable mechanism for inorganic aerosol formation over the range of temperatures studied (900-1500 K), 30-35% of the particles had aerodynamic diameters of <1 micrometer. Furthermore, a preponderance of cenospheres was observed in the large particle size fractions. It is conjectured that the NiO cenospheres form and burst to produce the submicron particles. In the Ca and Pb experiments, the amount of submicron particles produced was in qualitative agreement with the amount calculated for the time-dependent vaporization of the thermodynamically dominant monoxide species. However, two findings suggest that fragmentation contributed to submicron particle formation in these tests as well.

Keywords: *Particle size distribution, *Cadmium, *Nickel, *Lead(Metal), *Aerosols, Partitions, Fines, Incinerators, Nitrates, Oxides, Air pollution, Air pollution control, Simulation, Condensates, Reprints, Aqueous wastes.

PB91-191502/REB PC **A03**/MF **A01**
Environmental Protection Agency, Cincinnati, OH. Risk Reduction Engineering Lab.
Integrated Model for Predicting the Fate of Organics in Wastewater Treatment Plants. Journal article.
Cincinnati Univ., OH. Dept. of Chemical Engineering.
R. Govind, L. Lai, and R. Dobbs. c1991, 13p EPA/600/J-91/043
Grant EPA-R-812939-01
Pub. in Environmental Progress, v10 n1 p13-23 Feb 91. Sponsored by Environmental Protection Agency, Cincinnati, OH. Risk Reduction Engineering Lab.

An integrated Fate Model has been developed for predicting the fate of organics in a wastewater treatment plant. The Fate Model has been validated using experimental data from a pilot-scale facility. The biodegradation kinetic constants for some compounds in the Fate Model were estimated using the group contribution approach. The Fate Model has been compared with other existing models in the literature. Potential applications of the Fate Model include assessment of volatile organic compound (VOC) emissions from a wastewater treatment plant, evaluate pretreatment requirements prior to discharge to the sewer system, predict concentrations of toxic compounds on sludges, and provide a general framework for estimating the removal of toxic compounds during activated sludge treatment.

Keywords: *Sewage treatment plants, *Organic compounds, Biological treatment, Biodeterioration, Environmental impact assessments, Volatile organic compounds, Activated sludge treatment, Toxic substances, Vaporizing, Sorption, Aeration, Reaction kinetics, Physical properties, Concentration(Composition), Comparison, Pilot plants, Design criteria, Operating, Reprints, *Fate model, Pretreatment process.

PB91-191510/REB PC **A03**/MF **A01**
Hypothermic Effects of a Homologous Series of Short-Chain Alcohols in Rats. Journal article.
Health Effects Research Lab., Research Triangle Park, NC. Neurotoxicology Div.
F. S. Mohler, and C. J. Gordon. c1991, 13p EPA/600/J-91/044
Pub. in Jnl. of Toxicology and Environmental Health, v32 n2 p129-139 1991.

The purpose of the study was to assess the toxicity of various short-chain alcohols using the thermoregulatory system of the rat as an endpoint. Male Fischer rats developed significant hypothermia following acute administration (i.p.) of methanol, ethanol, 1-propanol, 2-propanol, 1-butanol, or 2-butanol. The hypothermic responses to the six alcohols all showed similar bimodal responses characterized by a threshold dose below which no change in body temperature occurred, and a suprathreshold regression with increasing dose causing greater hypothermia. Relative efficacy of the alcohols was compared using both the threshold dose to cause hypothermia and the dose which would cause body temperature to decrease by 1 C. Both measures gave the progression of toxicity from least to most potent of: methanol<ethanol<2-propanol<1-propanol<2-butanol<1-butanol. The effective dose of an alcohol was compared to its membrane/buffer partition coefficient (P(sub m/b)), and there was a high inverse-correlation between the hypothermic dose of an alcohol and its lipid solubility.

Keywords: *Toxicity, *Body temperature regulation, *Hypothermia, *Propanol, *Butanol, Rats, Dose-response relationships, Reprints.

PB91-191528/REB PC **A02**/MF **A01**
Toxic-Induced Hypothermia and Hypometabolism: Do They Increase Uncertainty in the Extrapolation of Toxicological Data from Experimental Animals to Humans. Journal article.
Health Effects Research Lab., Research Triangle Park, NC.
C. J. Gordon. 1991, 7p EPA/600/J-91/045
Pub. in Neuroscience and Biobehavioral Reviews, v15 n1 p95-98 Jan 91.

Commonly used experimental mammals, such as the rat and mouse, exhibit hypothermia and hypometabolism when exposed acutely to many drugs and other chemical substances. This toxic-induced hypothermic/hypometabolic state may be an inherently protective response that can reduce the lethality of a toxic insult. However, as body mass increases, the ability to lower body temperature in response to toxic insult is diminished. Hence, the presence of a protective hypometabolic/hypothermic response in small laboratory mammals and apparent lack thereof in larger species, such as humans, may represent an additional physiological dissimilarity which may underestimate the risk assessment of acute toxicological data.

Keywords: *Toxic substances, *Hypothermia, *Animal disease models, Rats, Mice, Risk assessment, Body weight, Toxicity, Body temperature, Reprints, *Hypometabolism.

PB91-191536/REB PC **A03**/MF **A01**
Health Effects Research Lab., Research Triangle Park, NC.
Prediction of the Reactivities of Cyclopenta-polynuclear Aromatic Hydrocarbons by Quantum Mechanical Methods. Journal article.
Environmental Health Research and Testing, Inc., Research Triangle Park, NC.
J. R. Rabinowitz, and S. B. Little. c1991, 15p EPA/600/J-91/046
Contract EPA-68-02-4456
Pub. in Xenobiotica, v21 n2 p263-275 Feb 91. Sponsored by Health Effects Research Lab., Research Triangle Park, NC.

The direction of epoxide ring opening may be predicted using the techniques of theoretical chemistry by comparing the computed total energy of the two possible carbocations formed. To predict the direction of epoxide ring opening and the potential binding of aceanthrylene 1,2-epoxide to biopolymers, quantum mechanical calculations were performed on the two potential hydroxy carbocations. The 2-hydroxy carbocation (II) was favored over the 1-hydroxy carbocation by 11.8 kcal/mol. Molecule II had more positive charge at the meso carbon group than at the nominally electrostatic potential confirm this result, and indicate the possibility of unusual adducts to biopolymers. Similar calculations on the equivalent epoxides of acenaphthylene and acephenanthrylene do not show the same results. Modeling the addition products of II with small nucleophiles indicates that these unusual addition products do not form, and that the interaction is con-

trolled by electronic effects and not electrostatic effects. The calculations on acephenanthrylene demonstrate the importance of including the hydroxyl group when making predictions relative to epoxide ring opening. Molecular descriptors are surrogates for the interactions of that molecule with an often unknown biological target. In cases where molecular descriptors are used without information about the target, small quantitative differences may not be appropriate discriminators. (Copyright (c) 1991 Taylor and Francis Ltd.)

Keywords: *Aromatic polycyclic hydrocarbons, *Epoxides, *Chemical reactivity, *Quantum theory, *Predictions, Molecular structure, Mathematical models, Charge density, Organic ions, Biopolymers, Reprints.

PB91-191544/REB PC **A03**/MF **A01**
Health Effects Research Lab., Research Triangle Park, NC.
Potentiation of 2,6-Dinitrotoluene Genotoxicity in Fischer 344 Rats by Pretreatment with Pentachlorophenol. Journal article.
North Carolina Univ. at Chapel Hill.
R. W. Chadwick, S. E. George, J. Chang, M. J. Kohan, and J. P. Dekker. c1991, 14p EPA/600/J-91/047
Grant EPA-R-815941
Pub. in Pesticide Biochemistry and Physiology, v39 n2 p168-181 Feb 91. Prepared in cooperation with Environmental Health Research and Testing, Inc., Research Triangle Park, NC. Sponsored by Health Effects Research Lab., Research Triangle Park, NC.

The organochlorine pesticide, pentachlorophenol (PCP), a potent sulfotransferase inhibitor, reduces binding of the hepatocarcinogen, 2,6-dinitrotoluene (DNT), to hepatic DNA by 95% after a single i.p. injection. Activation of DNT to genotoxic metabolites involves enzymes in both the liver and the intestinal flora. Since PCP also has bactericidal activity and induces hepatic mixed function oxidase activity after longer treatment, the effect of PCP on intestinal enzyme activity and the biotransformation of DNT to genotoxic metabolites, after 1, 2, 4, and 5 weeks of treatment, was studied. Male Fischer 344 rats were dosed daily, by gavage, with either 20 mg/kg PCP or the peanut oil vehicle. After 1, 2, 4, and 5 weeks, select control and treated animals were injected p.o. with 75 mg/kg 2,6-dinitrotoluene and transferred to metabolism cages, where urine was collected and tested for mutagenic activity. At 2 and 4 weeks, 6 control and 6 treated animals were sacrificed and nitroreductase, azo reductase, beta-glucuronidase, dechlorinase and dehydrochlorinase activities were analyzed in homogenates of the small intestine, large intestine, and cecum. At 5 weeks, hepatic DNA adduct formation was assayed by the (32)P-postlabeling of DNA. Results of the study indicated that PCP accelerated the biotransformation of DNT to genotoxic metabolites and potentiated the formation of DNT - induced DNA adducts in the liver.

Keywords: *Mutagens, *Pesticides, Sulfotransferases, Enzyme inhibitors, Mutagenicity tests, Rats, Metabolic activation, DNA damage, Chemical stimulation, Reprints, *Dinitrotoluenes, *Pentachlorophenol, Liver enzymes.

PB91-191551/REB PC **A03**/MF **A01**
Comparison of Rats of the Fischer 344 and Long-Evans Strains in Their Autonomic Thermoregulatory Response to Trimethyltin Administration. Journal article.
Health Effects Research Lab., Research Triangle Park, NC.
C. J. Gordon, and L. Fogelson. c1991, 14p EPA/600/J-91/048
Pub. in Jnl. of Toxicology and Environmental Health, v32 p141-152 1991.

The purpose of the study was to assess the effect of genetic strain on the acute and long-term thermoregulatory response to the neurotoxicant, trimethyltin (TMT) in rats of the Long-Evans (LE) and Fischer 344 (FCH) strains. In one study basic thermoregulatory responses including colonic temperature (Tc), metabolic rate (MR), evaporative water loss (EWL), motor activity (MA), and thermal conductance (Cd) were measured in both rat strains at ambient temperatures (Ta) of 10, 28, and 37 C. It was found that the LE rat has a significantly higher Tc when it is measured in their home cage. Because of its smaller mass the FCH rat has a higher MR at all Ta's. The FCH rat also has a greater rate of EWL during exposure to a Ta of 37 C. Following i.v. administration of 8.0 mg/kg TMT both rat strains become significantly hypothermic; however, the effect differed significantly between the strains. At 26 to 34 days after TMT exposure thermoregulatory responses at Ta's of 10 to 37 C were generally similar to that of the saline controls. However, there was a significant elevation in MR and MA of the TMT-treated FCH rat which merits further study. Overall, it appears that autonomic thermoregulatory responses measured 26 to 34 days after TMT are near normal in the FCH and LE rat strains.

Keywords: *Toxicology, *Body temperature regulation, *Trimethyltin, *Species specificity, Autonomic nervous system, Rats, Environmental pollutants, Motor activity, Metabolism, Reprints.

PB91-191569/REB PC **A03**/MF **A01**
Health Effects Research Lab., Research Triangle Park, NC. Reproductive Toxicology Branch.
In vitro/In vivo Effects of Ethane Dimethanesulfonate on Leydig Cells of Adult Rats. Journal article.
NSI Technology Services Corp., Research Triangle Park, NC.
G. R. Klinefelter, J. W. Laskey, and N. L. Roberts. c1991, 14p EPA/600/J-91/049
Contract EPA-68-02-4450
Pub. in Toxicology and Applied Pharmacology, v107 n3 p460-471 Mar 91. Sponsored by Health Effects Research Lab., Research Triangle Park, NC. Reproductive Toxicology Branch.

Ethane dimethanesulphonate (EDS) is well-recognized as a Leydig cell toxicant. Although this compound has been studied extensively to date, certain toxicological criteria have not been met. For instance, the dose-responsiveness of Leydig cells to EDS, both in vitro and in vivo, is not well established. In addition, the data regarding the cellular site of action of EDS during Leydig cell toxicity and the status of Leydig cell viability during the affected period remains controversial. The study used both highly purified (98 %) and interstitial (14 %) Leydig cell preparations to determine the in vitro EC50 (370 micro M) and in vivio (sub 50) (60 mg/kg) for hCG-stimulated testosterone (T) production, respectively. Leydig cells were recovered in approximately equal number following all in vivo and in vitro EDS exposures. Test results indicate that when Leydig cells are exposed to EDS either in vitro or in vivo, the biosynthesis of T is compromised between the production of cyclic adenosine monophosphate (CAMP) activation of protein kinase and the cholesterol side chain cleavage enzyme.

Keywords: *Toxicology, *Leydig cells, Rats, Testosterone, Biosynthesis, Cyclic adenosine monophosphate, Protein kinases, Cholesterol, In vitro analysis, In vivo analysis, Electron microscopy, Enzyme activation, Chorionic gonadotropins, Reprints, *Ethane demethanesulfonate.

PB91-191577/REB PC **A03**/MF **A01**
Rat Flash-Evoked Potential Peak N160 Amplitude: Modulation by Relative Flash Intensity. Journal article.
Health Effects Research Lab., Research Triangle Park, NC.
D. W. Herr, W. K. Boyes, and R. S. Dyer. c1991, 13p EPA/600/J-91/050
Pub. in Physiology and Behavior, v49 n2 p355-365 Feb 91.

The flash evoked potential (FEP) of rats has a large negative peak (N(sub 160)) approximately 160 msec following stimulation. The peak has been reported to be modulated by the subject's state of behavioral arousal and influenced by several test parameters. These experiments examine the influences of repeated testing, the number of stimuli/session, interaction of ambient illumination and flash intensity, and the effect of pupillary dilation on the development and amplitude of peak N(sub 160). The amplitude of peak N(sub 160) increased with daily testing, and reached an asymptotic amplitude by about day 10. This amplitude was affected by the intensity of the flash stimulus relative to the ambient illumination (RFI), and appeared to reach a ceiling amplitude at greater than 50 dB RFI. The number of stimuli/session and dilation of the subject's pupils did not have a large influence on the growth or asymptotic level of peak N(sub 160) amplitude. The data are consistent with the hypothesis that the growth of peak N(sub 160) may represent a sensitization-like phenomenon.

Keywords: *Visual evoked potentials, *Flashing, *Photic stimulation, Animal behavior, Lighting, Pupil, Tests, Reprints.

PB91-191585/REB PC **A03**/MF **A01**
Carcinogenicity of Dichloroacetic Acid in the Male B6C3F1 Mouse. Journal article.
Health Effects Research Lab., Cincinnati, OH.
A. B. DeAngelo, F. B. Daniel, J. A. Stober, and G. R. Olson. c1991, 13p EPA/600/J-91/051
Pub. in Fundamental and Applied Toxicology, v16 n2 p337-347 Feb 91. Prepared in cooperation with Pathology Associates, Inc., West Chester, OH.

Groups of male B6C3F mice (N=50) were provided drinking water containing 2 g/liter sodium chloride (control) and 0.05, 0.5 and 5 g/liter dichloroacetic acid (DCA). Treatment of 30 animals in each group was carried out to 60 or 75 weeks. In a separate experiment, mice exposed to 3.5 g/liter DCA and the corresponding acetic acid control group were killed at 60 weeks. Groups of 5 mice were killed at 4, 15, 30 and 45 weeks. Time=weighted mean daily doses of 7.6, 77, 410, and 486 mg/kg/day were calculated for 0.05, 0.5, 3.5, and 5 g/liter DCA treatments. Animals exposed to 3.5 and 5 g/liter DCA had final body weights that were 87 and 83%, respectively of the control value. Relative liver weights of 136, 230, and 351% of the control value were measured for 0.5, 3.5 and 5 g/liter, respectively. At 60 weeks mice receiving 5.0 g/liter DCA had a 90% prevalence of liver neoplasia with a mean multiplicity of 4.50 tumors/animal. Exposure to 3.5 g/liter DCA for 60 weeks resulted in a 100% tumor prevalence with an average of 4.0 tumors/animal. No liver tumors were found in the group treated with acetic acid. Hyperplastic nodules were seen in the 3.5 (58%; 0.92/animal) and 5 g/liter DCA groups (83%; 1.27/animal).

Keywords: *Dichloroacetate, *Potable water, *Water pollution effects(Animals), *Carcinogens, Mice, Liver neoplasms, Carcinogenicity tests, Hyperplasia, Adenoma, Organ weight, Body weight, Pathology, Reprints.

PB91-191593/REB PC **A03**/MF **A01**
Health Effects Research Lab., Research Triangle Park, NC.
Amplification of CCl4 Toxicity by Chlordecone: Destruction of Rat Hepatic Microsomal Cytochrome P-450 Subpopulation. Journal article.
Mississippi Univ. Medical Center, Jackson. Dept. of Pharmacology and Toxicology.
S. Chaudhury, and H. M. Mehendale. c1991, 20p EPA/600/J-91/052
Grant EPA-R-814053
Pub. in Jnl. of Toxicology and Environmental Health, v32 p277-294 Mar 91. Sponsored by Health Effects Research Lab., Research Triangle Park, NC., and Harry G. Armstrong Aerospace Medical Research Lab., Wright-Patterson AFB, OH.

Previous work has shown that chlordecone (CD)-amplified CCl4 hepatoxicity and lethality can be mitigated by pretreatment with (+)-cyanidanol. These studies also revealed that stimulated hepatocellular regeneration might play an important role in the cyanidanol protection of CD-amplified CCl4 toxicity. The present studies conducted over a time course of 0 to 120 hr after CCl4 challenge describe sequential changes in hepatic (3)H-thymidine incorporation into hepatocellular nuclear DNA, polyamines and related enzymes, and histomorphometry of liver sections from variously treated rats. Male Sprague-Dawley rats (125-150 g) were maintained on a control diet or on a diet contaminated with CD (10 ppm for 15 days) and/or pretreated with cyanidanol (250 mg/kg, ip) at 48, 24 and 2 hr before a single ip injection of 50 microliter CCl4/kg(L) to 100 microliter CCl4/kg(H) on day 16 of the dietary protocol. Cyanidanol-stimulated (3)H-thymidine incorporation was highly suppressed in rats receiving the CD + CCl4(H) combination treatment up to 36 hr, but after this time point a marked increase was observed. Hepatocellular regeneration, quantified histomorphometrically as volume density of cells in metaphase was progressively increased in rats protected from CD + CCl4 interaction by cyanidanol, starting at 36 hr and lasting until 72 hr.

Keywords: *Chlordecone, *Carbon tetrachloride, *Liver microsomes, *Cytochrome P-450, *Toxicity, Liver regeneration, Rats, Cathechin, Ion exchange chromatography, Mixed function oxidases, Organ weight, Liver enzymes, Reprints.

PB91-191601/REB PC **A02**/MF **A01**
Thermostability of Sperm Nuclei Assessed by Microinjection into Hamster Oocytes. Journal article.
Environmental Protection Agency, Research Triangle Park, NC. Reproductive Toxicology Branch.
K. Yanagida, S. D. Perreault, R. G. Kleinfeld, and R. Yanagimachi. c1991, 10p EPA/600/J-91/053
Pub. in Biology of Reproduction, v44 n3 p440-447 Mar 91. Prepared in cooperation with John A. Burns School of Medicine, Honolulu, HI. Dept. of Anatomy and Reproductive Biology.

Nuclei isolated from spermatozoa of various species (golden hamster, mouse, human, rooster, and the fissh tilapia) were heated at 50 - 125 deg for 20-120 min and then microinjected into hamster oocytes to determine whether they could decondense and develop into pronuclei. Mature, mammalian sperm nuclei, which are stabilized by protamine disulfide bonds, were moderately heat resistance. For example, they remained capable of pronucleus formation even after pretreatment for 30 min at 90 C. Indeed, a temperature of 125 C (steam) was required to inactivate hamster sperm nuclei completely. On the other hand, nuclei of rooster and tilapia spermatozoa and those of immature hamster and mouse spermatozoa, which are not stabilized by protamine disulfide bonds, were sensitive to heating; although some of them decondensed after exposure to 90 C, none formed male pronuclei. Furthermore, nuclei of mature hamster sperm became heat labile when they were pretreated with dithiothreitol to reduce their protamine disulfide bonds. These observations suggest that the thermostability shown by the nuclei of mature spermatozoa of eutherian mammals is related to disulfide cross-linking of sperm protamines.

Keywords: *Heat, *Spermatozoa, *Cell nucleus, Microinjections, Ovum, Golden hamsters, Autoradiography, pH, Species specificity, Chickens, Mice, Cross-linking reagents, Reprints.

PB91-191619/REB PC **A02**/MF **A01**
Glutamate Neurotoxicity in Rat Auditory System: Cochlear Nuclear Complex. Journal article.
Health Effects Research Lab., Research Triangle Park, NC. Neurotoxicology Div.
L. Schweitzer, K. F. Jensen, and R. Janssen. c1991, 7p EPA/600/J-91/054
Pub. in Neurotoxicology and Teratology, v13 n2 p189-193 Mar 91. Prepared in cooperation with Louisville Univ., KY. School of Medicine.

In other systems such as the hypothalamus and hippocampus, it has been shown that cells postsynaptic with respect to glutamatergic inputs degenerate when exposed to large doses of glutamate ('glutamate neurotoxicity'). Studies show that large doses of glutamate administered intraperitoneally are toxic to spiral ganglion cells in the inner ear of the rat. The present study investigated whether similar levels of glutamate cause alterations in the neurons of the cochlear nuclei. Specifically, the study investigated morphology and size of the cochlear nuclear complex and its subdivisions as well as the size and density of cochlear nucleus neurons following administration of glutamate. The morphological evidence indicates that glutamate caused severe anatomical alteration of the cochlear nuclei. The changes were most pronounced in the anteroventral cochlear nucleus, especially in the neurons that receive terminals of the end bulbs of Held from the cochlear nerve. This could be a direct effect of glutamate in the cochlear nuclei or secondary to degeneration of cochlear nerve fibers in the inner ear. (Copyright (c) Pergamon Press plc, 1991.)

Keywords: *Glutamates, *Nervous system, *Toxicity, *Cochlea, Histology, Denervation, Cells(Biology), Rats, Reprints, *Cochlear nuclear complex.

PB91-191627/REB PC **A02**/MF **A01**
Structure-Activity Study of Paracetamol Analogues: Inhibition of Replicative DNA Synthesis in V79 Chinese Hamster Cells. Journal article.
Health Effects Research Lab., Research Triangle Park, NC.
A. M. Richard, J. K. Hongslo, P. F. Boone, and J. A. Holme. c1991, 9p EPA/600/J-91/055
Pub. in Jnl. of Chemical Research in Toxicology, v4 n2 p151-156 Mar 91. Prepared in cooperation with National Inst. of Public Health, Oslo (Norway), and Environmental Health Research and Testing, Inc., Research Triangle Park, NC.

Experimental and theoretical evidence pertaining to cytotoxic and genotoxic activity of paracetamol in biological systems was used to formulate a simple mechanistic hypothesis to explain the relative inhibition of replicative DNA synthesis by a series of 19 structurally similar paracetamol analogues, 5 of which were specifically analyzed for the current study. It was hypothesized that the observed activity variation of the paracetamol analogues was based on the relative abilities of these compounds to undergo H atom loss at the phenolic oxygen, and on the relative stabilities of the resulting free-radical species. Three calculated parameters were found to be relevant--the partial atomic charge on the ring carbon attached to the phenolic oxygen, the partial charge on the phenoxy radical oxygen, and the energy difference between the parent phenolic paracetamol analogue and the corresponding radical dissociation products. The variation in parameter values was significantly correlated with the relative inhibition of DNA synthesis and was easily rationalized in terms of the mechanistic hypothesis proposed. More specifically, competive reaction with a tyrosyl radical species involving the transfer of a hydrogen atom at the active site of ribonucleotide reductase was suggested as the underlying mechanistic basis for the observed activity variation of the paracetamol analogues. (Copyright (c) 1991 by the American Chemical Society.)

Keywords: *Acetaminophen, *DNA replication, *Analgesics, *Toxicity, Structure-activity relationship, Chinese hamsters, Cultured cells, Cell survival, Mutagenicity tests, Reprints.

PB91-191635/REB PC **A03**/MF **A01**
Aerosol Therapy Implications of Particle Deposition Patterns in Simulated Human Airways. Journal article.
Health Effects Research Lab., Research Triangle Park, NC. Environmental Toxicology Div.
T. B. Martonen. c1991, 18p EPA/600/J-91/056
Pub. in Jnl. of Aerosol Medicine, v4 n1 p25-40 Feb 91. Prepared in cooperation with North Carolina Univ. at Chapel Hill. Dept. of Medicine.

The efficacy of inhalation therapy may be improved by the selective deposition of aerosolized medicines, by explicitly targeting and delivering drugs to prescribed lung sites. Here, the deposition patterns of test aerosols, mapped in surrogate respiratory tracts consisting of replica laryngeal casts and fabricated tracheobronchial models, are analyzed. Particles were preferentially deposited at bifurcations, specifically at carinal ridges. Evidence from other investigations indicates that mucociliary clearance may be impeded at such sites in vivo. When these two effects are coupled, the findings suggest that epithelial cells and receptors at airway branching sites may receive concentrated doses of inhaled pharmacological agents. To focus the effects of airborne drugs the lung should, therefore, be considered as a serial network of Y-shaped bifurcation units. The findings have important implications to aerosol therapy protocols including: (1) the treatment of bronchogenic carcinomas because malignant tumors have a predilection for upper airway bifurcations; and (2) lung diseases related to the afferent nervous system since components of neural pathways frequent such locations.

Keywords: *Aerosols, *Drug administration routes, *Trachea, *Bronchi, Inhalation, Humans, Bronchial neoplasms, Respiratory system, Anatomical models, Reprints, *Particle deposition.

PB91-191643/REB PC **A02**/MF **A01**
Comparability of Rat and Human Visual-Evoked Potentials. Journal article.
Health Effects Research Lab., Research Triangle Park, NC. Neurotoxicology Div.
H. K. Hudnell, and W. K. Boyes. c1991, 8p EPA/600/J-91/057
Pub. in Neuroscience and Biobehavioral Reviews, v15 p159-164 Mar 91.

A series of experiments was conducted to assess the comparability of physiological processes in rat and human visual systems. In the first set of experiments, transient visual evoked potentials (VEPs) were elicited by the onset of sine-wave gratings of various spatial frequencies. The spatial frequency-response profiles of the first positive and immediately succeeding negative components differed from one another, but were similar in the two species. In addition, amplitude of the negative, but not the positive, component was strongly attenuated in both species following stationary pattern adaptation. In the second set of experiments, steady-state VEPs were elicited by the onset and offset of the gratings. The spatial frequency profiles of the 1F (response amplitude at the frequency of stimulus onset-offset) and 2F response components differed from one another, but were similar in both species. The final set of experiments indicated that diazepam, a GABA agonist, reduced amplitude of 2F, but not 1F, in both species.

Keywords: *Visual evoked potentials, Comparative evaluations, Rats, Humans, Diazepam, Amplitude, Species specificity, Reprints.

PB91-191650/REB PC **A03**/MF **A01**
Assessment of the Hepatotoxicity of Acute and Short-Term Exposure to Inhaled p-Xylene in F-344 Rats. Journal article.
Health Effects Research Lab., Research Triangle Park, NC.
J. E. Simmons, J. W. Allis, E. C. Grose, J. C. Seely, and B. L. Robinson. c1991, 14p EPA/600/J-91/058
Pub. in Jnl. of Toxicology and Environmental Health, v32 p295-306 Mar 91. Prepared in cooperation with PATHCO, Inc., Research Triangle Park, NC.

Due to the ubiquitous presence of p-xylene in air and the existing uncertainty regarding its hepatotoxic potential, the authors examined the effect of acute and short-term exposure to inhaled p-xylene on the liver. Male F-344 rats were exposed to 0 or to 1600 ppm p-xylene, 6 h/d, for 1 or 3 d. Exposure to inhaled p-xylene caused no histopathological evidence of hepatic damage and had little or no effect on the serum levels of aspartate aminotransferase, alanine aminotransferase, lactate dehydrogenase, ornithine carbamyl transferase, alkaline phosphatase, and total bilirubin. Exposure to p-xylene for 1 or 3 d resulted in an increase in relative liver weight on d 1 post-exposure. The concentration of hepatic cytochrome P-450 was increased by both p-xylene exposure regimens on d 1 postexposure and had returned to control levels by d 3 following the single p-xylene exposure and by d 2 following the 3-d exposure. These observations provide consistent evidence that acute and short-term exposure to 1600 ppm p-xylene by inhalation did not produce overt hepatotoxicity but resulted in a significant increase in the concentration of hepatic cytochrome P-450, the principal enzyme system involved in the metabolic biotransformation of xenobiotics. (Copyright (c) 1991 by Hemisphere Publishing Corporation.)

Keywords: *Toxicity, *Xylenes, *Liver, *Air pollution effects(Animals), Rats, Liver enzymes, Metabolic activation, Enzyme induction, Body weight, Organ weight, Blood chemical analysis, Dose-response relationships, Reprints.

PB91-191668/REB PC **A03**/MF **A01**
Use of the Spiral Salmonella Assay to Detect the Mutagenicity of Complex Environmental Mixtures. Journal article.
Health Effects Research Lab., Research Triangle Park, NC.
V. S. Houk, G. Early, and L. D. Claxton. c1991, 12p EPA/600/J-91/059
Pub. in Environmental and Molecular Mutagenesis, v17 p112-121 Mar 91. Prepared in cooperation with Saint Augustine's College, Raleigh, NC.

Three sets of combustion emissions were selected for evaluation: automotive diesel exhaust, woodsmoke, and a coal combustion emission. Each sample was tested in the Salmonella mutagenicity assay according to standard protocol (plate incorporation) and spiral assay techniques. Two assays demonstrated the following: (1) Diesel exhaust was generally the most mutagenically potent sample in both assays. (2) Samples were more mutagenic on rev/microgram basis in the spiral assay, especially when metabolic activation was added. (3) The spiral assay required 1/20 the sample mass of the standard assay to test equivalent doses. (4) Dichloromethane extracts of the complex mixtures could be tested for mutagenicity in the spiral assay.

Keywords: *Mutagenicity tests, *Environmental pollutants, *Salmonella typhimurium, Mixtures, Exhaust emissions, Solvents, Metabolic activation, Diesel fuels, Reprints, Wood smoke, Coal combustion emissions.

PB91-191676/REB PC **A02**/MF **A01**
Ca(2+)/Calmodulin-Dependent Protein Phosphorylation Is Not Altered by Amygdaloid Kindling.
Journal article.
Health Effects Research Lab., Research Triangle Park, NC.
L. J. Burdette, and J. P. O'Callaghan. c1991, 7p EPA/600/J-91/060
Pub. in Brain Research Bulletin, v26 n3 p455-459 Mar 91.

The effects of amygdaloid kindling on Ca(2+)/Calmodulin (CaM)-dependent protein phosphorylation were assessed using one- and two-dimensional gel electrophoresis. In vitro phosphorylation of membrane and cytosol fractions in the presence or absence of Ca(2+)/CaM did not differentiate between kindled and non-kindled amygdaloid tissue. The results suggest that changes in Ca(2+)/CaM-dependent phosphorylation are not related to the mechanism(s) underlying the establishment of an amygdaloid kindled focus.

Keywords: *Calmodulin, *Calcium, *Kindling(Neurology), *Amygdala, Phosphorylation, Polyacrylamide gel electrophoresis, Electric stimulation, Rats, Reprints.

PB91-191684/REB PC **A06**/MF **A01**
Use and Development of Environmentally Controlled Chambers (Mesocosms) for Evaluating Biotechnology Products: The Proceedings of the Workshop on the Use and Development of Terrestrial Mesocosms.
Corvallis Environmental Research Lab., OR.
R. J. Seidler, and J. Settel. May 91, 104p EPA/600/9-91/013
Prepared in cooperation with Environment Canada, Hull (Quebec). Commercial Chemicals Branch, and Technical Resources, Inc., Rockville, MD.

The purpose of gathering an international expert panel for the workshop was to discuss containment technologies and to design a mesocosm chamber for use in the development of ecology databases and the calibration of test protocols for genetically engineered microorganism (GEM) risk assessments. Data obtained from GEMs mesocosm testing would provide a critical knowledge base for regulation of environmental releases of GEMs. Workshop presentations covered the positive and negative design features of specific microcosm and mesocosm systems that are currently being used in biotechnology and other kinds of research. Information from these presentations was used as the basis for design of a hypothetical mesocosm chamber that would meet appropriate containment and environmental control needs. The mesocosm was designed to support regulatory initiatives. It was not conceived to serve as a standard procedural tool mandated by regulatory agencies for evaluating risk assessments.

Keywords: *Genetic engineering, *Ecology, *Biotechnology, *Meetings, Databases, Terrestrial ecosystems, Insects, Plants(Botany), Bacteria, Soil microbiology, Carbon dioxide, *Mesocosms, Environmental chambers.

PB91-191692/REB PC **A06**/MF **A01**
Robert S. Kerr Environmental Research Lab., Ada, OK.
MOFAT: A Two-Dimensional Finite Element Program for Multiphase Flow and Multicomponent Transport. Program Documentation and User's Guide.
Virginia Polytechnic Inst. and State Univ., Blacksburg. Center for Environmental and Hazardous Material Studies.
A. K. Katyal, J. J. Kaluarachchi, and J. C. Parker. May 91, 119p EPA/600/2-91/020
Sponsored by Robert S. Kerr Environmental Research Lab., Ada, OK.

The manual describes a two-dimensional finite element model for coupled multiphase flow and multicomponent transport in planar or radially symmetric vertical sections. Flow and transport of three fluid phases, including water, nonaqueous phase liquid (NAPL), and gas are considered by the program. The program can simulate flow only or coupled flow and transport. The flow module can be used to analyze two phases, water and NAPL, with the gas phase held at constant pressure, or explicit three-phase flow of water, NAPL, and gas at various pressures. The transport module can handle up to five components which partition among water, NAPL, gas and solid phases assuming either local equilibrium or first-order mass transfer. Three phase permeability-saturation-capillary pressure relations are defined by an extension of the van Genuchten model. The governing equations are solved using an efficient upstream-weighted finite element scheme. The report describes the required inputs for flow analysis and transport analysis. Time dependent boundary conditions for flow and transport analysis can be handled by the program and are described in the report. Detailed instructions for creating data files needed to run the program and example input and output files are given in appendices.

Keywords: *Path of pollutants, *Computerized simulation, *Environmental transport, *Multiphase flow, Finite element method, Two-dimensional calculations, Ground water, Vapor phases, User manuals(Computer programs), Documentation, Land pollution, Soil contamination, Mass transfer, Water pollution, Vapor phases, Permeability, *MOFAT model, *Nonaqueous phase liquid.

PB91-191700/REB PC **A07**/MF **A01**
Environmental Protection Agency, Seattle, WA. Region X.
Current and Target Recovery Rates for Plastics Packaging in Oregon. Final rept.
Oregon State Dept. of Environmental Quality, Portland.
Oct 90, 134p EPA/910/9-91/016
Grant EPA-X1-000466-01
Prepared in cooperation with Resource Integration Systems, Ltd., Portland, OR. Sponsored by Environmental Protection Agency, Seattle, WA. Region X.

The study focuses on the generation and recovery of post-consumer plastic packaging manufactured from six common plastic resins. The study includes information on current recycling rates; economic, regulatory and technological trends; and collection and processing costs. It also projects recovery rates by resin type by utilizing assumptions for voluntary and regulatory changes in current Oregon plastics recovery programs. The study will be used by the ORDEQ to develop recommendations on effective recycling rates for plastic resins for the years 1992 to 2000.

Keywords: *Materials recovery, *Waste management, *Plastics, *Packaging materials, Oregon, Waste recycling, Forecasting, Technology utilization, Research and development, Polymers, Economic analysis, Waste processing, Regulations, Recommendations.

PB91-191718/REB PC **A03**/MF **A01**
Environmental Protection Agency, Seattle, WA. Region X.
Decisionmaker's Guide to Recycling Plastics. Final rept.
Oregon State Dept. of Environmental Quality, Portland.
Dec 90, 41p EPA/910/9-91/008
Grant EPA-X1-000466-01
Prepared in cooperation with Resource Integration Systems, Ltd., Portland, OR. Sponsored by Environmental Protection Agency, Seattle, WA. Region X.

The 'Decisionmaker's Guide to Recycling Plastics' is designed to assist community decisionmakers in determining the feasibility of plastics recycling by resin types. The guide outlines characteristics of successful plastics recycling programs, policy considerations, market considerations, and pros and cons of different types of collection programs. The document also presents information on determining what type of plastic to collect and how to collect it. It includes data and worksheets which enable decisionmakers to estimate amount of material to be recovered as well as startup and operating costs based on the type of recycling program which is implemented. A resource section listing other sources of information on markets, program planning, and new developments in plastics recycling is also contained in the guide.

Keywords: *Plastics recycling, *Guidelines, *Waste management, Decision making, Marketing, Waste recycling, Environmental policy, Economic analysis, Materials recovery, Collecting methods, Plastics industry, Resins, Costs.

PB91-191726/REB PC **A05**/MF **A01**
Environmental Protection Agency, Washington, DC. Office of the Assistant Administrator for Water.
Assessment of Single-Stage Trickling Filter Nitrification.
HydroQual, Inc., Mahwah, NJ.
O. K. Scheible, and A. Gupta. May 91, 95p EPA/430/9-91/005
Contract EPA-68-08-0023
Sponsored by Environmental Protection Agency, Washington, DC. Office of the Assistant Administrator for Water.

The report is part of a larger effort to compare different wastewater technologies that can achieve nitrification. It evaluates specific technologies and reports on their capabilities and limitations.

Keywords: *Water treatment, *Waste water, *Nitrification, *Trickling filtration, Field tests, Technology assessment, Water pollution, Tables(Data), Graphs(Charts), Municipalities.

PB91-193649/REB PC **A06**/MF **A01**
Intensive Survey of the Big Muddy Main Stem from Rend Lake to the Mississippi River, 1988.
Illinois State Environmental Protection Agency, Springfield. Div. of Water Pollution Control.
R. L. Hite, M. R. Matson, C. A. Bickers, and M. M. King. Jan 91, 111p IEPA/WPC/91-56
Prepared in cooperation with Southern Monitoring, Marion, IL.

In July and August 1988, the Illinois Environmental Protection Agency conducted an intensive stream quality survey of the lower Big Muddy River main stem. The survey focused on water quality, fish populations, contaminants in fish, instream habitat, and sediment chemistry in a 104-mile segment of the Big Muddy River between Rend Lake and the Mississippi River. The Big Muddy main stem survey was designed to assess stream quality in the vicinity of mine drainage sources and major municipal point source dischargers. A major objective of the project was to identify sources of acid mine drainage contributing to water quality degradation and fish kills in the Big Muddy River upstream from the public water supply intake at Royalton, Illinois. IEPA staff successfully identified two abandoned mines believed to be the major sources of mine-related water quality problems in the Big Muddy River in the vicinity of the Royalton. Water quality samples collected in summer 1988 at 14 main stem sites indicated Big Muddy River water quality was considered between fair/good and was generally not significantly impacted by point source dischargers. Main stem biotic integrity evaluated from fish population sampling at six sites was considered fair.

Keywords: *Water quality, *Acid mine drainage, *Water pollution effects, *Big Muddy River, Illinois, Pollution sources, Fishes, Habitats, Sediments, Biological effects, Fish population, Point sources, Environmental Protection Agency, Industrial wastes, Municipal wastes.

PB91-193847/REB PC **A04**/MF **A01**
Indoor Air-Assessment: Indoor Concentrations of Environmental Carcinogens.
Environmental Protection Agency, Research Triangle Park, NC. Environmental Criteria and Assessment Office.
K. W. Gold, D. F. Naugle, and M. A. Berry. Jan 91, 54p EPA/600/8-90/042, ECAO-R-0382
Prepared in cooperation with Research Triangle Inst., Research Triangle Park, NC.

In the report, indoor concentration data are presented for the following general categories of air pollutants: radon-222, environmental tobacco smoke (ETS), asbestos, gas phase organic compounds, formaldehyde, polycyclic aromatic hydrocarbons (PAH), pesticides, and inorganic compounds. These pollutants are either known or suspect carcinogens (i.e., radon-222, asbestos) or more complex mixtures or classes of compounds which contain known or suspect carcinogens. Concentration data for individual carcinogenic compounds in complex mixtures are usually far from complete. The data presented for complex mixtures often include compounds which are not carcinogenic or for which data are insufficient to evaluate carcinogenicity. Their inclusion is justified, however, by the possibility that further work may show them to be carcinogens, cocarcinogens, initiators or promotors, or that they

may be employed as markers (e.g., nicotine, acrolein) for the estimation of exposure to complex mixtures.

Keywords: *Indoor air pollution, *Air pollution sampling, *Carcinogens, *Public health, Concentration(Composition), Exposure, Tables(Data), Radon 222, Aromatic polycyclic compounds, Formaldehyde, Pesticides, Asbestos, Mixtures, Cigarette smoking, Inhalation.

PB91-195941/REB PC **A03**/MF **A01**
Conversion of Methanol-Fueled 16-Valve, 4-Cylinder Engine to Operation on Gaseous 2H2/CO Fuel. Interim Report 3. Technical rept.
Environmental Protection Agency, Ann Arbor, MI. Control Technology and Applications Branch.
R. M. Schaefer, G. K. Piotrowski, and J. C. Martin. Apr 91, 27p EPA/AA/CTAB-91/01
See also interim report 2, PB89-193353.

The report is the third in a series of progress reports to date on a project to convert a Nissan CA18ED engine previously modified for operation on M100 neat methanol to operation on dissociated methanol gaseous fuel. The report describes the modifications made to the engine and summarizes the results of testing.

Keywords: *Motor vehicle engines, *Automotive fuels, *Methanol, *Methyl alcohol, Internal combustion engines, Exhaust emissions, Fuel consumption, Test facilities, US EPA.

PB91-195958/REB PC **A04**/MF **A01**
Criteria for Assessing the Role of Transported Ozone/Precursors in Ozone Nonattainment Areas.
Environmental Protection Agency, Research Triangle Park, NC. Office of Air Quality Planning and Standards. May 91, 55p EPA/450/4-91/015

A series of modeling analyses appropriate for characterizing transport of ozone and its precursors into nonattainment areas is discussed in the report. Air quality and meteorological measurements needed to characterize transport in identified modeling techniques are also identified. The report fulfills requirements in Section 184(d) of the Clean Air Act Amendments of 1990, in which the U.S. Environmental Protection Agency is directed to identify criteria for estimating transport of pollutants into ozone nonattainment areas.

Keywords: *Environmental transport, *Ozone, *Air pollution control, Requirements, Monitoring, Design criteria, Sources, Estimates, Regional analysis, Mathematical models, Nitrogen oxides, Carbon monoxide, Halohydrocarbons, Trajectories, Urban areas, Oxidizers, Rural areas, Wind velocity, Concentration(Composition), *Clean Air Act Amendments of 1990, Volatile organic compounds.

PB91-195966/REB PC **A03**/MF **A01**
Recommended Operating Procedure No. 51: Glass Source Assessment Sampling System (Glass SASS). Final rept. Jul 90-Jan 91.
Environmental Protection Agency, Research Triangle Park, NC. Air and Energy Engineering Research Lab.
R. A. Grote. May 91, 38p EPA/600/8-91/036
Prepared in cooperation with Research Triangle Inst., Research Triangle Park, NC.

The report is a recommended operating procedure (ROP), prepared for use in research activities conducted by EPA's Air and Energy Engineering Research Laboratory (AEERL). The method described is applicable to the stack sampling of flue gas from a rotary kiln and to associated equipment of AEERL's Combustion Research Branch. It has been the standard method of sampling kiln flue gas due to the transient nature of the puff development and its capability to sample the maximum volume over the shortest time period. ROPs describe non-routine or experimental research operations where some judgment in application may be warranted. ROPs may not be applicable to activities conducted by other research groups, and should not be used in place of standard operating procedures. Use of ROPs must be accompanied by an understanding of the purpose and scope. Questions should be directed to the author.

Keywords: *Flue gases, *Kilns, *Air sampling, Air pollution control, Combustion products, Toxic substances, Stationary sources, Analyzing, *Source assessment sampling system, *Recommended operating procedure 51.

PB91-195974/REB PC **A03**/MF **A01**
Dense Nonaqueous Phase Liquids. Ground Water Issue.
Robert S. Kerr Environmental Research Lab., Ada, OK.
S. G. Huling, and J. W. Weaver. Mar 91, 22p EPA/540/4-91/002

Dense nonaqueous phase liquids (DNAPLs) are present at numerous hazardous waste sites and are suspected to exist at many more. Due to the numerous variables influencing DNAPL transport and fate in the subsurface, and consequently, the ensuing complexity, DNAPLs are largely undetected and yet are a significant limiting factor in site remediation. The paper is a literature evaluation focusing on DNAPLs and provides an overview from a conceptual fate and transport point of view, DNAPL phase distribution, monitoring, site characterization, remediation, and modeling.

Keywords: *Liquids, *Phase studies, *Environmental transport, *Hazardous materials, Ground water, Sites, Water pollution control, Density(Mass/volume), Mixtures, Hydrocarbons, Water, Interfacial tension, Monitoring, Halohydrocarbons, Mathematical models, Permeability, Diagrams, Stratigraphy, *Volatile organic compounds, Remedial action, Listings.

PB91-195982/REB PC **A03**/MF **A01**
ORD Health Biomarkers Program. Research Strategy Document. Final rept.
Health Effects Research Lab., Cincinnati, OH.
J. R. Fowle, and E. Collins. Apr 91, 29p EPA/600/9-91/009
Prepared in cooperation with Eastern Research Group, Inc., Arlington, MA.

The document outlines the framework for developing, validating, and applying biomakers that Office of Research and Development (ORD) uses to facilitate planning, budget allocations, and collaboration in biomarker research. Within the framework of the biomarkers research plan, ORD evaluates EPA's regulatory needs, its own capabilities, and the state-of-the-science. In the evaluation, ORD considers biomarker techniques as tools in understanding life processes: thus, rather than exploring biomarkers as ends in themselves, ORD incorporates biomarker research efforts into ongoing and future research programs. The document also defines terms and concepts used in the research in an effort to standardize their use across ORD laboratories.

Keywords: *Biological markers, *Environmental exposure, Research projects, Risk assessment, Toxicology, Health hazards, Dose-response relationships, Potable water, US EPA, Health Biomarkers Program.

PB91-195990/REB PC **A06**/MF **A01**
Environmental Monitoring Systems Lab., Las Vegas, NV.
Molecular Optical Spectroscopic Techniques for Hazardous Waste Site Screening.
Lockheed Engineering and Sciences Co., Inc., Las Vegas, NV.
D. Eastwood, and T. Vo-Dinh. Jun 91, 118p EPA/600/4-91/011
Contracts EPA-68-03-3249, DE-1824-B124-A1
Prepared in cooperation with Oak Ridge National Lab., TN. Sponsored by Environmental Monitoring Systems Lab., Las Vegas, NV., and Department of Energy, Washington, DC.

The U.S. Environmental Protection Agency is interested in field screening hazardous waste sites for contaminants in the soil and surface and ground water. The study is an initial technical overview of the principal molecular spectroscopic techniques and instrumentation currently available for field screening. The goal has been to describe the power and utility of molecular (optical) spectroscopic techniques for hazardous waste site screening and to define the main strengths, weaknesses, and applications of each major spectroscopic technique. A brief discussion is also given for some other techniques that rely on spectroscopic detection: colorimetry and fluorometry, as well as immunoassay and fiber-optic chemical sensors. The cost of instrumentation and analysis and the time requirements are briefly discussed. Broad guidelines are provided for the three categories of instrumentation: portable, field-deployable and semi-field-deployable. An outline of the spectroscopic principles and instrumentation for each particular spectroscopic techniques is given along with a description of state-of-the-art approaches. Advantages, limitations, sensitivities and examples of specific techniques and their applications to environmental contaminants are also discussed.

Keywords: *Hazardous materials, *Soil contamination, *Land pollution, *Water pollution detection, *Chemical analysis, Fiber optics, US EPA, Water analysis, Soil analysis, Site surveys, Ultraviolet spectroscopy, Molecular spectroscopy, Waste disposal, Fluorescence, Infrared spectroscopy, Raman spectroscopy, Spectrum analysis.

PB91-196006/REB PC **A08**/MF **A01**
Corvallis Environmental Research Lab., OR.
Final Technical Report for the Preliminary Field Survey and on-Site, In-situ and Laboratory Evaluations Completed at Milltown Reservoir (FY90).
ManTech Environmental Technology, Inc., Corvallis, OR.
G. Linder, M. Bollman, D. Wilborn, J. Nwosu, and W. Baune. Jun 91, 156p EPA/600/3-91/037
Sponsored by Corvallis Environmental Research Lab., OR.

The technical report contains work that was completed at Milltown Reservoir near Missoula Montana during the last quarter of FY90. Field and laboratory methods were screening in character, and were intended to contribute to future studies and development of the Sampling and Analysis Plan (SAP) and the Quality Assurance Project Plan (QAPjP) for FY91. Appropriate caution must be exercised in interpreting the results of these screening methods, and the biological information gained.

Keywords: *Water pollution, *Ecology, *Milltown Reservoir, Vegetation, Field tests, Sampling, Germination, Food chains, Amphibia, Metals, Mammals, Earthworms, Bacteria, Chemical analysis, Soils, Water quality, Maps, Tables(Data), *Missoula(Montana), *Wetlands.

PB91-196014/REB PC **A03**/MF **A01**
Corvallis Environmental Research Lab., OR.
Design of Terrecosm Enclosures for Use in Ecorisk Assessment Evaluations.
Technical Resources, Inc., Davis, CA.
C. M. Knapp, E. Heske, V. Marble, H. Weeks, and W. Eichler. Jun 91, 36p EPA/600/3-91/038
Contract EPA-68-CO-0021
Prepared in cooperation with New Mexico Univ., Albuquerque, California Univ., Davis, and Oregon State Univ., Corvallis. Sponsored by Corvallis Environmental Research Lab., OR.

The project has been designed to provide large, outdoor enclosures (terrecosms) for use in evaluating the risk assessment methodology used by the US EPA. These enclosures have been designed to permit testing effects of insecticide applications on non-target populations (voles) existing in nearly natural conditions. The study is necessitated because recent evidence indicates that the existing method (the quotient method, which compares an organism's exposure level to the level of hazard observed at that exposure level) has failed to anticipate ecological damage resulting from insecticide applications. As a result, EPA's Office of Pesticides and Toxic Substances (OPTS) has requested assistance from EPA's Environmental Research Laboratory in Corvallis, OR (ERL-C) in field validating or improving the quotient method.

Keywords: *Pesticides, *Terrestrial ecosystems, *Risk assessment, Voles, Health hazards, Exposure, *Terrecosm enclosures, Non-target populations.

PB91-196022/REB PC **A02**/MF **A01**
Sensitivity Analysis on the Effects of Serial Correlation on Exposure Estimates.
Environmental Protection Agency, Research Triangle Park, NC. Atmospheric Research and Exposure Assessment Lab.
W. B. Petersen, and J. S. Irwin. c1991, 8p EPA/600/D-91/102
Prepared in cooperation with National Oceanic and Atmospheric Administration, Research Triangle Park, NC. Atmospheric Sciences Modeling Div.

Statistical methods of estimating concentration values for use in human exposure estimates have become increasingly more popular because of the complexities in correlating the temporal and spatial concentration variations within microenvironments with the location of people. The number of variables and their associated uncertainty make deterministic models difficult to use. Monte-Carlo simulations of exposure conducted thus far have made no provision for serial correlation effects, and therefore tend to underestimate the highest exposures and overestimate the lowest exposures. The purpose of the sensitivity study is to quantify the factors affecting serial correlation in the indoor microenvironments. Further, the authors investigate in a very preliminary way use of personal exposure monitoring data to infer the value of variables needed to estimate indoor concentrations such as the rates of air exchange, pollutant removal, and pollutant generation. The authors conclude that the use of personal exposure monitoring data to derive rate constants may be useful for order of magnitude estimates.

Keywords: *Exposure, *Humans, *Sulfur dioxide, *Study estimates, *Indoor air pollution, Simulation, Air pollution monitoring, Statistical analysis, *Sensitivity analysis, Microenvironments.

PB91-196048/REB PC **A03**/MF **A01**
Bake-Out of a Portion of a New High-Rise Office Building. Final rept.
Environmental Protection Agency, Research Triangle Park, NC. Atmospheric Research and Exposure Assessment Lab.
A. B. Lindstrom, R. M. Taft, L. C. Michael, and M. C. Oberg. c1991, 16p EPA/600/D-91/104
Presented at the annual meeting of the Air and Waste Management Association (84th), Vancouver, B.C. (Canada), June 16-21, 1991. Prepared in cooperation with Research Triangle Inst., Research Triangle Park, NC. Dreyfus Lab., and Certified Health Services, Richmond, CA.

A partial building bake-out was performed in U.S. EPA's new Region IX Headquarters' Building in San Francisco, California in July, 1990. The intent of the bake-out was to reduce indoor air contaminant concentrations associated with residual volatile organic compounds (VOCs) found in a variety of common building materials and finishing agents. Four nearly identical floors from the 21 story office building were heated above 30 C for 34, 38, 54, and 86 hours to determine the effect of bake-out duration on post-bake pollutant concentrations. VOC and aldehyde sampling was conducted before, during, and after the bake-out. The results indicate that total volatile organic compound (TVOC) source strengths were reduced during the bake-out by 45-76%. Similar reductions in targeted VOC source strengths were also observed from the pre-to post-bake monitoring periods. While the most abundant aldehyde species concentrations increased approximately 65% during the mid-bake monitoring period, post-bake aldehyde concentrations remained similar to pre-bake levels.

Keywords: *Office buildings, *Indoor air pollution, US EPA, California, Construction materials, Volatile organic compounds, Concentration(Composition), Aldehydes, *Bake-out, San Francisco(California), EPA region 10.

PB91-196055/REB PC **A02**/MF **A01**
Chemical Characterization of Extractable Organic Matter from Ambient Aerosols Collected in Boise, Idaho.
Environmental Protection Agency, Research Triangle Park, NC. Atmospheric Research and Exposure Assessment Lab.
R. B. Zweidinger, J. Lewtas, and D. J. Thompson. c1991, 10p EPA/600/D-91/105
Prepared in cooperation with ManTech Environmental Technology, Inc., Research Triangle Park, NC.

Fine fraction (2.5 micron) ambient air aerosols were collected in Boise, ID between November, 1986, and February, 1987, under the Integrated Air Cancer Project. Two composite samples of extractable organic matter (EOM) were prepared with partial resolution of chemicals from Boise's wood smoke (WS) and mobile source (MS) emissions. The samples were separated by a nonaqueous anion solid phase extraction (SPE) method into neutral, polar neutral/weak acid, weak acid and strong acid fractions. The neutral fraction of the WS and MS composites contained 23% and 35% of the mass, respectively. However, the neutral fraction was the most mutagenic containing 48% of the mutagenicity in the WS sample and 59% in the MS sample. Concentrations of many PAH and nitro-PAH were higher in the MS sample.

Keywords: *Wood burning furnaces, *Mobile pollutant sources, *Combustion products, *Air pollution detection, *Bioassay, *Aerosols, Exhaust emission, Chemical analysis, Idaho, Organic matter, Aromatic polycyclic hydrocarbons, Air pollution sampling, Extraction, Nitrogen organic compounds, Carcinogens, Mutagens, Integrated Air Cancer Project, Boise(Idaho).

PB91-196063/REB PC **A02**/MF **A01**
Evaluation of Methodology for Determination of Polyhalogenated Dibenzo-'p'-Dioxins and Dibenzofurans in Ambient Air.
Environmental Protection Agency, Research Triangle Park, NC. Atmospheric Research and Exposure Assessment Lab.
R. L. Harless, R. G. Lewis, D. D. McDaniel, J. F. Gibson, and A. E. Dupuy. 1991, 10p EPA/600/D-91/106
Prepared in cooperation with National Aeronautics and Space Administration, Bay Saint Louis, MS. John C. Stennis Space Center.

General Metals Works PS-1 PUF air samplers and an analytical method based on high resolution gas chromatography - high resolution mass spectrometry (HRGC-HRMS) were evaluated for determination of polychlorinated dibenzo-p-dioxins and dibenzofurans (PCDDs/PCDFs) and polybrominated dibenzo-p-dioxins and dibenzofurans (PBDDs/PBDFs) in ambient air. Dilute solutions of these compounds and 13C12-1234-TCDD were used to spike the filters of PS-1 air samplers which were then operated 24 hours to sample 350-400 cu m ambient air. After sampling, each quartz-fiber filter and polyurethane foam (PUF) were spiked with 13C12-labeled PCDD, PCDF, PBDD, and PBDF internal standards before separate Soxhlet extractions with benzene. The extracts were subjected to clean-up procedures using microcolumns of silica gel, alumina and carbon and then analyzed by HRGC-HRMS. Results derived from this study satisfied QA/QC requirements for analytical data and demonstrated that the methodology could accurately determine pg/cu m and sub-pg/cu m levels of these compounds in ambient air. Background levels detected in ambient air are also discussed.

Keywords: *Air pollution sampling, *Air pollution detection, *Dioxins, *Furans, *Metal industry, Polychlorinated dibenzodioxins, Polychlorinated dibenzofurans, Gas chromatography, Mass spectroscopy, Quality assurance, Quality control, Isotopic labeling, Solvent extraction, Polybrominated dibenzodioxins, Polybrominated dibenzofurans.

PB91-196071/REB PC **A03**/MF **A01**
Environmental Protection Agency, Research Triangle Park, NC. Atmospheric Research and Exposure Assessment Lab.
Climate Data and Analysis for the New England Forest Health Monitoring Project (NEFHM/EMAP Forests).
National Oceanic and Atmospheric Administration, Research Triangle Park, NC. Air Resources Lab.
E. J. Cooter, S. K. LeDuc, L. Truppi, and D. R. Block. c1991, 25p EPA/600/D-91/107
Presented at the AMS Conference on Applied Climatology (7th) held in Salt Lake City, Utah on September 10-13, 1991. Prepared in cooperation with ManTech Environmental Technology, Inc., Research Triangle Park, NC. Sponsored by Environmental Protection Agency, Research Triangle Park, NC. Atmospheric Research and Exposure Assessment Lab.

The paper describes the development of climatological information products to support ecological data collection and analysis. Characteristics of climatological persistence and recurrence that are critical to New England forest health and productivity are identified. The appropriate data are assembled and presentations developed which address specific issues pertinent to climate change research; background (status and persistence); most recent decade (short-term trends); and near-term impacts (modeling and prediction). A Geographic Information System (GIS) is used for presentation, data management and analysis. Preliminary results of the research have been incorporated in United States Department of Agriculture Forest Service monitoring program reports. The application of regional climate research techniques to assessment and integrated activities of the Environmental Protection Agency (EPA) Environmental Monitoring and Assessment Program (EMAP) is being actively explored. Its future use in climate/forest integrated modeling is anticipated.

Keywords: *Climatology, *Ecology, *Environmental surveys, Data processing, Forests, Climatic changes, Mathematical models, *New England Forest Health Monitoring Project, Environmental Monitoring and Assessment Program.

PB91-196089/REB PC **A03**/MF **A01**
Ongoing Fundamental Hazardous Waste Incineration Research at EPA/RTP Facility.
Environmental Protection Agency, Research Triangle Park, NC. Air and Energy Engineering Research Lab.
R. E. Hall, P. M. Lemieux, W. P. Linak, and J. H. Wasser. c1991, 17p EPA/600/D-91/108
Presented at the Incineration Conference held in Knoxville, TN. on May 13-17, 1991.

The paper describes five combustors, results of some completed research, and plans for future studies at EPA/AEERL's RCRA-permitted facility at Research Triangle Park, NC. Research is conducted to examine the effect of operating parameters such as residence time, temperature, turbulence, and waste characteristics on incineration of principal organic hazardous constituents (POHCs), the formation of products of incomplete combustion (PICs), and the transformation of trace metals. The five combustion systems include a rotary kiln incinerator simulator, a package boiler simulator, a horizontal tunnel combustor, a two-stage fluidized-bed combustor, and a commercial package boiler.

Keywords: *Hazardous materials, *Waste disposal, *Incinerators, *Research and development, US EPA, Operating, Combustion efficiency, Fluidized bed processors, Boilers, Kilns, Design criteria, Resource Conservation and Recovery Act, Principal organic hazardous constituents.

PB91-196097/REB PC **A03**/MF **A01**
Innovative Thermal Destruction Technologies (Chapter 7). Book chapter.
Environmental Protection Agency, Cincinnati, OH. Risk Reduction Engineering Lab.
C. C. Lee, G. L. Huffman, G. Ondich, and S. C. James. 1991, 40p EPA/600/D-91/109
Pub. in CRC Handbook of Incineration of Hazardous Wastes, Chapter 7, p256-292 1991.

Ten innovative technologies for thermally destroying hazardous wastes were selected and described in the paper. These technologies were either supported by EPA's RCRA or SARA programs or developed by industry since 1980. Two of the important criteria used in selecting these technologies are that they are (or had been) at least at the stage of pilot-scale demonstration and appear to be promising in terms of destruction effectiveness. The 10 technologies are: Oxygen-Enriched Incineration, Westinghouse/O'Connor Combustor, Fluidized Bed Combustion, Circulating Bed Combustion, Molten Salt Combustion, Infrared System, Advanced Electrical Reactor, Plasma Arc, Wet Air Oxidation and Supercritical Fluid.

Keywords: *Incinerators, *Waste disposal, *Hazardous materials, Technology utilization, Performance evaluation, Industrial wastes, Combustion efficiency, Fluidized bed processing, Supercritical state, Oxidation, Wet methods, Oxygen enrichment, Circulating systems, Fused salts, Infrared equipment, Electric reactors, Plasma jets, Reprints, Resource Conservation and Recovery Act, Westinghouse/O'Connor Combustors.

PB91-196105/REB PC **A02**/MF **A01**
Status of Land Treatment as a Hazardous Waste Management Alternative in the United States.
Environmental Protection Agency, Cincinnati, OH. Risk Reduction Engineering Lab.
J. Matthews, M. McFarland, R. Sims, and E. Barth. c1991, 7p EPA/600/D-91/110
Pub. in Proceedings of the Application of U.S. Pollution Control Technology in Korea, Conference No. 2, Seoul, Korea, May 1-3, 1989.

Land treatment systems are widely used in the United States for treating petroleum refinery waste. Many of the petroleum compounds are degradable in bench

scale studies. Proper operation of the treatment is critical for successful performance.

Keywords: *Soil treatment, *Waste management, *Hazardous materials, Petroleum refining, Performance evaluation, Technology utilization, Substitutes, Biodeterioration, United States, Chemical reaction mechanisms.

PB91-196113/REB PC **A02**/MF **A01**
Detection of Radicals Produced 'In vivo' during Inhalation Exposure to Ozone: Use of Various Spin Traps.
Health Effects Research Lab., Research Triangle Park, NC.
C. H. Kennedy, G. E. Hatch, R. Slade, and R. P. Mason. c1991, 9p EPA/600/D-91/111
Prepared in cooperation with National Inst. of Environmental Health Sciences, Research Triangle Park, NC.

Ozone is known to induce lipid peroxidation of lung tissue, although no direct evidence of free radical formation has been reported. The study used the electron paramagnetic resonance (EPR) spin-trapping technique to search for free radicals produced in vivo by ozone exposure. The spin trap alpha-(4-pyridyl 1-oxide)-N-tert-butylnitrone (4-POBN) was administered i.p. to male Sprague-Dawley rats. The rats were then exposed for 2 hrs to either 0, 0.5, 1.0, 1.5 or 2.0 ppm ozone with 8% CO2 to increase their respiratory rate. A 6-line 4-POBN/radical spin adduct signal a(sup N)=15.02 G and a(sup H)beta-3.27 G) was detected by EPR spectroscopy in lipid extracts from lungs of rats treated with 4-POBN and then exposed to ozone. Only a very weak signal was observed in the corresponding solution from rats exposed to 0 ppm ozone (air with CO2 only). The concentration of the radical adduct increased as a function of ozone concentration. After administration of 4-POBN, rats were exposed for either 0.5, 1.0, 2.0 or 4.0 hrs to either 0 or 2.0 ppm ozone (with CO2). These results demonstrate that ozone induces the production of free radicals in rat lungs during inhalation exposure and that radical production may be involved in the induction of lung edema by ozone.

Keywords: *Free radicals, *Ozone, *Air pollution effects(Animals), Rats, Electron spin resonance, Pulmonary edema, Carbon dioxide, Lipid peroxidation.

PB91-196121/REB PC **A06**/MF **A01**
Health Effects Research Lab., Research Triangle Park, NC.
Interpretations and Limitations of Pulmonary Function Testing in Small Laboratory Animals.
ManTech Environmental Technology, Inc., Research Triangle Park, NC.
D. L. Costa, J. S. Tepper, and J. Raub. 1991, 104p EPA/600/D-91/112
Contract EPA-68-02-4450
Sponsored by Health Effects Research Lab., Research Triangle Park, NC.

Pulmonary function tests are tools available to the researcher and clinician to evaluate the ability of the lung to perform its essential function of gas exchange. To meet this principal function, the lung needs to operate efficiently with minimal mechanical work as well as provide an optimally minimal barrier to diffusion. Tests of lung function permit the nondestructive assessment of a continuum of lung performance, a continuum that may be influenced temporarily or permanently by inflammatory events or structural alterations. In theory, any function test conducted in human subjects can be applied to animals and largely interpreted in the same manner. Fortunately, those physiologic principles that form the basis for clinical assessments of function seem to apply to animals in a quantitative as well as qualitative manner. Nevertheless, being aware of the species differences and technical pitfalls is critical to the ultimate interpretation of the tests, especially when comparing them to their human analogues in health and disease. The test described in the paper will be useful to OAQPS and ECAO as a resource tool for analyzing toxicological data from animals for use in regulatory procedures.

Keywords: *Respiratory function tests, *Laboratory animals, Toxicology, Inflammation, Animal disease models, Anesthesia, Air pollution effects(Animals), Irritants.

PB91-196139/REB PC **A03**/MF **A01**
Model of 'Giardia lamblia' Inactivation by Free Chlorine. Book chapter.
Environmental Protection Agency, Cincinnati, OH. Drinking Water Research Div.
R. M. Clark. c1991, 14p EPA/600/D-91/113
Pub. in Modeling the Environmental Fate in Microorganisms, p242-253 1991.

The 1986 amendments to the Safe Drinking Water Act require the U. S. Environmental Protection Agency (EPA) to promulgate primary drinking water regulations (1) specifying criteria under which filtration would be required, (2) requiring disinfection as a treatment technique for all public water systems, and (3) establishing maximum contaminant levels or treatment requirements for control of Giardia lamblia, viruses Legionella spp., heterotrophic plate count bacteria, and turbidity. EPA has promulgated treatment technique requirements to fulfill the Safe Drinking Water Act requirement for system using surface waters and groundwaters under the direct influence of surface water (Federal Register, 1989). Additional regulations specifying disinfection requirements for systems using groundwater sources not under the direct influence of surface water will be proposed and promulgated at a later date. A model has been developed that relates pH, temperature, chlorine concentration, and inactivation level to Giardia inactivation by free chlorine. It was found that C times T (the product of disinfectant concentration (milligram per liter) and disinfectant contact (minutes) values increased with level of inactivation, disinfectant concentration and pH and decreased with temperature.

Keywords: *Giardia, *Potable water, *Microbiology, *Chlorine, *Disinfection, *Water treatment, Legionella, Turbidity, Viruses, Filtration, pH, Temperature, Virulence, Reprints, *Safe Drinking Water Act, Microbial colony count.

PB91-196147/REB PC **A03**/MF **A01**
Principles of Water Filtration. Book chapter.
Environmental Protection Agency, Cincinnati, OH. Drinking Water Research Div.
G. S. Logsdon. c1991, 17p EPA/600/D-91/114
Pub. in Methods for the Investigation and Prevention of Waterborne Disease Outbreaks, p169-183.

The paper reviews principles involved in the processes commonly used to filter drinking water for public water systems. The most common approach is to chemically pretreat water and filter it through a deep (2-1/2 to 3 ft) bed of granular media (coal or sand or combinations of these). The process may involve coagulation and filtration; coagulation, flocculation and filtration; or coagulation, flocculation, sedimentation and filtration. In any case, pretreatment with coagulant chemical is necessary, because particle removal occurs through the mechanism of attachment to grains of filtering material. In contrast, in typical diatomaceous earth filtration practice, coagulant is not used and particle removal by straining is an important aspect of the process. Slow sand filters are used to treat high quality water. No pretreatment coagulants are used, but a biological population develops in the 3 to 4 foot deep sand filter and removal by predation and attachment to sand surfaces and the top slimy layer above the sand (schmutzdecke) cause the quality improvement in the process.

Keywords: *Water treatment, *Filtration, *Potable water, Diotomaceous earth, Coagulation, Flocculating, Sedimentation, Sand filters, Reprints.

PB91-196154/REB PC **A03**/MF **A01**
Microorganisms in Municipal Solid Waste and Public Health Implications. Journal article.
Environmental Protection Agency, Cincinnati, OH. Risk Reduction Engineering Lab.
H. R. Pahren. c1987, 44p EPA/600/J-87/547
Pub. in CRC Critical Reviews in Environmental Control, v17 Issue 3 p187-228 1987.

The composition of municipal solid waste is quite heterogeneous. This mixed composition results in the presence of a variety of microorganisms that reach densities which are relatively high, and which remain high even after many years in a landfill. Microorganism densities in the air at municipal solid waste processing plants tend to be higher than levels near wastewater treatment facilities. This may be due to indoor operations. Composting can inactivate essentially all of the microorganisms associated with fecal matter, but thermophilic fungi may cause adverse health problems. The presence of microorganisms in municipal solid waste does not mean that there is a high risk of infection or disease if a person is occupationally exposed to the waste. Dose-response relationships with various microorganisms have shown that a relatively large number of microbes are necessary to initiate an infection or cause disease.

Keywords: *Earth fills, *Microorganisms, *Solid wastes, *Municipal wastes, *Public health, Health hazards, Dose-response relationships, Fungi, Feces, Virulence, Microbial colony count, Enteroviruses, Enterobacteriaceae, Reprints.

PB91-196162/REB PC **A02**/MF **A01**
Gas Chromatography/Mass Spectrometry Study of Mixed Haloacetic Acids Found in Chlorinated Drinking Water. Journal article.
Environmental Protection Agency, Cincinnati, OH. Water Engineering Research Lab.
J. C. Ireland, L. A. Moore, H. Pourmoghaddas, and A. A. Stevens. c1988, 6p EPA/600/J-88/569
Pub. in Biomedical and Environmental Mass Spectrometry, v17 p483-486 1988.

Over the last two years, the laboratory and others have identified mono-, di-, and trichloro- acetic acids as major byproducts of drinking water disinfection. In areas of the country where relatively high levels of bromine ion are naturally present in the source water, it is expected that significant amounts of the corresponding bromo and mixed chloro-bromo acetic acids will be formed. While developing an automated GC/MS procedure to 'screen' for both previously identified disinfection byproducts as well as the haloacetic acids it was discovered that reference mass spectra for 4 of the 9 possible chloro/bromo acetic acids (as their methyl esters) were unavailable. The paper presents experimental reference spectra for the methyl esters of the four acids mentioned above. All nine acids were synthesized in-situ by reacting an aqueous solution of phenol with chlorine in the presence of various amounts of bromide ion.

Keywords: *Potable water, *Chlorine organic compounds, *Bromine organic compounds, *Esters, *Gas chromatography, *Mass spectroscopy, Spectrum analysis, Chlorination, Disinfection, Reprints, *Haloacetic acids, Reference spectra.

PB91-196170/REB PC **A03**/MF **A01**
Modeling Contaminant Propagation in Drinking Water Distribution Systems. Journal article.
Environmental Protection Agency, Cincinnati, OH. Risk Reduction Engineering Lab.
R. M. Clark, W. M. Grayman, R. M. Males, and J. A. Coyle. c1988, 17p EPA/600/J-88/570
Pub. in Aqua, n3 p137-151 1988. Prepared in cooperation with RMM Technical Services, Inc., Cincinnati, OH., and North Penn Water Authority, Lansdale, PA.

The Safe Drinking Water Act (SDWA) of 1974 requires that the U. S. Environmental Protection Agency (USEPA) establish maximum contaminant levels (MCLs) for each contaminant which may have an adverse effect on the health of persons. The SDWA clearly specifies that these MCLs shall be met at the consumers tap. Nevertheless most regulatory concern has been focused on water as it leaves the treatment plant before entering the distribution system. There is, however, growing interest in determining the factors that cause water quality variation in drinking water distribution systems. In order to study the effort, the Drinking Water Research Division of EPA initiated a cooperative agreement with the North Penn Water Authority. The cooperative agreement has resulted in a series of field monitoring and systems modeling studies that lend insight into the movement of contaminants in distribution systems. Previous research has resulted in development of a steady state model the propogation of contaminants in distribution systems. In the paper a more intensive approach is taken to examining the actual pathways of water flow and the time of passage and percentage of water from a given source to a given node in a distribution system. A major finding of the research study is the importance of adequate hydraulic modeling of the systems being studied and the importance of field studies in verifying systems performance. The approach suggested in the research will provide useful insight into the water quality variation that may impact consumers at the tap and the development of monitoring strategies.

Keywords: *Distribution systems, *Water quality, *Potable water, *Water pollution sampling, *Mathematical models, Water treatment, Performance evaluation, Field tests, Hydraulics, Samplers, Water pollution standards, Tracer studies, Path of pollutants, Comparison, Standards compliance, Reprints, Safe Drinking Water Act of 1974.

PB91-196188/REB PC **A03**/MF **A01**
Destruction of Enteric Bacteria and Viruses during Two-Phase Digestion. Journal article.
Environmental Protection Agency, Cincinnati, OH. Risk Reduction Engineering Lab.
K. M. Lee, C. A. Brunner, J. B. Farrell, and A. E. Eralp. c1989, 11p EPA/600/J-89/526
Pub. in Jnl. of Water Pollution Control Federation, v61 n8 p1421-1429 Aug 89. Prepared in cooperation with Cincinnati Univ., OH. Dept. of Civil and Environmental Engineering.

The pathogenic microorganism destruction obtained during two-phase anaerobic digestion was compared to that for a conventional single-stage digester using municipal wastewater treatment sludge. Operation was draw-and-fill. Total digester residence times of 10 days and 20 days were evaluated. Evaluations were carried out at 35 and 53 C. Microorganisms measured included fecal coliforms, Escherichia coli, fecal streptococci, and enterovirus. Pathogen reductions were compared to those calculated from a kinetic relationship developed specifically for draw-and-fill operation. Ascaris were added to digested sludge and held at 53 C for up to 8 hours to observe their decline with time under thermophilic conditions. Common digester operating parameters were also measured. At the thermophilic temperature of 53 C essentially all the microorganisms measured were reduced to undetectable levels. At 35 C, two-phase digestion achieved from 0.48 to 0.91 greater log reduction of bacterial indicators, but essentially the same reduction in virus.

Keywords: *Enterobacteriaceae, *Enteroviruses, Kinetics, Escherichia coli, Streptococcus, Feces, Sludge, Heat, Decontamination, Water microbiology, Microbial colony count, Reprints.

PB91-196196/REB PC **A02**/MF **A01**
Presence-Absence Coliform Test for Monitoring Drinking Water Quality. Journal article.
Environmental Protection Agency, Cincinnati, OH. Risk Reduction Engineering Lab.
E. W. Rice, E. E. Geldreich, and E. J. Read. c1989, 8p EPA/600/J-89/527
Pub. in Public Health Reports, v104 n1 p54-58 Jan-Feb 89. Prepared in cooperation with Computer Sciences Corp., Cincinnati, OH.

Data from four comparative studies were analyzed to compare the recovery of total coliform bacteria from drinking water using the presence-absence test, the multiple fermentation tube procedure and the membrane filter technique. Combined recoveries showed the presence-absence test detected significantly higher numbers of samples with coliforms than either the fermentation tube or membrane filter methods, $P<0.01$. The fermentation tube procedure detected significantly more positive samples than the membrane filter technique, $P<0.01$. The presence-absence test offers a viable alternative to water utilities using frequency-of-occurrence monitoring for compliance regulation.

Keywords: *Water treatment, *Potable water, *Water pollution sampling, *Coliform bacteria, Comparison, Materials recovery, Performance evaluation, Compliance, Pollution regulations, Reprints, Presence-absence test, Multiple fermentation tube procedure, Membrane filter technique.

PB91-196204/REB PC **A02**/MF **A01**
Changing Solar Ultraviolet Climate and the Ecological Consequences for Higher Plants. Journal article.
Corvallis Environmental Research Lab., OR.
M. M. Caldwell, A. H. Teramura, and M. Tevini. c1989, 6p EPA/600/J-89/528
Pub. in Trends in Evolution and Ecology, v4 n12 p363-366 Dec 89. Prepared in cooperation with Utah Univ., Salt Lake City, Maryland Univ., College Park, and Karlsruhe Univ. (Germany, F.R.).

There is compelling evidence that a general erosion of the global ozone layer is occurring. Since ozone in the stratosphere absorbs much of the shortwave solar ultraviolet radiation (UV-B), diminished ozone means that more UV-B of a very specific wavelength composition will be received at the earth's surface. Evaluating the implications for vegetation involves consideration of the wavelength specificity of biological photochemical reactions and their sensitivity to the extent and future solar spectrum. Recent research suggests the occurrence of direct damaging reactions and of indirect morphological and chemical responses with implications at the community and ecosystem levels.

Keywords: *Ozone layer, *Atmospheric composition, *Solar ultraviolet radiation, *Vegetation, *Climatic changes, Depletion, Air pollution, Ecosystems, Photochemical reactions, Atmospheric chemistry, Plants(Botany), Biological effects, Plant growth, Reprints.

PB91-196212/REB PC **A03**/MF **A01**
National Science Foundation, Washington, DC.
Relationships between Laboratory and Pilot-Scale Combustion of Some Chlorinated Hydrocarbons. Journal article.
Environmental Protection Agency, Cincinnati, OH. Risk Reduction Engineering Lab.
D. P. Y. Chang, N. W. Sorbo, C. K. Law, R. R. Steeper, and M. K. Richards. c1989, 13p EPA/600/J-89/529
Grant NSF-CBT86-12579, Contract ARB-A6-051-32
Pub. in Environmental Progress, v8 n3 p152-162 Aug 89. Prepared in cooperation with California Univ., Davis, and Sandia National Labs., Livermore, CA. Combustion Research Facility. Sponsored by National Science Foundation, Washington, DC., and California State Air Resources Board, Sacramento.

Factors governing the occurrence of trace amounts of residual organic substance emissions (ROSEs) in full-scale incinerators are not fully understood. Pilot-scale spray combustion experiments involving some liquid chlorinated hydrocarbons (CHCs) and the dilute mixtures with hydrocarbons (HC) were undertaken at the USEPA's Center Hill Laboratory. Individual droplet-burning characteristics of CHCs and HCs were also studied at the University of California, Davis on a more fundamental level to isolate and identify potentially important phenomena. The practical implications of the experimental observations on incinerability ranking, formation of ROSEs, and strategies for reducing ROSEs are discussed.

Keywords: *Drops(Liquids), *Combustion, *Chlorohydrocarbons, *Incinerators, Laboratory tests, Mixtures, Alkanes, Decontaminatio, Pyrolysis, Reprints.

PB91-196220/REB PC **A02**/MF **A01**
Risk Equivalent Seasonal Waste Load Allocation. Journal article.
Environmental Protection Agency, Cincinnati, OH. Risk Reduction Engineering Lab.
L. A. Rossman. c1989, 10p EPA/600/J-89/530
Pub. in Water Resources Research, v25 n10 p2083-2090 Oct 89.

Seasonal wastewater discharge programs employ different effluent standards during different times of the year to take maximum advantage of a receiving water's natural capacity to assimilate pollutants. The rational design of the programs should try to achieve the maximum economic benefits possible without increasing the risk of water quality impairment. A method is developed for designing seasonal programs for individual dischargers that limits the risk of one or more water quality standard violations in any year. The key elements involve: (1) treating seasonal receiving water assimilative capacity as a random variable; (2) assuming Markov-like behavior of these random variables between seasons; and (3) using a nonlinear programming model to find seasonal discharge limits that minimize waste treatment efforts while maintaining an acceptable annual risk of water quality violation. A case study of controlling ammonia toxicity is presented as well as a comparison of the potential savings available from seasonalization for several pollutants on two rivers with differing seasonal regimes.

Keywords: *Water quality management, *Water pollution standards, *Risk assessment, *Computerized simulation, Seasonal variations, Pollution regulations, Load distribution, Stochastic processes, Statistical analysis, Water pollution sampling, Water pollution control, Concentration(Composition), Stream flow, Comparison, Reprints.

PB91-196238/REB PC **A03**/MF **A01**
Incineration of Solid Waste. Journal article.
Environmental Protection Agency, Cincinnati, OH. Risk Reduction Engineering Lab.
C. C. Lee, G. L. Huffman, and S. Stelmack. c1989, 11p EPA/600/J-89/531
Pub. in Environmental Progress, v8 n3 p143-151 Aug 89.

The concern over solid waste disposal and dump-site clean-up has resulted in the passage of three major U.S. environmental laws. They are the Resource Conservation and Recovery Act (RCRA) of 1976, Public Law 94-580, the Toxic Substances Control Act (TSCA) of 1976, Public Law 94-469, and the Comprehensive Environmental Response, Compensation and Liability Act (CERCLA) of 1980, Public Law 96-510. The implementation of these three laws has considerably intensified incineration research, because incineration represents the highest degree of destruction and environmental control possible for various waste types (types such as hazardous, medical and municipal waste). The objective of the paper is to review the fundamentals of incineration (combustion) and to provide an incinerator design example to show how combustion fundamentals are applied to an incineration system.

Keywords: *Solid waste disposal, *Incineration, *Pollution laws, Land pollution abatement, Reviews, Incinerators, Design criteria, Performance evaluation, Combustion efficiency, Industrial wastes, Municipal wastes, Hazardous materials, Reprints, Medical wastes, Resource Conservation and Recovery Act, Toxic Substances Control Act, Comprehensive Environmental Response Compensation and Liability Act.

PB91-196246/REB PC **A02**/MF **A01**
SITE Demonstration of the American Combustion Pyretron Oxygen-Enhanced Burner. Journal article.
Environmental Protection Agency, Cincinnati, OH. Risk Reduction Engineering Lab.
L. J. Staley, and R. E. Mournighan. c1989, 7p EPA/600/J-89/532
Pub. in Jnl. of the Air and Waste Management Association, v39 n2 p149-153 Feb 89.

A demonstration of the American Combustion Pyretron (TM) oxygen-enhanced burner was conducted under the Superfund Innovative Technology Evaluation (SITE) program. The Demonstration was conducted at the U.S. EPA's Combustion Research Facility (CRF) in Jefferson, Arkansas. An eight week test series was conducted which involved burning a mixture of listed waste K087 with contaminated soil from the Stringfellow Acid Pits under both oxygen enhancement and air-only conditions. Performance under both modes of operation was compared. Results show that the Pyretron operating with oxygen enhancement could meet RCRA emissions limitations at a throughput rate double that for air-only operation. Scrubber liquor and kiln ash from the tests contained no detectable levels of contaminants from either waste stream. (Copyright (c) 1989 Air and Waste Management Association.)

Keywords: *Incinerators, *Air pollution abatement, *Waste disposal, *Air pollution control equipment, Oxygen enrichment, Soil contamination, Arkansas, Air intakes, Performance evaluation, Scrubbers, Pollution regulations, Operations, Kilns, Design criteria, Combustion efficiency, Reprints, *Superfund Innovative Technology Evaluation Program, *Pyretron burners, Jefferson(Arkansas).

PB91-196253/REB PC **A03**/MF **A01**
Analysis of Inactivation of 'Giardia lamblia' by Chlorine. Journal article.
Environmental Protection Agency, Cincinnati, OH. Drinking Water Research Div.
R. M. Clark, E. J. Read, and J. C. Hoff. c1989, 13p EPA/600/J-89/533
Pub. in ASCE Jnl. of Environmental Engineering, v115 n1 p80-90 Feb 89. Prepared in cooperation with Computer Sciences Corp., Cincinnati, OH.

Amendments to the Safe Drinking Water Act (PL-93-523) highlight the continuing problem of waterborne disease by mandating the EPA to promulgate: (1) Criteria by which filtration will be required for surface water supplies; and (2) disinfection requirements for all water supplies in the United States. There is interest on the part of the EPA in applying the Ct concept for determining the inactivation of Giardia lamblia cysts as a key criterion for determining exceptions to the filtra-

tion rule. If a utility, in addition to meeting other requirements, can demonstrate that through effective disinfection, manifested by a sufficient Ct value, it can reduce Giardia levels by 99.9%, then it will be exempted from surface water filtration. In the paper, a model for calculation of Ct values based on animal infectivity data is developed. The model, based on first-order kinetics, relates Ct values to chlorine concentration, pH and temperature. The model predictions are compared to laboratory data.

Keywords: *Drinking water, *Water microbiology, *Giardia lamblia, *Chlorine, *Decontamination, Kinetics, pH, Temperature, Water treatment, Reprints, *Safe Drinking Water Act.

PB91-196261/REB PC **A02**/MF **A01**
NATO/CCMS Conference on the Demonstration of Remedial Action Technologies for Contaminated Land and Groundwater. Held in Bilthoven, The Netherlands on November 7-11, 1988. Journal article.
Environmental Protection Agency, Cincinnati, OH. Risk Reduction Engineering Lab.
S. C. James, and D. E. Sanning. c1989, 9p EPA/600/J-89/534
Pub. in Jnl. of the Air and Waste Management Association, v39 n9 p1178-1184 Sep 89. See also PB90-263229.

The problem of contamination to land and groundwater from improper handling of hazardous materials/waste is faced by all countries. Also the need for reliable, cost-effective technologies to address the problem at contaminated sites exists throughout the world. Many countries have only started to develop new innovative/alternative technologies while others have already started to apply these technologies to the cleanup of contaminated sites. The purpose of the NATO/CCMS Pilot Study is to discuss and evaluate new innovative/alternative technologies and/or existing systems that may be applicable to the cleanup of contaminated sites. Through the pilot study the exchange of information on new and existing technologies for dealing with problem hazardous waste sites is promoted. The pilot study is made up of an international group of experts drawn from the participating countries. The study, which was initiated in 1986, is planned to last five years. It is piloted by the United States and copiloted by the Federal Republic of Germany (FRG) and the Netherlands. The report includes an overview and history of the NATO/CCMS Pilot Study, but it primarily presents a documentation of the NATO/CCMS Second International Conference on the Demonstration of Remedial Action Technologies for Contaminated Land and Groundwater held in Bilthoven, the Netherlands on November 7-11, 1988. (Copyright (c) 1989, Air & Waste Management Association.)

Keywords: *Meetings, *Remedial action, *Land pollution, *Water pollution, *Waste disposal, *Hazardous materials, Ground water, Soil contamination, United States, Substitutes, Technology transfer, Netherlands, Federal Republic of Germany, Cost effectiveness, Reprints, Cleanup operations, Foreign technology.

PB91-196279/REB PC **A02**/MF **A01**
Corvallis Environmental Research Lab., OR.
Interaction of Elevated Ultraviolet-B Radiation and CO2 on Productivity and Photosynthetic Characteristics in Wheat, Rice, and Soybean. Journal article.
Maryland Univ., College Park. Dept. of Botany.
A. H. Teramura, J. H. Sullivan, and L. H. Ziska. c1990, 8p SCIENTIFIC-8184, CONTRIB-A6023, EPA/600/J-90/488
Pub. in Plant Physiology 94, p470-475 1990. Sponsored by Corvallis Environmental Research Lab., OR.

Wheat, rice and soybean were grown to determine if CO2-induced increases in photosynthesis, biomass, and yield are modified by increases in ultraviolet-B (UV-B) radiation corresponding to stratospheric ozone depletion. The experimental conditions simulated were: (1) an increase in CO2 concentration from 350 to 650 microliters per liter; (2) an increase in UV-B radiation corresponding to a 10% ozone depletion at the equator; and (3) a and b combination. Seed yield and total biomass increased significantly with elevated CO2 in all three species when compared to the control. However, with concurrent increases in UV-B and CO2, no increase in either seed yield (wheat and rice) or total biomass (rice) was observed with respect to the control. In contrast, CO2-induced increases in seed yield and total plant biomass were maintained or increased in soybean within the elevated CO2, UV-B environment. Whole leaf gas exchange indicated a significant increase in photosynthesis, apparent quantum efficiency (AQE) and water-use-efficiency (WUE) with elevated CO2 in all 3 species. Including elevated UV-B radiation with high CO2 eliminated the effect of high CO2 on photosynthesis and WUE in rice and the increase in AQE associated with high CO2 in all species. Elevated CO2 did not change the apparent carboxylation efficiency (ACE) in the three species although the combination of elevated CO2 and UV-B reduced ACE in wheat and rice. The results of the experiment illustrate that increased UV-B radiation may modify CO2-induced increases in biomass, seed yield and photosynthetic parameters and suggest that available data may not adequately characterize the potential effect of future, simultaneous changes in CO2 concentration and UV-B radiation.

Keywords: *Air pollution effects(Plants), *Ultraviolet rays, *Carbon dioxide, *Farm crops, *Photosynthesis, Soybeans, Rice, Wheat, Biomass, Seeds, Reprints.

PB91-196287/REB PC **A02**/MF **A01**
Corvallis Environmental Research Lab., OR.
Effects of UV-B Radiation on Soybean Yield and Seed Quality: A Six-Year Field Study. Journal article.
Maryland Univ., College Park. Dept. of Botany.
A. H. Teramura, J. H. Sullivan, and J. Lydon. c1990, 9p SCIENTIFICA-6024, CONTRIB-8185, EPA/600/J-90/489
Grant EPA-R-814017-01-1
Pub. in Physiologia Plantarum, v80 p5-11 1990. Prepared in cooperation with Department of Agriculture, Beltsville, MD. Sponsored by Corvallis Environmental Research Lab., OR.

Two soybean, (Glycine max (L.) Merr.) cultivars, Essex and Williams, were grown in the field for 6 consecutive seasons under ambient and supplemental levels of ultraviolet-B radiation to determine the potential for alterations in yield or seed quality with a reduction in the stratospheric ozone column. The supplemental UV-B fluences simulated a 16 or 25% ozone depletion. The data presented here represent the first field experiment conducted over multiple seasons which assesses the effects of increased UV-B radiation on seed yield. Overall, the cultivar Essex was found to be sensitive to UV-B radiation (yield reductions of 20%) while the cultivar Williams was tolerant. However, the effectiveness of UV-B radiation in altering yield was strongly influenced by the seasonal microclimate, and the 2 cultivars responded differently to these changing factors. Yield was reduced most in Essex during seasons in which water availability was high and was reduced in Williams only when water was severely limiting. The results of the experiments demonstrate the necessity for multiple-year experiments and the need to increase understanding of the interaction between UV-B radiation and other environmental stresses in order to assess the potential consequences of stratospheric ozone depletion.

Keywords: *Soybeans, *Ultraviolet rays, *Farm crops, *Seeds, Field tests, Precipitation, Ozone, Seasonal variation, Reprints.

PB91-196295/REB PC **A02**/MF **A01**
Corvallis Environmental Research Lab., OR.
Field Study of the Interaction between Solar Ultraviolet-B Radiation and Drought on Photosynthesis and Growth in Soybean. Journal article.
Maryland Univ., College Park. Dept. of Botany.
J. H. Sullivan, and A. H. Teramura. c1990, 8p SCIENTIFIC-8044, CONTRIBA-4997, EPA/600/J-90/490
Grant EPA-R-812150-02-0
Pub. in Plant Physiology, v92 p141-146 1990. Sponsored by Corvallis Environmental Research Lab., OR.

Soybean, Glycine max (L.) Merr. cv Essex, plants were grown in the field in a 2x2 factorial design, under ambient and supplemental levels of ultraviolet-B (UV-B) radiation (supplemental daily dose of 5.1 effective kilojoules per square meter) and were either well-watered or subjected to drought. Soil water potentials were reduced to -2.0 megapascals by the exclusion of natural precipitation in the drought plots and were maintained at approximately -0.5 megapascal by supplemental irrigation in well-watered plots. Plant growth and gas exchange characteristics were affected under both drought and supplemental UV-B radiation. The combined effect of both drought and UV-B radiation on photosynthetic gas exchange was a reduction in apparent quantum efficiency and the rapid appearance of biochemical limitations to photosynthesis concomitant with reduced diffusional limitations. However, the combination of stresses did not result in additive effects on total plant growth or seed yield compared to reductions under either stress independently.

Keywords: *Ultraviolet rays, *Photosynthesis, *Soybeans, *Droughts, *Farm crops, Field tests, Precipitation, Plant growth, Reprints, *Plant stress.

PB91-196303/REB PC **A03**/MF **A01**
Biologically Enhanced Oxygen Transfer in the Activated Sludge Process. Journal article.
Environmental Protection Agency, Cincinnati, OH. Risk Reduction Engineering Lab.
J. S. Mueller, H. D. Stensel, and R. C. Brenner. c1990, 13p EPA/600/J-90/491
Pub. in Research Jnl. WPCF, v63 n2 p193-203 Mar-Apr 90. Prepared in cooperation with Washington Univ., Seattle, and Manhattan Coll., Bronx, NY.

Biologically enhanced oxygen transfer has been a hypothesis to explain observed oxygen transfer rates in activated sludge systems that were well above that predicted from aerator clean-water testing. The enhanced oxygen transfer rates were based on tests using BOD bottle oxygen uptake rates (OURs) on samples removed from the activated sludge system. Bench- and full-scale plant studies were performed to compare results of in situ OUR measurement techniques to BOD bottle OUR measurements. The studies showed that the condition of low dissolved oxygen (DO) and high OUR for which the greatest enhanced oxygen transfer was reported resulted in OURs in the BOD bottle tests well above the actual in situ OURs. For high DO and high OUR activated sludge operating conditions, the BOD bottle OURs were below the actual in situ OURs. The BOD bottle OUR values accurately described in situ OURs for endogenous respiration conditions with nonlimiting DO concentrations. The results suggest that previously observed biologically enhanced oxygen transfer was not actually occurring but was the result of the BOD bottle test method and activated sludge operating condition.

Keywords: *Activated sludge process, *Aeration, *Biological treatment, *Sewage treatment, Oxygenation, Mass transfer, Design criteria, Performance evaluation, Dissolved oxygen, Biochemical oxygen demand, Mathematical models, In-situ processing, Oxygen demand, Reprints, Oxygen uptake rate.

PB91-196311/REB PC **A01**/MF **A01**
Technical Note: Adsorption Capacity of GAC for Synthetic Organics. Journal article.
Environmental Protection Agency, Cincinnati, OH. Risk Reduction Engineering Lab.
T. F. Speth, and R. J. Miltner. c1990, 4p EPA/600/J-90/492
Pub. in Jnl. American Water Works Association, p72-76 Feb 90. Prepared in cooperation with American Water Works Association, Denver, CO., Iowa State Water Resources Research Inst., Ames, Carus Chemical Co., La Salle, IL., and Iowa Univ., Iowa City. Dept. of Civil and Environmental Engineering.

Isotherms are presented for 58 compounds in distilled-deionized water, filtered river water, and filtered groundwater. The compounds, which ranged from volatile organics to insecticides, are either regulated or being considered for regulation by the US Environmental Protection Agency.

Keywords: *Water pollution control, *Isotherms, *Granular activated carbon treatment, *Chemical compounds, Insecticides, Volatile organic compounds, Adsorption, Performance evaluation, Equilibrium, Pollution regulations, Mathematical models, Tables(Data), Concentration(Composition), Reprints.

PB91-196329/REB PC **A03**/MF **A01**
Minimization of Transient Emissions from Rotary Kiln Incinerators, 1990. Journal article.
Arizona Univ., Tucson. Dept. of Chemical Engineering.
P. M. Lemieux, W. P. Linak, J. A. McSorley, J. O. L. Wendt, and J. E. Dunn. c1990, 17p EPA/600/J-90/493
Contract EPA-68-02-4701

Pub. in Combustion Science and Technology, v74 p311-325 1990. See also report for 1989, PB90-112558. Prepared in cooperation with Arkansas Univ., Fayetteville. Dept. of Mathematical Sciences, and Environmental Protection Agency, Research Triangle Park, NC. Air and Energy Engineering Research Lab.

The paper discusses combining experimental results from a pilot-scale rotary kiln incinerator simulator with a theoretical model in order to explore the potential of minimizing transient emissions through changes in kiln rotation speed and temperature, steady state oxygen enrichment, and oxygen enrichment in a dynamic mode. Results indicate that transient organic emissions can indeed be minimized by changes in these kiln operating parameters but, because of the complex interactions of physical and chemical processes controlling emissions, the appropriate abatement procedures must be implemented carefully. Transient emissions of organics occur from rotary kiln incinerators when drums containing liquid wastes bound on sorbents are introduced in batches. Physical processes controlling the release of waste from the sorbent material are greatly affected by the rotation speed and temperature of the kiln. Local partial pressure of oxygen influences the rate of oxidation of the puff formed inside the kiln. These physical and chemical phenomena can be used to control transient emissions by oxygen enrichment, where it is done in either a steady or a dynamic mode.

Keywords: *Air pollution abatement, *Kilns, *Solid waste disposal, *Incinerators, *Mathematical models, Oxygen enrichment, Pilot plants, Sorbents, Liquid wastes, Operating, Physical properties, Chemical properties, Performance evaluation, Reprints.

PB91-196337/REB PC **A02**/MF **A01**
Flow and Dispersion of Pollutants within Two-Dimensional Valleys. Journal article.
Environmental Protection Agency, Research Triangle Park, NC. Atmospheric Research and Exposure Assessment Lab.
W. H. Snyder, L. H. Khurshudyan, I. V. Nekrasov, R. E. Lawson, and R. S. Thompson. c1990, 8p EPA/600/J-90/494
See also PB90-186362. Prepared in cooperation with Main Geophysical Observatory, Leningrad (USSR), and Moscow State Univ. (USSR).

Wind-tunnel experiments and a theoretical model concerning the flow structure and pollutant diffusion over two-dimensional valleys of varying aspect ratio are described and compared. Three model valleys were used, having small, medium, and steep slopes. Measurements of mean and turbulent velocity fields were made upstream, within, and downwind of each of these valleys. Concentration distributions were measured downwind of tracer sources placed at an array of locations within each of the valleys. The data are displayed as maps of terrain amplification factors, defined as the ratios of maximum ground-level concentrations in the presence of the valleys to the maxima observed from sources of the same height located in flat terrain. Maps are also provided showing the distance to locations of the maximum ground-level concentrations. The concentration patterns are interpreted in terms of the detailed flow structure measured in the valleys. These data were also compared with results of a mathematical model for treating flow and dispersion over two-dimensional complex terrain. The model used the wind-tunnel measurements to generate mean flow fields and eddy diffusivities, and these were applied in the numerical solution of the diffusion equation. Measured concentration fields were predicted reasonably well by the model for the valley of small slope and somewhat less well for the valley of medium slope. Because flow separation was observed within the steepest valley, the model was not applied in this case.

Keywords: *Air pollution, *Dispersion, *Valleys, *Two dimensional flow, Wind tunnel tests, Mathematical models, Terrain, Diffusion, Natural convection, Slopes, Eddies, Reprints.

PB91-196345/REB PC **A02**/MF **A01**
Environmental Research Lab.-Duluth, MN.
Factors Influencing Mercury Concentrations in Walleyes in Northern Wisconsin Lakes. Journal article.
National Fisheries Contaminant Research Center, La Crosse, WI. Field Research Station.
J. G. Wiener, R. E. Martini, T. B. Sheffy, and G. E. Glass. c1990, 10p EPA/600/J-90/495
Grant EPA-R-809484
Pub. in Transactions of the American Fisheries Society, v119 p862-870 1990. Prepared in cooperation with Wisconsin Dept. of Natural Resources, Madison. Sponsored by Environmental Research Lab.-Duluth, MN.

The study examined relations between mercury concentrations in walleyes Stizostedion vitreum and the characteristics of clear-water Wisconsin lakes, which spanned a broad range of pH values (5.0-8.1) and acid-neutralizing capacities (-9 to 1,017 microgram eq/L). Total concentrations of mercury in axial muscle tissue of walleyes (total length, 25-56 cm) varied from 0.12 to 1.74 microgram g/g wet weight. Concentrations were greatest in fish from the eight lakes with pH less than 7.0; concentrations in these fish equaled or exceeded 0.5 microgram g/g in 88% of the samples analyzed and 1.0 microgram g/g in 44%. In the five lakes with pH of 7.0 and above, concentrations exceeded 0.5 microgram g/g in only 1 of 21 walleyes. Multiple regression revealed that lake pH and total length of fish accounted for 69% of the variation in mercury concentration in walleyes. Regression models with total length and either waterborne calcium or acid-neutralizing capacity as independent variables accounted for 67% of the variation in concentration. The observed differences in fish mercury concentration between the low-pH and high-pH lakes could not be logically attributed to differences in growth rate or diet among the walleye populations. Moreover, it is improbable that mercury influxes to the low-pH lakes were greater than those to the high-pH lakes, because of the close proximity and spatial interspersion of low- and high-pH lakes.

Keywords: *Water pollution effects(Animals), *Mercury(Metal), *Toxicity, *Lakes, pH, Regression analysis, Body size, Calcium, Biological availability, Muscles, Concentration(Composition), Reprints, *Walleye pike, *Northern Region(Wisconsin), Stizostedion vitreum.

PB91-196352/REB PC **A03**/MF **A01**
Incinerability Ranking Systems for RCRA Hazardous Constituents. Journal article.
Environmental Protection Agency, Cincinnati, OH. Risk Reduction Engineering Lab.
C. C. Lee, G. L. Huffman, and S. Stelmack. c1990, 33p EPA/600/J-90/496
Pub. in Hazardous Waste and Hazardous Materials, v7 n4 p385-415 1990.

The selection of Principal Organic Hazardous Constituents (POHCs) and determination of the incinerability ranking have been the subject of considerable scientific and policy debate since the RCRA/hazardous waste incinerator standards were established in 1981. POHCs have typically been selected for measurement of their Destruction and Removal Efficiencies (DREs) during incinerator trial burns based on their heats of combustion. In 1987, EPA's OSW joined ORD to evaluate the possibility of developing an improved POHC incinerability ranking system based on the concept of thermal stability under oxygen-starved, post-flame conditions. A theoretical evaluation of the thermal stability of 320 organic compounds on the Appendix VIII list was undertaken. These compounds were grouped in accordance with their possible reaction mechanisms. Selected compounds were tested in a laboratory-scale thermal decomposition unit equipped with a gas chromatograph to determine their Destruction Efficiencies (DEs) under low-oxygen, post-flame conditions. The Paper provides both the 'heat of combustion' ranking system and the 'thermal stability' ranking system for comparison and application.

Keywords: *Incineration, *Waste disposal, *Combustion efficiency, *Hazardous materials, *Air pollution abatement, Ranking, Pollution standards, Combustion heat, Performance standards, Thermal stability, Research and development, Air pollution sampling, Reprints, *Principal organic hazardous constituents, Resource Conservation and Recovery Act, Chemical reaction mechanisms.

PB91-196360/REB PC **A02**/MF **A01**
Determination of Total Organic Halide in Water: A Comparative Study of Two Instruments. Journal article.
Environmental Protection Agency, Cincinnati, OH. Risk Reduction Engineering Lab.
D. A. Reckhow, C. Hull, E. Lehan, J. M. Symons, and H. S. Kim. c1990, 10p EPA/600/J-90/497
Pub. in International Jnl. of Environmental Analytical Chemistry, v38 p1-7. Prepared in cooperation with Massachusetts Univ., Amherst. Dept. of Civil Engineering, and Atmospheric Environment Service, Downsview (Ontario).

Total organic halide (TOX) analyzers are commonly used to measure the amount of dissolved halogenated organic byproducts in disinfected waters. Because of the lack of information on the identify of disinfection byproducts, rigorous testing of the dissolved organic halide (DOX) procedure for method bias is not always possible. The note presents the results of a brief study comparing two commercial TOX analyzers with neutron activation. The purpose was to determine if differential bias exists between the two analyzers, and to determine analyte recovery of adsorbed disinfection byproducts. Disinfection byproducts of aquatic fulvic acid were prepared using the following disinfectants: chlorine, bromine, and monochloramine. Analysis of the samples indicated that the two commercial TOX analyzers gave similar results. Neutron activation analysis suggested that organic chlorine recovery from the activated carbon adsorbent was complete, however, results with organic bromine recovery were inconclusive. Additional tests indicated that one of the TOX analyzers is subject to significant interferences from inorganic iodide. (Copyright (c) 1990 Gordon and Breach, Science Publishers, Inc.)

Keywords: *Potable water, *Chlorination, *Disinfection, Performance evaluation, Chemical analysis, Fulvic acids, Chlorine organic compounds, Bromine organic compounds, Byproducts, Iodides, Comparison, Statistical analysis, Bias, Contaminants, Reprints, *Total organic halide analyzers.

PB91-196378/REB PC **A02**/MF **A01**
Environmental Protection Agency, Cincinnati, OH. Risk Reduction Engineering Lab.
Design Information Report: Sludge Management Systems. Journal article.
Montgomery (James M.) Consulting Engineers, Inc., Pasadena, CA.
A. Condren, K. Deeny, R. Dick, R. Hegg, and R. Reed. c1990, 10p EPA/600/J-90/498
Contract EPA-68-03-3429
Pub. in Water Environment and Technology, v2 n7 p62-69 Jul 90. Sponsored by Environmental Protection Agency, Cincinnati, OH. Risk Reduction Engineering Lab.

Over 270 comprehensive performance evaluations have shown that sludge management system limitations were severe enough to contribute to non-compliance with NPDES permits in 49 percent of the plants evaluated. Most limitations could be attributed to one or more of the following: inaccurately estimated masses and/or volumes of waste sludge, inadequately sized processing equipment to address waste sludge mass and/or volume variations, and inflexibility in sludge processing operations and sludge management system options. The document highlights common sludge management system oversights and presents concepts to illustrate how such oversights can be addressed by designers and reviewing agencies in the future.

Keywords: *Waste management, *Sludge disposal, *Sewage sludge, Performance evaluation, Permits, Sewage treatment, Standards compliance, Volume, Pollution regulations, Forecasting, Waste processing, Operations, Reprints, *National Pollutant Discharge Elimination System, *Publicly owned treatment works.

PB91-196386/REB PC **A03**/MF **A01**
Modeling the Inactivation of Giardia Lamblia. Journal article.
Environmental Protection Agency, Cincinnati, OH. Risk Reduction Engineering Lab.
R. M. Clark. c1990, 19p EPA/600/J-90/499
Pub. in Jnl. of Environmental Engineering, v116 n5 p837-853 Sep-Oct 90.

Under the auspices of the Safe Drinking Water Act (SDWA) the U.S. EPA has promulagated the Surface Water Treatment Rule (SWTR) requiring public water systems using surface water to provide minimum disinfection to control Giardia Lamblia, enteric viruses, and bacteria. The CT concept (concentration of disinfectant in mg/L times time in minutes) is used to establish the appropriate criteria for a surface system to achieve at least 99.9% inactivation of Giardia lamblia and

99.9% inactivation for viruses. In the SWTR, an empirical equation was developed based on water temperature, pH, concentration of chlorine, and inactivation level to predict required disinfection criteria (C times t values). The paper describes the development of an equation based on Chick-Watson kinetics that provides equivalent information but is theoretically more consistent.

Keywords: *Microbiology, *Giardia, *Potable water, *Disinfection, *Water treatment, Chlorine, Temperature, Kinetics, Enteroviruses, Virulence, Reprints, *Safe Drinking Water Act, Giardia lamblia.

PB91-196394/REB PC **A02**/MF **A01**
Hazardous Waste Decontamination with Plasma Reactors. Journal article.
Environmental Protection Agency, Cincinnati, OH. Risk Reduction Engineering Lab.
L. J. Staley. c1990, 7p EPA/600/J-90/500
Pub. in Jnl. of Hazardous Materials Control, v3 n2 p67-71 Mar/Apr 90.

The use of electrical energy in the form of plasma has been considered as a potentially efficient means of decontaminating hazardous waste. Only a few attempts have been made to actually treat hazardous waste with plasma, however. The paper discusses both direct and indirect waste heating with plasma. Direct heating involves the direct injection of liquid waste into the plasma plume. Indirect heating involves using the plasma to create a bath of molten solid material which is used to heat and decontaminate solid hazardous waste. The paper summarizes the experience to date with plasma based on hazardous waste treatment and discusses the implications of the limited data available.

Keywords: *Hazardous materials, *Decontamination, *Waste treatment, *Plasma devices, Solid wastes, Plasma temperature, Heat treatment, Technology utilization, Design criteria, Performance evaluation, Reprints.

PB91-196402/REB PC **A02**/MF **A01**
Environmental Protection Agency, Cincinnati, OH. Risk Reduction Engineering Lab.
Pollution Prevention: Not Only 'Where It's At' but 'Where It's Been'. Journal article.
Cincinnati Univ., OH. American Inst. for Pollution Prevention.
J. T. Ling, and D. G. Stephan. c1990, 6p EPA/600/J-90/501
Pub. in Jnl. of the American Academy of Environmental Engineers, v26 n4 p13-15, 23, Oct 90. Sponsored by Environmental Protection Agency, Cincinnati, OH. Risk Reduction Engineering Lab.

All sectors are beginning to see the inherent advantages that arise from avoiding the generation of pollutants in the first place - the reductions in environmental and health hazards, the avoidance of Federal, State and local regulatory requirements, the more efficient use of raw materials, the more economical production of goods and services, the conservation of natural resources, and the elimination of potential liability. The report is a brief outline of the mission, structure and activities of the American Institute for Pollution Prevention.

Keywords: *Pollution abatement, *Research and development, Economic analysis, Education, Implementation, State government, Local government, Environment management, Administrative procedures, Reprints, *American Institute for Pollution Prevention.

PB91-196410/REB PC **A02**/MF **A01**
Measuring and Modeling Variations in Distribution System Water Quality. Journal article.
Environmental Protection Agency, Cincinnati, OH. Drinking Water Research Div.
R. M. Clark, and J. A. Coyle. c1990, 10p EPA/600/J-90/502
Pub. in Jnl. American Water Works Association, v82 n8 p46-53 Aug 90.

Until recently most interest in drinking water quality has been in the finished water as it leaves the treatment plant. The Safe Drinking Water requires that MCLs be met at the consumers tap. Because finished water may undergo substantial changes while being transported through the distribution system to the consumer, interest has increased on the effect the system itself may have on water quality. The paper reports on a study that was conducted in cooperation with the North Penn Water Authority in Lansdale, Pennsylvania to study the effects that hydraulic behavior may have on contaminant propagation in the system. The study demonstrates that water quality varies not only with time but with space as well. Methods for continuous monitoring were evaluated as part of the study. Several different types of models were also developed in order to provide a framework for studying contaminant propagation.

Keywords: *Water quality, *Water pollution effects, *Distribution systems, *Potable water, *Mathematical models, Water pollution sampling, Case studies, Pennsylvania, Water treatment plants, Environmental transport, Hydraulics, Kinetics, Path of pollutants, Reprints, Lansdale(Pennsylvania).

PB91-196428/REB PC **A02**/MF **A01**
Possible Red Spruce Decline: Contributions of Tree-Ring Analysis. Journal article.
Corvallis Environmental Research Lab., OR.
P. C. Van Deusen, G. A. Reams, and E. R. Cook. c1991, 7p EPA/600/J-91/061
Pub. in Jnl. of Forestry, p20-24 Jan 91. Prepared in cooperation with Southern Forest Experiment Station, New Orleans, LA., Oregon State Univ., Corvallis, and Lamont-Doherty Geological Observatory, Palisades, NY.

In studies of the northeastern red spruce ecosystem, several points evoke some agreement: (1) many high-elevation sites exhibit substantial post-1960 mortality that could be due to winter injury; (2) there is widespread pre-1950 growth increase with a subsequent post-1960 growth decrease; (3) many locations show none of these effects; and (4) dendro-climate models suggest that late summer and early winter temperatures of the previous year are significant determinants of red spruce year-to-year growth. It is a mistake to advocate a single cause at this time, because there is compelling evidence that both climate and stand dynamics are involved to some degree. The study of long-term forest trends based on tree-ring data is difficult and subject to interpretation, but it is unlikely that other data is available for most natural forest areas. In fact, progress made in the study of northeastern red spruce owes much to tree-ring analysis, and other ecological studies could benefit as well.

Keywords: *Acid rain, *Air pollution effects(Plants), Climate, Plant growth, Mortality, Reprints, *Red spruce, *Forest decline, *Tree-ring analysis, Stand dynamics.

PB91-196436/REB PC **A02**/MF **A01**
Effects of Dietary Exposure to Methyl Parathion on Egg Laying and Incubation in Mallards. Journal article.
Corvallis Environmental Research Lab., OR.
R. S. Bennett, B. A. Williams, D. W. Schmedding, and J. K. Bennett. c1991, 9p EPA/600/J-91/062
Pub. in Environmental Toxicology and Chemistry, v10 p501-507 1991. Prepared in cooperation with NSI Technology Services Corp., Corvallis, OR.

An outdoor pen study was conducted with mallards (Anas platyrhynchos) to evaluate the effects of an 9-d dietary exposure to methyl parathion (400 ppm) on egg laying and incubation when treatment was initiated at different times in the nesting cycle. Treatment groups were defined as egg laying (chemical initiated after fourth egg laid in nest), early incubation (initiated after day 4 of incubation), late incubation (initiated after day 16 of incubation) and control (no chemical). Forty-eight pairs (12/group) were allowed to nest and hatch broods. In the egg laying group, daily egg production was reduced significantly during the treatment period compared to controls, but 4 of 10 hens resumed production post-treatment. One of ten control hens abandoned its nest, whereas 17 of 23 hens in the early and late incubation groups either died or exhibited changes in incubation behavior, with 7 hens abandoning their nests and 6 displaying reduced nest attentiveness for one or more days during treatment. Reproductive parameters were not significantly different between treatment groups, but the number of hatchlings per nest was 61, 43 and 58% of controls for the egg laying, early incubation and late incubation groups, respectively. The study showed that nesting success may be impacted by short dietary exposures to methyl parathion, particularly during early incubation.

Keywords: *Methyl parathion, *Organophosphate insecticides, *Ducks, *Reproduction(Biology), Eggs, Diet, Food consumption, Mortality, Embryo, Reprints, Anas platyrhynchos, Nest abandonment.

PB91-196444/REB PC **A03**/MF **A01**
Environmental Protection Agency, Research Triangle Park, NC. Air and Energy Engineering Research Lab.
Application of Staged Combustion and Reburning to the Co-Firing of Nitrogen-Containing Wastes. Journal article.
Acurex Corp., Research Triangle Park, NC.
W. P. Linak, J. A. Mulholland, J. A. McSorley, R. E. Hall, and R. K. Srivastava. c1991, 17p EPA/600/J-91/063
Contracts EPA-68-02-3988, EPA-68-02-4701
Pub. in Hazardous Waste and Hazardous Materials, v8 n1 p1-15 1991. Prepared in cooperation with Battelle, Columbus, OH. Sponsored by Environmental Protection Agency, Research Triangle Park, NC. Air and Energy Engineering Research Lab.

The paper gives results of an evaluation of a 0.6 MW precombustion chamber burner, designed for in-furnace NOx control, high combustion efficiency, and retrofit applications, for use with high nitrogen content fuel/waste mixtures. The 250- to 750-ms residence time precombustion chamber burner mounted on a prototype watertube package boiler simulator used air staging and in-furnace natural gas reburning to control NOx emissions. The paper reports results of research in which the low NOx precombustor was used to examine the co-firing characteristics of a nitrogenated pesticide, containing dinoseb (2-sec-butyl-4,6 dinitrophenol) in a fuel-oil/xylene solvent. The dinoseb formulation as fired contained 6.4% nitrogen. NO emissions without in-furnace NOx control exceeded 4400 ppm (at 0% O2). When NOx controls in the form of air staging and natural gas reburning were used, these emissions were reduced to < 150 ppm (96% reduction). Average CO and total hydrocarbon emissions were typically < 15 and 2 ppm, respectively. No dinoseb was detected in any emission sample, and the destruction efficiency was determined to be > 99.99%. Mutagenicity studies of the dinoseb emissions showed that reburning (used for NOx control) reduced the mutagenic emission factor about 60-70% from that with air staging alone.

Keywords: *Waste disposal, *Air pollution control, *Afterburning, *Cocombustion, *Incinerators, *Staged combustion, Combustion efficiency, Performance evaluation, Nitrogen oxides, Pesticides, Dinoseb, Design criteria.

PB91-196451/REB PC **A03**/MF **A01**
Environmental Protection Agency, Cincinnati, OH. Risk Reduction Engineering Lab.
Emissions of Metals and Organics from Municipal Wastewater Sludge Incinerators, 1991. Journal article.
Radian Corp., Research Triangle Park, NC.
C. R. Parrish, M. A. Palazzolo, M. A. Vancil, H. E. Bostian, and E. P. Crumpler. c1991, 12p EPA/600/J-91/064
Contract EPA-68-02-4288
Pub. in Trans IChemE, v69, Part B, Feb 91. See also PB91-151472. Prepared in cooperation with Mobay Corp., New Martinsville, WV. Sponsored by Environmental Protection Agency, Cincinnati, OH. Risk Reduction Engineering Lab.

Emissions of metals and organics from a series of four wastewater sludge incinerators were determined. Three multiple hearth units and one fluidized bed combustor were tested. Emissions were controlled with a combination of venturi and/or tray impingement scrubbers. One site incorporated an afterburner as well. Flue gas testing was conducted at the inlet and outlet to the air pollution control devices at two of the plants. Feed sludge was also extensively tested for moisture, metals, and organics, as well as overall feed rate and heating value. Testing operating conditions were categorized as short-term versus long term or normal (includes transients, start-up, feed interruptions, etc.).

Keywords: *Air pollution sampling, *Sludge disposal, *Incineration, *Air pollution control equipment, Sewage sludge, Metals, Organic compounds, Performance evaluation, Scrubbers, Afterburners, Moisture, Calorific value, Feed systems, Concentration(Composition), Reprints.

PB91-196469/REB PC **A02**/MF **A01**
Overview and Update of the Superfund Innovative Technology Evaluation (SITE) Demonstration Program. Journal article.
Environmental Protection Agency, Cincinnati, OH. Risk Reduction Engineering Lab.
J. F. Martin. c1991, 6p EPA/600/J-91/066
Pub. in Jnl. of Air and Waste Management Association, v41 n3 p344-347 Mar 91.

The Superfund Innovative Technology Evaluation (SITE) Program is now in its sixth year of demonstrating technologies applicable to Superfund sites. The SITE Program, conducted by the U.S. Environmental Protection Agency's Risk Reduction Engineering Laboratory, is intended to accelerate the use of new and innovative treatment processes as well as evaluate innovative measurement and monitoring techniques. Within the SITE Program, the Demonstration Program and the Emerging Technologies Program are responsible for innovative/alternative waste treatment technology development. Separate and parallel activities are progressing for development and evaluation of measuring and monitoring technologies as well as technology transfer operations. (Copyright (c) 1991, Air and Waste Management Association.)

Keywords: *Superfund, *Technology utilization, *Waste management, Substitutes, Cost analysis, Site surveys, Research and development, Performance evaluation, Reprints, *Superfund Innovative Technology Evaluation Program.

PB91-196477/REB PC **A03**/MF **A01**
Environmental Impacts on the Physiological Mechanisms Controlling Xenobiotic Transfer Across Fish Gills. Journal article.
Environmental Research Lab.-Duluth, MN.
J. M. McKim, and R. J. Erickson. c1991, 30p EPA/600/J-91/067
Pub. in Physiological Zoology, v64 n1 p39-67 Feb 91.

Fish physiologists have provided the basic information on gill morphology, gill function, and vascular dynamics with which to understand branchial flux of gases, water, and ions. In addition, pharmacologists and toxicologists, working in the area of drug action, have characterized the physicochemical attributes of xenobiotic chemicals that determine their rate of movement across biological membranes. Recently, aquatic toxicologists have applied the information to the question of what mechanisms control the movement of organic chemicals across fish gills and how exchange is affected by chemical properties. Mathematical models were developed that predict gill exchange as a function of basic processes such as water flow across the gills, blood flow through the gills, partitioning of the chemical between water and blood, and diffusion between blood and water across gill epithelia. Such mechanistic models can predict the effects of environmental conditions on exchange rates of xenobiotics. To fully develop a predictive capability for xenobiotic uptake and distribution by fish, it will be necessary to incorporate these gill models into emerging, physiologically based models for the entire animal.

Keywords: *Water pollution effects(Animals), *Biological transport, *Xenobiotics, *Gills, *Fishes, Organic chemicals, pH, Oxygen, Temperature, Mathematical models, Pharmacokinetics, Metabolism, Respiration, Reprints.

PB91-196493/REB PC **A03**/MF **A01**
Environmental Protection Agency, Research Triangle Park, NC. Air and Energy Engineering Research Lab.
Interaction of Vapour Phase Organic Compounds with Indoor Sinks. Journal article Jun 89-Feb 90.
Acurex Corp., Research Triangle Park, NC.
B. A. Tichenor, Z. Guo, J. E. Dunn, L. E. Sparks, and M. A. Mason. c1991, 15p EPA/600/J-91/069
Contract EPA-68-02-4701
Pub. in Indoor Air, v1 p23-35 1991. Prepared in cooperation with Arkansas Univ., Fayetteville. Dept. of Mathematical Sciences. Sponsored by Environmental Protection Agency, Research Triangle Park, NC. Air and Energy Engineering Research Lab.

The interaction of indoor air pollutants with interior surfaces (i.e., sinks) is a well known, but poorly understood, phenomenon. Studies have shown that re-emissions of adsorbed organic vapors can contribute to elevated concentrations of organics in indoor environments. Research is being conducted in small environmental test chambers to develop data for predicting sink behavior. The paper reports on the development of sink models based on fundamental mass transfer theory. The results of experiments conducted to determine the magnitude and rate of adsorption and desorption of vapor phase organic compounds for several materials are presented. Five materials were evaluated: carpet, painted wallboard, ceiling tile, window glass, and upholstery. Two organic compounds were tested with each material: tetrachloroethylene (a common cleaning solvent) and ethylbenzene (a common constituent of petroleum-based solvents widely used in consumer products). The results of the experimental work are presented showing the relevant sink effect parameters for each material tested and comparing the sorptive behavior of the two organic compounds evaluated. An indoor air quality (IAQ) model was modified to incorporate adsorption and desorption sink rates. The model was used to predict the temporal history of the concentration of total vapor phase organics in a test house after application of a wood finishing product. The predicted results are presented and compared to measured values. Suggestions for further research on indoor sinks are presented. (Copyright (c) 1991 Danish Technical Press.)

Keywords: *Indoor air pollution, *Construction materials, *Carpets, *Upholstery, *Volatile organic compounds, *Adsorption, *Desorption, Mass transfer, Test chambers, Tetrachloroethylene, ethyl benzene, Pollution control, Stationary sources, Reprints, *Pollution sinks.

PB91-196501/REB PC **A02**/MF **A01**
Models for Analyzing Data in Initiation-Promotion Studies. Journal article.
Environmental Protection Agency, Washington, DC. Office of Health and Environmental Assessment.
C. Chen, H. Gibb, and A. Moini. Feb 91, 8p EPA/600/J-91/070, OHEA-C-326
Pub. in Environmental Health Perspectives, v90 p 287-292 1991. Prepared in cooperation with Computer Sciences Corp., Falls Church, VA.

The objective of the paper is to construct a class of models for analyzing data in initiation-promotion (IP) studies. After the application of an initiator in animal IP studies, histochemical and/or histopathologic criteria are used to define the foci that are postulated to be the origin of tumors. Thus, the dynamics of foci growth are of inherent interest in the study of the mechanism of carcinogenesis. In the paper, models to explain these dynamics are developed and can be used to differentiate among proposed mechanisms of tumor formation and promotion. Examples are given to illustrate useful concepts for analyzing data from IP studies.

Keywords: *Carcinogenesis, *Carcinogens, Histopathology, Etiology, Statistical models, Neoplasms, Adenosine triphosphatase, Hepatectomy, Reprints, *Initiation-promotion studies.

PB91-196519/REB PC **A03**/MF **A01**
Prediction of Retention Times in Temperature-Programmed Multichromatography. Journal article.
Environmental Protection Agency, Research Triangle Park, NC. Atmospheric Research and Exposure Assessment Lab.
L. H. Wright, and J. F. Walling. c1991, 14p EPA/600/J-91/071
Pub. in Jnl. of Chromatography, v540 p311-322 1991.

The calculation of retention times for temperature programmed serially linked capillary gas chromatography columns is demonstrated. Equations are derived for the verification of operating conditions via internal standards and for the precise calculation of mid-point pressure corresponding to a given relative retentivity. The predicted retention times for 23 volatile organic compounds are compared to experimental results.

Keywords: *Gas chromatography, *Prediction equations, Surface properties, Volatile organic compounds, Thermodynamic properties, Reprints, *Retention times, *Temperature programmed multichromatography.

PB91-196527/REB PC **A03**
Sources of Air Pollutants Indoors: VOC and Fine Particulate Species. Journal article.
Environmental Protection Agency, Research Triangle Park, NC. Atmospheric Research and Exposure Assessment Lab.
C. W. Lewis. c1991, 16p EPA/600/J-91/072
Pub. in Jnl. of Exposure Analysis and Environmental Epidemiology, v1 n1 p31-44 1991.

The average concentrations of a large number of fine particle aerosol and VOC species measured in ten Boise, Idaho, residences in wintertime have been apportioned according to their contributions from all inside sources and all outside sources, regarded as two composite source categories. Air change rates for the residences were in the range 0.2 - 0.8/hr. None of the residences had obvious major indoor sources (smokers, woodburning appliances, etc.). The two category apportionment was accomplished through use of the single chamber mass balance indoor air quality model given by Dockery and Spengler. The method depends on the availability of average concentrations measured outside each residence during the same sampling periods used for the inside measurements, and on the ability to identify one or more species that have negligible indoor sources. Calculated infiltration factors (the indoor/outdoor ratio in the absence of indoor sources) for fine particle species averaged 0.5, and varied in a reasonable way with measured air change rates, essentially independent of species. Infiltration factors for the VOCs were indistinguishable from unity. The relative importance of indoor and outdoor sources to measured indoor concentrations showed great variation between species and between residences. In most homes the indoor source contribution was dominant for fine particle Si, Ca, and Fe, while the infiltration contribution was dominant for S, K, Pb, Zn, mass, and extractable organic matter. Indoor contributions to individual VOCs were frequently very large at a few residences and negligible at the others. (Copyright (c) 1991 Princeton Scientific Publishing Co., Inc.)

Keywords: *Houses, *Indoor air pollution, *Volatile organic compounds, *Air pollution monitoring, *Sources, *Pollution transport, *Fines, Particulate sampling, Aerosols, Metals, Winter, Reprints, *Boise(Idaho), Air quality modeling.

PB91-196535/REB PC **A03**/MF **A01**
EPA Program for Monitoring Ecological Status and Trends. Journal article.
Environmental Protection Agency, Research Triangle Park, NC. Atmospheric Research and Exposure Assessment Lab.
J. J. Messer, R. A. Linthurst, and W. S. Overton. c1991, 14p EPA-600/J-91/073
Pub. in Environmental Monitoring and Assessment 17, p67-78 1991. Prepared in cooperation with Oregon State Univ., Corvallis. Dept. of Statistics.

Despite hundreds of millions of dollars spent annually in the United States on environmental monitoring, policy and decision makers seldom have ready access to monitoring data to aid in prioritizing research and assessment efforts or to assess the extent to which current policies are meeting the desired objectives. EPA is currently conducting research to evaluate options for establishing an integrated, cooperative monitoring program, with participation by federal, state, and private entities, that could result in annual statistical reports and interpretive summaries on the status and trends in indicators of adverse disturbance and corresponding 'health' of the nation's ecosystems on the regional and national scale.

Keywords: *Environmental monitoring, *Ecology, Trends, US EPA, Environmental policy, Decision making, Research projects, Statistical analysis, State government, Local government, Biological indicators, Regional analysis, Reprints.

PB91-196543/REB PC **A02**/MF **A01**
Intercomparison of Atmospheric Nitric Acid Measurements at Elevated Ambient Concentrations. Journal article.
Environmental Protection Agency, Research Triangle Park, NC. Atmospheric Research and Exposure Assessment Lab.
K. G. Anlauf, H. A. Wiebe, E. C. Tuazon, A. M. Winer, and G. I. Mackay. c1991, 9p EPA/600/J-91/074
Pub. in Atmospheric Environment, v25A n2 p393-399 1991. Prepared in cooperation with Atmospheric Environment Service, Downsview (Ontario), California Univ., Riverside. Statewide Air Pollution Research Center, and Unisearch Associates, Inc., Concord (Ontario).

Several methods for measurement of ambient HNO3 were compared over a 9-day period during the Carbo-

naceous Species Methods Comparison Study at Glendora, CA, in August 1986. Hourly averaged HNO3 concentrations were in the range 0.5-25 ppbv, with hourly maxima each day in excess of 15 ppbv. The measurement methods included absorption by a nylon filter in an open-face filter pack (FP), a transition flow reactor tube (TRF) in conjunction with a nylon filter, tunable diode laser absorption spectroscopy (TDLAS) and Fourier transform infrared (FT-IR) spectroscopy. The latter method was chosen as the common method for comparison of the daytime HNO3 measurements (nighttime concentrations were below the 4 ppbv detection limit of the FT-IR). Comparing the mean daytime HNO3 mixing ratios, the 1-h FP method yielded 13.9 ppbv (vs 12.9 for FT-IR), the 1-h TDLAS was 11.7 ppbv (vs 13.2 for FT-IR) and the 12-h TFR was 11.4 ppbv (vs 12.0 for FT-IR). For the nighttime periods, the means of the 2-h FP and the 12-h TER were 1.2 and 0.95 ppbv, respectively. The measured means were within the uncertainties of the methods.

Keywords: *Nitric acid, *Air pollution monitoring, *Spectroscopic analysis, *Air sampling, Atmospheric chemistry, Comparison, Air filters, Performance evaluation, Reprints, Glendora(California).

PB91-196550/REB PC **A03**/MF **A01**
Preliminary Studies of Video Images of Smoke Dispersion in the Near Wake of a Model Building. Journal article.
Environmental Protection Agency, Research Triangle Park, NC. Atmospheric Research and Exposure Assessment Lab.
A. H. Huber, S. P. Arya, S. A. Rajala, and J. W. Borek.
c1991, 13p EPA/600/J-91/075
Pub. in Atmospheric Environment, v25A n7 p1199-1209 1991. Prepared in cooperation with North Carolina State Univ. at Raleigh, and Computer Sciences Corp., Research Triangle Park, NC.

A summary of analyses of video images of smoke in a wind tunnel study of dispersion in the near wake of a model building is presented. The analyses provide information on both the instantaneous and the time-average patterns of dispersion. Since the images represent vertically-integrated or crosswind-integrated smoke concentration, only the primary spatial and temporal scales of pollutant dispersion can be examined. Special graphic displays of the results are presented to have great potential as an easily quantifiable electronic medium for studying the dispersion of smoke.

Keywords: *Smoke, *Dispersion, *Wakes, *Air pollution, *Video signals, *Images, Model tests, Buildings, Wind(Meterology), Vortices, Wind tunnel tests, Wind tunnel models, Flow visualization, Reprints.

PB91-196568/REB PC **A03**/MF **A01**
Wind Tunnel and Gaussian Plume Modeling of Building Wake Dispersion. Journal article.
Environmental Protection Agency, Research Triangle Park, NC. Atmospheric Research and Exposure Assessment Lab.
A. H. Huber. c1991, 15p EPA-600/J-91/076
Pub. in Atmospheric Environment, v25A n7 p1237-1249 1991.

The paper summarizes a study of the relationship between Gaussian plume models and wind-tunnel models. Wind-tunnel measurements of the distribution of tracer concentrations downwind of a point source in the near wake of a rectangular model building were evaluated. Profiles of mean velocity and turbulence were measured to characterize the flow. These experiments were conducted in both a low-turbulence boundary layer and a simulated-atmospheric boundary layer. The study covered a range of four flow speeds and four different sized buildings. The differences in observed velocity and concentrations between the results for the low turbulence and simulated atmospheric boundary layer flow were not significant very near the building, but these differences increased in significance at downstream distance greater than 10 times the building height. The transition from building-affected dispersion levels to levels that were not significantly different from dispersion without a building was a function of the size of the building. The application of a modified Gaussian plume model showed it to be a simple, well-suited complement to wind-tunnel measurements of mean concentrations.

Keywords: *Plumes, *Air pollution, *Wakes, *Dispersion, *Wind tunnel models, Model tests, Boundary layer, Turbulent flow, Velocity distribution, Wind tunnel tests, Buildings, Mathematical models, Gaussian quadrature, Reprints.

PB91-196584/REB PC **A03**/MF **A01**
Moderately Stable Flow Over a Three-Dimensional Hill: A Comparison of Linear Theory with Laboratory Measurements. Journal article.
Environmental Protection Agency, Research Triangle Park, NC. Atmospheric Research and Exposure Assessment Lab.
R. S. Thompson, M. S. Shipman, and J. W. Rottman.
c1991, 17p EPA/600/J-91/078
Pub. in Tellus 43A, p49-63 1991. Prepared in cooperation with NSI Technology Services Corp., Research Triangle Park, NC., and North Carolina State Univ. at Raleigh. Dept. of Marine, Earth and Atmospheric Sciences.

Several series of experiments were performed in a stratified towing tank to study the near-field flow of a linearly stratified fluid over an isolated three-dimensional hill. The streamlines were obtained in the laboratory using a stereographic method to determine the paths of plumes of dye released upstream of the hill. Velocities over the hill center were obtained by analysis of video recordings of the dye plumes and with a propeller anemometer. The results of these experiments are compared with numerical solutions, computed using Fast Fourier Transforms, of the linearized equations of motion for an inviscid fluid. Good agreement is found for Froude numbers (based on the hill height) greater than about 2.0. For Froude numbers greater than about 4.0, flow patterns were observed to differ only slightly from those for neutral flow.

Keywords: *Plumes, *Inviscid flow, *Air pollution, *Hills, Equations of motion, Froude number, Fourier transformation, Mathematical models, Three dimensional flow, Dispersion, Laminar flow, Flow visualization, Natural convection, Reprints.

PB91-196592/REB PC **A03**/MF **A01**
National Institutes of Health, Bethesda, MD.
Germinomas and Teratoid Siphon Anomalies in Softshell Clams, 'Mya arenaria', Environmentally Exposed to Herbicides. Journal article.
Environmental Research Lab., Narragansett, RI.
G. R. Gardner, P. P. Yevich, J. Hurst, P. Thayer, and S. Benyi. c1991, 11p EPA/600/J-91/079, ERLN-949
Contract NIH-N01-CP-61063
Pub. in Environmental Health Perspectives, v90 p43-51 1991. Prepared in cooperation with Maine State Dept. of Marine Resources, West Boothbay Harbor, and National Museum of Natural History, Washington, DC. Sponsored by National Institutes of Health, Bethesda, MD.

Seminomas and dysgerminomas are epizootic in softshell clams, Mya arenaria, from three Maine estuaries contaminated with herbicides. The first epizootic was discovered in 22% of clams collected as Searsport near Long Cove Brook and three culverts that conveyed heating oil and jet fuel spilled from a tank farm in 1971. Data from subsequent epizootiological studies and a series of long-term experimental exposures of softshell clams to no. 2 fuel oil, JP-4, andJP-5 jet fuel at the U.S. EPA, Environmental Research Laboratory in Narragansett, Rhode Island, and in the field did not support an etiology by these petroleum products. In the two recent epizootics reported here, the germinomas have been observed in 3% of the softshell clams collected from Roque Bluffs near Machiasport and from 35% of softshell clams collected from Dennysville. Mya collected at Dennysville had pericardial mesotheliomas and teratoid siphon anomalies in addition to gonadal neoplasms. Estuaries at Dennysville had been contaminated by herbicides in a 1979 accidental spray overdrift during aerial application of Tordon 101 to adjacent forests. Further investigation determined widespread use of the herbicides Tordon 101,2,4-D, 2,4,5-T, and other agrochemicals in an extensive forestry and blueberry industry in both the Roque Bluffs and the Dennysville areas. Herbicide applications at Searsport were confirmed for railroad property bordering Long Cove estuary and for Long Cove Brook adjacent to the estuary where a highway department reportedly cleans its spray equipment. Herbicide contamination is the only common denominator identified at all three sites where Mya have been found with gonadal neoplasms.

Keywords: *Clams, *Herbicides, *Water pollution effects(Animals), Oil spills, Coastal regions, Maine, Pathology, Chemical analysis, Mesothelioma, Reprints, *Germinoma, *Clam siphons, D 2-4 herbicide, Mya arenaria, T 2-4-5 herbicide.

PB91-196600/REB PC **A03**/MF **A01**
National Institutes of Health, Bethesda, MD.
Carcinogenicity of Black Rock Harbor Sediment to the Eastern Oyster and Trophic Transfer of Black Rock Harbor Carcinogens from the Blue Mussel to the Winter Flounder. Journal article.
Environmental Research Lab., Narragansett, RI.
G. R. Gardner, P. P. Yevich, J. C. Harshbarger, and A. R. Malcolm. c1991, 16p EPA/600/J-91/080, ERLN-978
Contract NIH-N01-CP-61063
Pub. in Environmental Health Perspectives, v90 p53-66 1991. Prepared in cooperation with National Museum of Natural History, Washington, DC. Sponsored by National Institutes of Health, Bethesda, MD.

The eastern oyster (Crassostrea virginica) developed neoplastic disorders when experimentally exposed both in the laboratory and field to chemically contaminated sediment from Black Rock Harbor (BRH), Bridgeport, Connecticut. Neoplasia was observed in oysters after 30 and 60 days of continuous exposure in a laboratory flow-through system to a 20 mg/L suspension of BRH sediment plus postexposure periods of 0, 30, or 60 days. Composite tumor incidence was 13.6% (49 neoplasms in 40, n = 295) for both exposure. Tumor occurrence was highest in the renal excretory epithelium, followed in order by gill, gonad, gastrointestinal, heart, and embryonic neural tissue. Regression of experimental neoplasia was not observed when the stimulus was discontinued. In field experiments, gill neoplasms developed in oysters deployed in cages for 30 days at BRH and 36 days at a BRH dredge material disposal area in Central Long Island Sound, and kidney and gastrointestinal neoplasms developed in caged oysters deployed 40 days in Quincy Bay, Boston Harbor. Oysters exposed to BRH sediment in the laboratory and in the field accumulated high concentrations of polychlorinated biphenyls (PCBs), polyaromatic hydrocarbons (PAHs), and chlorinated pesticides. Chemical analyses demonstrated high concentrations of PCBs, PAHs, chlorinated pesticides, and heavy metals in BRH sediment. Known genotoxic carcinogens, cocarcinogens, and tumor promoters were present as contaminants. The uptake of parent PAH and PCBs from BRH sediment observed in oysters also occurs in blue mussels (Mytilus edulis). Winter flounder fed BRH-contaminated blue mussels contained xenobiotic chemicals analyzed in mussels.

Keywords: *Water pollution effects(Animals), *Oysters, *Carcinogens, *Flounder, *Mussels, Black Rock Harbor, Connecticut, Neoplasms, Polychlorobiphenyl compounds, Polycyclic aromatic hydrocarbons, Organochlorine insecticides, Food chains, Mytilus edulis, Sediments, Mutagens, Pathology, Reprints.

PB91-196618/REB PC **A03**/MF **A01**
Innovative Practices for Treating Waste Streams Containing Heavy Metals: A Waste Minimization Approach. Journal article.
Environmental Protection Agency, Cincinnati, OH. Risk Reduction Engineering Lab.
D. W. Grosse. c1991, 17p EPA/600/J-91/081
Pub. in Physical/Chemical Processes, v2 p221-235.

Innovative practices for treating waste streams containing heavy metals often involve technologies or systems that either reduce the amount of waste generated or recover reusable resources. With the land disposal of metal treatment residuals becoming less of an accepted waste management alternative, waste minimization practices have received increasing popularity in the primary metals industry. Preferred management practices for reducing or eliminating generated wastes are source reduction (i.e., material sustitution, recycle/reuse) and reduction of toxicity in order to meet technology-based treatment standards. Major topics to be discussed in the chapter will focus on waste stream characterizations, process descriptions, and summarized results on demonstrations and audits. Only state-of-the-art and innovative approaches will be considered for review. Particular emphasis will be placed on waste minimization approaches (e.g. source reduction techniques, concentration and reuse of waste contaminants, material substitution), recovery techniques (e.g. electrolytic recovery, membrane technologies,

ion exchange) and centralized waste treatment facilities.

Keywords: *Materials recovery, *Heavy metals, *Waste treatment, Hazardous materials, Waste management, Waste recycling, State of the art, Standards, Water pollution control, Sludge treatment, Pollution sources, Performance standards, Design criteria, Waste utilization, Reprints, *Waste minimization, Source reduction.

PB91-196626/REB PC **A03**/MF **A01**
Environmental Protection Agency, Cincinnati, OH. Risk Reduction Engineering Lab.
Development and Demonstration of a Pilot-Scale Debris Washing System. Journal article.
IT Environmental Programs, Inc., Cincinnati, OH.
M. L. Taylor, and N. P. Barkley. c1991, 11p EPA/600/J-91/082
Contract EPA-68-03-3413
Pub. in Jnl. of the Air and Waste Management Association, v41 n4 p488-496. Sponsored by Environmental Protection Agency, Cincinnati, OH. Risk Reduction Engineering Lab.

Metallic, masonry, and other solid debris that may be contaminated with hazardous chemicals litter numerous hazardous waste sites in the United States. Polychlorinated biphenyls (PCB's), pesticides, lead or other metals are some of the contaminants of concern. In some cases cleanup standards have been established (e.g., 10 micrograms PCB's/100 sq cm for surfaces to which humans may be frequently exposed). Decontaminated debris could be either returned to the site as 'clean' fill, or, in the case of the metallic debris, sold to a metal smelter. The project involves the development and demonstration of a technology specifically for performing on-site decontamination of debris. Both bench-scale and pilot-scale versions of a debris washing system (DWS) have been designed, constructed and demonstrated. The DWS entails the application of an aqueous solution during a high-pressure spray cycle, followed by turbulent wash and rinse cycles. The aqueous cleaning solution is recovered and reconditioned for reuse concurrently with the debris-cleaning process, which minimizes the quantity of process water required to clean the debris. (Copyright (c) 1991, Air and Waste Management Association.)

Keywords: *On-site investigations, *Decontamination, *Hazardous materials, *Debris, *Waste treatment, Polychlorinated biphenyls, Demonstration plants, Pilot plants, Pesticides, Metals, Litter, Waste recycling, Fillers, Spraying, Materials recovery, Cleaning, Waste utilization, Research and development, Washing, Reprints, *Cleanup operations.

PB91-196634/REB PC **A02**/MF **A01**
Presence of Enteric Viruses in Freshwater and Their Removal by the Conventional Drinking Water Treatment Process. Journal article.
Environmental Protection Agency, Cincinnati, OH. Risk Reduction Engineering Lab.
C. J. Hurst. c1991, 9p EPA/600/J-91/083
Pub. in Bulletin of the World Health Organization, v69 n1 p113-119 1991.

A review of recently published literature was performed to ascertain the levels of indigenous human enteric viruses found in untreated surface and subsurface freshwaters, and in drinking water which has been subjected to the complete process of conventional treatment. For the purpose of the review, the criterion used for defining conventional drinking water treatment was that of an operation which included coagulation followed by sedimentation, filtration, and disinfection. Also assessed was the stepwise efficiency of conventional drinking water treatment, as practiced at full-scale facilities, for removing indigenous viruses from environmental freshwaters. In addition, a list was compiled of recently published statistical correlations relating to the finding of indigenous viruses in water.

Keywords: *Microbiology, *Potable water, *Enteroviruses, *Water treatment, *Reviews, Surface waters, Disinfection, Public health, Statistical analysis, Fresh water, Sites, Reprints.

PB91-196642/REB PC **A03**/MF **A01**
Biodegradation of Hydrocarbon Vapors in the Unsaturated Zone. Journal article.
Robert S. Kerr Environmental Research Lab., Ada, OK.
D. W. Ostendorf, and D. H. Kampbell. c1991, 12p EPA/600/J-91/084
Pub. in Water Resources Research, v27 n4 p453-462 Apr 91. Prepared in cooperation with Massachusetts Univ., Amherst. Dept. of Civil Engineering.

The time-averaged concentration of hydrocarbon and oxygen vapors were measured in the unsaturated zone above the residually contaminated capillary fringe at the U.S. Coast Guard Air Station in Traverse City, Michigan. Total hydrocarbon and oxygen vapor concentrations were observed over a 13-month period. Supplementary grain size, porosity, and moisture content data support the assumption of a uniform, homogenous site geology which, in view of the planar hydrocarbon source term, abundant oxygen, and sparse data base, is suitable for simple analytical modeling. In the assumed absence of advection, leaching, and transcience, the analysis is a straight-forward balance of gaseous diffusion and biological degradation coupled stoichiometrically in the two reacting constituents. Volatilization is shown to be a significant transport mechanism for hydrocarbons at Traverse City, and biodegradation prevents the escape of appreciable contamination to the atmosphere for most locations at the site. Little oxygen is expected to reach the water table because of the aerobic biodegradation process in the unsaturated zone. (Copyright (c) 1991 the American Geophysical Union.)

Keywords: *Biodeterioration, *Hydrocarbons, *Soil contamination, *Air pollution abatement, *Water pollution abatement, *Oxygen, Land pollution, Zone of saturation, Unsaturated flow, Volatile organic compounds, Michigan, Time series analysis, Environmental transport, Soil gases, Mathematical models, Oil spills, Concentration(Composition), Sampling, Chemical reactions, Reprints, Traverse City(Michigan).

PB91-196659/REB PC **A03**/MF **A01**
Studies of Benzidine-Based Dyes in Sediment-Water Systems. Journal article.
Environmental Research Lab., Athens, GA.
E. J. Weber. c1991, 12p
Pub. in Environmental Toxicology and Chemistry, v10 n5 p609-618 May 91.

The sorption and degradation of several benzidine-based dyes were studied in sediment-water systems. Studies in resaturated sediment demonstrated that sorption was strongly dependent on pH and the nature and concentration of the inorganic salt in solution. Degradation of the dyes in anaerobic pond sediment followed pseudo-first-order kinetics with half-lives ranging from 2 to 16 d. Product studies indicated that the amount of recovered benzidine accounted for only 2 to 5% of lost Direct Red 28. Studies in pH-amended pond sediment demonstrated that degradation is inhibited when the dyes are strongly sorbed to the sediment.

Keywords: *Dyes, *Benzidine, *Sediments, *Water, *Biodegradation, *Sorption, Reaction kinetics, Water pollution, Ponds, Anaerobic conditions, Reprints.

PB91-196667/REB PC **A03**/MF **A01**
Predicting Chemical Accumulation in Shoots of Aquatic Plants. Journal article.
Environmental Research Lab., Athens, GA.
S. D. Wolf, R. R. Lassiter, and S. E. Wooten. c1991, 18p EPA/600/J-91/086
Pub. in Environmental Toxicology and Chemistry, v10 n5 p665-680 May 91. Prepared in cooperation with Technology Applications, Inc., Athens, GA.

Chemical exchange dynamics expected for diffusive transfer of a chemical between aqueous solution and plant shoots, and expected bioconcentration based on partitioning properties of the chemical, are explored by using a three-compartment model. The model utilizes three dynamic compartments--leaves, stems, and aqueous exposure medium. Chemical mass flux is dependent on the morphometry of the plant species, on exposure concentration, and on partitioning character of the chemical. The steady-state bioconcentration factor, K(sub SH), is dependent on composition of the plant species and partitioning character of the chemical. The model was parameterized for three species of aquatic plants (Myriophyllum spicatum, Bacopa caroliniana, and Hydrilla verticillata) and two chlorinated benzenes (1,2,3,4-tetrachlorobenzene (TCB) and 1,2-dichlorobenzene (DCB)). Predictions of uptake and bioconcentration are compared to results of static laboratory studies conducted with whole shoots of the three species over exposure periods ranging from 1 h to 21 d. Shoots approach steady-state tissue burdens between 1 and 3 d after initial exposure. K(sub SH) values for TCB (360-750), the more hydrophobic chemical, are at least one order of magnitude greater than those measured for DCB (11-28).

Keywords: *Water pollution effects(Plants), *Chlorohydrocarbons, *Aquatic plants, *Toxicity, Species diversity, Chlorobenzenes, Biological models, Diffusion, Reprints.

PB91-196675/REB PC **A05**/MF **A01**
Ecology and Management of the Zebra Mussel and Other Introduced Aquatic Nuisance Species.
Environmental Research Lab.-Duluth, MN.
J. D. Yount. Feb 91, 100p EPA/600/3-91/003
Presented at the EPA Workshop on Zebra Mussels and Other Introduced Aquatic Nuisance Species, Saginaw, MI., September 26-28, 1990. Prepared in cooperation with AScI Corp., Duluth, MN.

The report presents the content of presentations and discussions held over 2 1/2 days in a plenary session and in working groups at the Environmental Protection Agency's Introduced Species Workshop held in Saginaw, Michigan on Sept. 26-28, 1990. The purpose of the workshop was to review and evaluate existing information on the ecology and management of introduced aquatic nuisance species, with a particular emphasis on the zebra mussel (Dreissena polymorpha), and make recommendations on how to extend our knowledge and understanding in critical areas. Speakers were asked to provide extended abstracts of their presentations, which are included here in Appendix A. Two of the speakers, from the Soviet Union, submitted their entire manuscripts. The discussions from each working group are presented in the relevant sections. Recommendations are presented in the introductory section.

Keywords: *Ecology, *Pest control, *Meetings, Abundance, Animal behavior, Species diversity, Biological pest control, Chlorine, Great Lakes, *Zebra mussels, Dreissena polymorpha.

PB91-196683/REB PC **A11**/MF **A02**
Environmental Protection Agency, Research Triangle Park, NC. Atmospheric Research and Exposure Assessment Lab.
Acid Precipitation in North America: 1987 Annual and Seasonal Data Summaries from Acid Deposition System Data Base.
Battelle Pacific Northwest Labs., Richland, WA.
T. A. Erb, J. C. Simpson, and A. R. Olsen. Oct 89, 248p* EPA/600/4-90/018
Contract DE-AC06-76RLO-1830
See also PB88-166897.Portions of this document are not fully legible. Sponsored by Environmental Protection Agency, Research Triangle Park, NC. Atmospheric Research and Exposure Assessment Lab., and Department of Energy, Washington, DC.

The report summarizes the 1987 wet deposition precipitation chemistry data collected in North America and available in the Acid Deposition System (ADS) data base. Interpretative statistical analyses are not a focus of the report; however, users of the report will learn about major wet deposition monitoring networks in North America, the extent of their geographic coverage, and general characteristics of wet deposition for 1987. An overview of each network is given. Annual and seasonal (winter, summer) mosaic maps present the North American spatial pattern for hydrogen, sulfate, nitrate, ammonium and calcium ion concentration and deposition for 1987. An appendix lists 1987 annual statistical summaries for pH, hydrogen ion (derived from pH), and the ion species sulfate, nitrate, ammonium, calcium, chloride, sodium, magnesium and potassium. Computer-readable and printed copies are available for annual and seasonal (winter, spring, summer, fall) statistical summaries for all sites in the monitoring network.

Keywords: *Acid rain, *Air pollution monitoring, *Atmospheric chemistry, North America, Wet methods, Deposition, Statistical analysis, Site surveys, pH, Concentration(Composition), Seasonal variations, Annual variations, Tables(Data), *Acid Deposition System data base, Wet deposition.

PB91-196691/REB PC **A07**/MF **A01**
Environmental Protection Agency, Cincinnati, OH. Risk Reduction Engineering Lab.
Rate of Flow of Leachate through Clay Soil Liners.
Texas Univ. at Austin.
D. E. Daniel, C. D. Shackelford, W. P. Liao, and H. M. Liljestrand. Jun 91, 141p EPA/600/2-91/021
Sponsored by Environmental Protection Agency, Cincinnati, OH. Risk Reduction Engineering Lab.

The objective of the research was to measure the time of travel (TOT) of inorganic solutes through laboratory columns of compacted clay, to determine the physical and geochemical parameters that controlled solute transport through the soil columns, and to compare measured and predicted TOT's. Two clay soils were used: kaolinite (a low-plasticity, commercially-produced clay) and Lufkin clay (a highly plastic, naturally-occurring clay soil). Anionic tracers were chloride and bromide; potassium and zinc were the cationic tracers. Diffusion cells were designed, constructed, and used to measure the effective diffusion coefficient of the tracers in the two soils. Diffusion coefficients for anions were typically 0.000002 to 0.000007 sq cm/s; somewhat lower values were determined for cations. Column tests showed that the effective porosity ratio (defined as effective divided by total porosity) increased with increasing hydraulic gradient in kaolinite from a low of about 0.25 at a gradient of 1 to a high of 1 at a gradient of 20. With Lufkin clay, the effective porosity ratio was between 0.02 and 0.16. Breakthrough times were controlled much more by the low effective porosities than by molecular diffusion. The computer program SOILINER predicted times of travel that were larger than actual TOT's by a factor of up to 52. The failure to account for effective porosity ratios less than 1 was the cause for the poor predictions from SOILINER.

Keywords: *Kaolinite, *Diffusion coefficient, *Clay soils, *Porosity, *Inorganic compounds, Soil mechanics, Laboratory tests, Simulation, Solutes, Hydraulic gradients, Environmental transport, *Soil liners, *Leachates, Time of travel, Anionic tracers, Cationic tracers.

PB91-197053/REB PC **A06**/MF **A01**
Pesticides in Natural Systems: 'How Can Their Effects Be Monitored'. Proceedings of the Conference. Held in Corvallis, Oregon on December 11-12, 1990.
Environmental Protection Agency, Seattle, WA. Region X.
Apr 91, 115p EPA/910/9-91/011

A collection of papers representing some of the reports given at a Conference on the same subject held December 11 and 12 at Corvallis Oregon. The 10 papers are grouped under the headings, Aquatic Systems, Terrestrial Systems, Theoretic Studies, and Frameworks for Longterm Monitoring. The first three sessions include papers dealing with Puget Sound, upland game birds, reference watercourses, lichens as biomonitors, effects of a fungicide on soil communities, and mathematical methods of ordering data into meaningful groups. The last session contained a paper on EPA's Ecological Monitoring and Assessment Program, EMAP, and the US Geological Survey's River Basin Surveys (The Yakima River represents a pilot for these studies). Two of the papers served as focus papers on the subjects of Biomonitoring and Risk Assessment, respectively. Each of the two papers is followed by a transcript of the discussion which took place in a workshop on the same theme. The volume includes abstracts of papers not reproduced there in full.

Keywords: *Pesticides, *Environmental monitoring, *Meetings, Aquatic ecosystems, Terrestrial ecosystems, Birds, Wildlife, Biological markers, Risk assessment, Tissue distribution, Plants, Non-target organisms.

PB91-197061/REB PC **A23**/MF **A03**
Air Emissions from Municipal Solid Waste Landfills. Background Information for Proposed Standards and Guidelines.
Environmental Protection Agency, Research Triangle Park, NC. Office of Air Quality Planning and Standards.
Mar 91, 544p EPA/450/3-90/011A

The Background Information Document was developed to support EPA's proposal for New Source Performance Standards and Emission Guidelines under Section III of the Clean Air Act for air emissions from municipal solid waste landfills (MSW landfills). The standards and guidelines will apply to MSW landfills sized greater than 100,000 Mg of refuse in place and emit 150 Mg/yr or more annually of non-methane organic compounds (NMOC's). The document provides information for Best Demonstrated Technology recommended for the proposal as well as emission guidelines for implementation of the regulation.

Keywords: *Municipal wastes, *Air pollution standards, *Earth fills, *Waste management, *Air pollution abatement, Guidelines, New Source Performance Standards, Best technology, Implementation, Nonmethane hydrocarbons, Public health, Environmental effects, Waste disposal, Pollution regulation, Concentration(Composition), Air pollution control, Toxic substances, Volatile organic compounds.

PB91-197202/REB PC **E99**/MF **E99**
Environmental Protection Agency, Research Triangle Park, NC. Air and Energy Engineering Research Lab.
Proceedings: 1990 SO2 Control Symposium.
Electric Power Research Inst., Palo Alto, CA.
c1990, 2201p-in 4v
Set includes PB91-197210 through PB91-197244.
Sponsored by Environmental Protection Agency, Research Triangle Park, NC. Air and Energy Engineering Research Lab.

No abstract available.

PB91-197210/REB PC **A99**/MF **A04**
Environmental Protection Agency, Research Triangle Park, NC. Air and Energy Engineering Research Lab.
Proceedings: 1990 SO2 Control Symposium. Volume 1. Sessions 1, 2, 3A, and 3B.
Electric Power Research Inst., Palo Alto, CA.
c1990, 640p EPRI-GS-6963-VOL-1, EPRI-RP-982-VOL-1, EPA/600/9-91/015A
See also Volume 2, PB91-197228. Sponsored by Environmental Protection Agency, Research Triangle Park, NC. Air and Energy Engineering Research Lab.
Also available in set of 4 reports PC E99/MF E99, PB91-197202.

The proceedings are of The 1990 SO2 Control Symposium held in New Orleans, Louisiana, from May 8 through May 11. The objective of the Symposium was to provide a forum for the exchange of technical and regulatory information on sulfur oxide control technology, including wet and dry scrubbing, emerging processes, and international developments in clean coal/acid rain technologies. Specific topics covered during the Symposium included: SO2 control economics, furnace sorbent injection, byproduct utilization, spray dryer technology, wet FGD reliability and full scale operation, combined SOx/NOx technologies, vendor designs, post-combustion dry injection, and laboratory/pilot research. The audience included approximately 800 representatives from electric utilities, government agencies, industrial users of FGD, academia, consultants, process suppliers, equipment manufacturers, and R and D firms. The volume covers: International Overview, Economics, Furnace Sorbent Injection - Demos, and Byproduct Utilization.

Keywords: *Air pollution control, *Air pollution control equipment, *Sulfur dioxide, *Meetings, *Research and development, Flue gases, Nitrogen oxides, Technology utilization, Scrubbing, Economic analysis, Waste utilization, Technology transfer, Sorbents, Dry methods, Wet methods, Design criteria, Pollution regulations, Performance standards, Flue gas desulfurization, Foreign technology.

PB91-197228/REB PC **A24**/MF **A03**
Environmental Protection Agency, Research Triangle Park, NC. Air and Energy Engineering Research Lab.
Proceedings: 1990 SO2 Control Symposium. Volume 2. Sessions 4A, 4B, 4C, and 5.
Electric Power Research Inst., Palo Alto, CA.
c1990, 552p EPRI-GS-6963-VOL-2, EPRI-RP-982-VOL-2, EPA/600/9-91/015B
See also Volume 1, PB91-197210 and Volume 3, PB91-197236. Sponsored by Environmental Protection Agency, Research Triangle Park, NC. Air and Energy Engineering Research Lab.
Also available in set of 4 reports PC E99/MF E99, PB91-197202.

The proceedings are of The 1990 SO2 Control Symposium held in New Orleans, Louisiana, from May 8 through May 11. The objective of the Symposium was to provide a forum for the exchange of technical and regulatory information on sulfur oxide control technology, including wet and dry scrubbing, emerging processes, and international developments in clean coal/acid rain technologies. Specific topics covered during the Symposium included: SO2 control economics, furnace sorbent injection, byproduct utilization, spray dryer technology, wet FGD reliability and full scale operation, combined SOx/NOx technologies, vendor designs, post-combustion dry injection, and laboratory/pilot research. The audience included approximately 800 representatives from electric utilities, government agencies, industrial users of FGD, academia, consultants, process suppliers, equipment manufacturers, and R and D firms. The volume covers: FSI Recycle, Wet FGD Reliability, Spray Dryers, and Wet Full Scale Operation.

Keywords: *Air pollution control, *Air pollution control equipment, *Sulfur dioxide, *Meetings, *Research and development, Technology transfer, Waste utilization, Nitrogen oxides, Dryers, Wet methods, Technology utilization, Design criteria, Performance standards, Injection, Sorbents, Flue gas desulfurization, Foreign technology.

PB91-197236/REB PC **A19**/MF **A03**
Environmental Protection Agency, Research Triangle Park, NC. Air and Energy Engineering Research Lab.
Proceedings: 1990 SO2 Control Symposium. Volume 3. Sessions 6A, 6B, and 6C.
Electric Power Research Inst., Palo Alto, CA.
c1990, 430p EPRI-GS-6963-VOL-3, EPRI-RP-982-VOL-3, EPA/600/9-91/015C
See also Volume 2, PB91-197228 and Volume 4, PB91-197244. Sponsored by Environmental Protection Agency, Research Triangle Park, NC. Air and Energy Engineering Research Lab.
Also available in set of 4 reports PC E99/MF E99, PB91-197202.

The proceedings are of The 1990 SO2 Control Symposium held in New Orleans, Louisiana, from May 8 through May 11. The objective of the Symposium was to provide a forum for the exchange of technical and regulatory information on sulfur oxide control technology, including wet and dry scrubbing, emerging processes, and international developments in clean coal/acid rain technologies. Specific topics covered during the Symposium included: SO2 control economics, furnace sorbent injection, byproduct utilization, spray dryer technology, wet FGD reliability and full scale operation, combined SOx/NOx technologies, vendor designs, post-combustion dry injection, and laboratory/pilot research. The audience included approximately 800 representatives from electric utilities, government agencies, industrial users of FGD, academia, consultants, process suppliers, equipment manufacturers, and R and D firms. The volume covers: Emerging Technologies, Combined SOx/NOx Technologies, and Wet FGD Vendor Designs.

Keywords: *Air pollution control, *Air pollution control equipment, *Sulfur dioxide, *Meetings, *Research and development, Technology transfer, NOXSO process, Technology utilization, Wet methods, Design criteria, Performance standards, Nitrogen oxides, Flue gas desulfurization, Foreign technology.

PB91-197244/REB PC **A25**/MF **A04**
Environmental Protection Agency, Research Triangle Park, NC. Air and Energy Engineering Research Lab.
Proceedings: 1990 SO2 Control Symposium. Volume 4. Sessions 7A, 7B, and Posters.
Electric Power Research Inst., Palo Alto, CA.
c1990, 579p EPRI-GS-6963-VOL-4, EPRI-RP-982-VOL-4, EPA/600/9-91/015D
See also Volume 3, PB91-197236. Sponsored by Environmental Protection Agency, Research Triangle Park, NC. Air and Energy Engineering Research Lab.
Also available in set of 4 reports PC E99/MF E99, PB91-197202.

The proceedings are of The 1990 SO2 Control Symposium held in New Orleans, Louisiana, from May 8 through May 11. The objective of the Symposium was to provide a forum for the exchange of technical and regulatory information on sulfur oxide control technology, including wet and dry scrubbing, emerging processes, and international developments in clean coal/acid

rain technologies. Specific topics covered during the Symposium included: SO2 control economics, furnace sorbent injection, byproduct utilization, spray dryer technology, wet FGD reliability and full scale operation, combined SOx/NOx technologies, vendor designs, post-combustion dry injection, and laboratory/pilot research. The audience included approximately 800 representatives from electric utilities, government agencies, industrial users of FGD, academia, consultants, process suppliers, equipment manufacturers, and R and D firms. The volume covers: Post Combustion Dry Technologies, Wet FGD Research, and Poster Session.

Keywords: *Air pollution control, *Air pollution control equipment, *Meetings, *Sulfur dioxide, *Research and development, Technology utilization, Technology transfer, Dry methods, Wet methods, Design criteria, Performance standards, Post burning process, Flue gas desulfurization, Foreign technology.

PB91-197418/REB PC **A03**/MF **A01**
Health Effects Research Lab., Research Triangle Park, NC.
2-Methylhexanoic Acid Developmental Toxicity Testing.
ManTech Environmental Technology, Inc., Research Triangle Park, NC.
M. G. Narotsky, and R. J. Kavlock. Jun 91, 22p EPA/600/1-91/002
Contract EPA-68-02-4450
Sponsored by Health Effects Research Lab., Research Triangle Park, NC.

As part of an investigation of the developmental effects and structure-activity relationships of aliphatic acids, 2-methylhexanoic acid was administered by gavage to Sprague-Dawley rats on gestation days 6-15 at doses of 0, 300, and 400 mg/kg/day. The dams were allowed to deliver and their litters were examined through postnatal day 6. Pups that were found dead were examined for soft-tissue alterations. On day 6, two survivors per litter were preserved for skeletal examination. Maternal toxicity was demonstrated at both 300 and 400 mg/kg by weight loss and altered respiration (rales, dyspnea). In spite of the maternal toxicity present, there were no clear toxic effects on development; litter size, pre- and postnatal viability, and pup weights were unaffected by treatment. Skeletal examinations of selected pups yielded inconclusive data; a slight increase in the incidence of lumbar ribs was present a 400 mg/kg, but was not clearly attributable to treatment.

Keywords: *Toxicity, *Reproduction(Biology), *Teratogens, Dose-response relationships, Survival, Skeleton, Weight loss, Respiration, Tables(Data), Rats, *2-Methylhexanoic acid.

PB91-198051/REB PC **A05**/MF **A01**
Department of the Treasury, Washington, DC. Office of Synthetic Fuels Project.
Parachute Creek Shale Oil Project Monitoring Review Committee Meeting Report, August 9, 1990.
Unocal Corp., Parachute, CO. Energy Mining Div.
1990, 89p OSFP/PC-0025
See also PB90-177031. Sponsored by Department of the Treasury, Washington, DC. Office of Synthetic Fuels Project.

The Energy Security Act of 1980 established a program to provide financial assistance to private industry in the construction and operation of commercial-scale synthetic fuels plants. The Parachute Creek Shale Oil Program is one of the four projects awarded financial assistance. The support agreement included development of an Environmental Monitoring Plan, incorporating existing compliance monitoring and supplemental monitoring on water, air, solid waste, worker health and safety, and socioeconomic impacts during the period 1986-1993. Phase I of the project is to produce 10,000 barrels per day of syncrude from oil shale, using the Unishale 'B' process. The third annual meeting of the Monitoring Review Committee for the project included discussions of air, water and biological monitoring programs; spent shale pile inspecting; industrial hygiene monitoring; and medical assessments. Results of sampling 18 supplemental locations found no areas of significant environmental concern.

Keywords: *Environmental monitoring, *Environmental engineering, *Meetings, *Synthetic fuels refineries, *Energy source development, Financial assistance, Occupational safety and health, Compliance, Water pollution, Air pollution, Solid waste disposal, Socioeconomic factors, Shale oil, Spent shales, Auditing, *Parachute Creek Shale Oil Project, Energy Security Act of 1980.

PB91-199844/REB PC **A03**/MF **A01**
Environmental Protection Agency, Research Triangle Park, NC. Atmospheric Research and Exposure Assessment Lab.
Use of a Fourier Transform Spectrometer as a Remote Sensor at Superfund Sites.
Northrop Services, Inc., Research Triangle Park, NC.
G. M. Russwurm, R. H. Kagann, O. A. Simpson, and W. A. McClenny. 1991, 15p EPA/600/D-91/115
Contracts EPA-68-02-4444, EPA-68-DO-0106
Prepared in cooperation with MDA Scientific, Inc., Norcross, GA., and ManTech Environmental Technology, Inc., Research Triangle Park, NC. Sponsored by Environmental Protection Agency, Research Triangle Park, NC. Atmospheric Research and Exposure Assessment Lab.

A Fourier transform infrared remote sensor (FTIR-RS) was used to measure chemical emissions at the Shaver's Farm Superfund site in northwestern Georgia. The system was bistatic with a source/receiver at one end of a 250 m path and a retroreflector at the other end. The source/receiver was a Nicolet Model 730 FTIR system coupled to a telescope with the appropriate transfer optics. The average concentrations of target gases along the path are inferred by matching field spectra with reference spectra of precisely measured quantities of the target gases. Measurements indicated that benzonitrile and benzaldehyde concentrations at the site were lower than the FTIR-RS detection limits of 70 and 16 ppm-m, respectively. Background IR radiation was successfully eliminated by modulating the IR beam before it was transmitted along the path. Quality assurance measurements to establish the precision and accuracy of known gas burdens (ppm-m) were carried out using a 15-cm cell containing high concentrations of several gases.

Keywords: *Air pollution detection, *Remote sensing, *Superfund, *Waste disposal, *Fourier transform spectrometers, Site surveys, Infrared spectroscopy, Performance evaluation, Design criteria, Concentration(Composition), Quality assurance, Northwest Region(Georgia).

PB91-199851/REB PC **A03**/MF **A01**
Comparison of Screening Approaches.
Health Effects Research Lab., Research Triangle Park, NC. Neurotoxicology Div.
H. A. Tilson. 1991, 36p EPA/600/D-91/116

Procedures used to identify or screen for the presence of neurotoxicity are usually designed to test large numbers of animals and are not considered to be as sensitive to subtle effects as more specialized tests for neurobiological dysfunction. For purposes of screening, the use of a functional observational battery (FOB) is now generally accepted. A number of batteries containing different observations and measurements have been developed in several laboratories for rodents, dogs, and non-human primates. FOB used in screening typically assess several neurobiological domains including neuromuscular (i.e., weakness, incoordination, abnormal movements, gait, motor seizures, myoclonia, rigidity and tremor), sensory (i.e., auditory, visual and somatosensory) and autonomic (i.e., pupil response, salivation) functions. Most FOB used for screening do not assess cognitive function (i.e., learning and memory). FOB evaluations can yield important information concerning dose-response characterizatics and data on the onset, duration and persistence of an effect. FOB should be able to differentiate neurotoxicants from non-neurotoxicants and neurotoxicants having different mechanism(s) or site(s) of action.

Keywords: *Toxicity, *Nervous system, *Toxic substances, Animal behavior, Evoked potentials, Locomotion, Senses, Autonomic nervous system, Dose-response relationships, Environmental pollutants, Functional observational battery(FOB).

PB91-199869/REB PC **A02**/MF **A01**
Environmental Research Lab., Gulf Breeze, FL.
Use of Grass Shrimp ('Palaemonetes pugio') Larvae in Field Bioassays of the Effects of Agricultural Runoff into Estuaries.
Duke Univ., Beaufort, NC. Marine Lab.
W. W. Kirby-Smith, S. P. Thompson, and R. B. Forward. 1991, 10p EPA/600/D-91/117
Presented at 'Pesticides in Terrestrial and Aquatic Environments' Conference. Held in Blacksburg, VA., May 11-12, 1989. Sponsored by Environmental Research Lab., Gulf Breeze, FL.

Investigations of the effects of runoff from pesticide sprayed fields on survivorship of the larvae of the grass shrimp Palaemonetes pugio are described. Gravid shrimp were held in cages in the surface waters of two estuarine creeks; one creek received runoff from fields sprayed with the pesticides permethrin and thiodicarb while the other creek received runoff from an unsprayed forested area. Larvae released from field-exposed shrimp were reared in the laboratory in runoff water from the farm, from forest drainage, and in control water. Permethrin was undetectable (< 1 ng/sample) in all water except in one replicate of farm runoff. Survivorship was high (75-94%) in all treatments except for larvae reared in farm runoff water (27-35%). In a second experiment three weeks after pesticide application, survivorship was high (94-98%) in all treatments. The study concludes that runoff from agricultural fields sprayed with pesticides applied in accordance with labeled instructions can significantly reduce survivorship of larval grass shrimp, although cause of mortality is unknown.

Keywords: *Carbamate insecticides, *Water pollution effects(Animals), *Shrimp, *Larvae, Estuaries, Agriculture, Mortality, Reprints, *Palaemonetes pugio, Runoff water, Permethrin, Thiodicarb.

PB91-199877/REB PC **A03**/MF **A01**
Environmental Research Lab., Gulf Breeze, FL.
Environmental and Molecular Characterization of Systems Which Affect Genome Alteration in 'Pseudomonas aerugirosa'. Chapter 25. Book chapter.
Stritch School of Medicine, Maywood, IL.
R. V. Miller, T. A. Kokjohn, and G. S. Sayler. c1990, 19p EPA/600/D-91/118
Pub. in American Society for Microbiology, p252-268 1990. Prepared in cooperation with Tennessee Univ., Knoxville. Sponsored by Environmental Research Lab., Gulf Breeze, FL., and Potts Foundation, Chicago, IL.

Pseudomonas aeruginosa was used as a model organism to study mechanisms that lead to genome alteration in freshwater microbial populations. The studies demonstrated horizontal transmission by both transduction and conjugation in freshwater ecosystems and provided data that suggest that intracellular genome instability may be increased due to environmental stresses encountered by the cell in the habitat.

Keywords: *Pseudomonas, *Water pollution, *Water microbiology, *Bacterial genes, Genomic library, Genetic conjugation, Fresh water, Transfection, DNA repair, Ultraviolet rays, Mutation, recA protein, DNA damage, Reprints.

PB91-199885/REB PC **A02**/MF **A01**
Turbulent Flame Reactor Studies of Chlorinated Hydrocarbon Destruction Efficiency. Journal article.
Environmental Protection Agency, Cincinnati, OH. Risk Reduction Engineering Lab.
L. J. Staley, M. K. Richards, G. L. Huffman, R. A. Olexsey, and B. Dellinger. c1989, 8p EPA/600/J-89/535
Pub. in Waste Management, v9 p109-114 1989. Prepared in cooperation with Dayton Univ., OH. Research Inst.

Four mixtures of C1 and C2 chlorinated hydrocarbons, diluted in heptane, were burned in a Turbulent Flame Reactor (TFR) under high and low oxygen conditions. Emissions of undestroyed feed, stable organic byproducts, carbon monoxide, carbon dioxide and oxygen were measured and compared with the results of other thermal decomposition and combustion research on similar compounds. The results show that the volatile compounds emitted in the TFR's exhaust could be predicted based on an understanding of both the combustion chemistry of the compounds in question and of the physical environment existing within the combustion device during operation. Soot formation complicates the characterization of volatile organic emissions. (Copyright (c) Pergamon Press 1989.)

Keywords: *Chlorohydrocarbons, *Pyrolysis, *Combustion, *Air pollution control, Combustion products, Soot, Carbon monoxide, Carbon dioxide, Oxygen, Technology assessment, Hazardous materials, Reprints, *Turbulent flame reactor.

PB91-199893/REB PC **A03**/MF **A01**
Morphological and Behavioral Characters in Mosquitofish as Potential Bioindication of Exposure to Kraft Mill Effluent. Journal article.
Environmental Research Lab., Gulf Breeze, FL.
S. A. Bortone, W. P. Davis, and C. M. Bundrick. c1989, 11p EPA/600/J-89/537
Pub. in Bulletin of Environmental Contamination and Toxicology 43, p370-377 1989. Prepared in cooperation with University of West Florida, Pensacola.

Although the specific chemicals or factors actually responsible for induction of arrhenoidy among mosquitofish have not yet been identified, it is known that a wide variety of potential compounds occur as by-products from the processing of wood pump. The purpose of the study was to investigate the morphological and behavioral responses of mosquitofish environmentally exposed to kraft mill effluent (KME) and to evaluate the potential of these responses as bioassay endpoints. A method to quantify the morphological or behavioral responses of mosquitofish should provide an in situ bioindicator to assess impact of KME discharge on receiving water biota.

Keywords: *Water pollution effects(Animals), *Environmental monitoring, *Industrial wastes, Animal behavior, Morphology, Animal physiology, Paper industry, Toxicology, Reproduction(Biology), Reprints, *Mosquitofish.

PB91-199901/REB PC **A03**/MF **A01**
Health Effects Research Lab., Research Triangle Park, NC.
Coupled Mass and Energy Transport Phenomena in Aerosol/Vapor-Laden Gases. 2. Computer Modeling of Water Vapor/Droplet Interaction and Entrainment. Journal article.
NSI Technology Services Corp., Research Triangle Park, NC.
R. C. Graham, and A. D. Eisner. c1991, 12p EPA/600/J-90/504
Contract EPA-68-02-4450
Pub. in Jnl. of Aerosol Science, v21 n7 p849-858 Nov 90. Sponsored by Health Effects Research Lab., Research Triangle Park, NC.

A computer program has been developed to simulate vapor and heat transfer processes in multiphase flow in a tube. The primary purpose is to apply it to the respiratory conditions at which aerosol-laden air is inhaled in the human respiratory tract. The method of evaluating the analytical solution and the input needed to run the program are described. Aerosol-induced coupling between temperature and vapor concentration fields under different respiratory conditions is investigated. Simulation results for air-water vapor mixtures agree well with both simplified analytical solutions and with the results of Barrett and Clement for an infinite plane. The effect of tube radius on temperature, relative humidity and particle size is also demonstrated. (Copyright (c) 1990 Pergamon Press plc.)

Keywords: *Aerosols, *Computerized simulation, *Heat transfer, *Mass transfer, Water vapor, Respiration, Mathematical models, Temperature gradients, Tubes, Entrainment, Reprints.

PB91-199919/REB PC **A03**/MF **A01**
Development of Surrogate Lung Systems with Controlled Thermodynamic Environments to Study Hygroscopic Particles: Air Pollutants and Pharmacologic Drugs. Journal article.
Health Effects Research Lab., Research Triangle Park, NC. Environmental Toxicology Div.
T. B. Martonen. c1990, 22p EPA/600/J-90/505
Pub. in Particulate Science and Technology, v8 n1 -2 p1-20 Mar 91. Prepared in cooperation with North Carolina Univ. at Chapel Hill. Dept. of Medicine.

An objective of the text is to demonstrate advantages of interdisciplinary efforts, specifically, applications of engineering technology to health effects issues. The work describes the development of surrogate systems of the human lung for use in studies of hygroscopic growth kinetics and related deposition of inhaled particles. The models have become increasingly more physiologically realistic. Notable accomplishments are the successful simulations of in vivo environmental conditions, namely: (1) temperature and relative humidity atmospheres; (2) airstream profiles and thermodynamic processes; and, (3) lung morphology. Measurements of hygroscopic characteristics of a laboratory aerosol (NaCl) and bronchodilator drugs used in aerosol therapy were made using one of the models and are reported herein. The data clearly demonstrate the respective effects of respiratory tract geometry and particle chemical composition upon the behavior of inhaled substances. The surrogate lungs, offering unique research opportunities detailed within, are intended for experimental investigations that are complementary to inhalation exposures with human subjects. (Copyright (c) 1990 by Hemisphere Publishing Corporation.)

Keywords: *Respiratory system, *Simulation, *Aerosols, Hygroscopicity, Inhalation administration, Bronchodilator agents, Fluid dynamics, Sodium chloride, Water vapor, Temperature, Reprints, *Pulmonary deposition, *Hygroscopic growth kinetics.

PB91-199927/REB PC **A03**/MF **A01**
Aerodynamic Classification of Fibers with Aerosol Centrifuges. Journal article.
Health Effects Research Lab., Research Triangle Park, NC. Environmental Toxicology Div.
T. B. Martonen, and D. L. Johnson. c1990, 19p EPA/600/J-90/506
Pub. in Particulate Science and Technology, v8 n1-2 p37-53 Mar 90. Prepared in cooperation with Army Environmental Hygiene Agency, Aberdeen Proving Ground, MD.

The constituent particles of many ambient and workplace aerosols of health effects concerns are of fibrous and aggregate geometric shapes. The sites of deposition in the human respiratory system are primarily related to the mass median aerodynamic diameters of inhaled particle size distributions. Therefore, to assess potential exposure hazards it is necessary to have accurate kinetic classifications of airborne particulate matter. Centrifugal spectrometers give direct and continuously graded measures of the aerodynamic size distributions of sampled aerosols. A mathematical description of particle behavior in spiral channel centrifuges has been presented, and substantiated by comparisons with laboratory calibration data using polystyrene latex spheres. Here, the theory is extended to non-spherical forms by incorporating appropriate dynamic particle shape resistance factors in trajectory equations. It is demonstrated how optimum centrifuge performance is made possible by the a priori determination of favorable operating conditions permitting high-resolution characterization; specifically for fibrous aerosols.

Keywords: *Fibers, *Particle size distribution, Aerodynamic characteristics, Centrifuges, Aerosols, Respiratory system, Mathematical models, Laboratory tests, Occupational safety and health, Reprints, Pulmonary deposition.

PB91-199935/REB PC **A02**/MF **A01**
National Cancer Inst., Bethesda, MD.
Micronuclei in Epithelial Cells from Sputum of Uranium Workers. Journal article.
Health Effects Research Lab., Research Triangle Park, NC.
D. P. Loomis, C. M. Shy, J. W. Allen, and G. Saccomanno. c1990, 10p EPA/600/J-90/507
Pub. in Scandinavian Jnl. of Work, Environment and Health, v16 n5 p355-362 Oct 90. Prepared in cooperation with North Carolina Univ. at Chapel Hill. Dept. of Epidemiology, and Saint Mary's Hospital and Medical Center, Grand Junction, CO. Sponsored by National Cancer Inst., Bethesda, MD.

The exfoliated-cell micronucleus (MN) assay was used to assess cytogenetic effects of exposure to radon progeny and cigarette smoke among 99 Colorado plateau uranium workers. Subjects were selected at random from employees in underground and open-pit uranium mines, ore mills, laboratories, and offices participating in a sputum screening program from 1964-88. The prevalence of cells with MN was determined by scoring one sputum specimen for each worker. Data obtained by interview were used to classify exposure to radon progeny and smoking at the time sputum specimens were taken. Underground miners were considered exposed to radon progeny, and others were considered unexposed. Neither radon progeny exposure nor cigarette smoking had any appreciable effect on the prevalence of cells with MN; crude prevalence ratios were 1.0 (95% CI 0.7-1.4) and 0.9 (95% CE 0.6-1.3), respectively. The effects of radon and smoking were not confounded by each other or by age, and there was no evidence of synergy between exposures. The findings appear to cast doubt on the epidemiological utility of a sputum-based MN assay for studies of other populations exposed to occupational or environmental lung carcinogens.

Keywords: *Sputum, *Micronucleus tests, *Epithelium, *Uranium ores, *mining, *Occupational exposure, Radon, Daughter products, Smoking, Mutagens, Cells(Biology), Biological markers, Reprints.

PB91-199943/REB PC **A03**/MF **A01**
Non-Random Cell Killing in Cryopreservation: Implications for Performance of the Battery of Leukocyte Tests (BLT), 1. Toxic and Immunotoxic Effects. Journal article.
Health Effects Research Lab., Research Triangle Park, NC. Genetic Toxicology Div.
G. H. S. Strauss. c1991, 17p EPA/600/J-90/508
Pub. in Mutation Research, v252 n1 p1-15 Feb 91.

To eliminate between-tests error in longitudinal studies, for specimen sharing, convenient scheduling, etc., it is necessary to freeze freshly separated leukocytes as well as non-transformed, continuous T lymphocyte (CTL) lines. To test the efficacy of a programmable freezer (temperature falls at an optimal rate), freshly isolated lymphocytes and CTLs were each aliquoted into three sets of vials. The cells were thawed and/or washed and assayed for viability and T helper (T(sub h)0/T suppressor (T(sub s)) ratio. It is clear that omadequate freezing non-randomly damages cells of T cell subpopulations, T(sub h) being more sensitive than T(sub s). Further, it is proved that inadequate cryopreservation can confound results from a number of assessment methods owing to morphological and functional damages. The Battery of Leukocyte Tests (BLT) under development in the laboratory is designed to detect toxic, immunotoxic and genotoxic effects of in vivo mutagens exposure to human blood.

Keywords: *Cell survival, *Cryopreservation, Longitudinal studies, T lymphocytes, Cell line, Mutagens, Toxins, In vivo analysis, In vitro analysis, Reprints, *Battery of leukocyte tests.

PB91-199950/REB PC **A02**/MF **A01**
Development of the U.S. EPA Health Effects Research Laboratory Frozen Blood Cell Repository Program. Journal article.
Health Effects Research Lab., Research Triangle Park, NC. Genetic Toxicology Div.
G. H. S. Strauss, and S. J. Kelly. c1990, 8p EPA/600/J-90/509
Pub. in Mutation Research, v234 n5 p349-354 Oct 90. Prepared in cooperation with Environmental Health Research and Testing, Inc., Research Triangle Park, NC.

In previous efforts, it was suggested that proper blood cell freezing and storage is necessary in longitudinal studies with reduced between tests error, for specimen sharing between laboratories and for convenient scheduling of assays. A particular laboratory continues to develop and upgrade programs for the computerized laboratory notebook (CLN) wherein experimental protocols, data collection from laboratory equipment, database storage, data analysis and graphic presentations are computer automated in support of the battery of leukocyte tests (BLT). The article describes the design and use of a computer program, CRYOVIAL, for databased management of frozen cell repositories.

Keywords: *Blood banks, *Blood cells, *Freezing, Longitudinal studies, Leukocytes, Microcomputers, Reprints, Cryovial computer program.

PB91-199968/REB PC **A02**/MF **A01**
Health Effects Research Lab., Cincinnati, OH.
Identification of Organic N-Chloramines in vitro in Stomach Fluid from the Rat After Chlorination. Journal article.
Old Dominion Univ., Norfolk, VA. Dept. of Chemical Sciences.
F. E. Scully, K. E. Mazina, H. P. Ringhand, E. K. Chess, and J. A. Campbell. c1990, 8p EPA/600/J-90/510

Pub. in Chemical Research in Toxicology, v3 n4 p301-306 Jul 90. Presented at International Symposium on Health Effects of Drinking Water Disinfectants and Disinfection By-Products (2nd), Cincinnati, OH., August 27-29, 1985. Prepared in cooperation with Battelle Pacific Northwest Labs., Richland, WA., and North Carolina Univ. at Chapel Hill. Dept. of Environmental Sciences and Engineering.

When (36)Cl-N-cholorpiperidine (NCP) (300 mg/L as Cl2) was mixed with stomach fluid from laboratory rats (fasted either 24 or 48 hr) and incubated in the dark for 30 min at 37 C and at higher pH values, approximately one-third was reduced to chloride and between 7% and 63% of the radiolabel was found to chromatograph in a manner distinctly different from (36)Cl-chloride of (36)Cl-NCP. The new fraction is referred to as the (36) Cl-chloroorganic fraction. The remainder of the radiolabel was associated with (36)Cl-NCP. Varying concentrations of (36)Cl-NCP (3-200 mg/L as Cl2) have been incubated for 30 min at 37 C with stomach fluid at varying pH on the product distribution. At low pH values a threshold concentration of approximately 100 mg/L active chlorine was measured below which all chloramine was reduced to (36)Cl-chloride. As the pH and concentration of (36)Cl-NCP were increased, the percentage of chloramine reduced to chloride decreased. Using concentrations between 110 and 120 mg/L (Cl2) 7% and 4% of the label was associated with the (36)Cl-chloroorganic fraction at pH 7.1 and at pH 2.2, respectively.

Keywords: *Chlorination, *Stomach contents, *Chloramines, Rats, In vitro analysis, Temperature, pH, Isotopes, Amino acids, High performance liquid chromatography, Mass spectrometry, Ions, Reprints.

PB91-199976/REB PC **A02**/MF **A01**
Environmental Research Lab., Gulf Breeze, FL.
Transduction of Linked Chromosomal Genes between 'Pseudomonas aeruginosa' Strains during Incubation in situ in a Freshwater Habitat. Journal article.
Stritch School of Medicine, Maywood, IL.
D. J. Saye, O. A. Ogunseitan, G. S. Sayler, and R. V. Miller. c1990, 8p EPA/600/J-90/512
Pub. in Applied and Environmental Microbiology, v56 n1 p14-145 Jan 90. Prepared in cooperation with Tennessee Univ., Knoxville. Center for Environmental Biotechnology. Sponsored by Environmental Research Lab., Gulf Breeze, FL.

Both transduction of single chromosomal loci and cotransduction of closely linked loci were observed between lysogenic and nonlysogenic strains of Pseudomonas aeruginosa in a freshwater habitat. Transductants were recovered at frequencies of 10 to the minus 6 to 10 to the minus 5 transductants per CFU. Transductants of lysogenized strains were recovered 10- to 100-fold more frequently than were transductants of nonlysogenic parents. Lysogens are thus capable of introducing phages which mediate generalized transduction into the natural microbial community and serving as recipients of transduced DNA. It would appear that lysogeny has the potential of increasing the size and flexibility of the gene pool available to natural populations of bacteria. The ability to generate and select new genetic combinations through phage-mediated exchange can be significant in the face of a continually changing environment and may contribute to the apparent fitness of the lysogenic state in natural ecosystems. (Copyright (c) 1990, American Society for Microbiology.)

Keywords: *Bacterial genes, *Pseudomonas aeruginosa, *Bacterial chromosomes, *Water microbiology, *Genetic transduction, Fresh water, Microbial colony count, Bacteriophages, Plasmids, Genotype, Reprints, Lysogens.

PB91-199984/REB PC **A03**/MF **A01**
Department of Energy, Washington, DC.
Risks of Toxic Contaminants to Exploited Fish Populations: Influence of Life History, Data Uncertainty and Exploitation Intensity. Journal article.
Oak Ridge National Lab., TN. Environmental Sciences Div.
L. W. Barnthouse, G. W. Suter, and A. E. Rosen. c1990, 17p ORNL/PUB-3336, EPA/600/J-90/513
Contract DE-AC05-84OR21400
Pub. in Environmental Toxicology and Chemistry, v9 p297-311 1990. Prepared in cooperation with Martin Marietta Energy Systems, Inc., Oak Ridge, TN. Sponsored by Department of Energy, Washington, DC., and Environmental Research Lab., Gulf Breeze, FL.

Use of toxicity test data for population-level risk assessment was investigated as follows: (1) the influence of life history characteristics of menhaden and striped bass on vulnerability of contaminant-induced stress; (2) the importance of test data availability; and (3) the influence of exploitation intensity. Menhaden and striped bass differed in terms of their capacity to sustain the same level of contaminant-induced mortality. Changes in exploitation intensity affect the responses of both populations to the same level of additional contaminant-induced mortality. However, the quantitative effects of both factors were small compared to the uncertainty associated with estimating long-term effects from short-term tests or QSARs.

Keywords: *Toxic substances, *Water pollution effects(Animals), *Marine fishes, Stress, Risk assessment, Life cycles, Dose-response relationships, Bass, Reprints, Menhaden, Quantitative structure-activity relationship(QSAR), Brevoortia patronus, Morone saxatilis.

PB91-199992/REB PC **A02**/MF **A01**
Statistical Issues in Risk Assessment of Reproductive Outcomes with Chemical Mixtures. Journal article.
Health Effects Research Lab., Research Triangle Park, NC.
V. S. Hertzberg, G. K. Lemasters, K. Hansen, and H. M. Zenick. c1991, 7p EPA/600/J-91/087
Pub. in Environmental Health Perspectives, v90 p171-175 Jan 91. Prepared in cooperation with Cincinnati Univ., OH. Dept. of Environmental Health.

Establishing the relationship between a given chemical exposure and human reproductive health risk is complicated by exposures or other concomitant factors that may vary from pregnancy to pregnancy. Moreover, when exposures are to complex mixtures of chemicals, varying with time in number of components, doses of individual components, and constancy of exposure, the picture becomes even more complicated. A pilot study of risk of adverse reproductive outcomes among male wastewater treatment workers and their wives is described. Wives of 231 workers were interviewed to evaluate retrospectively the outcomes of spontaneous early fetal loss and infertility. In addition, 87 workers participated in a cross-sectional evaluation of sperm/semen parameters. Due to the ever-changing nature of exposure and lack of quantification of specific exposures, six dichotomous variables were used for each specific job description to give a surrogate measure of exposure. Hence, no quantitative exposure-response relationships could be modeled. These six variables were independently assigned by two environmental hygienists, and their interrater reliability was assessed. Results are presented and further innovations in statistical methodology are proposed for further applications.

Keywords: *Reproduction(Biology), *Risk assessment, *Toxic substances, *Mixtures, *Occupational exposure, *Wastewater treatment, Pregnancy outcome, Spermatozoa, Infertility, Spontaneous abortion, Reprints, Cross-sectional studies.

PB91-200220/REB PC **A03**/MF **A01**
Effects of 2,4-Dithiobiuret on Sensory and Motor Function. Journal article.
Health Effects Research Lab., Research Triangle Park, NC. Neurotoxicology Div.
K. M. Crofton, K. F. Dean, R. C. Hamrick, and W. K. Boyes. c1991, 15p EPA/600/J-91/088
Pub. in Fundamental and Applied Toxicology, v16 n3 p469-481 Apr 91. Prepared in cooperation with Northrop Services, Inc., Research Triangle Park, NC.

2,4-Dithiobiuret (DTB) exposure causes a delayed onset muscle weakness in rats that has been attributed to depressed neuromuscular transmission. The present study compares the effects of DTB on both sensory and motor function in rats. Adult male Long-Evans hooded rats were exposed to saline, 0.25, 0.5, or 1.0 mg/kg/day DTB, ip, for 5 consecutive days (Days 1-5). Body weights were monitored throughout the experiment. Motor activity was measured for 1 hr in figure-eight mazes on Days 0, 6, 13, and 27. Forelimb and hindlimb grip strength were assessed on Days 6, 13, and 27. Auditory thresholds were determined for 5- and 40-kHz tones using reflex modification of the startle response on Days 0, 7, 14, and 28. Visual function was examined on Day 6 in animals exposed at 0.5 mg/kg/day using flash- and pattern-elicited visual evoked potentials (FEPs and PEPs, respectively). Thermal sensitivity was measured using the hot plate procedure. All motor endpoints were decreased in a dosage- and time-dependent manner; the higher the dosage the longer the effects lasted. There were no effects on any measure of sensory function with the exception of peak N2 of the FEP. Both the amplitude and latency of FEP N2 were altered by DTB exposure. Decreases in body weight were maximal on Day 9 at 1.0 mg/kg/day (20% from control), but recovered by Day 22. (Copyright (c) 1991 by the Society of Toxicology.)

Keywords: *Toxicology, *Psychomotor performance, *Motor activity, *Sensory thresholds, Dose-response relationships, Visual cortex, Body weight, Visual evoked potentials, Startle reaction, Heat, Rats, Reprints, *Dithiobiuret.

PB91-200238/REB PC **A03**/MF **A01**
Behavioral and Neurochemical Changes in Rats Dosed Repeatedly with Diisopropylfluorophosphate. Journal article.
Health Effects Research Lab., Research Triangle Park, NC. Neurotoxicology Div.
P. J. Bushnell, S. S. Padilla, T. Ward, C. N. Pope, and V. B. Olszyk. c1991, 11p EPA/600/J-91/089
Pub. in Jnl. of Pharmacology and Experimental Therapeutics, v256 n2 p741-750 Feb 91. Prepared in cooperation with Northeast Louisiana Univ., Monroe. School of Pharmacy, and Northrop Services, Inc., Research Triangle Park, NC.

Behavioral effects of organophosphates (OPs) typically decrease with repeated exposure, despite persistence of OP-induced inhibition of acetylcholinesterase (AChE) and downregulation of muscarinic acetylcholine (ACh) receptors. To characterize this tolerance phenomenon, rats were trained to perform an appetitive operant task which allowed daily quantification of working memory (delayed matching-to-position), reference memory (visual discrimination) and motor function (choice response latencies and inter-response times (IRTs) during delay). Findings indicate that animals showing a definitive sign of tolerance to OP administration (subsensitivity to a cholinergic agonist) were also functionally impaired on both the motoric and mnemonic demands of a working memory task. The nature of this impairment suggests further that it results from compensatory changes in the CNS, e.g., muscarinic receptor downregulation, considered to produce 'tolerance' to OPs in exposed animals.

Keywords: *Animal behavior, *Toxicology, *Organophosphorus compounds, *Neurochemistry, Cholinesterase inhibitors, Acetylcholinesterase, Downregulation(Physiology), Cognition, Memory, Motor activity, Cerebral cortex, Hippocampus, Dose-response relationships, Rats, Reprints, *Diisopropylfluorophosphate.

PB91-200246/REB PC **A02**/MF **A01**
Health Effects Research Lab., Research Triangle Park, NC.
Cytogenetic Studies of Ethyl Acrylate Using C57BL/6 Mice. Journal article.
Environmental Health Research and Testing, Inc., Research Triangle Park, NC.
A. D. Kligerman, A. L. Atwater, M. F. Bryant, G. L. Erexson, and P. Kwanyuen. c1991, 7p EPA/600/J-91/090
Contract EPA-68-02-4456
Pub. in Mutagenesis, v6 n2 p137-141 Mar 91. Sponsored by Health Effects Research Lab., Research Triangle Park, NC.

The clastogenicity of ethyl acrylate (EA) was examined in vivo by injecting i.p. 5 male C57BL/6 mice per dose group with either 125, 250, 500, 1000 mg/kg EA dissolved in saline. Twenty-four hours after injection, the animals were anesthetized, the spleens aseptically removed, and the splenic lymphocytes cultured for scoring chromosome aberrations (CAs) in first division cells and sister chromatid exchanges (SCEs) in second division cells. In the remaining cultures cytochalasin B was added to produce binucleated cells for scoring micronuclei (MN). There was no other significant increase in SCEs or CAs at any of the doses of EA examined. At the highest dose examined (1000 mg/kg), EA did cause a small but significant increase in binucleated cell MN. Isolated splenocytes were exposed to a wide range of concentrations of EA during the G(sub

0) stage of the cell cycle or 23 h after mitogen stimulation during the late G(sub 1) or early S-phrase of the cell cycle. Although EA was toxic for both exposure regimes, significant increases in chromatid-type aberrations were found only when the target cells were treated 23 h after mitogenic stimulation. No statistically-significant increase in SCE frequency was found after either treatment regime.

Keywords: *Chromosome aberrations, *Toxicology, *Mutagens, In vivo analysis, Dose-response relationships, Cytochalasin B, Sister chromatid exchange, Mitosis, Spleen, Lymphocytes, Micronucleus test, Cell cycle, Mice, Reprints, *Ethyl acrylate.

PB91-200253/REB PC **A03**/MF **A01**
Health Effects Research Lab., Research Triangle Park, NC.
Rat Strain and Stock Comparisons Using a Functional Observational Battery: Baseline Values and Effects of Amitraz. Journal article.
NSI Technology Services Corp., Research Triangle Park, NC.
V. C. Moser, K. L. McDaniel, and P. M. Phillips. c1991, 19p EPA/600/J-91/091
Contract EPA-68-02-4450
Pub. in Toxicology and Applied Pharmacology, v108 n2 p267-283 Apr 91. Sponsored by Health Effects Research Lab., Research Triangle Park, NC.

A functional observational battery (FOB) was utilized to assess the effects of 3-day exposure to the formamidine pesticide amitraz in outbred Sprague-Dawley derived and inbred Fischer-344 derived (F344) rats (both from Charles River Laboratories), and in outbred Long-Evans rats obtained from two commercial suppliers (Charles River Breeding Laboratories and Blue Spruce Farms). Significant strain and stock differences were obtained in baseline values for one-third of the FOB measures. Characteristic signs of amitraz exposure consisting of increased excitability, hyperreactivity, and physiological and autonomic changes, were evident in all treated rats. These effects increased with repeated dosing, and many were still present 6 days after dosing. On individual measures, there were differences between the strains and stocks in terms of sensitivity and time course of amitraz effects. In general, Blue Spruce Long-Evans rats displayed more effects of amitraz and F344 rats recovered more quickly than others. On the other hand, Sprague-Dawley rats showed the largest increases in the sensorimotor responses to stimuli.

Keywords: *Toxicity, *Pesticides, *Species specificity, Rats, Graphs(Charts), Dose-response relationships, Nervous system, Physiological effects, Psychomotor performance, Reprints, *Amitraz, *FOB(Functional observational battery).

PB91-200261/REB PC **A03**/MF **A01**
Effect of Cadmium and Other Metal Cations on In vitro Leydig Cell Testosterone Production. Journal article.
Health Effects Research Lab., Research Triangle Park, NC. Reproductive Toxicology Branch.
J. W. Laskey, and P. V. Phelps. c1991, 14p EPA/600/J-91/092
Pub. in Toxicology and Applied Pharmacology, v108 n2 p296-306 1991.

In vivo assessment of toxicant action on Leydig cell function is subject to homeostatic mechanisms which make it difficult to determine whether any changes seen in serum testosterone (T) concentration are due to extragonadal endocrine alterations or to a direct effect on the Leydig cell. Studies used a testicular cell culture technique to evaluate Leydig cell testosterone biosynthesis in the presence of several metal cations. To determine the site of toxic action, the Leydig cells were stimulated to produce testosterone by using human chorionic gonadotrophin (hCG), dibutyl cyclic adenosine monophosphate (db cAMP) or several substrates required for the biosynthesis of testosterone. Ca(2+), Cr(3+), Fe(3+), Mg(2+), Na(1+) or Pb(2+) had no effect on stimulated testosterone. Dose response depression in both hCG and db-cAMP stimulated testosterone production were seen with Cd(2+), Co(2+), Cu(2+), Hg(2+), Ni(2+), and Zn(2+) treatment. Surprisingly several of the metal cations which caused a depression in hCG and db cAMP stimulated testosterone production caused significant increases in HCHOL and PREG stimulated testosterone production over untreated and similarly stimulated cultures.

Keywords: *Cadmiums, *Toxicology, *Leydig cells, *Testosterone, Cations, Biosynthesis, In vivo analysis, Chorionic gonadotropins, Radioimmunoassay, Dose-response relationships, In vitro analysis, Cyclic 3',5'-adenosine monophosphate, Rats, Cultured cells, Reprints.

PB91-200279/REB PC **A03**/MF **A01**
Pharmacokinetic Basis of Age-Related Changes in Sensitivity to Toxicants. Journal article.
Health Effects Research Lab., Research Triangle Park, NC. Environmental Toxicology Div.
L. S. Birnbaum. c1991, 28p EPA/600/J-91/093
Pub. in Annual Review of Pharmacology, v31 p101-128 Mar 91.

The article examines the pharmacokinetic behavior of environmental chemicals and drugs that are altered during aging. Absorption may be the least sensitive parameter to age-related perturbations. However, pulmonary and dermal absorption, which are both dependent upon passive diffusion, do appear to decline. In contrast, no evidence supports a decrease in passive transport across the gut wall, while active processes in the GI tract do decline in the aged. Distribution is affected by changes in body composition, the decrease in lean body mass resulting in a decreased Vd for water-soluble chemicals and enhanced persistence of lipophilic ones. Changes in protein binding and blood flow also alter the concentration of unbound chemicals reaching the target site. The changes in metabolism are extremely complex, with increases, decreases, and no change being observed for different enzymes with varying substrates in different tissues, sexes, strain, and species. Only excretion tends to consistently change with age, in large part due to the altered blood flow, structure, and physiology of the kidney. Hepatic and pulmonary elimination also tend to decline with age.

Keywords: *Toxic substances, *Pharmacokinetics, *Aging, *Sensitivity, Environmental pollutants, Adrenergic receptors, Environmental exposure pathways, Metabolism, Absorption, Excretion, Reprints.

PB91-200287/REB PC **A02**/MF **A01**
Air Quality Data Analysis System for Interrelating Effects, Standards, and Needed Source Reductions: Part 11. A Lognormal Model Relating Human Lung Function Decrease to O3 Exposure. Journal article.
Health Effects Research Lab., Research Triangle Park, NC.
R. I. Larsen, W. F. McDonnell, D. H. Horstman, and L. J. Folinsbee. c1991, 8p EPA/600/J-91/094
Pub. in Jnl. of Air and Waste Management Association, v41 n4 p455-459 Apr 91. See also Part 10, PB90-100553. Prepared in cooperation with ABB Environmental Services, Inc., Chapel Hill, NC.

Forced expiratory volume in 1 second (FEV1) was measured in 21 men exercising while exposed to four O3 concentrations (0.0, 0.08, 0.10, and 0.12 ppm). A lognormal multiple linear regression model was fitted to their mean FEV1 measurements to predict FEV1 percent decrease as a function of O3 concentration and exposure duration. The exercise level used was probably comparable to heavy manual labor. The longest O3 exposure studied was 6 h. Extrapolating cautiously to an 8-h workday of heavy manual labor, the model predicts that O3 concentrations of 0.08, 0.10, and 0.12 ppm would decrease FEV1 by 9, 15, and 20 percent respectively. (Copyright (c) 1991 Air & Waste Management Association.)

Keywords: *Air quality, *Air pollution effects(Humans), *Ozone, *Mathematical models, Exposure, Biological effects, Linear regression, Regression analysis, Lung, Respiratory function tests, Respiratory airflow, Concentration(Composition), Data processing, Reprints.

PB91-200295/REB PC **A02**/MF **A01**
Effect of beta-Cyclodextrin on Mucochloric Acid and 3-Chloro-4-(dichloromethyl)-5-hydrox-2(5H)-furanone. Journal article.
Health Effects Research Lab., Cincinnati, OH.
I. R. Politzer, K. T. Crago, W. Benjamin, J. Joseph, and K. Amos. c1991, 6p EPA/600/J-91/095
Pub. in Archives of Environmental Contamination and Toxicology, v20 n3 p371-374 Apr 91. Prepared in cooperation with Xavier Univ. of Louisiana, New Orleans.

Using a combination of IR and UV techniques, evidence is presented for inclusion complex formation between mucochloric acid and B-cyclodextrin in acidic aqueous solutions. UV evidence supports the conclusion that under these acidic conditions mucochloric acid-B-cyclodextrin complex could be isolated by recrystallization of a 1:1 mole ratio of the above compounds from water at pH2. Solid sample IR (KBr or nujol) showed a carbonyl shift of approximately 20 cm(sup minus 1) when mucochloric acid was compared to the mucochloric acid-B-cyclodextrin complex. No such shift was found upon simply grinding together the above components. Thus the carbonyl shift is ascribed to inclusion complexation of mucochloric acid into the B-cyclodextrin cavity. Melting point and thin layer chromatographic analyses also yield supporting evidence for the formation of solid mucochloric acid-B-cyclodextrin complexes. Pilot studies with 3-chloro-4-(dichloromethyl)-5-hydroxy-2(5h)-furanone (MX), suggest a similar B-cyclodextrin-complex formation in acidic solutions.

Keywords: *Chemical interactions, *Cyclodextrins, Infrared spectrophotometry, Ultraviolet spectrophotometry, pH, Thin layer chromatography, Melting point, Fourier analysis, Reprints, *Mucochloric acid.

PB91-200303/REB PC **A02**/MF **A01**
Health Effects Research Lab., Research Triangle Park, NC. Reproductive Toxicology Branch.
Suppression of the Luteinizing Hormone Surge by Chlordimeform in Ovariectomized, Steroid-Primed Female Rats. Journal article.
NSI Technology Services Corp., Research Triangle Park, NC.
J. M. Goldman, R. L. Cooper, T. L. Edwards, G. L. Rehnberg, and W. K. McElroy. cFeb 91, 8p EPA/600/J-91/096
Contract EPA-68-02-4450
Pub. in Pharmacology and Toxicology, v68 n2 p131-136 Feb 91. Sponsored by Health Effects Research Lab., Research Triangle Park, NC. Reproductive Toxicology Branch.

The midcycle surge of luteinizing hormone (LH) from the pituitary provides the physiological trigger in the mammalian female for the process of ovulation. Accordingly, any agent that compromises the LH surge could function as a reproductive toxicant. The acaricide chlordimeform (CDF) has previously been found to decrease serum LH, probably by altering the hypothalamic noradrenergic transmitter control of LH secretion. Consequently, the present study focused on the effect of acute CDF administration on the appearance of the induced LH surge. Single intraperitoneal injections of CDF (0, 10, 25, 50 mg/kg) in OVX, estradiol - implanted female Long-Evans rats approximately 5 hrs prior to the expected surge caused a complete suppression at 25 and 50 mg/kg. Ten mg/kg had no effect on surge amplitude, but advanced the LH peak by 2 hrs. Since CDF has been found to elevate serum corticosterone (CORT), 10 mg CORT/rat were given at different times prior to the surge. Following 20 hrs of CORT exposure, only a partial lowering was seen; 5 hrs exposure were ineffective, indicating an indirect adrenal effect was not the principal route, but may accompany an action of CDF on the hypothalamic mechanisms regulating the surge.

Keywords: *Toxicology, *LH, *Chlorophenamidine, *Chemical depression, Ovariectomy, Estradiol, Reproduction(Biology), Ovulation, Corticosterone, Blood chemical analysis, Reprints.

PB91-200311/REB PC **A02**/MF **A01**
Respiratory Response of Humans Exposed to Low Levels of Ozone for 6.6 Hours. Journal article.
Health Effects Research Lab., Research Triangle Park, NC. Clinical Research Branch.
W. F. McDonnell, H. R. Kehrl, S. Abdul-Salaam, P. J. Ives, and L. J. Folinsbee. cMay 91, 8p EPA/600/J-91/097
Pub. in Archives of Environmental Health, v46 n3 p145-150 May 91. Prepared in cooperation with ABB Environmental Services, Inc., Chapel Hill, NC.

Recent evidence suggests that prolonged exposures of exercising men to 0.08 ppm ozone (O3) result in significant decrements in lung function, induction of respiratory symptoms, and increases in nonspecific airway reactivity. The purpose of the study was to confirm or refute these findings by exposing 38 healthy young men to 0.08 ppm (O3) for 6.6 h. During exposure, sub-

jects performed exercise for a total of 5 h, which required a minute ventilation of 40 l/min. Significant (O3)-induced decrements were observed for forced vital capacity (FVC, -0.25 l), forced expiratory volume in 1 s (FEV(sub 1.0), -0.35 l), and mean expiratory flow rate between 25% and 75% of FVC (FEF(sub 25-75), -0.57 l/s), and significant increases were observed in airway reactivity (35%), specific airway resistance (0.77 cm H2O/s), and respiratory symptoms. These results essentially confirm previous findings. A large range in individual responses was noted (e.g., percentage change in FEV(sub 1.0): 4% increase to 38% decrease). Responses also appeared to be nonlinear in time under these experimental conditions.

Keywords: *Air pollution effects(Humans), *Ozone, *Respiratory function tests, Exercise, Airway resistance, Dose-response relationships, Vital capacity, Forced expiratory volume, Reprints.

PB91-200329/REB PC **A03**/MF **A01**
DNA Sequence Analysis of Revertants of the 'hisD3052' Allele of 'Salmonella typhimurium' TA98 Using the Polymerase Chain Reaction and Direct Sequencing: Application to 1-Nitropyrene-Induced Revertants. Journal article.
Health Effects Research Lab., Research Triangle Park, NC. Genetic Toxicology Div.
D. A. Bell, J. G. Levine, and D. M. DeMarini. c1991, 12p EPA/600/J-91/098
Pub. in Mutation Research, v252 n1 p35-44 Feb 91.

The study used the polymerase chain reaction (PCR) to speed the processing of revertants of Salmonella typhimurium TA98 for DNA sequence analysis. Briefly, a crude DNA extract from a single colony was prepared and used in an asymmetric PCR to amplify a 228-bp fragment containing the hisD3052 mutation approximately in the center. Following ultra-filtration, the ssDNA was sequenced using an end-labeled probe and dideoxy sequencing. The most frequent mutation among the revertants was a -2 deletion of GC or CG within the sequence CGCGCGCG, which is upstream of the hisD3052 mutation. The deletion occurred in 38% (6/16) of the spontaneous (-S9) revertants and in 94% (15/16) of a set of 1-nitropyrene-induced revertants. Misalignment of complementary DNA strands within this repeat may account for this mutation, although the possible formation of Z-DNA within this region may also play a role. Other mutations, mostly deletions but also some complex mutations (insertions/deletions/substitutions), occurred within quasi-palindromic regions of DNA. The potential DNA secondary structures within such regions may mediate the templated production of some of these mutations.

Keywords: *Bacterial DNA, *Salmonella typhimurium, *Mutation, *Polymerase chain reaction, *Alleles, Base sequence, Metabolic activation, Single-stranded DNA, Nucleic acid conformation, Agar gel electrophoresis, Reprints, 1-Nitropyrene.

PB91-200337/REB PC **A02**/MF **A01**
Toxicity Tests of Effluents with Marsh Plants in Water and Sediment. Journal article.
Environmental Research Lab., Gulf Breeze, FL.
G. E. Walsh, D. E. Weber, T. L. Simon, and L. K. Brashers. c1991, 10p EPA/600/J-91/099, PUB-686
Pub. in Environmental Toxicology and Chemistry, v10 p517-525 1991.

Methods are described for toxicity testing of water and sediment with two varieties of the freshwater marsh plant Echinochloa crusgalli (Linneaus) Palisot de Beauvois (Poaceae), and complex effluents. Two tests are described: a seed germination and early seedling growth test in water, and a survival and seedling growth test in natural and synthetic sediments. Effects of effluents from a sewage treatment plant, tannery, textile mill, pulp and paper mill, coking plant and sewage treatment plant included inhibition of germination, chlorophyll synthesis and growth. The tests with rooted marsh plants were sensitive to pollutants and detected toxicity of a range of pollutants in water and sediment. Synthetic sediments similar to natural sediments allowed toxicity tests to be done under carefully controlled conditions of particle size distribution, organic content, pH, electrode potential (Eh) and cation exchange capacity (CEC).

Keywords: *Toxicity, *Aquatic plants, *Chemical water pollutants, *Effluents, *Marshes, Waste water, Sewage, Germination, Sediments, Reprints, Echinochloa crusgalli.

PB91-200634/REB PC **A07**/MF **A01**
Chicago Dept. of Water, IL. Water Quality Surveillance Section.
Lake Michigan Water Quality Report, 1988.
Illinois State Environmental Protection Agency, Springfield. Div. of Air Pollution Control.
Jun 90, 150p IEPA/WPC/90-172
See also PB88-185871. Sponsored by Chicago Dept. of Water, IL. Water Quality Surveillance Section.

Evaluation of the water quality of the southwest portion of Lake Michigan is based on standards as set by the Illinois Pollution Control Board (35 IL Adm Code 302). Because it is a unique and invaluable resource, Lake Michigan is protected to a higher level than other lakes in the State. Its waters are required to meet: Lake Michigan Standards, General Use Standards and Public and Food Processing Water Supply Standards. Additionally, a criterion for beach closure was also used in the evaluation (IDPH, 1987). The Executive Summary covers data for the current year only. Section B of the report entitled 'Water Quality Trend Analysis', contains data for the period 1970-88. The water quality of the Illinois area of Lake Michigan has improved substantially since the 1960's and 1970's due to diversion of municipal and industrial treated wastewater discharges away from Lake Michigan to the Des Plaines River Basin. Discharges along the Illinois shore now consist primarily of cooling water and some combined sewer overflows. Major sources of pollutants along the Illinois shore of Lake Michigan are atmospheric deposition, urban runoff and in-place contaminants.

Keywords: *Lake Michigan, *Water quality data, *Water pollution abatement, Environmental monitoring, Site surveys, Illinois, Water pollution standards, Trends, Liquid wastes, Industrial wastes, Water runoff, Tables(Data), Municipal wastes, Sewage disposal, Pollution sources, Air water interactions, Air pollution, Deposition.

PB91-200659/REB PC **A06**/MF **A01**
Intensive Survey of Shawnee National Forest Region Streams of Southern Illinois, 1986-1987.
Illinois State Environmental Protection Agency, Springfield. Div. of Water Pollution Control.
R. L. Hite, C. A. Bickers, and M. M. King. Jun 90, 114p IEPA/WPC/90-171
Prepared in cooperation with Southern Monitoring, Marion, IL.

In 1986 and 1987 the Illinois Environmental Protection Agency and Illinois Department of Conservation conducted a cooperative survey of 14 Shawnee National Forest region streams in Southern Illinois. Monitoring included collection of aquatic macroinvertebrates, water quality, sediment chemistry, stream habitat, and fish population samples. Biological, chemical, and physical data collected during the Shawnee study revealed an unusual assemblage of high quality streams characterized by excellent biotic integrity and water quality, and exceptional physical and aesthetic attributes. Outstanding streams in the Shawnee National Forest include Big, Lusk, and Big Grand Pierre Creeks in the Ohio River watershed and upper Clear and Miller Creeks in the Mississippi River watershed. Streams exhibiting lowest quality included lower Bay Creek, Bay Creek Ditch, and Cedar Creek in the Ohio drainage, and the lower Clear Creek continuum near the Shawnee's western edge. High quality streams were generally located in the Shawnee Hills or Ozark Natural Divisions; low quality streams were generally located in agricultural bottomlands.

Keywords: *Streams, *Environmental monitoring, *Water quality data, *Water pollution effects, Illinois, Regional analysis, Aquatic biology, Sediments, Biological effects, Tables(Data), Invertebrates, Chemical properties, Physical properties, Vegetation, Fishes, Hydrology, *Shawnee National Forest, Southern Region(Illinois).

PB91-206185/REB PC **A09**/MF **A02**
Review of the National Ambient Air Quality Standards for Lead: Assessment of Scientific and Technical Information. Staff paper.
Environmental Protection Agency, Research Triangle Park, NC. Office of Air Quality Planning and Standards.
J. Cohen, G. Brion, and J. Haines. Dec 90, 200p EPA/450/2-89/022
See also PB89-207914.

The paper evaluates and interprets the updated scientific and technical information that EPA staff believes is most relevant to the review of the primary (health) and secondary (welfare) national ambient air quality standards for lead. The assessment is intended to bridge the gap between the scientific review in the EPA criteria document and the judgements required of the Administrator in setting the ambient air quality standards for lead. The major recommendations of the staff paper are: (1) the range of standards under consideration should be from 0.5 to 1.5 microg/cu m; (2) a monthly averaging period would better reflect children's responsiveness to lead exposures than a quarterly averaging period; (3) the most appropriate form of the standard is the second highest monthly average in a 3 year span; (4) with a monthly averaging period, more frequent sampling is needed in areas with point sources; and (5) the hi-volume sampler should be retained to monitor compliance with the lead NAAQS.

Keywords: *Lead(Metal), *Air pollution effects(Humans), *Public health, *National Ambient Air Quality Standards, Risk assessment, Reviews, Air pollution standards, Technology transfer, Exposure, Biological effects, Ecosystems, Toxicity, Standards compliance, Children, Dose-response relationships, Point sources, Air pollution sampling.

PB91-206193/REB PC **A03**/MF **A01**
Environmental Protection Agency, Washington, DC. Office of Municipal Pollution Control.
Collecting Household Hazardous Wastes at Wastewater Treatment Plants. Case Studies.
Environmental Resources Management, Inc., Exton, PA.
J. Demuro, and C. Nunley. Dec 90, 39p EPA/430/9-90/016
Contract EPA-68-C9-0035
Sponsored by Environmental Protection Agency, Washington, DC. Office of Municipal Pollution Control.

The report is intended to provide details on the organization, development and implementation of HHW programs related to Wastewater Treatment Plants. It evaluates principle problems and limitations associated with HHW collection.

Keywords: *Household wastes, *Sewage treatment plants, *Collecting methods, *Hazardous materials, *Solid waste management, Case studies, Implementation, Waste disposal, Substitutes, State government, Regional analysis, Cost analysis, Source reduction, Saint Johns(Michigan), Palo Alto(California), New Haven(Connecticut), Jefferson County(Kentucky), Orange County(California).

PB91-206219/REB PC **A04**/MF **A01**
Environmental Protection Agency, Research Triangle Park, NC. Office of Air Quality Planning and Standards.
Impact of Declaring Soybean Oil Exempt from VOC Regulations on the Coatings Program. Final rept.
Radian Corp., Research Triangle Park, NC.
M. Strum, and C. Blackley. Apr 91, 56p EPA/450/3-91/011
Contract EPA-68-02-4378
Portions of this document are not fully legible. Sponsored by Environmental Protection Agency, Research Triangle Park, NC. Office of Air Quality Planning and Standards.

The document presents the findings of a study to evaluate the impact of declaring soybean and other vegetable seed oils exempt from VOC regulation on the coatings program. The physical and chemical characteristics of 10 vegetable seed oils are tabulated and their uses are discussed. Tests conducted with EPA reference Methods 24 and 24a showed no weight loss, indicating that the oils contain no VOC. However, the study discloses that VOC's are emitted during the autoxidation reaction which occurs when these oils are in contact with atmospheric oxygen.

Keywords: *Air pollution abatement, *Pollution regulations, *Volatile organic compounds, *Soybean oil, *Coating processes, Chemical properties, Physical properties, Food processing, Oxidation, Air pollution control, Dry methods, Curing, Air pollution detection, Vegetable oils, Comparison, Chemical analysis, EPA method 24, EPA method 24A.

PB91-206227/REB PC **A03**/MF **A01**
Toxic Substances Control Act: A Guide for Chemical Importers/Exporters. An Overview.
Environmental Protection Agency, Washington, DC. Office of Toxic Substances.
Apr 91, 42p EPA/560/1-91/001

The publication summarizes the requirements of sections 12(b), Exports, and 13, Imports, of the Toxic Substances Control Act (TSCA), and the rules and policies issued under these sections.

Keywords: *Guidelines, *Chemical compounds, *International trade, Pollution regulations, Legal aspects, Law enforcement, US EPA, Customs laws, *Toxic Substances Control Act.

PB91-206235/REB PC **A03**/MF **A01**
National Air Quality and Emissions Trends Report, 1989. Executive Summary and Chapter 4-Excerpts.
Environmental Protection Agency, Research Triangle Park, NC. Office of Air Quality Planning and Standards.
T. Curran, R. Faoro, T. Fitz-Simons, N. Frank, and W. Freas. Feb 91, 49p EPA/450/4-91/003B
See also report for 1989, PB91-172247.

The report presents national and regional trends in air quality from 1980 through 1989 for total suspended particulate, sulfur dioxide, carbon monoxide, nitrogen dioxide, ozone and lead. Air quality trends are also presented for 14 metropolitan areas. Both national and regional trends in each of these pollutants are examined. National air quality trends are also presented for both the National Air Monitoring Sites (NAMS) and other site categories. In addition to ambient air quality, trends are also presented for annual nationwide emissions. These emissions are estimated using the best available engineering calculations; the ambient levels presented are averages of direct measurements. The report also includes a section, Air Quality Levels in Metropolitan Statistical Areas (MSAs). Its purpose is to provide interested members of the air pollution control community, the private sector and the general public with greatly simplified air pollution information. Air quality statistics are presented for each of the pollutants for all MSAs with data in 1989.

Keywords: *Air pollution effects(Humans), *Air quality, *Air pollution monitoring, National Ambient Air Quality Standards, Air pollution standards, Biological effects, Trends, Forecasting, Metropolitan areas, Regional analysis, Site surveys, Concentration(Composition), Total suspended particulates, Lead(Metal), Sulfur dioxide, Information transfer, Public information, Statistical analysis, Carbon monoxide, Nitrogen dioxide, Ozone, *Emission inventories.

PB91-206243/REB PC **A05**/MF **A01**
Environmental Protection Agency, Cincinnati, OH. Risk Reduction Engineering Lab.
State-of-the-Art Field Hydraulic Conductivity Testing of Compacted Soils.
IT Environmental Programs, Inc., Cincinnati, OH.
J. O. Sai, and D. C. Anderson. Jun 91, 95p EPA/600/2-91/022
Contract EPA-68-03-3413
Prepared in cooperation with Brown (K.W.) and Associates, Inc., College Station, TX. Sponsored by Environmental Protection Agency, Cincinnati, OH. Risk Reduction Engineering Lab.

The report documents the available technical information on field hydraulic conductivity test methods for soil liners. The methods discussed are currently used and readily available for determining the hydraulic conductivity of soils compacted in the field. Hydraulic conductivity test methods currently used on soil liners were evaluated for their ability to meet the minimum requirements for field tests; i.e., that the test be capable of measuring hydraulic conductivities at least as low as 1 x 10 to the -9th power m/s and that the values obtained be representative of the overall soil liner. Of the few methods capable of meeting the minimum requirements, even fewer are both practical to use and rarely give false low values. Based on the advantages of the methods evaluated, the best and most practical currently available technologies for evaluating hydraulic conductivity are large single-ring infiltrometers and sealed double-ring infiltrometers.

Keywords: *Soil compacting, *Hydraulic conductivity, *Linings, *Waste management, *Hazardous materials, State of the art, Technology utilization, Field tests, Performance standards, Infiltration, Permeability, Measuring instruments, Lysimeters.

PB91-206250/REB PC **A24**/MF **A03**
Environmental Impact Statement/State Analysis Report. Cedar Bay Cogeneration Project, Jacksonville, Florida (EPA and FDER). Including Technical Appendix. Draft rept.
Environmental Protection Agency, Atlanta, GA. Region IV.
May 90, 556p EPA/904/9-90/003A, EPA/904/9-90/003B
Prepared in cooperation with Florida State Dept. of Environmental Regulation, Tallahassee.

AES/Cedar Bay, Inc. proposes to construct and operate a cogeneration facility on and existing industrial site within the North District of Duval County, approximately eight miles north of Jacksonville, Florida. The plant will produce 225 megawatts of electricity for sale to Florida Power and Light Company. In addition, steam will be sold to the adjacent Seminole Kraft Corporation paper mill. The document, prepared pursuant to the National Environmental Policy Act, assesses the proposed project and alternatives with respect to impacts on the natural and man-made environments. Potential mitigative measures are also evaluated. The Technical Appendix includes a copy of U.S. EPA's draft National Pollutant Discharge Elimination System permit, FDER's Conditions of Power Plant Siting Certification, as well as other state agency reports pertinent to the proposed project.

Keywords: *Environmental impact statements-Draft, *Dual-purpose power plants, Electric power plants, Cogeneration, Paper industry, Mitigative, Florida, Permits, Performance standards, Design criteria, *Cedar Bay Cogeneration Project, Jacksonville(Florida), National Pollutant Discharge Elimination System.

PB91-206573/REB PC **A03**/MF **A01**
Terbutryn: Decision Document.
Environmental Protection Agency, Washington, DC. Office of Pesticide Programs.
Oct 81, 37p EPA/540/09-91/136
See also PB87-121877.

Terbutryn is a triazine-related herbicide registered and used in the U.S. for control of many broadleaf weeds and grasses on wheat, barley, and sorghum, and in noncropland areas. The document reports the results of the Agency's review of currently available information concerning the potential health effects of terbutryn. Part I is the introduction, which describes the organization of the document. Part II presents the chemical and physical characteristics and other general information about terbutryn. Part III is a summary of the chronic effects of terbutryn observed in the laboratory. Part IV contains the Agency's analysis of terbutryn exposure to both the general population and applicators. Part V consists of the Agency's quantitative assessments of risk to these exposed populations. The conclusions and recommendations regarding terbutryn as a RPAR candidate are given in Part VI. Finally, Part VII is a bibliographic listing of the studies cited in the report.

Keywords: *Pesticides, *Risk assessment, *Pollution regulations, *Biological effects, Reviews, Herbicides, Sulfur organic compounds, Toxic substances, Public health, Toxicity, Exposure, Occupational safety and health, Chemical properties, Physical properties, Ecology, Environmental transport, *Terbutryn, Triazine/(tert-butylamino)-(ethylamino)-(methylthio)-5, CAS 886-50-0.

PB91-206581/REB PC **A04**/MF **A01**
Oxydemeton-Methyl PD-1: Initiation of Special Review.
Environmental Protection Agency, Washington, DC. Office of Pesticide Programs.
30 Sep 87, 53p EPA/540/09-91/135
See also PB88-179643.

The Position Document addresses the risks and benefits of pesticide products containing Oxydemeton-Methyl. The Agency has determined that the use of products containing Oxydemeton-Methyl may meet or exceed a risk criterion described in 40 CFR Part 154. Potential hazards will be examined further to determine the nature and extent of the risk, and considering the benefits of Oxydemeton-Methyl, whether such risks cause unreasonable adverse effects on the environment.

Keywords: *Pesticides, *Risk assessment, *Pollution regulations, *Biological effects, Reviews, Environmental effects, Toxicity, Public health, Sulfur organic compounds, Laboratory animals, Notification procedures, Decisions and orders, Farm crops, Environmental transport, Legal aspects, Ecology, *Oxydemeton methyl, Federal Insecticide Fungicide and Rodenticide Act, Phosphorothioic acid/(dimethyl-ester)-S-((ethylsulfinyl)ethyl), CAS 301-12-2.

PB91-206607/REB PC **A99**/MF **A04**
Environmental Protection Agency, Washington, DC. Office of Solid Waste.
Proceedings of the National Conference on Household Hazardous Waste Management (5th). Held in San Francisco, California on November 5-7, 1990.
Duxbury (Dana) and Associates, Andover, MA.
Mar 91, 758p* EPA/530/SW-91/059
Grant EPA-T-901776-01-0
See also PB90-163189.Portions of this document are not fully legible. Prepared in cooperation with Governmental Refuse Collection and Disposal Association, Silver Spring, MD. Sponsored by Environmental Protection Agency, Washington, DC. Office of Solid Waste.

The report is a compendium of presentations made at the 5th Annual Household Hazardous Waste Management Conference. The texts were submitted by the speakers themselves, and except where noted, have not been summarized or edited. The speeches do not necessarily reflect EPA's position.

Keywords: *Household wastes, *Meetings, *Hazardous materials, *Waste management, Waste recycling, Indoor air pollution, Consumer products, Marketing, Public opinion, Management planning, Pollution regulations, Case studies, Heavy metals, Paints, Oil wastes, Waste utilization, Collecting methods, Education, Public information, Pesticides, Source reduction.

PB91-206722/REB PC **A07**/MF **A01**
Department of Energy, Washington, DC. Building Services Div.
User Manual NBSAVIS CONTAM88. A User Interface for Air Movement and Contaminant Dispersal Analysis in Multizone Buildings.
National Inst. of Standards and Technology (BFRL), Gaithersburg, MD.
R. A. Grot. Jun 91, 150p NISTIR-4585
Sponsored by Department of Energy, Washington, DC. Building Services Div., Consumer Product Safety Commission, Washington, DC. Directorate of Engineering Science, and Environmental Protection Agency, Research Triangle Park, NC. Atmospheric Research and Exposure Assessment Lab.

The manual describes the usage of three computer programs for analyzing the air movement and indoor air quality in multizone buildings. The first program NBSAVIS creates and edits a building description and generates the leakage, fan and contaminant data necessary to predict the air infiltration and internal air movement in a building and perform an indoor air quality analysis. These data are used by the program CONTAM88 which calculates the air flows and both dynamic and steady state levels of indoor contaminants. CONTAMEZ also produces an output file which can serve as the input for the NIST programs CONTAM86 and CONTAM87 developed by Dr. James Axley.

Keywords: *User manuals(Computer programs), *Indoor air quality, *Air flow, Buildings, Indoor air pollution, Ventilation, Steady state, Air quality, Contaminants, Leakage, Environmental quality, CONTAM88 computer program.

PB91-206805/REB PC **A03**/MF **A01**
Environmental Radiation Data. Report 62, April-June 1990.
National Air and Radiation Environmental Lab., Montgomery, AL.
Dec 90, 50p EPA/520/5-91/013
See also PB91-178996.

Environmental Radiation Data (ERD) contains data from the Environmental Radiation Ambients Monitor-

ing System (ERAMS). Data from similar networks operated by contributing States, Canada, Mexico, and the Pan American Health Organization are reported in the ERD when available. The ERAMS is comprised of nationwide sampling stations that provide air, surface, and drinking water and milk samples from which environmental radiation levels are derived. Sampling locations are selected to provide optimal population coverage while functioning to monitor fallout from nuclear devices and other forms of radioactive contamination of the environment. The radiation analyses performed on these samples include gross beta levels, gamma analyses for fission products, and specific analyses for uranium, plutonium, strontium, iodine, radium, krypton, and tritium.

Keywords: *Environmental monitoring, *Radiation monitoring, Water pollution sampling, Air pollution sampling, Potable water, Milk, Radiation detection, Data processing, Surface waters, Tables(Data).

PB91-206839/REB PC **A03**/MF **A01**
Environmental Research Lab., Gulf Breeze, FL.
Comparison and Evaluation of Field and Laboratory Toxicity Tests with Fenvalerate on an Estuarine Crustacean. Journal article.
South Carolina Univ., Columbia. Dept. of Environmental Health Sciences.
D. S. Baughman, D. W. Moore, and G. I. Scott. c1989, 14p EPA/600/J-89/538
Grant EPA-R-813138
Pub. in Environmental Toxicology and Chemistry, v8 p417-429 1989. Presented at the Symposium on Aquatic Toxicology of the Pyrethroid Insecticides, Annual Meeting of the Society of Environmental Toxicology and Chemistry (7th), Alexandria, VA., November 2-5, 1986. Prepared in cooperation with CH2M Hill, Charleston, SC. Sponsored by Environmental Research Lab., Gulf Breeze, FL.

Field and laboratory toxicity tests were conducted on the grass shrimp, Palaemonetes pugio, to evaluate the usefulness of laboratory testing in estimating mortality from fenvalerate exposure associated with agricultural runoff. The study examined an integrated approach for assessing the impacts of fenvalerate on estuarine fauna, using 96-h static-renewal and 6-h pulsed-dose laboratory toxicity tests and in situ toxicity tests. The laboratory toxicity tests with fenvalerate gave 96-h LC50 values ranging from 0.007 to 0.071 microgram/L and 6-h PDLC50 values ranging from 0.100 to 0.130 microgram/L. Comparisons of the results of two field toxicity tests with laboratory-derived LC50 values showed good agreement between field and laboratory toxicity data. The variation between field and laboratory toxicity tests may have been due to the limitations of the water sampling regime used in characterizing the pesticide exposure during the field toxicity tests. These comparisons suggest that a combination of laboratory and field toxicity testing is required to estimate the actual field mortality from fenvalerate exposure associated with agricultural runoff. Future studies should include composite water sampling and more frequent discrete sampling methods to better characterize field exposure regimes. (Copyright (c) 1989 SETAC.)

Keywords: *Shrimp, *Estuaries, *Water pollution effects(Animals), *Organophosphate insecticides, *Toxicity, Field tests, Dose-response relationships, Reprints, *Fenvalerate, Palaemonetes pugio, Agricultural runoff.

PB91-206847/REB PC **A01**/MF **A01**
Expert Systems: Tools for Hazardous Waste Managers. Journal article.
Environmental Protection Agency, Cincinnati, OH. Risk Reduction Engineering Lab.
D. G. Greathouse. c1989, 5p EPA/600/J-89/539
Pub. in Environmental Software Report, v1 n7 p1, 4, 18, Feb/Mar 1989.

It is well known that protection of human health and the environment from the risks of hazardous wastes involves evaluation of numerous complex issues. Approximately 4 years ago a few people began to explore the possibility of using expert system techniques to expedite the transfer of professional decision expertise to a wider audience of decision makers. Currently several organizations are developing expert systems to expedite hazardous waste decision making and improve the quality and consistency of resulting decisions. It is anticipated that system development will proliferate during the next few years. Expert systems will change the way in which information is passed between organizations.

Keywords: *Hazardous materials, *Waste management, *Information transfer, *Expert systems, Management planning, Decision making, Software tools, Reprints.

PB91-206854/REB PC **A01**/MF **A01**
Determining the Nutrient Status of Drinking Water. Journal article.
Environmental Protection Agency, Cincinnati, OH. Risk Reduction Engineering Lab.
E. W. Rice. c1989, 5p EPA/600/J-89/540
Pub. in the Bench Sheet, v11 n5 p6-7 Sep/Oct 89.

The presence of biodegradable organic matter in drinking water can result in biologically unstable water that has been linked to various taste, odor and color problems. When the implicated bacteria are members of the total coliform group, those occurrences can result in major compliance violations. The amount of biodegradable organic matter in potable water is difficult to measure. The measurement of biodegradable matter in drinking water is an operationally defined parameter and can only be expressed in relative terms. The use of bioassay assays can provide important information regarding the nutrient status of water.

Keywords: *Potable water, *Nutrients, *Bioassay, *Water pollution standards, *Water analysis, Biocontrol, Microorganism control(Water), Odor control, Taste, Standards compliance, Color, Organic matter, Biodeterioration, Aquatic bacteria, Pseudomonas, Reprints.

PB91-206904/REB PC **A03**/MF **A01**
Divergence between Populations of a Monogamous Polychaete with Male Parental Care: Premating Isolation and Chromosome Variation. Journal article.
Environmental Research Lab., Narragansett, RI.
J. R. Weinberg, V. R. Starczak, C. Mueller, G. C. Pesch, and S. M. Lindsay. c1990, 11p EPA/600/J-90/518, ERLN-1308
Pub. in Marine Biology, v107 p205-213 1990. Also pub. as Woods Hole Oceanographic Institution, MA. Dept. of Biology rept. no. WHOI-CONTRIB-7218. Prepared in cooperation with Woods Hole Oceanographic Institution, MA. Dept. of Biology, and South Carolina Univ., Columbia. Dept. of Biological Sciences.

Low dispersal and sexual selection are characteristic of the coastal polychaete Nereis acuminata Ehlers 1868 (also known as Nereis arenaceodentata Moore 1903 and Nereis (Neanthes) caudata Delle Chiaje 1841). A study assessed levels of premating isolation between populations of the polychaete. Four North American populations were used, two from the Atlantic and two from the Pacific. Worms from all sites (1) were collected in 1987 and 1988 from the same habitat type, (2) were morphologically similar and keyed out as N. acuminata, and (3) reproduced monogamously and exhibited male parental care, an extremely rare reproductive mode in marine invertebrates. Results suggest strongly that the Atlantic and Pacific populations have been allopatric for a long time, and are different species.

Keywords: *Polychaeta, *Animal behavior, *Variation(Genetic), *Chromosomes, *Population genetics, Marine biology, Tolerances(Physiology), Cold, Karyotyping, Reprints, *Male parental care, *Premating isolation, Nereis acuminata, Nereis caudata.

PB91-206912/REB PC **A03**/MF **A01**
Environmental Protection Agency, Cincinnati, OH. Risk Reduction Engineering Lab.
Pressure and Temperature Fluctuations in Underground Storage Tank Pipelines Containing Gasoline. Journal article.
Vista Research, Inc., Mountain View, CA.
J. W. Maresca, M. P. MacArthur, A. Regalia, J. W. Starr, and C. P. Wilson. c1990, 30p EPA/600/J-90/519
Contract EPA-68-03-3409
Pub. in Oil and Chemical Pollution Jnl., v7 n1 p29-56 1990. Sponsored by Environmental Protection Agency, Cincinnati, OH. Risk Reduction Engineering Lab.

A common method of detecting a small leak in a pressurized underground storage tank pipeline system containing petroleum is to monitor the pressure in the line. A leak is declared if the pressure drops below a specified threshold pressure. Small changes in the temperature of the product in the line also produce large changes in pressure which can easily exceed those of a small leak. The paper presents theoretical models to predict the pressure changes associated with leaks and product temperature changes in pressurized pipelines. These models have been validated in experiments at retail petroleum facilities and the EPA's UST Test Apparatus. The magnitude of the product temperature changes that can be expected during a pressure test at a retail station is predicted from a heat conduction model. The model includes the effects of product delivery and product dispensing and uses experimentally determined values of thermal diffusivity for the product in the pipeline and for the gravel and soil around the pipeline.

Keywords: *Leak detectors, *Pipelines, *Underground storage, Tanks, Subsurface structures, Gasoline, Models, Pressure gradients, Reprints.

PB91-206920/REB PC **A02**/MF **A01**
Human Alveolar and Peritoneal Macrophages Mediate Fungistasis Independently of L-Arginine Oxidation to Nitrite or Nitrate. Journal article.
Health Effects Research Lab., Research Triangle Park, NC.
M. L. Cameron, D. L. Granger, J. B. Weinberg, W. J. Kozumbo, and H. S. Koren. c1990, 9p EPA/600/J-90/520
Pub. in American Review of Respiratory Disease, v142 n6 p1313-1319 Dec 90.

Human alveolar macrophages (HAM) from 28 normal volunteers were found to inhibit replication of Cryptococcus neoformans. Conditions under which fungistasis occurred were different than those required for mouse peritoneal macrophage-mediated fungistasis. Inhibition of fungal replication by mouse peritoneal macrophages (MPM) requires that the macrophages are activated and that the cocultures of C. neoformans and macrophages be done in the presence of serum, L-arginine, and endotoxin. HAM-mediated fungistasis was not enhaced by endotoxin or by recombinant human interferon-gamma (rHIFN-gamma). The combination of endotoxin and rHIFN-gamma inhibited the fungistatic effect of HAM. Human peritoneal macrophages (HPM) from women undergoing laparoscopy were tested for fungistasis and L-arginine nitrogen oxidation. Partial inhibition of cryptococcal replication occurred; however, there was no evidence of L-arginine metabolism to NO2- or NO3-. The absence of L-arginine-dependent nitrogen oxidation in HAM and HPM, compared to MPM, during conditions under which fungistasis occurs suggests that the phenomenon is species specific rather than specific to the tissue origin of the macrophages.

Keywords: *Macrophages, *Immunology, *Arginine, *Nitrates, *Nitrites, *Oxidation, *Fungicides, Pulmonary alveoli, Peritoneal cavity, Cryptococcus neoformans, Endotoxins, Interferon type II, Liquid chromatography, Phagocytosis, Biosynthesis, Reprints.

PB91-207019/REB PC **A02**/MF **A01**
Brain Cholinesterase Activity of Bobwhite Acutely Exposed to Chlorpyrifos. Journal article.
Corvallis Environmental Research Lab., OR.
M. A. Cairns, C. C. Maguire, B. A. Williams, and J. K. Bennett. c1991, 10p EPA/600/J-91/108
Pub. in Environmental Toxicology and Chemistry, v10 p657-664 1991. Prepared in cooperation with NSI Technology Services Corp., Corvallis, OR.

Northern bobwhite, Colinus virginianus, were orally dosed with the organophosphorus insecticide chlorpyrifos to examine effects on brain cholinesterase (AChE) activity. Two-week-old quail were acutely exposed and euthanized at selected times following gavage-dosing, ranging from 1 to 120 h later. The AChE activity was determined in treated birds and compared to concurrently tested control (corn oil) birds. It was found that a lag time of 2 to 4 h following dose exposure was necessary to detect significant AChE depression caused by chlorpyrifos. The lowest dose that produced ChE to detect significant ChE depression in these tests was between approximately 30 and 50 mg chlorpyrifos/kg body weight, with some mortality occurring at the high end of that range. Depression typically persisted for at least 24 h.

Keywords: *Brain chemistry, *Dursban, *Cholinesterase, *Birds, *Organophosphate insecticides, Dose-response relationships, Toxicity, Statistical analysis, Reprints, *Northern bobwhite, *Chlorpyrifos, Colinus virginianus.

PB91-207100/REB PC **A02**/MF **A01**
Causes of Waterborne Outbreaks in the United States. Journal article.
Health Effects Research Lab., Cincinnati, OH.
G. F. Craun. c1991, 6p EPA/600/J-91/117
Pub. in Water Science Technology, v24 n2 p17-20 Feb 91.

A total of 1648 waterborne outbreaks and 446,377 cases of waterborne disease have been reported in the United States since 1920. During the most recent period, 1981-1988, 248 waterborne outbreaks occurred in community (45%) and noncommunity (34%) water systems and from the ingestion of contaminated water from individual (11%) and recreational (10%) water sources. The average annual number of outbreaks reported in the period are only slightly less than reported during the previous period, 1971-1980, and is comparable to that reported during 1931-1950. Although, several large outbreaks have recently been reported, most waterborne outbreaks since 1971 have occurred in small community and noncommunity water systems. The average number of cases of waterborne disease per outbreak during 1971-1988 is less than reported during 1920-1940 but more than reported during 1941-1960.

Keywords: *Disease outbreaks, *Water microbiology, *Epidemiology, *Potable water, United States, Virus diseases, Bacterial infections, Toxic substances, Parasitic diseases, Reprints.

PB91-207126/REB PC **A03**/MF **A01**
Exposure of Humans to Ambient Levels of Ozone for 6.6 Hours Causes Cellular and Biochemical Changes in the Lung. Journal article.
Health Effects Research Lab., Research Triangle Park, NC.
R. B. Devlin, W. F. McDonnell, R. Mann, S. Becker, and D. E. House. c1991, 12p EPA/600/J-91/119
Pub. in American Jnl. of Respiratory, Cellular, and Molecular Biology, v4 p72-81 Jan 91. Prepared in cooperation with North Carolina Univ. at Chapel Hill. School of Medicine, and ABB Environmental Services, Inc., Chapel Hill, NC.

An acute (2h) exposure of humans to 0.4 ppm ozone initiates biochemical changes in the lung resulting in the production of components which mediate inflammation and acute lung damage as well as components which have the potential to lead to long term effects such as fibrosis. However, many people are exposed to lower levels of ozone than this, but for periods of several hours. Therefore, it is important to determine if a prolonged exposure to low levels of ozone is also capable of causing cellular and biochemical changes in the lung. Non-smoking males were randomly exposed to filtered air and either 0.10 ppm ozone or 0.08 ppm ozone for 6.6 h with moderate exercise (40 1/min). Bronchalveolar lavage (BAL) was performed 18 h after each exposure, and cells and fluid analyzed. The BAL fluid of volunteers exposed to 0.10 ppm ozone had significant increases in neutrophils (PMNs), protein, PGE2, fibronectin, interleukin-6 (IL-6), and lactate dehydrogenase (LDH) compared with BAL fluid from the same volunteers exposed to filtered air. The study concludes that exposure of humans to low levels of ozone is sufficient to initiate an inflammatory reaction in the lung.

Keywords: *Air pollution effects(Humans), *Ozone, *Biochemistry, *Toxicology, Inflammation, Pulmonary fibrosis, Bronchoalveolar lavage fluid, Neutrophils, Dinoprostone, Interleukin 6, Lactate dehydrogenase, Fibronectin, Alpha 1-antitrypsin, Eicosanoids, Superoxide, Phagocytosis, Reprints.

PB91-506998/REB CP **D02**
Surface Impoundment Modeling System, Version 2.0 (for Microcomputers). Software.
Environmental Protection Agency, Research Triangle Park, NC. Office of Air Quality Planning and Standards.
Oct 90, 1 diskette* EPA/SW/DK-91/079
System: IBM Compatible PC; DOS 2.0 operating system, 512K. Language: C-compiled. Supersedes PB90-501115.

The software is contained on one 1.2M, 5 1/4 inch diskette, high density. Documentation may be ordered separately as PB91-156711 and PB91-156729.

The Surface Impoundment Modeling System (SIMS) estimates volatile organic compound (VOC) emissions and toxic air pollutant emission from surface impoundments and collection system emponents individually or in series. It can be used to estimate emissions from wastewater sources at hazardous waste treatment works, storage and disposal facilities (TSDFs), publically owned treatment works (POTW's), and industrial wastewater treatment facilities. The minimum information required to use SIMS is the type of device to be modeled, the total flow to the device, the total surface area of the device, and the type of industry discharging wastewater to the device. Default values for water discharged from typical industries are supplied by the program. The user can adjust these default values to match their particular system. The SIMS is a personal computer based program designed to estimate the air emissions from surface impoundments. The emission estimates are based on mass transfer models developed by the Emissions Standards Division (ESD) of EPA during the evaluation of hazardous waste treatment, storage, and disposal facilities (TSDF's). SIMS allows the user to specify all the required inputs to these emission models when the information is available, or when only limited information is available, provides default values for most of the model inputs.

Keywords: *Surface impoundments, *Software, *Air pollution, *Hazardous materials, Volatile organic compounds, Waste treatment, Waste disposal, Waste storage, Industrial waste treatment, Waste management, Water pollution control, Sewage treatment, Mass transfer, State government, Diskettes, Study estimates, *Surface Impoundment Modeling System.

PB91-507137/REB CP **D01**
Fate Model Program, Version 1.0 (for Microcomputers). Software.
Environmental Protection Agency, Cincinnati, OH. Risk Reduction Engineering Lab.
1991, 1 diskette EPA/SW/DK-91/080
System: IBM-PC or compatible; Language: FORTRAN 77.
The software is contained on one, 5 1/4 inch diskette, double density. Documentation is on a diskette.

The FATE Model has been developed for predicting the fate of organics in a completely mixed activated sludge treatment plant operated under acclimated conditions. It has been validated using experimental data from a pilot-scale facility and full-scale treatment plants. The biogradation kinetic constants for some compounds were estimated using group contribution approach. Applications of the model include (1) assessment of emissions of volatile organic compounds from wastewater treatment plants, (2) estimation of the concentration of toxic compounds associated with sludges, and (3) a general framework for estimating the removal of toxic compounds during conventional primary/activated sludge treatment.

Keywords: *Software, *Sewage treatment, *Activated sludge process, Diskettes, Biodeterioration, Volatile organic compounds, Air pollution, Study estimates, Toxic substances, Concentration(Composition), Kinetics, *FATE model.

PB91-507301/REB CP **T05**
Toxic Substances Control Act Chemical Substances Inventory: Revised Inventory Synonym and Preferred Name File, January 1991. Data file.
Environmental Protection Agency, Washington, DC.
9 Jan 91, mag tape EPA/DF/MT-91/082
System: IBM 3090 400E; MVS/ESA Sp3.1.OE operating system. File format: EBCDIC. Supersedes PB90-504226. See also PB86-220795 and PB86-220803.
Available in 9-track EBCDIC character set, 1600 bpi. For 6250 bpi, the price is T05. Documentation included; may be ordered separately as PB91-167767.

The computer tape contains the Inventory Synonym Name File and the Inventory Preferred Name File of the Toxic Substances Control Act (TSCA) Toxic Substance Inventory. These files reflect the 60,552 substances on the non-confidential Inventory file as of January 9, 1991. The EPA 'N' flag, which indicates a polymeric substance containing no free-radical initiator in its Inventory name, but is considered to cover the designated polymer made with any free-radical initiator regardless of the amount used, appears on these tapes for the appropriate polymers that were included in the 1990 Supplement. The tapes do not include this flag for polymers that were listed in the 1985 Edition. A review of the statistics for the amounts of CBI and non-CBI records on the source file and the file that produced these tapes, as well as the types of data elements selected, confirms that no TSCA CBI data are on the tapes.

Keywords: *Data file, *Chemical compounds, *Environmental surveys, Pollution, Magnetic tapes, Revisions, Polymers, Toxic substances, *Toxic Substances Control Act, *Toxic Substance Inventory, CAS Registry Number, Molecular formula.

PB91-507319/REB CP **T02**
Commenced PMN Case Number Cross-Reference File to Chemical Abstracts Registry Number or Accession Number, January 1991. Data file.
Environmental Protection Agency, Washington, DC.
Jan 91, mag tape EPA/DF/MT-91/083
System: IBM 3090 400E; MVS/ESA SP3.1.OE operating system. See also PB91-507301.
Available in 9-track EBCDIC character set, 1600 bpi. For 6250 bpi, the price is T02.

The Commenced PMN Case Number Concordance or Cross-Reference file contains PMN Case Numbers cross-referenced to Chemical Abstracts (CAS) Registry Numbers and Environmental Protection Agency (EPA) Accession Numbers assigned to the substances described in PMN Notices of Commencement of Manufacture or Import. If no claim of confidentiality for the substance identity was made when the Notice of Commencement was submitted, or if the submitter subsequently withdrew the claim of confiddEntlality for the substance identity, then the substance will have a CAS Registry Number. If Confidentiality was claimed for the substance in the Notice of Commencement and there has been no change to that claim, then the substance will have an EPA Accession Number, which is a unique five or six-digit number EPA assigns to each confidential substance added to the Toxic Substances Control Act (TSCA) Inventory. The file is in Case Number order. Associated with each Case Number is one or more CAS Registry Numbers or EPA Accession Numbers. Typically there will be only one of these numbers associated with a Case Number, however where more than one unique substance is encompassed by a single commenced PMN, the appropriate CAS Registry Number or EPA Accession Number for each substance will be included in the workunit for that particular Case number. Each issue of the file is cummulative.

Keywords: *Data file, *Chemicals, Magnetic tapes, *Commenced PMN case numbers, *Chemical abstracts, Toxic Substances Control Act, Environmental Protection Agency.

PB91-507376/REB CP **D03**
OZIPR: Ozone Isopleth Plotting Package (Research Version) (for Microcomputers). Software.
Environmental Protection Agency, Research Triangle Park, NC. Atmospheric Research and Exposure Assessment Lab.
16 Jul 90, 2 diskettes EPA/SW/DK-91/084
System: IBM or IBM compatible; PC DOS or MS-DOS Version 2.0 or higher operating system, 256K. Language: FORTRAN.
The software is on two 1.2M, 5 1/4 inch diskettes, high density. Documentation included; may be ordered separately as PB91-175877.

Ozone Isopleth Plotting Package (Research Version) (OZIPR) is a trajectory-based air quality simulation model that can be used with complex chemical kinetics mechanisms to relate ozone concentrations to initial levels of organic and oxides of nitrogens (NOx) precursors. OZIPR is based on previous versions of EPA's Ozone Isopleth Plotting Program, but it contains improved and expanded capabilities that make the model useful for research purposes. It serves the dual purpose of providing: (1) a simple moving box model capable of using detailed chemistry, emissions and various meteorological parameters to predict oxidant formation and (2) procedures through which the Empirical Kinetics Modeling Approach (EKMA) can be implemented for calculating emission reductions needed to achieve the National Ambient Air Quality Standard for ozone. The program is designed to run on an IBM PC/AT or fully compatible personal computer. The software package includes the executable program as well

as the source code and input/output files for nine examples.

Keywords: *Software, *Air quality, Ozonosphere, Reaction kinetics, Photochemical reactions, Models, Emission factors, Oxidants, Nitrogen oxides, Computerized simulation, Diskettes, *Ozone isopleths, Empirical Kinetics Modeling Approach.

PB91-507509/REB CP **T14**
Toxic Release Inventory (TRI), 1989. Data file.
Environmental Protection Agency, Washington, DC. Office of Toxic Substances.
1989, mag tape EPA/DF/MT-91/085
System: IBM ES 9000; OS/MVS operating system. Approximate bytes: 43,481,350. See also PB90-502030 (1988), PB89-186068 (1987).
Available in 9-track, ASCII character set, 1600 or 6250 bpi. For 6250 bpi, the price is T14. Documentation included; may be ordered separately as PB91-187500.

Section 313 of the Emergency Planning and Community Right-to-Know Act (also known as Title III) of the Superfund Amendments and Reauthorization Act of 1986 (Public Law 99-499) requires EPA to establish a National Inventory of toxic chemical emissions from certain facilities. The final Toxic Chemical Release Form R and regulations for the 1987 reporting year were published in the Federal Register on February 16, 1988 (53 FR 4500-4554). The list of toxic chemicals subject to reporting consisted initially of chemicals listed for similar reporting purposes by the States of New Jersey and Maryland. There are over 300 chemicals and categories on these lists. The reporting requirement applies to owners and operators of facilities that have 10 or more full-time employees, that are in Standard Industrial Classification (SIC) codes 20 through 39 (i.e., manufacturing facilities) and that manufacture (including importing), process or otherwise use a listed toxic chemical in excess of specified threshold quantities. The law mandates that the data be made publicly available through a computer database. The online TRI file should appeal to a broad based user audience including industry, state and local environmental agencies, emergency planning committees, the Federal Government and other regulatory groups. Another important user group is likely to be concerned citizens who, on their own or through public interest groups and public libraries, can use TRI to ask questions about chemical releases in their communities.

Keywords: *Data file, *Toxic substances, *Environmental surveys, Magnetic tapes, Information systems, Chemical compounds, Pollution regulations, Superfund, Public information, Management planning, *Toxic Release Inventory, Emergency Planning and Community Right-to-Know Act, Emission inventories.

PB91-507541/REB CP **D02**
Landfill Air Emissions Estimation Model, Version 1.1 (for Microcomputers). Software.
Environmental Protection Agency, Research Triangle Park, NC. Air and Energy Engineering Research Lab.
Sep 90, 1 diskette EPA/SW/DK-91/081
System: IBM PC; DOS 2.0 operating system, 512K. Language C.
The software is contained on one 360K, 5 1/4 inch diskette, double density. File format: ASCII. Documentation included; may be ordered separately as PB91-167718.

The Landfill Air Emissions Estimation Model is an aid for local and state agencies in estimating landfill air emission rates for nonmethane organic compounds and individual air toxics. The program will also be helpful to landfill owners and operators affected by by the upcoming New Source Performance Standard (NSPS) and Emission Guidelines for Municipal Solid Waste Landfill Air Emissions. The model is based on the Scholl Canyon Gas Generation Model, used in development of the soon-to-be-proposed regulation for landfill air emissions. The Scholl Canyon Model is a first order decay equation that uses site-specific characteristics for estimating the gas generation rate. In the absence of site-specific data, the program provides conservative default values from the soon-to-be-proposed NSPS for new landfills and emission guidelines for existing landfills. These default values may be revised based on future information collected by the Environmental Protection Agency.

Keywords: *Earth fills, *Software, *Air pollution standards, *Computerized simulation, Pollution regulations, Diskettes, New Source Performance Standards, Guidelines, State government, Concentration(Composition), Toxic substances, Nonmethane hydrocarbons, Waste disposal, Site surveys, Study estimates, *Landfill Air Emissions Estimation Model.

PB91-780163/REB PC**$28.75**/MF**$10.00**
Field Citations Training: Instructor's Manual.
Environmental Protection Agency, Washington, DC. Office of Underground Storage Tanks.
Feb 91, 153p EPA/530/UST-91/015
See also PB91-780171.

The manual is designed to be used as part of an overall inspector training course or as a stand alone training on field citation techniques. It contains a basic outline for the material to be covered in the course, specific instructions for class activities which will reinforce the training concepts and encourage class participation, hard copies of hand-outs for the class, and suggestions for program-specific materials that could be developed at the state or local level.

Keywords: *Inspection, *Instructors, *Environmental protection, *Personnel development, Specialized training, Institutional facilities, Pollution regulations, Education, Implementation, Administrative procedures, Law enforcement, Notice of probable violation, Decision making, *Training manuals, *Field citation program.

PB91-780171/REB PC**$21.25**/MF**$10.00**
Field Citations Training: Student's Manual.
Environmental Protection Agency, Washington, DC. Office of Underground Storage Tanks.
Feb 91, 54p EPA/530/UST-91/016
See also PB91-780163.

The Student's Manual is designed to be used as part of an overall inspector training course or as a stand alone training manual on field citation techniques. The training course covers the steps involved in designing, setting up and implementing a field citation program.

Keywords: *Inspection, *Personnel development, *Students, *Environmental protection, Pollution regulations, Education, Design criteria, Implementation, Administrative procedures, Law enforcement, Notice of probable violation, Decision making, Institutional facilities, Specialized training, *Training manuals, *Field citation program.

PB91-921200/REB Standing Order
Superfund Technical Publication. Irregular repts.
Environmental Protection Agency, Washington, DC. Office of Emergency and Remedial Response.
1991, 1p*
Paper copy available on Standing Order, deposit account required (U.S., Canada, and Mexico $500; all others $1000). Single copies also available in paper copy or microfiche.

The Technical Publications are users manuals, annual reports, study summaries, guidance documents, responses to directives and technology documents.

Keywords: *Hazardous materials, *Waste treatment, Manuals, Abstracts, Instructions, Technical assistance, Directories, Periodicals, *Superfund.

PB91-921207/REB PC **A06**/MF **A01**
Superfund: Focusing on the Nation at Large. A Decade of Progress at National Priorities List Sites.
Environmental Protection Agency, Washington, DC. Office of Emergency and Remedial Response.
Sep 90, 103p* EPA/540/8-90/009
Supersedes PB91-921202. See also PB91-921209 through PB91-921258.
Paper copy available on Standing Order, deposit account required (minimum deposit $200 U.S., Canada, and Mexico; all others $400). Single copies also available in paper copy or microfiche.

The publication summarizes the progress made in hazardous site clean-up of sites on the National Priorities List (NPL). It also provides a state-by-state summary of 422 improved sites. 'Superfund: Focusing on the Nation at Large' is supplemented by individual State books which contain detailed information on all 1,236 NPL sites.

Keywords: *Superfund, *Hazardous materials, *Remedial action, *Pollution control, Site surveys, Public opinion, Industrial plants, National government, Long term effects, Performance standards, Environmental effects, Risk assessment, *National Priorities List, *Cleanup.

PB91-921209/REB Standing Order
National Priorities List Sites.
Environmental Protection Agency, Washington, DC. Office of Emergency and Remedial Response.
1990,50 issues
Paper copy available on Standing Order, deposit account required (minimum deposit $200 U.S., Canada and Mexico; all others $400). Single copies also available in paper copy or microfiche.

Together with the companion National Overview volume this publication provides general Superfund background information and descriptions of activities at each State National Priorities List (NPL) site. The document is intended to clearly describe what the problems are, what EPA and others participating in site cleanups are doing, and how the Nation can move ahead in solving these serious problems. The State volume compiles site summary fact sheets on each State site being cleaned up under the Superfund program.

Alabama. 1990, 56p PC A04/MF A01 **PB91-921209/REB**
Alaska. 1990, 42p PC A03/MF A01 **PB91-921210/REB**
Arizona and Nevada. 1990, 59p PC A04/MF A01 **PB91-921211/REB**
Arkansas. 1990, 53p PC A04/MF A01 **PB91-921212/REB**
California. 1990, 222p PC A10/MF A02 **PB91-921213/REB**
Colorado. 1990, 70p PC A04/MF A01 **PB91-921214/REB**
Connecticut. 1990, 59p PC A04/MF A01 **PB91-921215/REB**
Delaware. 1990, 75p PC A04/MF A01 **PB91-921216/REB**
Florida. 1990, 147p PC A07/MF A01 **PB91-921217/REB**
Georgia. 1990, 59p PC A04/MF A01 **PB91-921218/REB**
Hawaii. 1990, 43p PC A03/MF A01 **PB91-921219/REB**
Idaho. 1990, 50p PC A03/MF A01 **PB91-921220/REB**
Illinois. 1990, 111p PC A06/MF A01 **PB91-921221/REB**
Indiana. 1990, 108p PC A06/MF A01 **PB91-921222/REB**
Iowa. 1990, 75p PC A04/MF A01 **PB91-921223/REB**
Kansas. 1990, 53p PC A04/MF A01 **PB91-921224/REB**
Kentucky. 1990, 66p PC A04/MF A01 **PB91-921225/REB**
Louisiana. 1990, 53p PC A04/MF A01 **PB91-921226/REB**
Maine. 1990, 49p PC A03/MF A01 **PB91-921227/REB**
Maryland. 1990, 55p PC A04/MF A01 **PB91-921228/REB**
Massachusetts. 1990, 90p PC A05/MF A01 **PB91-921229/REB**
Michigan. 1990, 202p PC A10/MF A02 **PB91-921230/REB**
Minnesota. 1990, 122p PC A06/MF A01 **PB91-921231/REB**
Mississippi. 1990, 35p PC A03/MF A01 **PB91-921232/REB**
Missouri. 1990, 82p PC A05/MF A01 **PB91-921233/REB**
Montana. 1990, 54p PC A04/MF A01 **PB91-921234/REB**
New Jersey. 1990, 276p PC A13/MF A02 **PB91-921235/REB**
Nebraska. 1990, 43p PC A03/MF A01 **PB91-921236/REB**
New Hampshire. 1990, 65p PC A04/MF A01 **PB91-921237/REB**
New Mexico. 1990, 51p PC A04/MF A01 **PB91-921238/REB**
New York. 1990, 209p PC A10/MF A02 **PB91-921239/REB**
North Carolina. 1990, 78p PC A05/MF A01 **PB91-921240/REB**
North and South Dakota. 1990, 42p PC A03/MF A01 **PB91-921241/REB**

Ohio. 1990, 100p PC A05/MF A01 **PB91-921242/REB**
Oklahoma. 1990, 51p PC A04/MF A01 **PB91-921243/REB**
Oregon. 1990, 46p PC A03/MF A01 **PB91-921244/REB**
Pennsylvania. 1990, 245p PC A11/MF A02 **PB91-921245/REB**
Rhode Island. 1990, 54p PC A04/MF A01 **PB91-921246/REB**
South Carolina. 1990, 78p PC A05/MF A01 **PB91-921247/REB**
Tennessee. 1990, 61p PC A04/MF A01 **PB91-921248/REB**
Texas. 1990, 92p PC A05/MF A01 **PB91-921249/REB**
Utah. 1990, 54p PC A04/MF A01 **PB91-921250/REB**
Vermont. 1990, 45p PC A03/MF A01 **PB91-921251/REB**
Virginia. 1990, 75p PC A04/MF A01 **PB91-921252/REB**
Washington. 1990, 130p PC A07/MF A01 **PB91-921253/REB**
West Virginia. 1990, 39p PC A03/MF A01 **PB91-921254/REB**
Wisconsin. 1990, 117p PC A06/MF A01 **PB91-921255/REB**
Wyoming. 1990, 35p PC A03/MF A01 **PB91-921256/REB**
Puerto Rico. 1990, 47p PC A03/MF A01 **PB91-921257/REB**
American Samoa, Guam and Trust Territories. 1990, 36p PC A03/MF A01 **PB91-921258/REB**

PB91-921259/REB PC **A11**/MF **A02**
Environmental Protection Agency, Washington, DC. Office of Emergency and Remedial Response.
Analysis of State Superfund Programs: 50-State Study, 1990 Update.
Environmental Law Inst., Washington, DC.
Sep 90, 226p EPA/540/8-91/002
Contract EPA-68-W8-0098
See also PB90-272733. Sponsored by Environmental Protection Agency, Washington, DC. Office of Emergency and Remedial Response.
Paper copy available on Standing Order, deposit account required (minimum deposit $200 U.S., Canada, and Mexico; all others $400). Single copies also available in paper copy or microfiche.

Updates a study initially conducted in 1989 by the Environmental Law Institute for OERR. The study examines site cleanup capabilities in all 50 States and provides descriptions of statutes, program organization, funding and cleanup procedures. This revised version also contains an analysis of political subdivision involvement in the cleanup process. The report provides detailed information for each State in a 'State Summaries' chapter and in 50-State tables that facilitate comparisons between States.

Keywords: *Superfund, *State programs, *Remedial action, *Hazardous materials, *Waste management, Revisions, States(United States), Tables(Data), Waste disposal, Comprehensive planning, Law enforcement, Compliance standards, Financing, *Remedial response, *US EPA Regions 1-10, Cleanup operations, National Priorities List, Potentially responsible parties, Cooperative agreements, Community relations.

PB91-921260/REB PC **A07**/MF **A01**
Superfund Emergency Response Actions: A Summary of Federally Funded Removals. Fourth Annual Report - Fiscal Year 1989.
Environmental Protection Agency, Washington, DC. Office of Emergency and Remedial Response.
Sep 90, 130p* EPA/540/8-90/014, EPA/9360.6-05
Paper copy available on Standing Order, deposit account required (minimum deposit $200 U.S., Canada, and Mexico; all others $400). Single copies also available in paper copy or microfiche.

Summarizes short-term actions (removals) undertaken by EPA and the U.S. Coast Guard in response to hazardous substance incidents. The documents present an historical perspective of the program and summarize removal actions taken.

Keywords: *Superfund, *Emergency planning, *Hazardous materials, *Waste management, Site characterization, National government, State government, Local government, Oil spills, Land pollution, Historical aspects, Remedial action, Tables(Data), *Remedial response, Cleanup operations, Cooperation agreements, US EPA Regions 1-10, National Priorities List.

PB91-921300/REB Standing Order
Superfund Fact Sheet and Directives. Irregular repts.
Environmental Protection Agency, Washington, DC. Office of Emergency and Remedial Response.
1991, 1p*
Paper copy available on Standing Order, deposit account required (U.S., Canada, and Mexico $150; all others $300). Also available individually in paper copy or microfiche.

The fact sheets are brief descriptions of hazardous waste issues written for public understanding or summaries of technology and technical reports. Directives contain policy decisions for EPA regional managers.

Keywords: *Government policies, *Hazardous materials, Abstracts, Instructions, Decision making, Managers, Technical reports, *Superfund, EPA.

PB91-921301/REB PC **A01**/MF **A01**
Streamlining the RI/FS for CERCLA Municipal Landfill Sites. Fact sheet.
Environmental Protection Agency, Washington, DC. Office of Emergency and Remedial Response.
Sep 90, 5p EPA/9355.3-11/FS
Paper copy available on Standing Order, deposit account required (minimum deposit $150 U.S., Canada, and Mexico; all others $300). Single copies also available in paper copy or microfiche.

Approximately 20 percent of the sites on the National Priorities List (NPL) are municipal landfills which typically share similar characteristics. Because of the similarity the Superfund Program anticipates that their remediation will involve similar waste management approaches. As stated in the National Contingency Plan, EPA expects that containment technologies will generally be appropriate for waste that poses a relatively low long-term threat or where treatment is impracticable (Sec. 300.430(a)(1)(iii)(B),55FR8846(March 8, 1990)). In addition, EPA expects treatment to be considered for identifiable areas of highly toxic and/or mobile material that constitute the principal threat(s) posed by the site (Sec. 300.430(a)(1)(iii)(A)). The similarity in landfill characteristics and the NCP expectations make it possible to streamline the RI/FS for municipal landfills with respect to site characterization, risk assessment, and the development of remedial action alternatives. The fact sheet outlines available streamlining techniques for each of these three phases of an RI/FS. Additional information, including tools to assist in scoping activities, will be included in the document Conducting Remedial Investigations/Feasibility Studies for CERCLA Municipal Landfill Sites (November 1990, Directive No. 9355.3-11). The document will be available from the Center for Environmental Research Information (FTS 684-7562 or 513-569-7562).

Keywords: *Superfund, *Waste management, *Remedial action, *Municipal wastes, *Earth fills, Feasibility studies, Site surveys, Ground water, Environmental transport, Risk assessment, Ground cover, Leaching, Technology utilization, Methane, Substitutes, *Office of Solid Waste and Emergency Response, *Comprehensive Environmental Response Compensation and Liability Act, National Priorities List, National Contingency Plan.

PB91-921302/REB PC **A01**/MF **A01**
Closing the NPL Book under the Original HRS. Fact sheet.
Environmental Protection Agency, Washington, DC. Office of Emergency and Remedial Response.
Nov 90, 5p EPA/9320.7-04/FS
Paper copy available on Standing Order, deposit account required (minimum deposit $150 U.S., Canada, and Mexico; all others $300). Single copies also available in paper copy or microfiche.

The Fact Sheet discusses the closing of the Old NPL under the original HRS. Since 1982, the U.S. Environmental Protection Agency (EPA) has been preparing the National Priorities List (NPL). The list informs the public of uncontrolled hazardous waste sites that warrant further investigation to determine if they pose risks to public health or the environment. Such sites are eligible for long-term 'remedial action' financed under the Trust Fund established by the Comprehensive Environmental Response, Compensation, and Liability Act as amended by the Superfund Amendments and Reauthorization Act of 1986 (SARA). Sites are placed on the NPL primarily on the basis of their scores under EPA's Hazard Ranking System (HRS) model developed in 1982. EPA has now revised the HRS in response to SARA. The revised HRS, which will become effective late in February 1991, 90 days after its publication in the Federal Register, is a more comprehensive and accurate scoring system than the original HRS and will add new types of sites to the NPL.

Keywords: *Superfund, *Waste management, *Hazardous materials, Pollution regulations, Site surveys, Public information, Remedial action, Long term effects, Comprehensive planning, Risk assessment, *Office of Solid Waste and Emergency Response, *National Priorities List, *Hazard Ranking System.

PB91-921303/REB PC **A03**/MF **A01**
Revised Hazard Ranking System: Background Information. Fact sheet.
Environmental Protection Agency, Washington, DC. Office of Emergency and Remedial Response.
Nov 90, 13p EPA/9320.7-03/FS
Paper copy available on Standing Order, deposit account required (minimum deposit $150 U.S., Canada, and Mexico; all others $300). Single copies also available in paper copy or microfiche.

The Fact Sheet discusses the Hazard Ranking System (HRS) in response to the Superfund Amendments and Reauthorization Act of 1986 (SARA). The HRS is the scoring system EPA uses to assess the relative threat associated with the release or potential release of hazardous substances from a waste site. The HRS score is the primary criterion EPA uses to determine whether a site should be placed on the National Priorities List (NPL). The NPL identifies sites that warrant further investigation to determine if they pose risks to public health or the environment. Sites on the NPL are eligible for long-term 'remedial action' financed under the Comprehensive Environmental Response, Compensation, and Liability Act of 1980 (CERCLA), as amended by SARA. SARA authorizes a 'Hazardous Substances Superfund' totalling $8.5 billion over 5 years to pay costs not assumed by those responsible for problems at a site. The HRS uses data that can be collected relatively quickly and inexpensively, thus allowing most Superfund resources to be directed to remedial actions at sites on the NPL.

Keywords: *Superfund, *Hazardous materials, *On-site investigations, *Waste management, US EPA, Revisions, Remedial action, Risk assessment, Public health, Path of pollutants, Decision making, Ecosystems, Air pollution, Exposure, Water pollution, Ground water, Environmental transport, Surface waters, Soil contamination, Land pollution, *Hazard Ranking System, *Office of Solid Waste and Emergency Response, National Priorities List.

PB91-921304/REB PC **A01**/MF **A01**
Exemptions from the Statutory Limits on Removal Actions. Fact sheet.
Environmental Protection Agency, Washington, DC. Office of Emergency and Remedial Response.
Nov 90, 2p EPA/9360.0-12/FS
Paper copy available on Standing Order, deposit account required (minimum deposit $150 U.S., Canada, and Mexico; all others $300). Single copies also available in paper copy or microfiche.

The Fact Sheet summarizes two exemptions from the statutory time and dollar limits on removal actions provided for in section 104(c) of CERCLA. The first is the 'emergency' exemption for when a response action isimmediately required to protect public health or welfare or the environment. The second is the 'consistency' exemption for when further response actions are appropriate and consistent.

Keywords: *Superfund, *Remedial action, *Waste management, Emergency planning, Environmental protection, Environmental transport, Pollution regulations, Exceptions, *Office of Solid Waste and Emergency Response, *Comprehensive Environmental Response Compensation and Liability Act, Remedial response.

PB91-921305/REB PC **A02**/MF **A01**
Revised Hazard Ranking System: Qs and As. Fact sheet.
Environmental Protection Agency, Washington, DC. Office of Emergency and Remedial Response.
Nov 90, 8p EPA/9320.7-02/FS
Paper copy available on Standing Order, deposit account required (minimum deposit $150 U.S., Canada, and Mexico; all others $300). Single copies also available in paper copy or microfiche.

The Fact Sheet discusses U.S. Environmental Protection Agency (EPA) revised Hazard Ranking System (HRS) in response to the Superfund Amendments and Reauthorization Act (SARA). These revised HRS Qs and As address the SARA requirements for the revised HRS, specific revisions to the HRS, the impact of the revised HRS on the site assessment and remedial processes, and selection of the cutoff score.

Keywords: *Superfund, *Hazardous materials, *Waste management, US EPA, Site surveys, Remedial action, Public information, Risk assessment, Path of pollutants, Environmental transport, Decision making, Revisions, *Office of Solid Waste and Emergency Response, *Hazard Ranking System, National Priorities List.

PB91-921306/REB PC **A01**/MF **A01**
Public Awareness Signs at Superfund Sites. Fact sheet.
Environmental Protection Agency, Washington, DC. Office of Emergency and Remedial Response.
Oct 90, 2p EPA/9375.5-10/FS
Paper copy available on Standing Order, deposit account required (minimum deposit $150 U.S., Canada, and Mexico; all others $300). Single copies also available in paper copy or microfiche.

The Fact Sheet is designed to inform individuals involved in the Superfund program about the need to post signs at every Superfund site. Superfund sites have been and will continue to be of interest and concern to people in surrounding communities and to the public in general. Through the posting of signs at each site, the Superfund program can work to promote continued interaction with communities as well as assure that interested parties can access information or report unusual or criminal activities.

Keywords: *Superfund, *Waste management, *Hazardous materials, Public information, Pollution regulations, Site surveys, Remedial action, *Office of Solid Waste and Emergency Response, *Signs.

PB91-921307/REB PC **A01**/MF **A01**
Revised Hazard Ranking System: An Improved Tool for Screening Superfund Sites. Fact sheet.
Environmental Protection Agency, Washington, DC. Office of Emergency and Remedial Response.
Nov 90, 4p EPA/9320.7-01/FS
Paper copy available on Standing Order, deposit account required (minimum deposit $150 U.S., Canada, and Mexico; all others $300). Single copies also available in paper copy or microfiche.

The Fact Sheet discusses the revised HRS which retains the same cutoff score and basic approach as the original HRS, while incorporating SARA requirements as well as improvements identified as necessary by EPA and the public. The revised HRS retains the ground water, surface water, and air pathways, drops the direct contact and fire/explosion pathways, and adds a fourth pathway, soil exposure. Several key provisions of the revised HRS make it more comprehensive. Other provisions make the revised HRS more accurate. The complexity and scope of the issues involved in revising the HRS required EPA to get widespread input. The majority of the commenters believed that the revised HRS represented an improvement over the original HRS. The result is a revised HRS that is a practical and effective tool in identifying the nation's worst hazardous waste sites.

Keywords: *Superfund, *Hazardous materials, *On-site investigations, *Waste management, US EPA, Revisions, Land pollution, Air pollution, Water pollution, Decision making, Exposure, Ecosystems, Environmental transport, Path of pollutants, Soil contamination, Risk assessment, Public health, *Office of Solid Waste and Emergency Response, *Hazard Ranking System, National Priorities List.

PB91-921308/REB PC **A01**/MF **A01**
Long-Term Contracting Strategy for Superfund. Fact sheet.
Environmental Protection Agency, Washington, DC. Office of Emergency and Remedial Response.
Sep 90, 4p EPA/9242.6-07/FS
Paper copy available on Standing Order, deposit account required (minimum deposit $150 U.S., Canada, and Mexico; all others $300). Single copies also available in paper copy or microfiche.

The U.S. Environmental Protection Agency, as discussed in the Fact Sheet, has developed a Long-Term Contracting Strategy for the Superfund program. The Agency's objectives in developing the strategy were to analyze the long-term contracting needs of the program, and to design a portfolio of Superfund contracts to meet those needs over the next ten years. This strategic planning effort was recommended by the 1989 Agency report on A Management Review of the Superfund Program.

Keywords: *Superfund, *Waste management, *Hazardous materials, *Contract administration, Long term effects, Flow charting, Law enforcement, Pollution regulations, Remedial action, Budgeting, State implementation plans, Regional analysis, Hazardous materials transportation, Waste disposal, *Office of Solid Waste and Emergency Response, Preremedial actions.

PB91-921309/REB PC **A01**/MF **A01**
CERCLA Compliance with the RCRA Toxicity Characteristics (TC) Rule: Part 2. Fact sheet.
Environmental Protection Agency, Washington, DC. Office of Emergency and Remedial Response.
Oct 90, 5p EPA/9347.3-11/FS
Paper copy available on Standing Order, deposit account required (minimum deposit $150 U.S., Canada, and Mexico; all others $300). Single copies also available in paper copy or microfiche.

The Fact Sheet discusses CERCLA remedial actions which must comply with the requirements of the Resource Conservation and Recovery Act (RCRA) when they are determined to be applicable or relevant and appropriate requirements (ARARs) unless a waiver is justified. For RCRA Subtitle C hazardous waste requirements to be applicable, the CERCLA response action must constitute either treatment, storage, transport, or disposal of a RCRA hazardous waste. Therefore, to make determinations about the applicability or relevance and appropriateness of RCRA requirements, site managers need to understand how to identify whether a CERCLA waste is a RCRA hazardous waste (including when a waste exhibits the newly promulgated toxicity characteristics (TC)). The purpose of the guide, the second dealing with the TC rule (see ARARs Qs & As, Compliance with the Toxicity Characteristics Rule: Part I, May 1990, Publication 9234.2-08FS) is to provide a general framework for managing CERCLA wastes in accordance with the new requirements.

Keywords: *Superfund, *Waste management, *Hazardous materials, *Remedial action, *Toxic substances, Standards compliance, Ground disposal, Waste disposal, Waste treatment, Waste storage, Hazardous materials transportation, Leaching, Environmental transport, Decision making, Management planning, *Office of Solid Waste and Emergency Response, *Comprehensive Environmental Response Compensation and Liability Act, Resource Conservation and Recovery Act, Applicable or Relevant and Appropriate Requirements, Remedial response, Record of Decision.

PB91-921310/REB PC **A02**/MF **A01**
Obtaining a Soil and Debris Treatability Variance for Removal Actions. Superfund LDR Guide No. 6B. Fact sheet.
Environmental Protection Agency, Washington, DC. Office of Emergency and Remedial Response.
Sep 90, 6p EPA/9347.3-06B/FS
Paper copy available on Standing Order, deposit account required (minimum deposit $150 U.S., Canada, and Mexico; all others $300). Single copies also available in paper copy or microfiche.

The Office of Emergency and Remedial Response (OERR) issued a series of Superfund LDR Guides in July and December of 1989. Since the issuance of these guides, the Environmental Protection Agency, with cooperation from outside parties (e.g., environmental groups, industry representatives), has conducted an analysis of the potential impacts associated with applying the LDR treatment standards to Superfund and RCRA Corrective Action cleanups. As a result of these analyses, it was decided that they Agency will promulgate a third set of treatment standards (in addition to the wastewater and nonwastewater categories currently in effect) specifically for soil and debris wastes. In the interim, there is the presumption that CERCLA response actions involving the placement of soil and debris contaminated with RCRA restricted wastes will utilize a Treatability Variance to comply with the LDRs and that, under these variances, the treatment levels outlined in Superfund LDR Guide 6B will serve as alternative 'treatment standards' for removal action. The guide has been prepared to outline the process for obtaining and complying with a Treatability Variance for soil and debris that are contaminated with RCRA hazardous wastes until such time that the Agency promulgates treatment standards for soil and debris.

Keywords: *Debris, *Superfund, *Waste treatment, *Hazardous materials, *Guidelines, *Remedial action, *Soil contamination, Pollution regulations, Ground disposal, Waste disposal, Standards compliance, Best technology, Biological treatment, Land pollution, Technology utilization, Substitutes, Thresholds(Perception), Office of Emergency and Remedial Response, Resource Conservation and Recovery Act, Cooperative agreements, Remedial response.

PB91-921311/REB PC **A02**/MF **A01**
ARARs Q's and A's: State Ground-Water Antidegradation Issues. Fact sheet.
Environmental Protection Agency, Washington, DC. Office of Emergency and Remedial Response.
Jul 90, 9p EPA/9234.2-11/FS
Paper copy available on Standing Order, deposit account required (minimum deposit $150 U.S., Canada, and Mexico; all others $300). Single copies also available in paper copy or microfiche.

The Fact Sheet discusses, section 121(d)(2) of CERCLA, as amended by the 1986 Superfund Amendments and Reauthorization Act (SARA), requires that remedial actions must at least attain Federal and more stringent State applicable or relevant and appropriate requirements (ARARs) upon completion of the remedial action. The Q's and A's fact sheet is designed to provide guidance on the status of State ground-water antidegradation provisions as potential ARARs for CERCLA ground-water and soil remedial actions. The guidance in the fact sheet reiterates Agency policy already in practice in EPA's Regional offices. The goal and policy of the Superfund program is to return usable ground water to its beneficial uses within the timeframe that is reasonable, given the particular circumstances of the site. In addition to their goal of groundwater cleanup, Superfund has a nondegradation policy in that they strive for the prevention of further degradation of the ground water during their remedial actions. However, it should be noted that more stringent State standards than those imposed by EPA policy may be imposed by State antidegradation requirements. Such State requirements, if they have been determined to be ARARs for the site, would have to be met (e.g., by meeting the discharge requirements) or waived (e.g., by the interim remedy waiver). Nevertheless, even where temporary degradation of the ground water may be required during the remedial action, they will provide protection by restricting access or providing institutional controls, and EPA response actions will ultimately result in restoration of the ground water's beneficial uses.

Keywords: *Superfund, *Hazardous materials, *Water pollution abatement, *Land pollution abatement, *Ground water, *Waste management, State government, Soil contamination, Remedial action, Regional analysis, Water resources development, Pollution regulations, Environmental protection, *Applicable or Relevant and Appropriate Requirements, *Office of Solid Waste and Emergency Response.

PB91-921313/REB PC **A01**/MF **A01**
Compliance with Third Third Requirements Under the LDRs. Superfund LDR Guide No. 8. Fact sheet.
Environmental Protection Agency, Washington, DC. Office of Emergency and Remedial Response.
Oct 90, 4p EPA/9347.3-08/FS
Paper copy available on Standing Order, deposit account required (minimum deposit $150 U.S., Canada,

and Mexico; all others $300). Single copies also available in paper copy or microfiche.

The 1984 Hazardous and Solid Waste Amendments (HSWA) require EPA to promulgate regulations restricting the land disposal of RCRA hazardous wastes. EPA previously promulgated regulations restricting the land disposal of solvent- and dioxin-containing, California list, First Third, and Second Third wastes. The Guide (the eigth in a series of LDR guides prepared by the Office of Emergency and Remedial Response (OERR)) summarizes the key provisions of the Third Third LDR rule and discusses potential implications for CERCLA response actions. More detailed guidance on Superfund compliance with the LDRs is being prepared by the Office of Solid Waste and Emergency Response (OSWER).

Keywords: *Superfund, *Guidelines, *Hazardous materials, *Waste treatment, *Remedial action, Pollution regulations, Ground disposal, Standards compliance, Radioactive wastes, Pollution sources, Solvents, Toxic substances, Waste water, Land pollution, Technology utilization, Resource Conservation and Recovery Act, Remedial response, Office of Emergency and Remedial Response.

PB91-921314/REB PC **A03**/MF **A01**
Risk Assessment Guidance for Superfund. Volume 1. Human Health Evaluation Manual. Supplemental Guidance: 'Standard Default Exposure Factors'. Final interim rept. (Directive).
Environmental Protection Agency, Washington, DC. Office of Emergency and Remedial Response.
25 Mar 91, 28p OSWER-9285.6-03
See also PB90-155581.
Paper copy available on Standing Order, deposit account required (minimum deposit $150 U.S., Canada, and Mexico; all others $300). Single copies also available in paper copy or microfiche.

The document supplements the Risk Assessment Guidance for Superfund (RAGS): Human Health Evaluation Manual, Part A. Where exposure factors presented in the guidance differ from those in Part A, the values found in the guidance supersede those in Part A. The guidance was developed to encourage a consistent approach to characterizing potential human exposures at Superfund sites. The exposure factors presented in the document are generally considered most appropriate for estimating Reasonable Maximum Exposures (RME), and should be used in baseline risk assessments unless alternate or site-specific values can be clearly justified by supporting data.

Keywords: *Public health, *Humans, *Exposure, *Hazardous materials, Pollution control, Manuals, Sites, Guidelines, Land use, Concentration(Composition), Soils, Dust, Inhalation, Food consumption, Vegetables, Path of pollutants, Meat, Fishes, Organic compounds, Potable water, *Superfund, *Risk assessment.

PB91-921315/REB PC **A03**/MF **A01**
Assessing Reports of Continuous Releases of Hazardous Substances: A Guide for EPA Regions.
Environmental Protection Agency, Washington, DC. Office of Emergency and Remedial Response.
Oct 90, 18p EPA/540/G-91/002, OSWER DIRECTIVE-9360.7-04
Paper copy available on Standing Order, deposit account required (minimum deposit $200 U.S., Canada, and Mexico; all others $400). Single copies also available in paper copy or microfiche.

Reporting continuous releases of hazardous substances that equal or exceed a reportable quantity (RQ) has been required under the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) since its enactment in 1980. Section 103(f)(2) of CERCLA provides that releases of hazardous substances that are continuous and stable in quantity and rate may be reported annually or whenever there is a statistically significant increase (SSI). The purpose of the guidance document is to provide assistance to the EPA Regions by discussing and making recommendations regarding the options available for evaluating reports of continuous releases. The effective implementation of the continuous release reporting regulation will depend largely on whether the EPA Regions are able to fully and easily evaluate the continuous release reports they receive.

Keywords: *Hazardous materials, *Guidelines, *Reporting requirements, *Superfund, Assessments, Regional analysis, Information transfer, Risk assessment, Notification procedures, Pollution sources, Pollution regulations, Performance evaluation, Notice of probable violation, Standards compliance, *US EPA Regions 1-10, *Comprehensive Environmental Response Compensation and Liability Act, *Superfund, Emergency Response Notification System.

PB91-921316/REB PC **A01**/MF **A01**
CERCLIS - WasteLAN - CleanLAN. Fact sheet.
Environmental Protection Agency, Washington, DC. Office of Emergency and Remedial Response.
Apr 91, 3p* OSWER-9221.2-01FS
Paper copy available on Standing Order, deposit account required (minimum deposit $150 U.S., Canada, and Mexico; all others $300). Single copies also available in paper copy or microfiche.

CERCLIS, WasteLAN and CleanLAN information management systems are an integral component of the Superfund program site planning and management structure and progress reporting. These three integrated systems provide information for Superfund regional program and project management as well as reporting activities to EPA management, Congress, USACE and the public.

Keywords: *Program management, *Information systems, *Hazardous materials, Regional analysis, Sites, Project planning, Land use, Design, Scheduling, Reporting, *Superfund, *Comprehensive Environmental Response Compensation and Liability Act of 1980, PC, Fact sheets.

PB91-921317/REB PC **A01**/MF **A01**
Guide to Developing Action Memorandums. Fact sheet.
Environmental Protection Agency, Washington, DC. Office of Emergency and Remedial Response.
Dec 90, 5p OSWER-9360.3-01FS
Paper copy available on Standing Order, deposit account required (minimum deposit $150 U.S., Canada, and Mexico; all others $300). Single copies also available in paper copy or microfiche.

The fact sheet describes the essential components of Action memorandums used to initiate a removal action, as well as special cases like enforcement-lead removals and special circumstances such as actions that require additional funds, a change in the scope of response, or an exemption to the statutory limits under section 104(c) of CERCLA. EPA prepares Action Memos for all Fund-lead removal actions. Action Memos describe a site's history, current activities, health and environmental threats, and proposed actions and costs.

Keywords: *Superfund, *Hazardous materials, *Waste management, Guidelines, Decisions and orders, Remedial action, Law enforcement, Site surveys, Environmental effects, Public health, Law enforcement, Cost analysis, Cost repayment, *Office of Solid Waste and Emergency Response, Remedial response.

PB91-921318/REB PC **A01**/MF **A01**
Superfund Guide to RCRA Management Requirements for Mineral Processing Wastes. Fact sheet.
Environmental Protection Agency, Washington, DC. Office of Emergency and Remedial Response.
Jan 91, 5p OSWER-9347.3-12FS
Paper copy available on Standing Order, deposit account required (minimum deposit $150 U.S., Canada, and Mexico; all others $300). Single copies also available in paper copy or microfiche.

The report summarizes recent revisions to the 1980 mining waste exclusion, explains the potential effects of these revisions on waste management options for mineral processing wastes, and provides a general framework for managing mineral processing wastes at CERCLA sites in accordance with RCRA land disposal restrictions (LDRs) and the recently promulgated toxicity characteristics (TC) rule.

Keywords: *Mining, *Solid waste disposal, *Revisions, *Hazardous materials, Guidelines, Requirements, Waste management, Regulations, Extraction, Beneficiation, Toxicity, Earth fills, *Superfund, *Mineral processing wastes, Resource Conservation and Recovery Act.

PB91-921319/REB PC **A01**/MF **A01**
U.S. Bureau of Reclamation Assistance to the Superfund Program. Fact sheet.
Environmental Protection Agency, Washington, DC. Office of Emergency and Remedial Response.
Dec 90, 5p OSWER-9355.15FS
Paper copy available on Standing Order, deposit account required (minimum deposit $150 U.S., Canada, and Mexico; all others $300). Single copies also available in paper copy or microfiche.

The fact sheet outlines assistance available from the Department of the Interior's Bureau of Reclamation's Denver Office and the five Regional Offices. Reclamation has developed expertise in total project management, including planning, engineering design, research, construction management, and in project operation and maintenance. Under an Interagency Agreement (IAG) entitled 'Superfund Management and Support Activities,' funding has been authorized for a number of activities relating to Reclamation's assistance in Superfund.

Keywords: *Superfund, *Waste management, *Hazardous materials, *Bureau of Reclamation, Decisions and orders, Remedial action, Interagency cooperation, Financing, Management planning, Operation and maintenance, Research and development, Design, *Office of Solid Waste and Emergency Response.

PB91-921320/REB PC **A02**/MF **A01**
Using State and Local Officials to Assist in Community Relations (Superfund Management Review: Recommendation No. 43.K,L). Directive.
Environmental Protection Agency, Washington, DC. Office of Emergency and Remedial Response.
28 Sep 90, 6p OSWER-9230.0-17
Paper copy available on Standing Order, deposit account required (minimum deposit $150 U.S., Canada, and Mexico; all others $300). Single copies also available in paper copy or microfiche.

The report outlines the suggestion and discusses specific methods for using State and local officials to increase Superfund's communication with the public. The study discusses recommendations that describe the use of State and local officials to serve as liaisons, to provide and maintain information, and to assist in public meetings.

Keywords: *Community relations, *Hazardous materials, Sites, Remote areas, Communicating, State government, Local government, Training, Meetings, *Superfund, Liasons, *US EPA.

PB91-921321/REB PC **A01**/MF **A01**
ARARs Q's and A's: The Fund-Balancing Waiver. Fact sheet.
Environmental Protection Agency, Washington, DC. Office of Emergency and Remedial Response.
Jan 91, 5p OSWER-9234.2-13FS
Paper copy available on Standing Order, deposit account required (minimum deposit $150 U.S., Canada, and Mexico; all others $300). Single copies also available in paper copy or microfiche.

The fact sheet implements the applicable or relevant and appropriate requirements (ARARs) provisions EPA has developed guidance and provided training to Regions and States on the identification of and compliance with ARARs. It is part of a series that provide guidance on a number of questions that arose in developing ARARs policies, in ARARs training sessions, and in identifying and complying with ARARs at specific sites. The fact sheet addresses the Fund-balancing waiver.

Keywords: *Superfund, *Waste management, *Hazardous materials, Guidelines, Compliance, Financing, Remedial action, Training analysis, Language, Administrative procedures, *Applicable or Relevant and Appropriate Requirements, *Office of Solid Waste and Emergency Response, *Fund-balancing waivers, Potentially responsible parties.

PB91-921322/REB PC **A02**/MF **A01**

Making Superfund Documents Available to the Public throughout the Cleanup Process, and Discussing Site Findings and Decisions as They are Developed (Superfund Management Review: No. 43 G, H, Q, R, T). Directive.
Environmental Protection Agency, Washington, DC. Office of Emergency and Remedial Response.
5 Nov 90, 8p OSWER-9230.0-16
Paper copy available on Standing Order, deposit account required (minimum deposit $150 U.S., Canada, and Mexico; all others $300). Single copies also available in paper copy or microfiche.

The directive summarizes five recommendations for improving Superfund efforts towards timely release of information to the public during site cleanup activities. It provides guidance for the Regions to make documents available to the public throughout the cleanup process and to discuss site findings and decisions as they are developed for the sake of more fully involving citizens in the cleanup process and ensuring two way communication between Superfund staff and local communities.

Keywords: *Superfund, *Waste management, *Hazardous materials, *Remedial action, Public information, Decisions and orders, Site surveys, Local government, Administrative procedures, State implementation plans, *Office of Solid Waste and Emergency Response, Cleanup operations, Community relations, Management reviews.

PB91-921323/REB PC **A03**/MF **A01**
Memorandum of Understanding between ORD and OERR. Directive.
Environmental Protection Agency, Washington, DC. Office of Emergency and Remedial Response.
5 Nov 90, 17p OSWER-9295.4-01
Paper copy available on Standing Order, deposit account required (minimum deposit $150 U.S., Canada, and Mexico; all others $300). Single copies also available in paper copy or microfiche.

The directive transmits a copy of the Memorandum of Understanding (MOU) between OSWER and ORD that was signed on March 10, 1990. OERR proposed the establishment of the Technology Support Center (TSC) in the Office of Health and Environmental Assessment (OHEA), Environmental Criteria Assessment Office, Cincinnati to address the human health risk assessment issues pertinent to Superfund-related activities. This MOU establishes functions and responsibilities for the TSC.

Keywords: *Superfund, *Waste management, *Hazardous materials, *Decisions and orders, Public health, Risk assessment, State implementation plans, Management planning, Administrative procedures, *Office of Solid Waste and Emergency Response, *Office of Research and Development, Office of Emergency and Remedial Response, Technical Support Centers.

PB91-921324/REB PC **A02**/MF **A01**
Final Policy on Setting RI/FS Priorities. Directive.
Environmental Protection Agency, Washington, DC. Office of Emergency and Remedial Response.
27 Dec 90, 10p OSWER-9200.3-11
Paper copy available on Standing Order, deposit account required (minimum deposit $150 U.S., Canada, and Mexico; all others $300). Single copies also available in paper copy or microfiche.

The directive summarizes the final policy on setting RI/FS prioritization. The policy's goal is to demonstrate Superfund's compliance with the Worst Problems First Policy at the earliest stage of the remedial process. It outlines the specific objectives and goals of the new policy and offers guidance to the regions on how best to implement the policy.

Keywords: *Superfund, *Waste management, *Hazardous materials, *Remedial action, Guidelines, Feasibility studies, Law enforcement, State government, Compliance, Decision making, Decisions and orders, Financial assistance, *Office of Solid Waste and Emergency Response, National Priorities List.

PB91-921325/REB PC **A02**/MF **A01**
Suggested ROD Language for Various Ground Water Remediation Options. Directive.
Environmental Protection Agency, Washington, DC. Office of Emergency and Remedial Response.
10 Oct 90, 10p OSWER-9283.1-03
Paper copy available on Standing Order, deposit account required (minimum deposit $150 U.S., Canada, and Mexico; all others $300). Single copies also available in paper copy or microfiche.

The directive provides supplemental guidance to the October 18, 1989 OSWER directive 9355.4-03, entitled 'Consideration in Ground Water Remediation at Superfund Sites,' which examined the role of ground water remediation in Superfund cleanups and recommends modifications to the current approach. It offers suggested language for Records of Decision corresponding to the recommendations 1 and 2 from the OSWER Directive. The recommendations are: (1) initiation of early or interim response measures; and (2) provision for changes in the remedy during implementation in the Record of Decision. The Directive offers standard language that may be employed, when appropriate, to correspond to site-specific remediation scenarios. Language is suggested for Final Actions, Contingency Measures/Goals, and Interim Actions.

Keywords: *Superfund, *Waste management, *Hazardous materials, *Water pollution control, *Remedial action, Ground water, Administrative procedures, Decision making, Substitutes, Language, *Office of Solid Waste and Emergency Response, *Records of Decision, Remedial response, Cleanup operations.

PB91-921326/REB PC **A03**/MF **A01**
Policy on Management of Post-Removal Site Control. Directive.
Environmental Protection Agency, Washington, DC. Office of Emergency and Remedial Response.
3 Dec 90, 16p OSWER-9360.2-02
Paper copy available on Standing Order, deposit account required (minimum deposit $150 U.S., Canada, and Mexico; all others $300). Single copies also available in paper copy or microfiche.

The directive transmits the OSWER policy on management of post-removal site control for Fund-financed removal activities and communicating decisions to States on the use of institutional controls. It provides procedures to ensure that, when necessary and to the extent practicable, provision for post-removal site control at both National Priorities List (NPL) and non-NPL sites is made prior to initiation of a Fund-financed removal action. Procedures are also provided for communicating decisions to States on the use of institutional controls when waste is left on-site following a removal action.

Keywords: *Superfund, *Waste management, *Hazardous materials, State government, Remedial action, Financing, Administrative procedures, US EPA, Regional analysis, Notification procedures, Cost repayment, *Office of Solid Waste and Emergency Response, National Priorities List, Potentially responsible parties.

PB91-921327/REB PC **A02**/MF **A01**
Superfund LDR Guide No. 6A (2nd Edition) Obtaining a Soil and Debris Treatability Variance for Remedial Actions. Fact sheet.
Environmental Protection Agency, Washington, DC. Office of Emergency and Remedial Response.
Sep 90, 7p OSWER-9347.3-06FS
Paper copy available on Standing Order, deposit account required (minimum deposit $150 U.S., Canada, and Mexico; all others $300). Single copies also available in paper copy or microfiche.

The fact sheet outlines the process for obtaining and complying with a Treatability Variance for soil and debris that are contaminated with RCRA hazardous wastes until such time that the Agency promulgates treatment standards for soil and debris. In the interim before the Agency promulgates a third set of treatment standards specifically for soil and debris wastes, there is the presumption that CERCLA response actions involving the placement of soil and debris contaminated with RCRA restricted wastes will utilize a Treatability Variance to comply with the LDRs. Treatment levels outlined in the fact sheet will serve as alternative 'treatment standards'.

Keywords: *Superfund, *Waste management, *Remedial action, *Waste treatment, *Soil treatment, *Hazardous materials, Guidelines, Pollution regulations, Waste disposal, Debris, Standards, Substitutes, Feasibility studies, *Office of Solid Waste and Emergency Response, *Treatability variance, Resource Conservation and Recovery Act, Remedial response.

PB91-921328/REB PC **A03**/MF **A01**
OSWER Superfund Telephone Directory. Directive.
Environmental Protection Agency, Washington, DC. Office of Emergency and Remedial Response.
Apr 91, 35p OSWER-9200.0-03C
See also PB90-249434.
Paper copy available on Standing Order, deposit account required (minimum deposit $150 U.S., Canada, and Mexico; all others $300). Single copies also available in paper copy or microfiche.

OSWER Superfund Telephone Directory is a compilation of Headquarters and Regional Superfund Personnel telephone numbers. It lists key contact persons.

Keywords: *Superfund, *Directories, *Personnel, Federal agencies, Regional analysis, Administrative procedures, *Office of Solid Waste and Emergency Response, *Telephone directories, US EPA Regions 1-10.

PB91-921329/REB PC **A03**/MF **A01**
Policy on Floodplains and Wetland Assessments for CERCLA Actions. Directive.
Environmental Protection Agency, Washington, DC. Office of Emergency and Remedial Response.
6 Aug 85, 15p OSWER-9280.0-02
Paper copy available on Standing Order, deposit account required (minimum deposit $150 U.S., Canada, and Mexico; all others $300). Single copies also available in paper copy or microfiche.

The directive discusses specific situations requiring preparation of a flood plains or wetlands assessment and the factors to be considered in preparing such an assessment.

Keywords: *Superfund, *Waste management, *Hazardous materials, Wetlands, Flood plains, Remedial action, Environmental impact assessments, Substitutes, Decision making, Compliance, Pollution regulations, Public opinion, *Office of Solid Waste and Emergency Response.

PB91-921330/REB PC **A03**/MF **A01**
Sampler's Guide to the Contract Laboratory Program. Directive.
Environmental Protection Agency, Washington, DC. Office of Emergency and Remedial Response.
Dec 90, 42p EPA/540/P-90/006, OSWER-9240.0-06
Paper copy available on Standing Order, deposit account required (minimum deposit $150 U.S., Canada, and Mexico; all others $300). Single copies also available in paper copy or microfiche.

The Sampler's Guide provides gu idance and direction to program clients. It is designed to clarify sampling procedures necessary to submit samples for CLP analysis. The Sampler's Guide acts as a reference for the Regions and sampling contractors to promote consistency in sampling procedures throughout the Regions and ensure the proper adherence to CLP requirements.

Keywords: *Superfund, *Guidelines, *Sample preparation, *Waste management, Administrative procedures, Soil contamination, Land pollution, Regional analysis, Laboratories, Performance evaluation, Hazardous materials, Quality assurance, Remedial action, US EPA, *Office of Solid Waste and Emergency Response, *Contract Laboratory Program.

PB91-921331/REB PC **A04**/MF **A01**
Management of Investigation-Derived Wastes during Site Inspections. Directive.
Environmental Protection Agency, Washington, DC. Office of Emergency and Remedial Response.
May 91, 70p OSWER-9345.3-02
Paper copy available on Standing Order, deposit account required (minimum deposit $150 U.S., Canada, and Mexico; all others $300). Single copies also available in paper copy or microfiche.

The guidance presents a general regulatory background and options for management of investigation-derived wastes (IDW) generated during Superfund site inspections (SIs). These wastes include soil cuttings, drilling muds, purged ground water decontamination

fluids (water and other fluids), disposable sampling equipment (DE), and disposable personal protective equipment (PPE). The National Contingency Plan (NCP) requires that management of IDW generated during SIs compiles with all applicable or relevant and appropriate requirements (ARARS) to the extent practicable. In addition, other legal and practical consideration may affect the handling of IDW. Therefore, site inspection managers and other involved parties should be familiar with this guidance, as well as the requirements of the NCP, ARARs, and EPA's interpretation of these requirements.

Keywords: *Superfund, *Waste management, *Pollution regulations, *Inspection, *Site surveys, Guidelines, Materials handling, Protective equipment, Drilling fluids, Sampling, Legal aspects, Soil contamination, *Office of Solid Waste and Emergency Response, Preremedial actions, Applicable or Relevant and Appropriate Requirements, National Contingency Plan.

PB91-921400/REB Standing Order
Superfund Records and Decisions (ROD). Irregular repts.
Environmental Protection Agency, Washington, DC. Office of Emergency and Remedial Response.
1991, 1p*
Paper copy available on Standing Order, deposit account required (U.S., Canada, and Mexico $200; all others $400). Single copies also available in paper copy or microfiche.

The Superfund Records of Decisions (RODS) are documents covering the application of specific mandates in the superfund amendments and reauthorization act of 1986. Each ROD addresses the selection of remedial action for a specific superfund site and the preference for treatment.

Keywords: *Hazardous materials, *Waste treatment, Law(Jurisprudence), Sites, Selection, Aeration, Separation, Activated carbon treatment, Containment, Solvent extraction, *Superfund, *Records of Decision, Remedial action, Cleanup.

PB91-921401/REB PC **A12**/MF **A02**
Superfund Record of Decision (EPA Region 1): Coakley Landfill, North Hampton, New Hampshire (First Remedial Action), June 28, 1990.
Environmental Protection Agency, Washington, DC. Office of Emergency and Remedial Response.
28 Jun 90, 263p* EPA/ROD/R01-90/047
Paper copy available on Standing Order, deposit account required (minimum deposit $150 U.S., Canada, and Mexico; all others $300). Single copies also available in paper copy or microfiche.

The 92-acre Coakley Landfill site is in the towns of Greenland and North Hampton, Rockingham County, New Hampshire. The site includes a 27-acre landfill, and borders farmland, undeveloped woodlands, and wetlands to the north and west and commercial and residential properties to the east and south. In 1979, the State received complaints concerning leachate breakouts in the area and, by 1983 VOC-contamination had been identified in a domestic drinking water well. The Record of Decision (ROD) addresses source control and ground water contamination near the landfill. The selected remedial action for the site includes excavating and consolidating approximately 2,000 cubic yards of wetlands sediment and 30,000 cubic yards of solid waste and depositing the material into the landfill prior to capping; collecting and treating landfill gases using a thermal destruction process; ground water pumping and treatment using chemical precipitation for metals removal, air stripping for VOC removal, and biological treatment.

Keywords: *Hazardous materials, *Waste treatment, *Pollution control, Sites, Industrial wastes, Soils, Metals, Waste disposal, Earth fills, Drainage, Refuse, Phenols, Metals, Water wells, Water pollution, Sediments, Excavation, Activated sludge process, Activated carbon treatment, Cost estimates, *Superfund, *First Remedial Action, *Rockingham County(New Hampshire), Record of Decision, Volatile organic compounds, Wetlands.

PB91-921402/REB PC **A06**/MF **A01**
Superfund Record of Decision (EPA Region 2): Woodland Township Route 72 Site, Burlington County, New Jersey (First Remedial Action), May 16, 1990.
Environmental Protection Agency, Washington, DC. Office of Emergency and Remedial Response.
16 May 90, 102p* EPA/ROD/R02-90/101
Paper copy available on Standing Order, deposit account required (minimum deposit $150 U.S., Canada, and Mexico; all others $300). Single copies also available in paper copy or microfiche.

The 12-acre Woodland Route 72 Dump site is an abandoned hazardous waste dump in Woodland Township, Burlington County, New Jersey. The site is being remediated concurrently with another abandoned dump. Several chemical manufacturing firms dumped chemicals and other wastes into trenches and lagoons or burned the waste at the sites from the early 1950s to 1962. The primary contaminants of concern affecting the surface soil, sediment, sludge, debris, and ground water are VOCs including benzene, toluene, TCE and xylenes; organics including PAHs, pesticides, and phenols; radionuclides (e.g., uranium and thorium series); and metals including lead and chromium. The selected remedial action for the site includes excavation, further characterization, and offsite disposal at a permitted facility of 54,000 cubic yards (total from both sites) of contaminated surface soil, sludges, debris and sediment; offsite disposal of 19 cubic yards (total from both sites) of radiologically contaminated surface materials including a drum of radioactive pellets; ground water pumping and treatment with treatment to be determined during design. The total estimated present worth cost for the concurrent remedial actions at the Route 72 and Route 532 sites is $142,200,000.

Keywords: *Hazardous materials, *Waste treatment, *Pollution control, Sites, Industrial wastes, Soils, Metals, Waste disposal, Pesticides, Radioactive wastes, Lead(Metal), Excavation, Ground water, Pumping, Activated sludge process, Activated carbon treatment, Cost analysis, *Superfund, *First Remedial Action, *Woodland Township(New Jersey), Record of Decision, Dumps, Volatile organic compounds, Air stripping.

PB91-921403/REB PC **A04**/MF **A01**
Superfund Record of Decision (EPA Region 2): Radium Chemical Company Site, Woodside, Queens County, New York (First Remedial Action), Final Report, June 21, 1990.
Environmental Protection Agency, Washington, DC. Office of Emergency and Remedial Response.
21 Jun 90, 55p* EPA/ROD/R02-90/103
Paper copy available on Standing Order, deposit account required (minimum deposit $150 U.S., Canada, and Mexico; all others $300). Single copies also available in paper copy or microfiche.

The Radium Chemical site consists of a one-story brick building in a light industrial/residential section in Woodside, Queens County, New York. The Radium Chemical Company (RCC) produced luminous paint beginning in 1913 and later manufactured, leased, and sold radium226 to hospitals, medical centers and research laboratories. RCC abandoned the building without complying leaving a large number of radium-containing sealed devices, some of which were suspected of releasing radium and radon gas. Also onsite were hundreds of containers of laboratory chemicals. In 1989, a Public Health Advisory was issued for the site based on the threatened release of radium226. The selected remedial action for the site includes partial decontamination and complete dismantling of the contaminated building, followed by offsite disposal of debris as appropriate based on a contamination level; excavation and offsite disposal of contaminated soil and subsurface piping, followed by replacement of piping and backfilling with clean soil; and treatment of some radium-contaminated hazardous waste, followed by offsite disposal of treated and untreated radium-contaminated hazardous wastes in approved facilities.

Keywords: *Hazardous materials, *Waste treatment, *Pollution control, Sites, Industrial wastes, Soils, Waste disposal, Radioactive wastes, Radon, Decay, Buildings, Decontamination, Backfills, Cleaning, Removal, Cost estimates, *Superfund, *First Remedial Action, Queens County(New York), Record of Decision, Radium 226.

PB91-921404/REB PC **A04**/MF **A01**
Superfund Record of Decision (EPA Region 3): W. M. Manufacturing Superfund Site, Danville, Pennsylvania (Second Remedial Action), June 29, 1990.
Environmental Protection Agency, Washington, DC. Office of Emergency and Remedial Response.
29 Jun 90, 75p* EPA/ROD/R03-90/087
Paper copy available on Standing Order, deposit account required (minimum deposit $150 U.S., Canada, and Mexico; all others $300). Single copies also available in paper copy or microfiche.

The 15-acre M.W. Manufacturing site is a former copper recovery facility in Montour County, Pennsylvania, two miles north of Danville. The initial remedial investigation revealed several areas posing potential threats to public health: the carbon waste pile, four wire-fluff waste piles, a surface impoundment, a buried lagoon, and contaminated soil, drums and storage tanks. A 1989 remedial action addressed the concerns for direct contact with, and migration of contaminants from, the carbon waste pile by excavating the carbon waste pile and incinerating the waste offsite. The second remedial action addresses the remaining principal threats at the site by treating the onsite waste and contaminated soil. A subsequent remedial action will address possible remediation of contaminated ground water and offiete soil, sediment and surface water contamination. The primary contaminants of concern affecting the soil, debris and lagoon water are VOCs including PCE and TCE; other organics including PCBs; and metals including lead.

Keywords: *Hazardous materials, *Waste treatment, *Pollution control, Sites, Soils, Excavation, Industrial wastes, Fly ash, Incinerators, Capping, Earth fills, Waste disposal, Activated carbon treatment, Metals, Discharge(Water), Streams, Storage tanks, Containment, Stabilization, *Superfund, *Second remedial action, Record of decision, *Danville(Pennsylvania), *Volatile organic compounds.

PB91-921405/REB PC **A07**/MF **A01**
Superfund Record of Decision (EPA Region 3): Croydon TCE Site, Bucks County, Pennsylvania (Second Remedial Action), Final Report, June 29, 1990.
Environmental Protection Agency, Washington, DC. Office of Emergency and Remedial Response.
29 Jun 90, 134p* EPA/ROD/R03-90/088
Paper copy available on Standing Order, deposit account required (minimum deposit $150 U.S., Canada, and Mexico; all others $300). Single copies also available in paper copy or microfiche.

The Croydon TCE site is in Bristol Township, Bucks County, Pennsylvania. A series of studies conducted by EPA beginning in 1984 led to the detection of VOC contamination in the ground water over a 3.5-square mile area referred to as the study area. The area is composed of the Croydon residential community and several manufacturing and commercial establishments. The 1990 ROD addresses the remediation of the ground water contamination at the site. The primary contaminants of concern affecting the ground water are VOCs including TCE and 1,1-DCE. The selected remedial action for the site includes ground water pumping and onsite treatment using air stripping, followed by carbon adsorption as an ancillary treatment step before onsite discharge of the treated ground water; vapor-phased carbon adsorption treatment of air stripper exhaust, followed by offsite disposal or treatment of spent carbon and ground water monitoring. The estimated present worth cost for this remedial action is $1,345,000, which includes an estimated annual O and M cost of $46,709 for 45 years.

Keywords: *Hazardous materials, *Waste treatment, *Pollution control, Sites, Industrial wastes, Soils, Ground water, Waste disposal, Vinyl chloride, Pumping, Absorption, Vapors, Exhaust gases, Cost estimates, Plumes, *Superfund, *Second Remedial Action, Bucks County(Pennsylvania), Record of Decision, *Volatile organic compounds, Air stripping.

PB91-921406/REB PC **A05**/MF **A01**
Superfund Record of Decision (EPA Region 3): Walsh Landfill Site, Chester County, Pennsylvania (First Remedial Action), June 29, 1990.
Environmental Protection Agency, Washington, DC. Office of Emergency and Remedial Response.
29 Jun 90, 82p* EPA/ROD/R03-90/089

Paper copy available on Standing Order, deposit account required (minimum deposit $150 U.S., Canada, and Mexico; all others $300). Single copies also available in paper copy or microfiche.

The 7-acre Walsh Landfill site encompasses an approximately 1.5-acre landfill and surrounding area in a heavily wooded region of Honeybrook Township, Chester County, Pennsylvania. The landfill reportedly received mixed municipal and industrial wastes for disposal between 1963 and 1976; although State investigations in 1979 revealed that disposal of hazardous waste at the site had resumed after that period. The primary contaminants of concern affecting soil, sediment, and ground water are VOCs including benzene, PCE, and TCE; other organics including PAHs; and metals including arsenic and lead. The selected remedial action for the site includes removal of bulky items and debris from the landfill surface for resource recovery, followed by construction of an approximately 5.2-acre landfill cap; provision of an alternate water supply to approximately 50 residences by extending the municipal water system; ground water monitoring; and implementation of site access restrictions and institutional controls, including land use, ground water use, and deed restrictions.

Keywords: *Hazardous materials, *Waste treatment, *Pollution control, Sites, Industrial wastes, Soils, Metals, Solid waste disposal, Arsenic, Benzene, Capping, Earth fills, Containers, Solvents, Monitoring, Water supply, Land use, Regulations, Cost analysis, *Superfund, *First Remedial Action, *Chester County(Pennsylvania), Record of Decision, Volatile organic compounds, Cleanup.

PB91-921407/REB PC **A05**/MF **A01**
Superfund Record of Decision (EPA Region 3): Lord-Shope Landfill Site, Erie County, Pennsylvania (First Remedial Action), Final Report, June 29, 1990.
Environmental Protection Agency, Washington, DC. Office of Emergency and Remedial Response.
29 Jun 90, 99p* EPA/ROD/R03-90/090
Paper copy available on Standing Order, deposit account required (minimum deposit $150 U.S., Canada, and Mexico; all others $300). Single copies also available in paper copy or microfiche.

The 25-acre Lord-Shope Landfill site is an inactive hazardous waste landfill in Girard Township, Erie County, northwestern Pennsylvania. The site consists of a 4-acre landfill and adjacent areas of contaminated soil, surface water and ground water. The primary contaminants of concern affecting the landfill material, surrounding soil, and ground water are VOCs including benzene, PCE, and TCE; and metals including arsenic, chromium, and lead. The selected remedial action for the site includes in-situ vapor stripping using vacuum wells to volatize and remove VOCs from the landfill material and the surrounding soil; collection and treatment of gas emissions generated by the vapor stripping process using carbon filtration; ground water pumping and treatment including pretreatment for metal removal, followed by air stripping, to halt plume migration, with final discharge of treated ground water into the nearby surface tributaries; implementation of site access restrictions and institutional controls including ground water use restrictions. The estimated present worth cost for the remedial action is $5,760,000, which includes an annual O and M cost of $420,000 for years 1 - 2 and $310,000 for years 3 - 50.

Keywords: *Hazardous materials, *Waste treatment, *Pollution control, Sites, Industrial wastes, Soils, Metals, Waste disposal, Earth fills, Strippers, Activated carbon treatment, Filtration, Regulations, Cost estimates, Ground water, Surface waters, Cost analysis, *Superfund, *First remedial action, *Girard Township(Pennsylvania), Record of decision, Volatile organic compounds, Air stripping, Leachate.

PB91-921408/REB PC **A04**/MF **A01**
Superfund Record of Decision (EPA Region 3): Army Creek Landfill Site, New Castle, Delaware (Second Remedial Action), Final Report, June 29, 1990.
Environmental Protection Agency, Washington, DC. Office of Emergency and Remedial Response.
29 Jun 90, 64p* EPA/ROD/R03-90/091
Paper copy available on Standing Order, deposit account required (minimum deposit $150 U.S., Canada, and Mexico; all others $300). Single copies also available in paper copy or microfiche.

The Army Creek Landfill site, a former sand and gravel quarry, is approximately two miles southwest of New Castle, Delaware. The site abuts Army Creek/Pond and high quality wetlands to the south and east and lies adjacent to Delaware Sand and Gravel Landfill, another Superfund site. From 1960 to 1968, when the landfill reached capacity and closed. A 1986 Record of Decision (ROD) provided for capping of the landfill and for the continued operation of the recovery well network to maintain the ground water divide. The extracted ground water currently discharged into Army Creek Pond untreated. The selected remedial action for the site includes ground water pumping using the recovery well network and treatment using a modified conventional precipitation water treatment plant which involves aeration, precipitation, sedimentation, and filtration followed by onsite discharge of the effluent to Army Creek/Pond; sampling and disposal of sludge generated during the treatment process; and monitoring of the sediment, recovered ground water, surface water, and wetlands. The estimated present worth cost for the remedial action is $4,900,000 which includes an annual O and M cost of $294,000.

Keywords: *Hazardous materials, *Waste treatment, *Pollution control, Sites, Industrial wastes, Soils, Metals, Waste disposal, Earth fills, Army Creek Pond, Ground water, Pumping, Water wells, Aeration, Sedimentation, Filtration, Monitoring, Cost analysis, Sludge disposal, *Superfund, *Second remedial action, *New Castle(Delaware), Record of decision, Wetlands.

PB91-921409/REB PC **A05**/MF **A01**
Superfund Record of Decision (EPA Region 8): Whitewood Creek Site, Lawrence, Meade, and Butte Counties, South Dakota (First Remedial Action), Final Report, March 30, 1990.
Environmental Protection Agency, Washington, DC. Office of Emergency and Remedial Response.
30 Mar 90, 81p* EPA/ROD/R08-90/028
Paper copy available on Standing Order, deposit account required (minimum deposit $150 U.S., Canada, and Mexico; all others $300). Single copies also available in paper copy or microfiche.

The Whitewood Creek site is a mine tailings deposit area near the town of Whitewood in Lawrence, Mead, and Butte counties, South Dakota. From 1877 to 1977, arsenic-rich tailings from gold and ore mining and milling operations, conducted by the Homestake Mining Company, were discharged directly into Whitewood Creek. Residential soil contains arsenic contamination as a result of a building in the tailings area. The selected remedial action for the site includes removing and/or covering frequently used areas with clean surface soil (arsenic <20 mg/kg) in residential areas with arsenic levels above 100 mg/kg followed by disposal of the arsenic-contaminated soil, if approved by EPA, and revegetation of the remediated area; soil sampling at all remediated areas to confirm that arsenic levels are below 100 mg/kg. EPA is invoking ARAR waivers based on the technical impracticability of remediating contaminated ground and surface waters. The estimated present worth cost for the remedial action is $882,813, which includes an annual O and M cost of $12,000 for years 1-5 and $6,000 for years 6-30.

Keywords: *Hazardous materials, *Waste treatment, *Pollution control, Sites, Industrial wastes, Soils, Metals, Waste disposal, Whitewood Creek, Tailings, Arsenic, Removal, Sampling, Coverings, Concentration(Composition), Cost analysis, Standards, *Superfund, *First Remedial Action, *Lawrence County(Minnesota), Record of Decision, Land pollution, Revegetation.

PB91-921410/REB PC **A06**/MF **A01**
Superfund Record of Decision (EPA Region 5): Onalaska Municipal Landfill Site, Lacrosse County, Wisconsin (First Remedial Action), Final Report, August 14, 1990.
Environmental Protection Agency, Washington, DC. Office of Emergency and Remedial Response.
14 Aug 90, 110p* EPA/ROD/R05-90/125
Paper copy available on Standing Order, deposit account required (minimum deposit $150 U.S., Canada, and Mexico; all others $300). Single copies also available in paper copy or microfiche.

The 11-acre Onalaska Municipal Landfill site includes a 7-acre landfill owned by the Township of Onalaska, which is located in central-western Wisconsin. The Black River and its associated wetlands are 400 feet west of the site and lie within a wildlife and fish refuge. Approximately 320,000 gallons of liquid solvent waste and approximately 1,000 drums of solvent waste were either burned with other trash onsite or poured directly into holes for burial in the southwestern portion of the landfill. The primary contaminants of concern affecting the soil and ground water are VOCs, including benzene, toluene, xylenes, and TCE; other organics including PAHs; and metals including arsenic and lead. The selected remedial action for the site includes insitu bioremediation of the solvent-contaminated soil and, if feasible, a portion of the landfill debris; pumping and treatment of the ground water plume using aeration, clarification, and filtration, followed by discharge of the treated ground water into the Black River and onsite disposal of the sludge.

Keywords: *Hazardous materials, *Waste treatment, *Pollution control, Sites, Industrial wastes, Soils, Metals, Waste disposal, Earth fills, Solvents, Lead(Metal), Refuse, Ground water, Water pollution control, Activated sludge process, Pumping, Aeration, Capping, Methane, Cost analysis, *Superfund, *First Remedial Action, *Lacrosse County(Wisconsin), Record of Decision, Volatile organic compounds.

PB91-921411/REB PC **A03**/MF **A01**
Superfund Record of Decision (EPA Region 9): Watkins-Johnson (Stewart Division), Scotts Valley, California (First Remedial Action), Final Report, June 29, 1990.
Environmental Protection Agency, Washington, DC. Office of Emergency and Remedial Response.
29 Jun 90, 31p* EPA/ROD/R09-90/046
Paper copy available on Standing Order, deposit account required (minimum deposit $150 U.S., Canada, and Mexico; all others $300). Single copies also available in paper copy or microfiche.

The Watkins-Johnson site is an active research and development, manufacturing, and industrial complex in Santa Cruz County, five miles north of Santa Cruz, California. The Watkins-Johnson Company has owned and operated the complex since 1963, conducting such activities as: metal machining, degreasing, metal plating, and photo laboratory activities. During these activities, a variety of organics, inorganics and metals were used. The primary contaminants of concern affecting the soil and ground water are VOCs including PCE and TCE, and metals including silver. The selected remedial action for the site includes soil vapor (vacuum) extraction with pretreatment of extracted vapors using GAC prior to ambient discharge; capping and grading contaminated soil areas to minimize the potential for mobilization of soil contaminants to the ground water; installing infiltration leachfields to prevent offsite migration of ground water contaminants in the perched zone; installing gravity drains to transfer the contaminated ground water from the perched zone to the regional aquifer zone for subsequent extraction; ground water pumping and onsite treatment to remove contamination from both the perched and regional zones using GAC adsorption with offsite regeneration of spent carbon. The estimated present worth cost for this remedial action is $2,156,243, which includes an estimated annual O and M cost of $167,820.

Keywords: *Hazardous materials, *Waste treatment, *Pollution control, Sites, Industrial wastes, Soils, Metals, Waste disposal, Ground water, Silver, Vacuum apparatus, Separation, Drains, Capping, Extraction, Activated carbon treatment, Pumping, Cost analysis, Water pollution control, Aquifers, *Superfund, *First Remedial Action, *Santa Cruz County(California), Record of Decision, Volatile organic compounds.

PB91-921412/REB PC **A03**/MF **A01**
Superfund Record of Decision (EPA Region 5): Rose Township, Oakland County, Michigan. (First Remedial Action), September 18, 1989. Final rept.
Environmental Protection Agency, Washington, DC. Office of Emergency and Remedial Response.
18 Jan 89, 35p
Paper copy available on Standing Order, deposit account required (minimum deposit $150 U.S., Canada, and Mexico; all others $300). Single copies also available in paper copy or microfiche.

The Rose Township site is in rural Rose Township, Oakland County, Michigan. The 110-acre site comprises an upland area almost completely surrounded by wetlands, with an abundance of wildlife onsite. Testing between 1980 and 1987 indicated the presence of organic chemical contamination in soil and

ground water. The Record of Decision (ROD) amends a September 30, 1987 ROD that addressed the remediation of onsite soil contamination using thermal destruction. EPA has determined that incineration of surface soil will remove most of the insoluble contaminants present, and the Agency has determined that in-situ soil washing or soil flushing should be tested as a viable option to thermal destruction of subsurface soil contamination. The primary contaminants of concern affecting soil and ground water are VOCs including benzene; other organics including PCBs and PAHs; and metals including arsenic and lead. The selected remedial action for the amendment is included.

Keywords: *Superfund, *Remedial action, *Waste disposal, *Soil contamination, Wetlands, Land pollution, Water pollution control, Ground water, Performance standards, Incineration, On-site investigations, Cost analysis, Volatile organic compounds, Metals, Polychlorinated biphenyls, Aromatic polycyclic hydrocarbons, Drums(Containers), *Cleanup operation, *Record of Decision, Soil flushing, Oakland County(Michigan).

PB91-921413/REB PC **A05**/MF **A01**
Superfund Record of Decision (EPA Region 1): Tinkham's Garage Site, Londonderry, New Hampshire. (First Remedial Action), March 10, 1989.
Environmental Protection Agency, Washington, DC. Office of Emergency and Remedial Response.
10 Mar 89, 90p
Paper copy available on Standing Order, deposit account required (minimum deposit $150 U.S., Canada, and Mexico; all others $300). Single copies also available in paper copy or microfiche.

The Tinkham's Garage site includes 375 acres of residential and undeveloped land in Londonderry, New Hampshire. EPA site investigations in 1981 revealed onsite soil and ground water contaminated with VOCs resulting from onsite surface dumping of liquids and sludge in 1978 and 1979. The major contaminated soil area is in a field behind Tinkham's Garage. The first remedial action selected for the site was documented in a 1986 Record of Decision (ROD), which included excavation of approximately 10,800 cubic yards of contaminated soil with onsite treatment using either thermal aeration, composting or soil washing. Local wetlands impacted by soil excavating activities and contaminated ground water were also to be remediated. Information generated during a pre-design study led EPA in 1988 to propose the amendment to the 1986 ROD. As a result of the pre-design study findings, the remedial action selected in the 1986 ROD was never implemented. The primary contaminants of concern affecting the soil and ground water are VOCs including TCE and PCE. The selected remedial action for the site is included.

Keywords: *Superfund, *Remedial action, *Waste disposal, *Soil contamination, On-site investigation, Volatile organic compounds, Ground water, Water pollution, Soil treatment, Ethylene/trichloro, Tetrachloroethylene, Wetlands, *Record of Decision, Londonderry(New Hampshire).

PB91-921414/REB PC **A04**/MF **A01**
Superfund Record of Decision (EPA Region 10): Teledyne Wah Chang, Albany, OR. (First Remedial Action), December 1989.
Environmental Protection Agency, Washington, DC. Office of Emergency and Remedial Response.
28 Dec 89, 60p* EPA/ROD/R10-90/021
Portions of this document are not fully legible.
Paper copy available on Standing Order, deposit account required (minimum deposit $150 U.S., Canada, and Mexico; all others $300). Single copies also available in paper copy or microfiche.

The Teledyne Wah Chang (TWC) site, in Millersburg, Oregon, is an active plant used to produce nonferrous metals and products. The site consists of a 110-acre plant site, which contains the plant's former sludge ponds, and a 115-acre farm site, which contains four active wastewater sludge ponds. Portions of the TWC site are within the Willamette River's 100- and 500-year floodplain. The Wah Chang Corporation began operating a U.S. Bureau of Mines zirconium metal sponge pilot plant under contract with the U.S. Atomic Energy Commission in 1956. Additional facilities were subsequently built near the plant beginning in 1957 to produce nonferrous metals and products. The Lower River Solids Pond (LRSP) and Schmidt Lake sludge pond, which stored wastewater generated from the plant operations, are being addressed by this remedial action. The sludge in both the LRSP and Schmidt Lake contains heavy metals, organic compounds, and trace levels of radionuclides. The selected remedial action for the site includes excavation of 85,000 cubic yards of sludge with partial solidification of the sludge, followed by offsite disposal in a permitted solid waste landfill.

Keywords: *Hazardous materials, *Pollution control, *Sludge disposal, Sites, Industrial wastes, Organic compounds, Radioactive wastes, Volume, Schmidt Lake, Design, Ground water, Earth fills, Excavation, Solidification, Sludge, Cost analysis, *Superfund, First remedial action, *Millersburg(Oregon), Record of Decision, Heavy metals, *Cleanup.

PB91-921415/REB PC **A15**/MF **A02**
Superfund Record of Decision (EPA Region 9): Coast Wood Preserving, Inc., Ukiah, CA. (First Remedial Action, September 1989). Final rept.
Environmental Protection Agency, Washington, DC. Office of Emergency and Remedial Response.
29 Sep 89, 349p EPA/ROD/R09-89/038
Portions of this document are not fully legible.
Paper copy available on Standing Order, deposit account required (minimum deposit $150 U.S., Canada, and Mexico; all others $300). Single copies also available in paper copy or microfiche.

The 8-acre Coast Wood Preserving (CWP) site is an active wood preserving facility in a rural, agricultural area three miles south of Ukiah, California. Wood preserving operations began at the site in 1971, and since then near-surface soil contamination has occurred primarily as the result of drippings. Investigations by CWP beginning in the early 1970s revealed elevated chromium and arsenic concentrations in near-surface soil and elevated chromium concentrations in ground water particularly near the main treatment and storage areas. In addition, offsite migration of chromium has occurred via ground water. A number of measures have been implemented by CWP to improve overall site conditions. Interim remedial measures were conducted in 1983 to intercept and limit migration of chromium in ground water. The primary contaminants of concern for soil and ground water are metals including arsenic and chromium. The selected remedial action for the site includes paving exposed soil; onsite treatment of soil after site closure in 10 years using the best available technology at the time; plume control and aquifer remediation via ground water pumping and reuse in CWP's operations to the extent possible or electrochemical treatment of excess ground water which cannot be recycled followed by discharge to the Ukiah Sewage Treatment Plant and/or reinjection; ground water monitoring; and development of a contingency plan for offsite ground water remediation if needed.

Keywords: *Environmental transport, Contamination, Soils, Chromium, Arsenic, Ground water, Planning, Water treatment, Environment protection, Land reclamation, California, *Superfund, Record of Decision, Coast Wood Preserving Incorporated, Remedial actions, Ukiah(California).

AD-A235 140/1/REB PC **A03**/MF **A01**
Air Force Office of Scientific Research, Bolling AFB, DC.
Potentiation of 2,6-Dinitrotoluene Genotoxicity in Fischer 344 Rats by Pretreatment with Pentachlorophenol.
Environmental Protection Agency, Research Triangle Park, NC.
R. W. Chadwick, S. E. George, J. Chang, M. J. Kohan, and J. P. Dekker. 1991, 15p AFOSR-TR-91-0433, Grant AFOSR-ISSA-90-0029
Availability: Pub. in Pesticide Biochemistry and Physiology, v39 p168-181 1991. Available only to DTIC users. No copies furnished by NTIS.

The organochlorine pesticide, pentachlorophenol, a potent sulfotransferase inhibitor, reportedly reduces the binding of 2,6-dinitrotoluene, an industrial hepatocarcinogen to hepatic DNA by 95% after a single i.p. injection. Activation of 2,6-dinitrotoluene to genotoxic metabolites involves enzymes in both the liver and the intestinal flora. Since pentachlorophenol also has bactericidal activity and induces hepatic mixed function oxidase activity after longer treatment, the effect of pentachlorophenol on intestinal enzyme activity and the biotransformation of 2,6-dinitrotoluene to genotoxic metabolites was studied after 1, 2, 4, and 5 weeks of treatment. Male Fischer 344 rats were dosed daily, by gavage, with either 20 mg/kg pentachlorophenol or the peanut oil vehicle. After 1, 2, 4, and 5 weeks, select control and treated animals were injected p.o. with 75 mg/kg 2,6-dinitrotoluene and transferred to metabolism cages, where urine was collected for 24 hr and tested for mutagenic activity by the Ames Salmonella typhimurium reversion assay.

Keywords: Animals, Chlorine, Enteric bacteria, Germicides, Intestines, Liver, Metabolites, Mutagens, Organic compounds, Peanut oil, Pesticides, Urine, Vehicles, *Organochlorine insecticides, *Dinitrotoluenes, *Pentachlorophenol, Carcinogens, Mixed function oxidases, *Mutagens.

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KEYWORD INDEX

Index entries in this section are selected to indicate important ideas and concepts presented in a report. When using the keyword index, be sure to look under terms narrower, broader, or related to a particular topic. Although some of the keywords are not selected from a controlled vocabulary of terms, most of them have been selected from the DoD, DoE, NASA, or NTIS controlled vocabularies. The entries are arranged by keyword and then by the NTIS order number.

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SAMPLE ENTRY

Contract or Grant Number	**EPA-68-01-2281**
Performing Organization	Clemson Univ., SC, Dept. of Environmental Systems Engineering
NTIS Order Number/Media Code Price Code	PB85-169597 PC A02/MF A01

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SAMPLE ENTRY

Performing Organization Report number(s)	**EPA/600/D-85/036**
Title	PAH (Polycyclic Aromatic Hydrocarbons) Uptake by Plants: Methodology and Initial Investigations.
NTIS Order Number/Media Code Price Codes	PB85-169597/REB PC A02/MF A01
NTIS Order Number	**PB85-169597/REB**
Title	PAH (Polycyclic Aromatic Hydrocarbons) Uptake by Plants: Methodology and Initial Investigations.
NTIS Order Number/Media Code Price Codes	PB85-169597/REB PC A02/MF A01
Sponsoring Organization Report Number(s)	EPA, Environmental Research Lab Athens, GA **EPA/600/D-85/036**
Title	PAH (Polycyclic Aromatic Hydrocarbons) Uptake by Plants: Methodology and Initial Investigations.
NTIS Order Number/Media Code Price Codes	PB85-169597/REB PC A02/MF A01

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CONTRIB-A6023
Interaction of Elevated Ultraviolet-B Radiation and CO2 on Productivity and Photosynthetic Characteristics in Wheat, Rice, and Soybean.
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PB91-921401/REB PC **A12**/MF **A02**

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PB91-921402/REB PC **A06**/MF **A01**

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PB91-921403/REB PC **A04**/MF **A01**

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PB91-921404/REB PC **A04**/MF **A01**

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PB91-921405/REB PC **A07**/MF **A01**

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PB91-921406/REB PC **A05**/MF **A01**

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Spatio-Temporal Fluctuations in the Distribution and Abundance of Demersal Fish and Epibenthic Crustaceans in Yaquina Bay, Oregon.
PB91-183228/REB PC **A03**/MF **A01**

EPA/600/J-90/468
Significance of the Surface Microlayer to the Environmental Fate of Di(2-ethylhexyl)phthalate Predicted from Marine Microcosms.
PB91-183210/REB PC **A03**/MF **A01**

EPA/600/J-90/469
Water Relations of Differentially Irrigated Cotton Exposed to Ozone.
PB91-183202/REB PC **A02**/MF **A01**

EPA/600/J-90/470
Design Stream Flows Based on Harmonic Means.
PB91-182204/REB PC **A02**/MF **A01**

EPA/600/J-90/471
Survival and Degradative Capacity of 'Pseudomonas putida' Induced or Constitutively Expressing Plasmid-Mediated Degradation of 2,4-Dichlorophenoxyacetate (TFD) in Soil.
PB91-182196/REB PC **A02**/MF **A01**

EPA/600/J-90/472
Gas Exchange in 'Quercus rubra' (Northern Red Oak) during a Drought: Analysis of Relations among Photosynthesis Transpiration, and Leaf Conductance.
PB91-182188/REB PC **A03**/MF **A01**

EPA/600/J-90/473
Effects of Parameter Uncertainty on Long-Term Simulations of Lake Alkalinity.
PB91-182170/REB PC **A03**/MF **A01**

EPA/600/J-90/474
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PB91-182162/REB PC **A02**/MF **A01**

EPA/600/J-90/475
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PB91-182154/REB PC **A02**/MF **A01**

EPA/600/J-90/476
Inertial Impaction and Gravitational Deposition of Aerosols in Curved Tubes and Airway Bifurcations.
PB91-182147/REB PC **A03**/MF **A01**

EPA/600/J-90/477
Coupled Mass and Energy Transport Phenomena in Aerosol/Vapor-Laden Gases-1. Theory of the Hygroscopic Aerosol Effects on Temperature and Relative Humidity Patterns of Inspired Air.
PB91-182139/REB PC **A03**/MF **A01**

EPA/600/J-90/478
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PB91-182121/REB PC **A03**/MF **A01**

EPA/600/J-90/479
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PB91-182113/REB PC **A02**/MF **A01**

EPA/600/J-90/480
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PB91-191411/REB PC **A03**/MF **A01**

EPA/600/J-90/481
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PB91-191429/REB PC **A02**/MF **A01**

EPA/600/J-90/482
EPA's Control Technology Approach to Assisting States and Regions with Air Toxics Problems: Five Case Studies.
PB91-191437/REB PC **A03**/MF **A01**

EPA/600/J-90/483
Bench-Scale Evaluation of Calcium Sorbents for Acid Gas Emission Control.
PB91-191445/REB PC **A02**/MF **A01**

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PB91-191452/REB PC **A03**/MF **A01**

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PB91-191478/REB PC **A02**/MF **A01**

EPA/600/J-90/487
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PB91-191486/REB PC **A02**/MF **A01**

EPA/600/J-90/488
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PB91-196279/REB PC **A02**/MF **A01**

EPA/600/J-90/489
Effects of UV-B Radiation on Soybean Yield and Seed Quality: A Six-Year Field Study.
PB91-196287/REB PC **A02**/MF **A01**

EPA/600/J-90/490
Field Study of the Interaction between Solar Ultraviolet-B Radiation and Drought on Photosynthesis and Growth in Soybean.
PB91-196295/REB PC **A02**/MF **A01**

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PB91-196303/REB PC **A03**/MF **A01**

EPA/600/J-90/492
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PB91-196337/REB PC **A02**/MF **A01**

EPA/600/J-90/495
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PB91-196345/REB PC **A02**/MF **A01**

EPA/600/J-90/496
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PB91-196352/REB PC **A03**/MF **A01**

EPA/600/J-90/497
Determination of Total Organic Halide in Water: A Comparative Study of Two Instruments.
PB91-196360/REB PC **A02**/MF **A01**

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PB91-196394/REB PC **A02**/MF **A01**

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PB91-196402/REB PC **A02**/MF **A01**

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PB91-196410/REB PC **A02**/MF **A01**

EPA/600/J-90/504
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PB91-199901/REB PC **A03**/MF **A01**

EPA/600/J-90/505
Development of Surrogate Lung Systems with Controlled Thermodynamic Environments to Study Hygroscopic Particles: Air Pollutants and Pharmacologic Drugs.
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PB91-199950/REB PC **A02**/MF **A01**

EPA/600/J-90/510
Identification of Organic N-Chloramines In vitro in Stomach Fluid from the Rat After Chlorination.
PB91-199968/REB PC **A02**/MF **A01**

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Transduction of Linked Chromosomal Genes between 'Pseudomonas aeruginosa' Strains during Incubation In situ in a Freshwater Habitat.
PB91-199976/REB PC **A02**/MF **A01**

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Risks of Toxic Contaminants to Exploited Fish Populations: Influence of Life History, Data Uncertainty and Exploitation Intensity.
PB91-199984/REB PC **A03**/MF **A01**

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PB91-206920/REB PC **A02**/MF **A01**

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PB91-183517/REB PC **A02**/MF **A01**

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Murine Susceptibility to Organophosphorus-Induced Delayed Neuropathy (OPIDN).
PB91-183491/REB PC **A03**/MF **A01**

EPA/600/J-91/018
Functional Deficits Produced by 3-Methylindole-Induced Olfactory Mucosal Damage Revealed by a Simple Olfactory Learning Task.
PB91-183483/REB PC **A03**/MF **A01**

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PB91-183467/REB PC **A02**/MF **A01**

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PB91-183434/REB PC **A02**/MF **A01**

EPA/600/J-91/024
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PB91-183418/REB PC **A03**/MF **A01**

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Particle Transmission Characteristics of an Annular Denuder Ambient Sampling System.
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Particulate Characteristics and Visual Effects of the Atmosphere at Research Triangle Park.
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PB91-182253/REB PC **A03**/MF **A01**

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PB91-182246/REB PC **A03**/MF **A01**

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Comparative Analysis of Health Risk Assessments for Municipal Waste Combustors.
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PB91-182212/REB PC **A03**/MF **A01**

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PB91-191502/REB PC **A03**/MF **A01**

EPA/600/J-91/044
Hypothermic Effects of a Homologous Series of Short-Chain Alcohols in Rats.
PB91-191510/REB PC **A03**/MF **A01**

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Toxic-Induced Hypothermia and Hypometabolism: Do They Increase Uncertainty in the Extrapolation of Toxicological Data from Experimental Animals to Humans.
PB91-191528/REB PC **A02**/MF **A01**

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PB91-191536/REB PC **A03**/MF **A01**

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PB91-191551/REB PC **A03**/MF **A01**

EPA/600/J-91/049
In vitro/In vivo Effects of Ethane Dimethanesulfonate on Leydig Cells of Adult Rats.
PB91-191569/REB PC **A03**/MF **A01**

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Rat Flash-Evoked Potential Peak N160 Amplitude: Modulation by Relative Flash Intensity.
PB91-191577/REB PC **A03**/MF **A01**

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Carcinogenicity of Dichloroacetic Acid in the Male B6C3F1 Mouse.
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EPA/600/J-91/053
Thermostability of Sperm Nuclei Assessed by Microinjection into Hamster Oocytes.
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Glutamate Neurotoxicity in Rat Auditory System: Cochlear Nuclear Complex.
PB91-191619/REB PC **A02**/MF **A01**

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Structure-Activity Study of Paracetamol Analogues: Inhibition of Replicative DNA Synthesis in V79 Chinese Hamster Cells.
PB91-191627/REB PC **A02**/MF **A01**

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Aerosol Therapy Implications of Particle Deposition Patterns in Simulated Human Airways.
PB91-191635/REB PC **A03**/MF **A01**

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PB91-191643/REB PC **A02**/MF **A01**

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PB91-191668/REB PC **A03**/MF **A01**

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Emissions of Metals and Organics from Municipal Wastewater Sludge Incinerators, 1991.
PB91-196451/REB PC **A03**/MF **A01**

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PB91-196618/REB PC **A03**/MF **A01**

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PB91-200261/REB PC **A03**/MF **A01**

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